

## STRATEGY SELECTION FOR DIGITAL COMPANIES WITH AHP-VIKOR TECHNIQUES

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### Abstract

One of the most significant trends in the past decades is digitalization. Digitalization aims to improve operational efficiency, create new customer experience and generate new revenue streams while keeping pace with the changing conditions. Digitalization has a major impact on the way companies conduct their business and affects strategy development of companies. Therefore, the aim of this paper is to introduce a practical model for companies to help developing their digitalization strategy by providing an analytical approach. Since the strategy selection is a crucial decision, companies attach great importance to this issue. There is a number of factors to be taken into account while choosing the right digitalization strategy. Therefore, in this paper, Multi-Criteria Decision Making (MCDM) approach is introduced. Analytic Hierarchy Process (AHP) method is applied to find the success factors' weight and the VIKOR (which stands for 'VlseKriterijumska Optimizacija I Kompromisno Resenje,' meaning multi-criteria optimization and compromise solution) method is applied to select the right strategy. In order to prove the robustness of the method, the proposed methodology is applied to a company and the results of the study is given. The success factors and strategy models are developed based on structured review of industry reports and academic papers. After analysis of the digitalization strategies, four strategy models based on Deloitte's report are presented. The strategy models are indicated as: the tactical model, the centralization model, the champion model and the business as usual model. Finally, the future perspectives of the study are presented.

**Keywords:** Digitalization, digital company, digitalization strategy, multi-criteria decision making (MCDM), strategy selection.

### DİJİTAL ŞİRKETLER İÇİN AHP-VIKOR TEKNİKLERİYLE STRATEJİ SEÇİMİ

#### Özet

Son yılların en önemli trendlerinden biri dijitalleşmedir. Dijitalleşme, değişen koşullara ayak uydururken operasyonel etkinliği arttırmayı, yeni müşteri deneyimleri yaratmayı ve yeni gelir kaynakları oluşturmayı hedeflemektedir. Dijitalleşmenin şirketlerin işlerini yürütme şekilleri üzerinde büyük bir etkisi vardır ve dijitalleşme şirketlerin strateji geliştirme süreçlerini etkilemektedir. Bu nedenle, bu çalışmanın amacı, şirketler için analitik bir yaklaşım sağlayarak dijitalleşme stratejilerini geliştirmeye yardımcı olacak pratik bir modeli tanıtmaktır. Strateji seçimi kritik bir karar olduğundan, şirketler bu konuya büyük önem vermektedir. Uygun dijitalleşme stratejisini seçerken şirketlerin dikkate alması gereken birçok faktör vardır. Bu nedenle, bu çalışmada, Çok Kriterli Karar Verme (ÇKKV) yaklaşımı uygulanmıştır. Başarı faktörlerinin ağırlığını bulmak için Analitik Hiyerarşi Süreci (AHS) yöntemi uygulanmıştır ve doğru stratejiyi seçmek için VIKOR (çok kriterli optimizasyon ve uzlaşma çözümü anlamına gelen VlseKriterijumska Optimizacija I Kompromisno Resenje) yöntemi uygulanmıştır. Metodun sağlamlığını kanıtlamak için önerilen metodoloji bir şirkete uygulanmış ve çalışma sonuçları verilmiştir. Çalışmada kullanılan başarı faktörleri ve strateji modelleri, endüstri raporlarının ve akademik yayınların incelenmesiyle geliştirilmiştir. Dijitalleşme stratejilerinin analizinden sonra Deloitte'in raporu baz alınarak dört strateji modeli sunulmuştur. Bu strateji modelleri şu şekildedir: taktik model, merkezileştirme modeli, şampiyon model ve her zamanki gibi iş modelidir. Son olarak, gelecek çalışmaların perspektifleri sunulmuştur.

**Anahtar Kelimeler:** Dijitalleşme, dijital şirket, dijitalleşme stratejisi, çok kriterli karar verme (ÇKKV), strateji seçimi.

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## Introduction

Over the past years, digitalization's impact on the economy and society has increased significantly. Potential impacts of digitalization on business are relevant to job content, profiles and professions. From an economic point of view, digital technologies are expected to create new revenue streams. However, when we consider social impacts, there is a perception that digital technologies will take place of existing jobs (URL1). The acceptance of digitalization by the society is very crucial for adapting the concept of digitalization. In the same way, companies should positively perceive the changes that digitalization brings about the way they do their business. As a result, companies' business conducting styles are developing very quickly and it is essential to adapt the expected and unexpected changes to be successful. These changes affects strategy development of companies. To keep pace with this rapid change, the only possible way is choosing the right strategy.

Therefore, the purpose of this paper is to propose a digitalization evaluation model for helping companies to develop strategy by using analytical techniques. The model of the paper consists of 2 phases. In the first phase, the success factors, which have influences on digitalization of companies are identified. In the second phase, the possible digitalization strategies are determined. After conducting a detailed literature review of digitalization strategies, four strategy models based on Deloitte's report are presented (URL2). The strategy models are presented as: the tactical model, the centralization model, the champion model and the Business as Usual (BAU) model.

Choosing the right digital strategy depends on various factors. For this reason, in this paper, Multi-Criteria Decision Making (MCDM) approach is used. Analytic Hierarchy Process (AHP) method is applied to find the success factors' weights and the VIKOR (which stands for 'VlseKriterijumska Optimizacija I Kompromisno Resenje,' meaning multi-criteria optimization and compromise solution) method is used to select the most appropriate strategy.

The plan of the work is as follows; after introducing the paper's subject and its purpose, the second section presents the studies related to this topic in the literature. In the third chapter, the evaluation model is introduced by proposing success factors affecting digitalization and digital strategy models. In the fourth chapter, the research methodology is explained. In the fifth chapter, a numerical application is implemented. In the last part, the results of the study and the perspectives for future studies are given.

### 1. Literature Survey

Gil-Garcia and Pardo (2005) investigated e-government area and proposed critical success factors for digitalization of governments. Dubelaar et al. (2005) studied critical success factors for e-business solutions. Biehl (2007) investigated the success factors of IT project implementation. Al-Debei et al. (2008) identified four business models for the concept of digitalization.

Furthermore, Grover and Kohli (2012) presented a digital strategy system framework based on visibility and value. Lerner (2015) studied a successful business strategy within the digitalization process.

Additionally, Bharadwaj et al. (2013) determined the key themes on digital strategy development and proposed a framework. Bleicher and Stanley (2016) proposed a framework to analyze the potential of digital strategy development for companies. Holotiuk and Beimborn (2017) built up a digital strategy

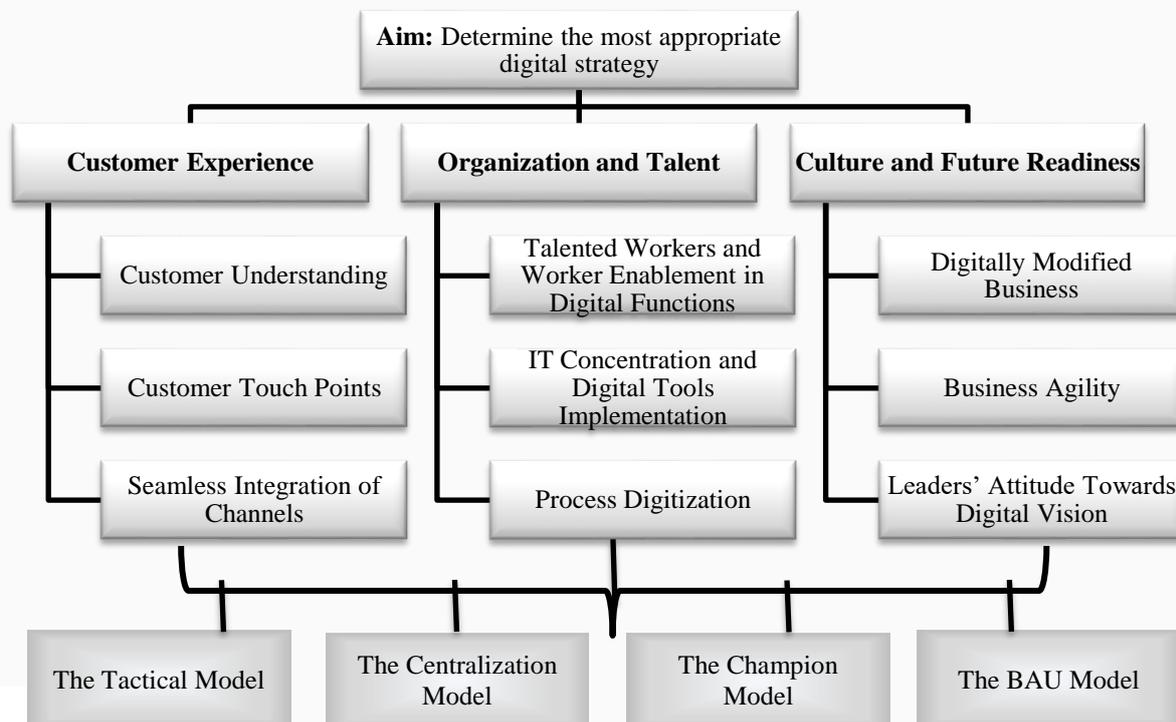
framework by reviewing industry reports. Hyvönen (2018) investigated strategic leading of digitalization in Nordic companies in his master’s thesis.

According to the related literature, there are not many studies about digitalization and MCDM tools together. Yeh (2017) used integrated Analytic Network Process (ANP) method and Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method to evaluate digital content development strategies. Moreover, there is a literature gap for those studies implementing digital strategy selection subject with MCDM techniques. For this reason, this is the first paper which highlights strategy selection for digital companies by combining AHP and VIKOR methods.

## 2. Evaluation Model Proposition

The evaluation model of the study is composed of 2 phases. In the first phase, the success factors who affects digitalization of companies are determined and evaluated by using AHP method. In the second phase, the digitalization strategies are determined and evaluated by using VIKOR method to select the most appropriate strategy. The overview of the study is provided in Figure 1. The further explanations are given below in detail.

Figure 1. The model of the study



### 2.1.Success Factors for Digitalization

To analyze digital strategies’ effects on achieving the goal of the companies, critical success factors are determined first. The purpose of finding success factors is to determine factors which are most needed to reach a defined goal (Holotiuik and Beimbörn, 2017). Therefore, the best strategy is evaluated according to the success factors that denoted as criteria. The success factors are developed based on structured review of industry reports and academic papers. Main factors are determined as customer experience, organization and talent and culture and future readiness. Following sections detail the success factors of the study.

### 2.1.1. Customer Experience (C<sub>1</sub>)

- **Customer Understanding (C<sub>11</sub>)**

Companies invest in digital platforms to understand the needs of specific geographies and market segments. To strengthen customer understanding, companies promote their trademarks by using social media or by building a set of educational digital tools. They are also building new online communities to provide customer loyalty and they are building analytics capability to guide customer behavior (URL4).

- **Customer Touch Points (C<sub>12</sub>)**

Customers can trust companies which deliver fast and transparent problem resolution service. For this reason, digitalization can significantly enhance customer service. Companies are using digital tools for offering self-service model to customers. In this way, companies save money while customers are saving time. Furthermore, mobile apps are another option to enhance companies' customer touch points.

- **Seamless Integration of Channels (C<sub>13</sub>)**

Enhancing seamless customer experience is an important action for connecting physical and digital worlds. It requires integration of online and offline channels. However, seamless integration of multiple channels requires implementing change across customer experience.

### 2.1.2. Organization and Talent (C<sub>2</sub>)

- **Talented Workers and Worker Enablement in Digital Functions (C<sub>21</sub>)**

Companies realize the rapid change of their business driven by digitalization. The core business is digital transformation. To manage digital transformation ideally, all employees of the organizations should be taken into account. Digitalization must have a strong focus on skills and talent, with the support of top management. For this reason, four digital capabilities are very important: digital awareness, digital capacity, digital expertise, and digital leadership (URL3, URL4, URL5).

- **IT Concentration and Digital Tools Implementation (C<sub>22</sub>)**

IT is the backbone of the digitalization. IT characterizes a technology platform that integrates internal and external services to provide a natural ecosystem of services. Digitally mature organizations manage their platforms like managing a city. IT platforms should consist of a set of high-level standards and a governance model. To implement digital tools in reliable way, standardization of services should be developed (URL3, URL6).

- **Process Digitization (C<sub>23</sub>)**

Automation enables efficiency and quality gains in business processes e.g. transaction, finance, and supply chain. By using automated systems, companies focus on innovative ideas and creative works rather than repetitive tasks. Digital technologies extend these benefits beyond efficiency. Digitalization removes the need for shipping physical prototypes back and forth. In this way, product development lifecycle decreases by 30 percent. Therefore, process digitalization makes a significant contribution to companies' agility (URL4).

### 2.1.3. Culture and Future Readiness (C<sub>3</sub>)

- **Digitally Modified Business (C<sub>31</sub>)**

Nowadays, companies are aware of the need for digital transformation. Many companies are ready to change the way they do business for keeping pace with digitalization. Digitally modified business is offering solutions to augment benefits of physical business with digital tools and to share content across all organization. That is, companies improve traditional products by building digitalization (URL4).

- **Business Agility (C<sub>32</sub>)**

Agility is the ability to respond quickly and appropriately to changes and to flip those changes (URL9). In today's highly competitive environment, companies must have business agility. Along with evolving technology, the most important way for firms to increase their agility is digitalization. People who can make decisions in a rapid and flexible way, processes with reduced time, technologies high data processing capability are important components of business agility (URL3, URL7).

- **Leaders' Attitude Towards Digital Vision (C<sub>33</sub>)**

Digital leaders must foster a digital vision to drive the digital transformation of their companies. They must place digital capabilities into their business and make digitalization a core competency (URL8). Leaders should have knowledge about digitalization and the capability to be trained or skilled about digital business (URL5, URL8).

## 2.2. Digitalization Strategies

To implement the right digital strategy, existing models in theory and practice are investigated. After systematic research, the strategies are determined based on Deloitte's industry report (URL2). The digital strategies are denoted as alternatives. The detail of digital strategies is provided in following sections.

### 2.2.1. The Tactical Model (A<sub>1</sub>)

In the Tactical Model, business units use digital tools and digital working methods to reach their existent targets. In this model, digital marketing techniques or online sales channels are preferred frequently.

#### Features of the Model:

- Investments are made in silos.
- Large but not strategic type of investments.
- Digitalization is at the edge of the business.
- Challenges and opportunities constrained to the minds of a minority.

According to the features of the model, it is possible to say that Seamless Integration of Channels (C<sub>13</sub>), Talented Workers, Worker Enablement in Digital Functions (C<sub>21</sub>) and Business Agility (C<sub>32</sub>) are very important success factors for companies implementing this strategy.

**Type of Company:**

- Companies which want to set up a digital market presence,
- Companies which are not connected to a consistent digital strategy,
- Companies which want to create greater value without re-engineering of their business,

Therefore, this type of companies mainly focus on Customer Understanding (C<sub>11</sub>), IT Concentration and Digital Tools Implementation (C<sub>22</sub>), Process Digitization (C<sub>23</sub>) and Leaders' Attitude towards Digital Vision (C<sub>33</sub>).

**2.2.2. The Centralization Model (A<sub>2</sub>)**

In the Centralization Model, digital initiatives and skills are unified into a central unit. This unification provides appropriate governance over digital spending.

**Features of the Model:**

- Central team transforms corporate strategy into priorities.
- Digital team's first task is identifying the initiatives.
- Building innovative technologies, products and ways of working are the main tasks of the central team.
- Empowering leaders to use digital models is priority.

In this model, the most important success factors are Process Digitization (C<sub>23</sub>), Digitally Modified Business (C<sub>31</sub>) and Leaders' Attitude towards Digital Vision (C<sub>33</sub>).

**Type of Company:**

- Companies whose central digital team represents organization's feature
- Companies where the notion 'Guerrilla Units' is used to define the well intentioned projects
- Companies where the important talents and ideas are gathered in one team.

Therefore, Seamless Integration of Channels (C<sub>13</sub>) and Business Agility (C<sub>32</sub>) are very important for this type of companies.

**2.2.3. The Champion Model (A<sub>3</sub>)**

In the Champion Model, a digital strategy exists and communicated across the business. Leaders and employees exactly knows the meaning and the importance of digitalization.

**Features of the Model:**

- Not all responsibility for digitalization belongs to a central digital team.
- Main concept is sharing expertise, training and raising others in the business.
- Data science, innovation and rapid prototyping are shared capabilities.
- Encouraging employees to continuously learn is the main concept.

For this kind of companies, Talented Workers and Worker Enablement in Digital Functions (C<sub>21</sub>) and Process Digitization (C<sub>23</sub>) are indispensable.

**Type of Company:**

- Companies which have enough openness and trust on realizing plans
- Companies which have supporting leaders and employees in the same direction
- Companies that are self-sufficient in digital methods.

Customer Understanding (C<sub>11</sub>), Customer Touch Points (C<sub>12</sub>), Seamless Integration of Channels (C<sub>13</sub>) and Leaders' Attitude towards Digital Vision (C<sub>33</sub>) have significant value for the Champion model.

**2.2.4. The Business as Usual (BAU) Model (A<sub>4</sub>)**

In the Business As Usual (BAU) Model, digital business models, digital culture, digital processes and digital technology are completely embedded in everyday working life.

**Features of the Model:**

- The business is flexible and agile at all levels.
- There is no need for a centralized function.
- There is no need for re-joining business units with specific digital skills.

Presence of Talented Workers and Worker Enablement in Digital Functions (C<sub>21</sub>), IT Concentration and Digital Tools Implementation (C<sub>22</sub>) and Process Digitization (C<sub>23</sub>) have major role for this strategic model.

**Type of Company:**

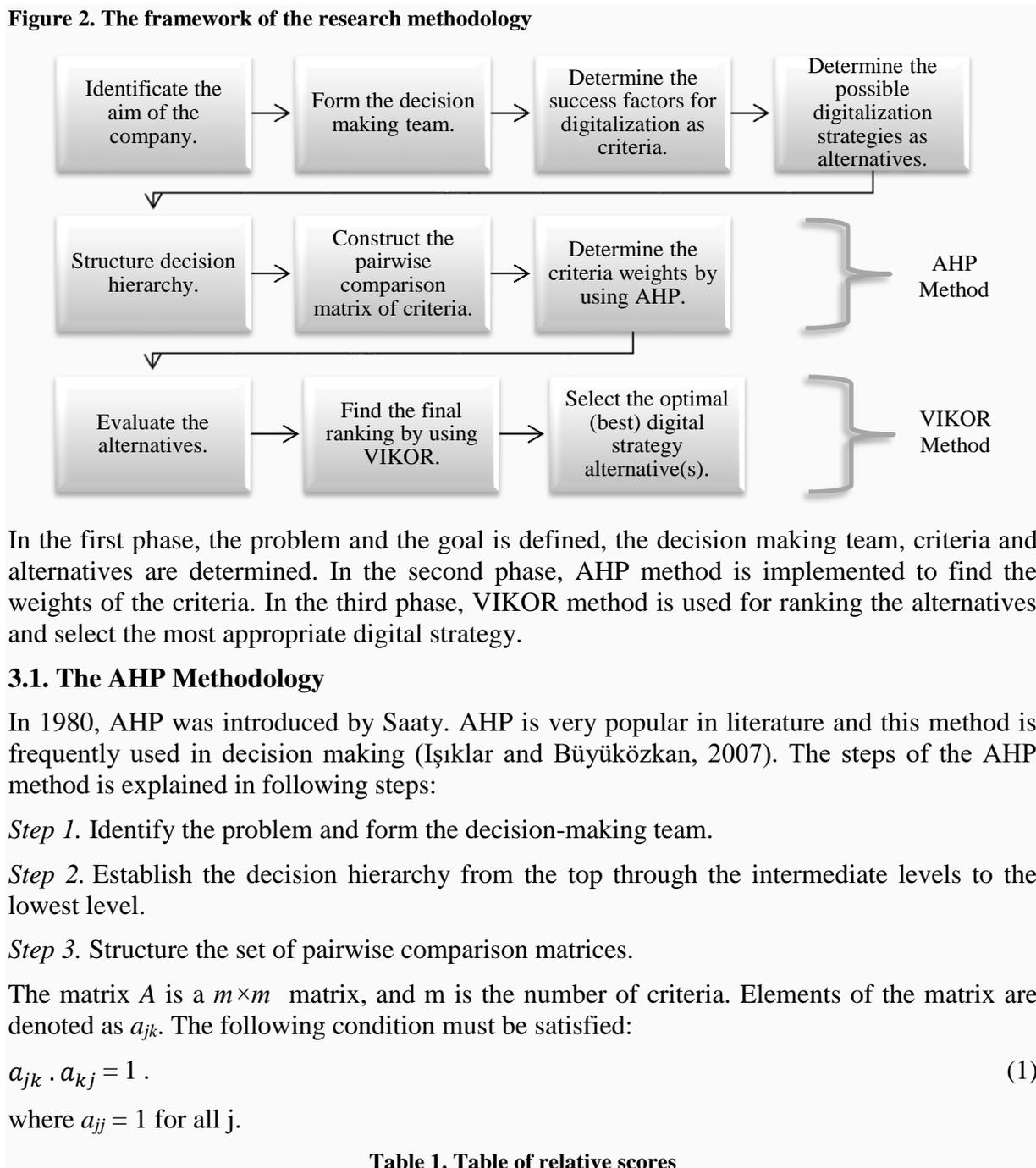
- Companies which behaves like a digital organization
- Companies which changes dynamically based on requirements

BAU model incorporates with the existence of Digitally Modified Business (C<sub>31</sub>) and Leaders' Attitudes towards Digital Vision (C<sub>33</sub>).

**3. Research Methodology**

Generally, MCDM tools structure the problem in a systematic way. Therefore, it is possible to investigate the problem and scale it according to the different situations (Işıklar and Büyüközkan, 2007). The framework of the study is illustrated in Figure 2.

Figure 2. The framework of the research methodology



In the first phase, the problem and the goal is defined, the decision making team, criteria and alternatives are determined. In the second phase, AHP method is implemented to find the weights of the criteria. In the third phase, VIKOR method is used for ranking the alternatives and select the most appropriate digital strategy.

**3.1. The AHP Methodology**

In 1980, AHP was introduced by Saaty. AHP is very popular in literature and this method is frequently used in decision making (Işıklar and Büyüközkan, 2007). The steps of the AHP method is explained in following steps:

*Step 1.* Identify the problem and form the decision-making team.

*Step 2.* Establish the decision hierarchy from the top through the intermediate levels to the lowest level.

*Step 3.* Structure the set of pairwise comparison matrices.

The matrix *A* is a  $m \times m$  matrix, and *m* is the number of criteria. Elements of the matrix are denoted as  $a_{jk}$ . The following condition must be satisfied:

$$a_{jk} \cdot a_{kj} = 1 . \tag{1}$$

where  $a_{jj} = 1$  for all *j*.

**Table 1. Table of relative scores**

Value of $a_{jk}$	Interpretation
1	<i>j</i> and <i>k</i> are equally important
3	<i>j</i> is slightly more important than <i>k</i>
5	<i>j</i> is more important than <i>k</i>
7	<i>j</i> is strongly more important than <i>k</i>
9	<i>j</i> is absolutely more important than

Source: (Saaty, 1980)

To compare criteria with each other, a scale that helps to express the importance of one criteria from another criteria is needed. Table 1 exhibits the scale (Saaty, 2008).

The normalized pairwise comparison matrix  $A_{norm}$  is constructed from matrix  $A$ . Each element  $a_{jk}$  of the matrix  $A_{norm}$  is computed as:

$$\bar{a}_{jk} = \frac{a_{jk}}{\sum_{i=1}^m a_{jk}}. \quad (2)$$

By averaging the elements on each row, the criteria weight vector  $w$  is found.

$$w_j = \frac{\sum_{l=1}^m \bar{a}_{jl}}{m}. \quad (3)$$

*Step 4.* The priorities obtained from the comparisons are used for weighing the priorities of the lower level. Then for each element in the lower level, its weighted values are added. Finally, its overall or global priority are determined (Saaty, 1980).

*Step 5.* An inconsistency index ( $CI$ ) is calculated to control the consistency of the evaluation phase.  $CI$  is computed with the equation:

$$CI = \frac{\lambda_{max} - N}{N - 1}. \quad (4)$$

### 3.2. The VIKOR Methodology

In 1998, VIKOR was introduced by Opricovic. This methodology solves decision-making problems with the the Lp-metric concept (Opricovic and Tzeng, 2004). This method aims to rank and choose from number of alternatives (Chiu et al., 2013). It is a method for optimization of complicated systems with multi-criteria because it considers different conflicting criteria (Opricovic and Tzeng, 2004).

The alternatives are defined as  $a_1, a_2, \dots, a_J$ . For alternative  $a_j$ , the rating of the  $i^{th}$  criteria is indicated by  $f_{ij}$  (Dağ and Önder, 2013).

The steps of the VIKOR method are:

*Step 1.* The ideal  $f_i^*$  and the worst  $f_i^-$  values of all criteria functions ( $i=1,2, \dots, n$ ) with respect to benefit or cost functions are determined.

If the  $i^{th}$  function symbolizes a benefit, then:

$$f_i^* = \max f_{ij}, \quad \tilde{f}_i = \min f_{ij} \quad (5)$$

If the  $i^{th}$  function symbolizes a cost, then:

$$f_i^* = \min f_{ij}, \quad \tilde{f}_i = \max f_{ij} \quad (6)$$

*Step 2.* The values  $S_j$  and  $R_j$ ,  $j=1,2, \dots, J$ , are calculated by:

$$S_j = \sum_{i=1}^n w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \quad (7)$$

$$R_j = \max \left[ w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \right] \quad (8)$$

Where  $w_i$  refers to weights of criteria, expressing their relative significance.

*Step 3.* The  $Q_j$  values,  $j=1,2,\dots,J$ , are calculated by:

$$Q_j = (1 - v) \frac{(R_j - R^*)}{(R^- - R^*)} + v \frac{(S_j - S^*)}{(S^- - S^*)} \quad (9)$$

Where

$$S^* = \min S_j, \quad S^- = \max S_j \quad (10)$$

$$R^* = \min R_j, \quad R^- = \max R_j \quad (11)$$

where  $v$  refers to the weight for the strategy of the maximum group utility, whereas  $1-v$  is the weight of the individual regret. In this study the value of  $v$  is taken as 0.5.

*Step 4.* The  $S$ ,  $R$  and  $Q$  values are sorted in decreasing order.

*Step 5.* A compromise solution the alternative ( $a'$ ) which is best by the minimum  $Q$  value is suggested if these two circumstances are satisfied:

*C1. Acceptable Advantage:*

$$Q_a'' - Q_a' \geq DQ \quad (12)$$

$a''$  is the alternative in second position in the ranking list by  $Q$ ;  $DQ = 1/(J-1)$ ;  $J$  is the number of alternatives.

*C2. Acceptable stability in decision making:*

The best ranked by  $S$  or/and  $R$  values is also must be alternative  $a'$ . This compromise solution is consistent with the process.

If one of the conditions is unsatisfactory, a set of compromise solutions is suggested and the solution(s) are:

- If only condition C2 is unsatisfactory, alternatives  $a'$  and  $a''$
- If condition C1 is unsatisfactory, alternatives  $a'$ ,  $a''$ , ...,  $a^{(M)}$  and  $a^{(M)}$  is determined by the relation (12) for maximum  $M$ .

The best solution is the one which has the lowest  $Q$ , ranked by  $Q$ .

#### 4. Application of the Methodology

There is a company which wants to implement a digitalization strategy. For privacy concerns, the company will thereafter be named as XYZ.

##### 4.1. Background of the Company

XYZ is a company in Turkey. XYZ operates in all business segments of the banking sector including corporate, commercial, SME, retail, private and investment banking, payment systems. XYZ aims to achieve sustainable growth by creating value for all of its stakeholders, and all of its customers on the principles of continuous improvement of its customer experience by offering products and services tailored to its needs. XYZ invests in technology to create innovative products and to increase its service level. Therefore, XYZ installs digitalization at the core of its business. XYZ focuses on making for their customers' lives easier with their innovative product and service approach. XYZ encourages its employees to continuously learn and supports its leaders and employees in the same direction.

In addition to digitalization in products and services, XYZ aims to renew its branches in the axis of digitalization and transform them into the future with the right strategy. In order to decide on the most appropriate strategy, scientific methods will be used. This study aims to rank the digitalization strategy alternatives by taking customer preferences in consideration.

The criteria and sub-criteria are: Customer Experience (C1) (with Customer Understanding (C11), Customer Touch Points (C12), Seamless Integration of Channels (C13)); Organization and Talent (C2) (with Talented Workers and Worker Enablement in Digital Functions (C21), IT Concentration and Digital Tools Implementation (C22), Process Digitization (C23)) and Culture and Future Readiness (C3) (with Digitally Modified Business (C31), Business Agility (C32), Leaders' Attitude Towards Digital Vision (C33)).

There are four possible alternatives based on Deloitte's report, they are: The Tactical Model (A1) The Centralization Model (A2), The Champion Model (A3) and The Business as Usual (BAU) Model (A4).

Decision-making team consists of three DMs. They are XYZ's general manager, finance director and technology advisor. The importance degrees of the DMs are assumed to be equal. The steps of the application and the results are given in following sections.

##### 4.2. Criteria Weight Calculation with AHP

In the first stage, every criterion is compared to each other. The pairwise comparison matrix for main criteria, and sub-criteria are constructed. (Table 2, Table 3, Table 4, Table 5)

Table 2. Evaluation about Main Criteria

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
C <sub>1</sub>	1,00	0,33	3,00
C <sub>2</sub>	3,00	1,00	5,00
C <sub>3</sub>	0,33	0,20	1,00

**Table 3. Evaluation about sub-criteria of C<sub>1</sub>**

	C <sub>11</sub>	C <sub>12</sub>	C <sub>13</sub>
C <sub>11</sub>	1,00	1,00	5,00
C <sub>12</sub>	1,00	1,00	3,00
C <sub>13</sub>	0,20	0,33	1,00

**Table 4. Evaluation about sub-criteria of C<sub>2</sub>**

	C <sub>21</sub>	C <sub>22</sub>	C <sub>23</sub>
C <sub>21</sub>	1,00	0,50	0,33
C <sub>22</sub>	2,00	1,00	0,33
C <sub>23</sub>	3,00	3,00	1,00

**Table 5. Evaluation about sub-criteria of C<sub>3</sub>**

	C <sub>31</sub>	C <sub>32</sub>	C <sub>33</sub>
C <sub>31</sub>	1,00	0,20	0,33
C <sub>32</sub>	5,00	1,00	3,00
C <sub>33</sub>	3,00	0,33	1,00

The associated criteria weights are calculated by utilizing (2) and (3). The consistency ratio is calculated in respect to (4). The obtained criteria weights are shown in Table 6.

**Table 6. The criteria weights**

Criteria	C <sub>11</sub>	C <sub>12</sub>	C <sub>13</sub>	C <sub>21</sub>	C <sub>22</sub>	C <sub>23</sub>	C <sub>31</sub>	C <sub>32</sub>	C <sub>33</sub>
Weight	0,125	0,106	0,030	0,101	0,160	0,373	0,011	0,067	0,028
Ranking	3	4	7	5	2	1	9	6	8
C.I.	0,025			0,046			0,033		

The results about weights shows that the most important criterion is Process Digitization (C<sub>23</sub>). The second criterion is IT Concentration and Digital Tools Implementation (C<sub>22</sub>) and the third is Customer Understanding (C<sub>11</sub>).

#### 4.3.Ranking Alternatives with VIKOR Method

The VIKOR method is applied to rank the alternatives. Thus, the experts evaluated four alternatives with respect to nine criteria. (Table 7)

The ideal and the worst values of all criteria functions ( $i=1,2,\dots,n$ ) are determined according to benefit or cost functions by using (5) and (6).

**Table 7. Evaluation about alternatives**

Alternatives	Criteria								
	C <sub>11</sub>	C <sub>12</sub>	C <sub>13</sub>	C <sub>21</sub>	C <sub>22</sub>	C <sub>23</sub>	C <sub>31</sub>	C <sub>32</sub>	C <sub>33</sub>
A <sub>1</sub>	6	5	6	7	7	6	5	6	8
A <sub>2</sub>	5	5	7	4	5	8	8	7	6
A <sub>3</sub>	9	8	7	8	6	8	6	5	7
A <sub>4</sub>	4	4	5	8	6	7	7	5	8

The rankings of digitalization strategy alternatives are calculated by using (7), (8) and (9). ( $v$  is taken as 0.5). By using (10) and (11), the values of  $S^*$ ,  $S^-$ ,  $R^*$  and  $R^-$  are calculated. Table 8 shows the evaluation results and ranking of alternatives in respect to  $S_j$ ,  $R_j$  and  $Q_j$  values.

**Table 8. The ranking of alternatives**

Alternatives	$S_j$	Ranking	$R_j$	Ranking	$Q_j$	Ranking
A <sub>1</sub>	0,612	4	0,373	4	1,000	4
A <sub>2</sub>	0,467	2	0,160	2	0,473	2
A <sub>3</sub>	0,168	1	0,080	1	0,000	1
A <sub>4</sub>	0,598	3	0,186	3	0,666	3

*C1. Acceptable Advantage:*

$$Q(A_2) - Q(A_3) \geq 1 / (4 - 1)$$

$$0,473 \geq 0,333$$

Where  $a'' = A_2$  is the the second alternative in the ranking list by  $Q$ ;  $DQ = 1 / (4 - 1) = 0,333$ ; 4 is the number of alternatives. Thus, *C1* is satisfactory.

*C2. Acceptable Stability in Decision Making:*

Alternative  $a' = A_3$  must also be the best ranked by  $S$  or/and  $R$ . Since this condition is met, this ranking result is stable within a decision making.

The results about ranking of alternatives shows that the best ranked alternative is The Champion Model (A<sub>3</sub>) with his nearest competitor The Centralization Model (A<sub>2</sub>). The third ranked digital strategy alternative is The Business As Usual (BAU) Model (A<sub>4</sub>). The Tactical Model (A<sub>1</sub>) is ranked as the last one.

## Conclusion

The aim of this study was to provide a quantitative method for helping companies to select the most appropriate digital strategy according to the success factors. In this respect, at the first phase of the study, existing critical success factors have been examined through literature review and expert opinions. In the light of the information obtained from the experts, the importance weight of these factors on digitalization of companies were calculated by using AHP method. According to the results obtained, Process Digitization (C<sub>23</sub>) has a great impact on the development of digital strategy.

At the second phase of the study, existing digital strategies have been examined by investigating industry reports and the models in Deloitte's report is chosen. The selection of the most appropriate model for chosen company is provided by using VIKOR method. In this respect, it is clearly seen that, companies that have decided for digitalization, should pay more attention to implementing The Champion Model (A<sub>3</sub>) strategy.

This study will help researchers and people interested in digitalization in terms of proposing an evaluation model by providing an analytical methodology.

One of the perspectives for future work can be to consider the dependence between criteria, the interaction between the criteria, and to extend our methodology by implementing the ANP method. Additionally, as the second perspective, it is possible to extend our analysis by implementing fuzzy logic (Zadeh, 1965). Therefore, uncertainty in experts' evaluations can be reflected.

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## References

- Al-Debi, Mutaz M., El-Haddadeh, R. & Avison, D. (2008), "Defining the Business Model in the New World of Digital Business" *AMCIS 2008 Proceedings*. 1-11.
- Bharadwaj, A., El Sawy, O., Pavlou, P., & Venkatraman, N. (2013), "Digital business strategy: toward a next generation of insights", *MIS Quarterly, Digital Business Strategy*, Vol. 37 No. 2, 471-482.
- Biehl, M. (2007), "Success factors for implementing global information systems", *Communications of the ACM*, Vol. 50 No. 1, 52-58.
- Bleicher, J., & Stanley, H. (2016), "Digitization as a catalyst for business model innovation a three-step approach to facilitating economic success", *Journal of Business Management*, Vol. 12, 62-72.
- Yeh C.C. (2017), "Using a hybrid model to evaluate development strategies for digital content", *Technological and Economic Development of Economy*, Vol.23:6, 795-809,
- Chiu, W. Y., Tzeng, G. H., & Li, H. L. (2013), "A new hybrid MCDM model combining DANP with VIKOR to improve e-store business", *Knowledge-Based Systems*, Vol.37, 48-61.
- Dag, S., & Önder, E. (2013), "Decision-making for facility location using VIKOR method".
- Dubelaar, C., Sohal, A., & Savic, V. (2005), "Benefits, impediments and critical success factors in B2C E-business adoption", *Technovation*, Vol. 25 No.11, 1251-1262.
- Gil-García, J. R., & Pardo, T. A. (2005), "E-government success factors: Mapping practical tools to theoretical foundations", *Government information quarterly*, Vol.22(2), 187-216.
- Grover, V., & Kohli, R. (2013), "Revealing Your Hand: Caveats in Implementing Digital Business Strategy", *Mis Quarterly*, Vol.37(2).
- Holotiuk, F., & Beimborn, D. (2017), "Critical success factors of digital business strategy", *13th International Conference on Wirtschaftsinformatik*, February 12-15, 2017, St. Gallen, Switzerland, 991-1005.
- Hyvönen, J. (2018), "Strategic leading of digital transformation in large established companies—a multiple case-study".
- Işıklar G., Büyüközkan, G. (2007), "Using a multi-criteria decision making approach to evaluate mobile phone alternatives", *Computer Standards & Interfaces*, Vol. 29, 265–274.
- Lerner, S. (2015), "Digital business strategy", *Touro Accounting & Business Journal*, 49-52.
- Opricovic, S., & Tzeng, G. H. (2004), "Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS", *European journal of operational research*, Vol.156(2), 445-455.
- Saaty T. (2008), "Decision making with the analytic hierarchy process", *International Journal of. Services Sciences*, Vol.1, No. 1, 83-98.
- Saaty, T.L. (1980), "The Analytic Hierarchy Process." *McGraw-Hill, New York*.
- Zadeh, L. A. (1965), "Fuzzy sets" *Information and control*, 8(3), 338-353.
- URL1, European Commission (2017), [https://ec.europa.eu/newsroom/document.cfm?doc\\_id=44515](https://ec.europa.eu/newsroom/document.cfm?doc_id=44515)
- URL2, Deloitte (2015), [https://www2.deloitte.com/content/dam/Deloitte/be/Documents/technology/deloittedigital/Deloitte-Digital-BE\\_Building-your-digital-DNA\\_download\\_HR.pdf](https://www2.deloitte.com/content/dam/Deloitte/be/Documents/technology/deloittedigital/Deloitte-Digital-BE_Building-your-digital-DNA_download_HR.pdf)
- URL3, IDC (2015), [http://www.digitalnaobljuba.si/\\_files/2/Company-SAP\\_digital\\_transformation.pdf](http://www.digitalnaobljuba.si/_files/2/Company-SAP_digital_transformation.pdf)
- URL4, CapGemini (2011), <https://www.capgemini.com/resources/digital-transformation-a-roadmap-for-billiondollar-organizations/>
- URL5, "Five Pillars of Digital Transformation: Skills and Talent Management" <http://www.digitalistmag.com/future-of-work/2017/06/08/5-pillars-of-digital-transformation-skills-and-talent-management-05143666>
- URL6, "The role of IT in digital transformation" <https://postshift.com/the-role-of-it-in-digital-transformation/>
- URL7, "Business Agility And Digital Transformation" <https://arsalankhan.com/2017/11/27/business-agility-and-digital-transformation/>
- URL8, Forrester (2016), <https://forrester.nitro-digital.com/pdf/Forrester-s%20Digital%20Maturity%20Model%204.0.pdf>
- URL9, "Tedarik zinciri yönetiminde dijitalleşmenin önemi" <http://www.lojistikhatti.com/haber/2016/01/tedarik-zinciri-yonetiminde-dijitallesmenin-onemi>