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<p>End-To-End Strategic Planning Model Proposal with Artificial Intelligence</p> <p>Yapay Zekâ ile Uçtan Uca Stratejik Planlama Modeli Önerisi</p> <p>Video Link: https://youtu.be/tG5LFrZk84</p>	
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Yapay Zekâ ile Uçtan Uca Stratejik Planlama Modeli Önerisi

Öz

Stratejik yönetimin bir parçası olan stratejik planlama ile işletmeler gelecekte doğru konumlanarak geleceği yönetmek isterler. Proaktif bir yaklaşım olan stratejik planlama, uzun vadeli bir planlama türü ve veriye dayalı bir tahmin etme durumudur. Ayrıca, istatistiksel geçmişi olmayan karmaşık, belirsiz ve dilyimsel birçok veri içerir. Stratejik planlamada olduğu gibi gerçek hayat problemleri de karmaşık, belirsiz ve çok kriterlidir. Bu tür problemlerde yapay zekâ tekniklerinin kullanılması optimum sonuçlar verdiği ve insan hatalarını en aza indirdiği bilinmektedir. Aynı zamanda çok kriterli karar verme yöntemlerinin yapay zekâ teknikleriyle birlikte kullanılması karar vericiye doğru ve etkili sonuçlar sağlamaktadır. Günümüzün fenomeni olan yapay zekâ uygulamaları hayatımızın her alanına girmeye devam etmekte, kullanım alanı hızla yaygınlaşmaktadır. Stratejik planlama aşamalarında yapay zekâ teknikleri de kullanılmaktadır. Stratejik planlamada mevcut durumu belirlemek için çok sık kullanılan metot olan SWOT analizi ile yapay zeka (bulanık mantık) uygulamaları bulunmaktadır. Dahası, planlamanın başından sonuna kadar tüm aşamalarında yapay zekâ teknikleri ile çözüm sunan model sayısı azdır. Bu çalışmada yapay zekâ teknikleriyle uçtan uca stratejik planlamanın hazırlanması için bir model önerisi sunulmuştur. Önerilen modelde stratejik planlama mevcut durum analizi, stratejik kavramlar, strateji oluşturma, ölçme ve değerlendirme olmak üzere 4 aşamada incelenmiştir. Her aşama için yapay zekâ teknikleri önerilmiştir. Önerilen teknikler literatürde en çok kullanılan tekniklerden seçilmiştir. Bu yöntemler üç tiptir. Birincisi yapay zekâ tekniklerinden olan bulanık mantık, uzman sistemler, yapay sinir ağları, genetik algoritmadır. İkinci tip veri toplamada kullanılan delfi tekniği ile karar verme yöntemlerinden olan çok kriterli karar verme yöntemlerinin bulanık mantık ile kullanılmasıdır. Bulanık delfi ve bulanık çok kriterli karar verme yöntemleri. Üçüncü tip ise bulanık mantıkla diğer yapay zekâ tekniklerinin kullanılmasıdır. Bulanık uzman sistemler, bulanık yapay sinir ağları. Bu çalışmanın amacı stratejik planlama yapan organizasyonlara ve uzmanlara bir bakış açısı sunmaktır.

Anahtar Kelimeler: Stratejik plan, SWOT analizi, Stratejik kavramlar, Yapay zekâ, Bulanık Mantık.

End-To-End Strategic Planning Model Proposal with Artificial Intelligence

Abstract

Organizations want to manage the future by being positioned correctly in the future with strategic planning, which is a part of strategic management.



Strategic planning, which is a proactive approach, is a long-term type of planning and a case of forecasting based on data. It also contains many data that are complex, uncertain and linguistic, without statistical history. Real-life challenges, like strategic planning, are dynamic, unpredictable, and multi-criteria. It is known that the use of artificial intelligence techniques in such problems gives optimum results and minimizes human errors. At the same time, the use of multi-criteria-decision-making methods together with artificial intelligence techniques provides accurate and effective results to the decision maker. Artificial intelligence (AI) applications, which is the phenomenon of today, continue to enter all areas of our lives and its usage area is rapidly spreading. AI techniques are also used in the stages of strategic planning. There are applications of artificial intelligence (fuzzy logic) with SWOT analysis, which is a very common method to determine the current situation in strategic planning. Moreover, the number of models offering solutions with artificial intelligence techniques at all stages of planning from the very beginning to the end is low. In this study, a model proposal is presented for the preparation of end-to-end strategic planning with AI techniques. In the proposed model, strategic planning was examined in four stages as analyses of current situation, strategic concepts, assessment and evaluation. (Strategic planning was examined in four stages in the proposed model: current situation analyses, strategic concepts, assessment, and evaluation.) AI techniques are suggested for each stage. The proposed AI techniques have been chosen from among the most used techniques in the literature. The methods used are of 3 types. The first type is fuzzy logic (FL) which is one of the AI techniques, expert systems (ES), artificial neural networks (ANN), and genetic algorithms (GA). The second type is the combination of delphi technique used in data collection and multi-criteria decision-making methods, which is the decision-making methods, and FL. Fuzzy delphi and fuzzy multi-criteria-decision-making methods. The third type is the use of other AI techniques with FL. Fuzzy ES, fuzzy ANN. The aim of this study is to provide a perspective to organizations and experts that make strategic planning.

Keywords: Strategic Plan, SWOT Analyses, Strategic Concepts, Artificial Intelligence, Fuzzy Logic.

Introduction

Strategic planning, which is a process for determining the position that organizations want to be in the future, is also considered as one of the tools that make organizations stand out from the competition. Strategic plans are prepared by the relevant experts, which naturally can cause the plans to be subjective. Therefore, it can be said that these plans are realized in line with the vision of the experts. However, it is very important for organizations to



have objective strategic plans and to create a basis where resources are used effectively. While strategic plans are a compass that positions the organizations in the future, a strategic plan that is not based on data and not prepared by analytical methods may cause the organizations to unsuccessful or be less successful. Moreover, since the strategic plan is a long-term process, the results emerge after years and the return of it can be very difficult.

The experts preparing the strategic plan also try to deal with uncertain and complex data. The existence of complex and uncertain data, which is characteristic of real-life problems, is also valid for strategic plans. Since the use of artificial intelligence (AI) techniques in real life problems with such characteristics gives effective and efficient results, it is mentioned in the literature (For example: Dağdeviren, 2007, p.798; Öztemel, 2010, p.2; Kubat, 2012, p.629; Karatop; 2015, p.25).

The aim of this study is; to make a model proposal by taking into consideration the availability of AI techniques at every stage of the strategic plan, as well as the examples in the literature.

Since the scope of the topics covered in the article is very wide, only the information focused on the research topic is given. In this context, explanatory information about the proposed model is included in strategic planning and AI theoretical information.

Strategic Planning and Implementation Challenges

Strategic planning, as a part of strategic management, enables organizations to manage the future by positioning them correctly in the future. It is a long-term planning, the state of guessing and a proactive process. Although the term strategic planning has been found in the literature since the late 1930s (Kroener, 1939, p.136; Reed, 1946, p.632; Smith & Farmer, 1946, p.41; Spaatz, 1946, p.385), strategic planning was formally introduced to organizations in the mid-1950s (Steiner, 2010, p.158).

These plans, which were used by large companies at the time, were called long-term planning (LTP) (Steiner, 2010, p.331). Big companies in our country were used in long-term planning studies until the end of the 1980s. Later this planning method (which is different than the systematic strategic planning) is converted to strategic planning.

In practice, the strategic planning process should be fully supported by the top official of the enterprise. However, the contribution, joint effort and support of all stakeholders is a fundamental requirement for the success of the strategic plan. At the same time, decisions in strategic planning should be based on data, and analyzes should be made with analytical methods and algorithmic perspective.



Strategic planning consists of 4 main parts: "current situation analysis" seeking the answer to the question of where are we, and "future projection" seeking an answer to the question of where do we want to be, and "strategic positioning" seeking an answer to the question of how to go where we want to go, and "performance evaluation" that responds to the question of how we follow and evaluate the path we are going in the direction we want to go (Figure 1).

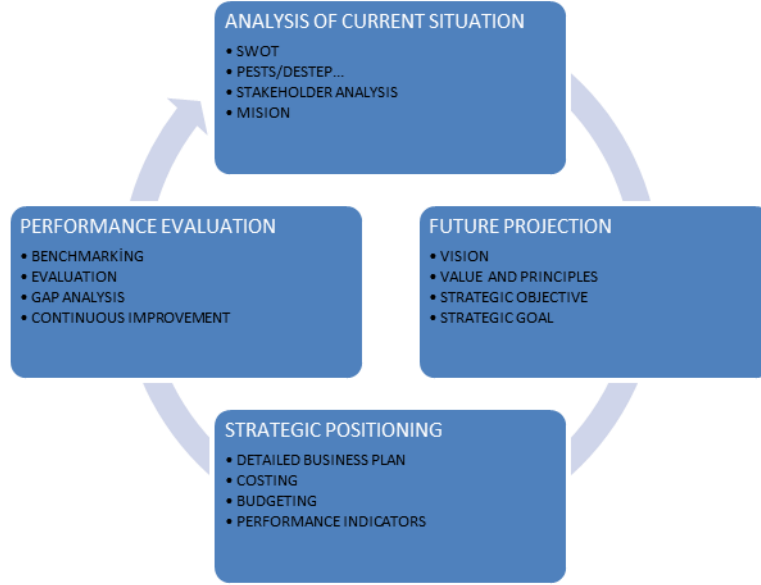


Figure 1. Strategic Planning Lifecycle (Source: Karatop and Taşkan, 2019, p.22)

Strategic planning is not a one-off implementation and requires a periodic cycle. Analyzes and decisions are an important activity that must be done every time. In addition to the importance of stakeholder participation in these activities, the vision of the experts who make up the strategic plan and the analysis and techniques used in decision-making processes are also very critical.

The most used method in current situation analysis is SWOT analysis, which is an analysis that evaluates the internal and external environment of the organizations. SWOT analysis is prepared to determine the strategic direction and strategies of the organizations and its current state is based on. It forms the basis for formulating the strategy (Dyson, 2004, p.631). Although SWOT analysis is an effective method for strategy development, it has structural problems that reduce performance. One of the structural problems is not prioritizing internal and external factors (Kheirkhah et al., 2008, p.325). Researchers use SWOT analysis and MCDM techniques together to solve this problem.

The current situation consists of the organizations itself and its environment. There are opportunities and threats around the organizations as well as its strengths and weaknesses. SWOT analysis examines the current situation in



these 4 dimensions and produces evidence to create a strategy. Two of the four dimensions are positive (strengths and opportunities) and two are negative (weaknesses and threats) (Figure 2). The main strategy for creating a strategy with SWOT analysis is to “eliminate negative factors or turn them into positive using positive factors”.



Figure 2. SWOT Analysis Factors

There are also PESTS and DESTEP analyzes that only make environmental analysis for current situation analysis. With the PESTS analysis, the political, economic, social, technological and sectoral environment of the enterprise is investigated, data is collected and analyzed. With the DESTEP analysis, the demographic, economic, socio-cultural, technological, ecological and political (Yiğit & Yiğit; 2011, p.119) environment of the enterprise is investigated, data is collected and analyzed. PESTS and DESTEP analyzes are actually environmental analysis that occur from the opportunities and threats (OT) of SWOT analysis and when these analyzes are combined with each other, more comprehensive results can be obtained. Strategic plans are based on mission, vision, core values and analyzes such as SWOT, PESTS.

While the mission defines the reason for the existence of the organizations; vision defines the grand goal and direction to move forward. Basic values are the concepts that define how to make a decision and area of ethics to capture the vision based on mission. These three concepts constitute the infrastructure of the road map of the strategic plan in general.

Strategic concepts (mission, vision and core values) and analysis can also be considered as a source that sustaining and supports the strategies of the enterprise. Although strategic concepts are so important, they cannot go beyond being a few sentences that are memorized in most organizations. At the same time, these concepts, which are the basis of the strategy of the enterprise, often do not measure performance and the organizations mission, vision, and core values cannot be measured at what level they realize.

Strategic planning process is an uncertain, complex and dynamic process as in the characteristics of real-life problems. The basis of the strategic plan will be solid by making the analyzes based on data in order to cope with this uncertainty, complexity and dynamism. Analyzes are used effectively in the



creation and / or revision of strategic concepts, as well as in creating creative strategies. Strategies are transformed into goals; goals are transformed into activities and evaluated with key performance indicators of all stages (Figure 3).

Organization's strategies are created from the evidence of SWOT analysis and the data of strategic concepts. However, the strategies formed are completely related to the vision of the expert or expert group that prepared the plan. The techniques used to decide which strategies to focus on (multi-criteria decision-making techniques and AI) will help experts to determine creative strategies.

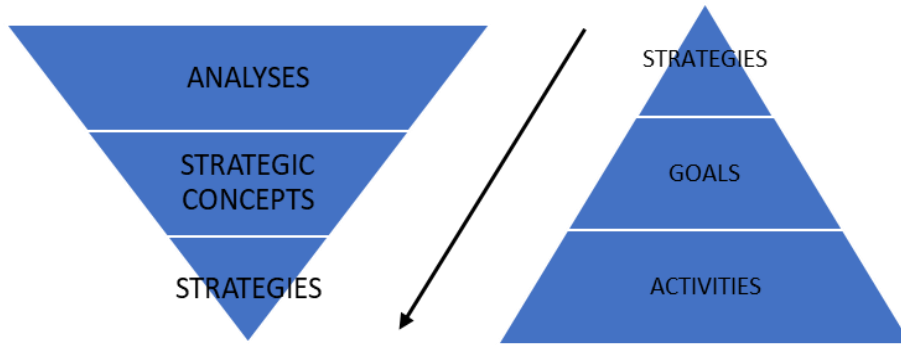


Figure 3. Process of Strategic Planning (Source: Güler and Karatop, 2019)

Typical questions in the traditional SWOT analysis procedure can lead organizations to wrong strategies (Valentin, 2001, p.54) or it is not possible to determine effective strategy (Piercy & Giles, 1989, p.6). While the authors criticize the traditional SWOT analysis, they actually criticize the nature and scope of the questions prepared. In addition, the scope and nature of the stakeholders who prepared the answers to the questions of the SWOT analysis are also important.

Many difficulties are encountered during the implementation of strategic plans. Some of these difficulties are given below.

- Plans are not applicable.
- Not determining the strategy, goals and objectives that lead the organizations to the vision
- Inconsistency of goals with each other
- Failure to establish a sustainable performance evaluation system
- Information does not enter the decision process by analytical methods



- Decisions are revealed in practice, whether they are right or wrong and the decisions taken affect each other in a chain
- The plan depends on the vision and attention of the expert team that makes the planning.

Some of the main reasons for these difficulties can be counted as not including stakeholders in strategic planning, not conducting data-based analyzes, and not using analytical and AI techniques in decision-making processes. Especially the use of AI techniques can make a significant contribution to minimizing these difficulties.

Artificial Intelligence for Strategic Planning

AI is done by the machine through software that behaviors that are considered as intelligence when done by humans (Kubat, 2012, p.620) and it refers to systems that can offer behaviors that require 'intelligence' and make decisions on their own by making analyzes, creating reactions in order to achieve defined specific goals (EC HLEG AI, 2018, p.1). At the same time, AI is all of the studies carried out to improve the ability to think, learn, conduct ideas, understand / perceive problems and draw conclusions through computer software (Kubat, 2012, p.620). According to Içen and Günay (2014, p.38), AI is "the imitation of thinking, understanding, comprehending, interpreting, learning structures with programming to solve a problem."

The goal of researchers and scientists continues to work on AI to achieve excellent results that facilitate human work, increase productivity, and use resources more effectively and efficiently. It is possible to say that these studies are carried out to make human life easier. For this reason, it continues to work to develop AI applications that can learn, draw conclusions, sort, be aware of its environment, interact with objects (internet of things), calculate, evaluate, interpret and make decisions. AI also shows success in clustering the ideas produced by a group (Chen et al., 1994, p.56).

Among the AI techniques, those related to the subject of this study are briefly explained below.

Expert Systems

Expert systems are systems that produce solutions to problems in the same way that an expert solves problems. An algorithm running in the background in the system is equipped with expert knowledge. In this way, inference mechanisms can make decisions by establishing relationships between information (Öztemel, 2012, p. 13). An expert system is expected to be capable of performing at a level close to human expert performance. Systems need to be tested to ensure they reach an acceptable level of performance (Balci and Smith, 1986, p.2).



Bensghir in his book published in 1996 (as cited in Göl, 1999, p.360), expert systems; It refers to the information-based system that produces solutions to problems by transferring the knowledge of people specialized in a particular subject to the computer. It is the most widely used technology in AI and can be used at every stage of life. In other words, expert systems are computer systems that can solve problems with their knowledge and experience like experts (Allahverdi, 2002, p.23).

Fuzzy expert systems, in which fuzzy logic and expert systems are used together, produce the best (optimum) effective solutions in solving complex problems involving ambiguous, complex and linguistic expressions (Içen & Günay, 2014, p.37).

Fuzzy Logic

Fuzzy sets were found by Lütü Ali Askerzade (Zadeh) in 1965 for the use of non-statistical uncertainties with data and information (Zadeh, 1965, p.338). Fuzzy logic helps to make decisions with ambiguous or incomplete information and predictive values (Fullér, 1995, p.3) Fuzzy logic is capable of approximate thinking and processing with data and information that are inadequate, incomplete and uncertain (Şen, 2009, p.3).

In daily life, often "not very clear", "probably it is" and "approximately" as used expressions. The common point of such expressions is that they have uncertainty. This uncertainty in human decision making is called "blurr" in the scientific literature (Pochampally and Gupta, 2008, p.73). Fuzzy logic is a technique with imprecise expressions, and its application area covers a wide range from earthquake engineering to finance. The most important of these areas is fuzzy logic-based process control design (Zadeh, 1988, p.83). Fuzzy logic, which can be applied in situations where there is uncertainty or when the most appropriate (optimal) decisions need to be reached with incomplete information, provides a more flexible decision environment for the decision maker. With fuzzy logic, the numerical equivalents of verbal information are obtained and included in the solution (Karatop, 2015, p.84).

Artificial Neural Networks

Artificial neural networks (ANN) are computer systems that perform the learning function, which is the basic feature of the human brain. Performs the learning process with the help of examples (Öztemel, 2012, p.15). The main function of ANN is that like the neural networks in the human brain, computers learn about events and make similar decisions in the face of similar events. It was developed by Hebb (1949) that the biologically possible learning procedure is performed by a computer. The beginning of ANN can be considered as this study. Hebb developed a learning rule in his work.



ANN work with numerical information, but fuzzy logic and linguistic expressions can be included in the process. ANN perform learning using Examples. ANN have the ability to process uncertain information. It can generate information about unseen examples. It has the ability to self-organize and learn. It can work with missing information. It is having fault tolerance.

ANN are widely used in decision making and prediction problems. It is used frequently especially in production planning and demand forecasting problems. The findings of these studies show that estimation models prepared with ANN give much more accurate results than statistical models (Yavuz & Deveci, 2011, p.185).

Genetic Algorithm

The genetic algorithm used in the solution of complex problems is a technique used in cases where there is little or no solution information (Öztemel, 2009, p.394; Öztemel, 2010, p.13; Kubat, 2012, p.624).

Genetic algorithms are an evolution-inspired computational model. These algorithms encode a potential solution to a specific problem on a simple chromosome-like data structure and proceed (with recombination operators) to protect critical information. The implementation of the genetic algorithm begins with a (random) chromosome population. Then these structures are evaluated, and reproductive opportunities are allocated such that chromosomes that offer a better solution to the target problem are given a greater chance of 'reproduction' than chromosomes, which are weaker solutions (Whitley, 1994, p.65).

In addition to the publications (e.g. Cowgill et al., 1999, p.99; Maulik & Bandyopadhyay, 2000, p.1455) that use genetic algorithms in the clustering of data, there are also publications (e.g. Leardi, 2000, p.643; Frohlich et al., 2003, p.142) that optimize the prediction by selecting features in the data sets.

Application of Artificial Intelligence in Strategic Planning

There are many studies in the literature where AI techniques are used in the stages of the strategic planning process. It is seen that the first studies have created models with fuzzy logic and decision support systems. In subsequent studies, other AI techniques, mainly fuzzy logic has been used.

Nancy G. Hall (1988, p.638) established a prototype fuzzy decision support system called "stratassist" to overcome some of the decision-making problems inherent in strategic planning decision. The author states that the stratassist shows the ability to increase the quality of the strategic decisions of experienced or inexperienced managers, planners and entrepreneurs. A prototype for strategic planning, with the help of stratassist, which is a fuzzy



decision support system, has been tested by the author in the research that users will produce better strategy statements. Pochampally and Gupta (2008, p.72) used a multiphase fuzzy logic approach in strategic planning of the reverse supply chain network. In the article, the authors divided the supply chain network into 3 phases. Fuzzy logic approach was used in the establishment of the first two phases, the recycling facility, and the minimization of the third phase, the total cost.

Effective participation of stakeholders in strategic planning positively affects the quality of planning. In this way, more effective and more efficient outputs are expected from the planning process. Conducting a study focusing on the inclusion of stakeholders in the strategic planning process, Orwig et al. (1997, p.47) used the clustering feature of AI. The article clusters the concepts with AI software to eliminate the complexity of the textual expressions of the participating stakeholder groups in the strategic plan preparation process and aims to guide the planning process.

There are also studies that use the Delphi technique and fuzzy logic together as a strategic planning tool. Li et al. (2002, p.273) presented a hybrid model in which Delphi technique, fuzzy logic and expert systems are used together to determine marketing strategies. Fuzzy logic has been applied to the results of the SWOT analysis obtained by the group delfi method. Expert systems are used to determine marketing strategies. Prusty et al. (2010, p.442) determined the hierarchy of goals, objectives and strategy that play a key role in strategic planning, and fuzzy logic calculated applicability scores for goals and strategies. This study is an inclusive study in terms of the area it covers in the strategic plan.

Raikov (2020, p.147) proposed a cognitive model for strategic planning and the author reports that the genetic algorithm helps to find effective strategic decisions and reduce decision-making risks.

Expert systems, decision support systems (Hall, 1988, p.638; Mockler, 1987, p.32; Pinson et al.1997, p.35) and AI techniques (Orwig et al.1997, p.37; Karatop et al.2018, p.1314) will assist in solving the problem of strategy formulation, which is critical for the sustainability of organizations success.

It incorporates the concept of fuzzy set theory into scenario analysis to deal with the numerical data shortage and linguistic expression of strategic planners. Thus, uncertainties in a strategic planning are taken into account (Wang & Chang, 2001, p.195).

SWOT analysis and fuzzy logic studies, which form the framework of the strategic plan, are quite abundant in the literature. The first most comprehensive article combining fuzzy logic with SWOT analysis, Ghazinoory et al. (2007, p.99) published by. The authors transformed qualitative data into quantitative data using fuzzy logic in SWOT analysis, It was possible to prioritize strategies. Kheirkhah et al. (2009, p.325) used fuzzy SWOT analysis to determine strategy. Hosseini-Nasab et al (2011, p.23), who



used fuzzy SWOT analysis to eliminate the disadvantages of traditional SWOT analysis, validated their thesis by applying in a company. Amin et al (2011, p.670) also used fuzzy SWOT analysis and fuzzy linear programming methods for supplier selection and order allocation decision. This and similar studies are quite abundant in the literature.

A combination of fuzzy SWOT analysis and multi-criteria decision-making methods is also quite common (eg. Azimi et al., 2011, p.670; Shahanipour et al., 2020, p.119). Kajanus et al. (1996) used SWOT analysis together with the analytical hierarchy process (AHP), one of the multi-criteria decision-making techniques. Similarly, Kangas et al. (2001, p.189) developed A'WOT method by combining AHP method with SWOT. It is preferred by researchers to use fuzzy logic, multi-criteria decision-making techniques and SWOT analysis together to determine renewable energy strategies (e.g. Adar et al., 2016, p.429; Papapostolou et al., 2020, p.2; Wang et al., 2020, p.1). In other application areas, the number of articles producing evidence for strategy determination by using multi-criteria decision-making techniques, fuzzy logic and SWOT analysis together is also high.

Strategic planning, whose purpose is to guide an organization to achieve its long-term development and desired goals, is based on forecasts (Wang & Chang, 2001, p.193). ANN, one of the AI techniques, is a method used frequently in demand forecasting, especially in production planning. Akbarian-Saravi et al. (2020, p.244) proposed a strategic and tactical planning model with decision support system in which mathematical model and ANN are used together. The authors tested the model with case analysis, taking into account economic, environmental and social analysis. The number of studies using ANN method in strategic planning is limited.

Recommended Model

The model covers every stage of strategic planning and is based on the use of AI techniques in the decision process of these stages. For this, AI applications in the literature were examined in other application areas, especially in strategic planning. The model has been established with the methods that can be used during strategic planning (Figure 4).

The purpose of the model is to contribute to making the most appropriate decisions during strategic planning and to eliminate or minimize the problems that arise during the implementation of the strategic plan. In the model, which AI techniques can be used at which stage of strategic planning was determined. At the same time, it has been suggested to use other data collection and decision-making methods (Delphi and multi-criteria decision making techniques), which can be used with fuzzy logic, which has very high functionality among AI techniques. In the meantime, using fuzzy logic with other AI techniques will help achieve the best result.



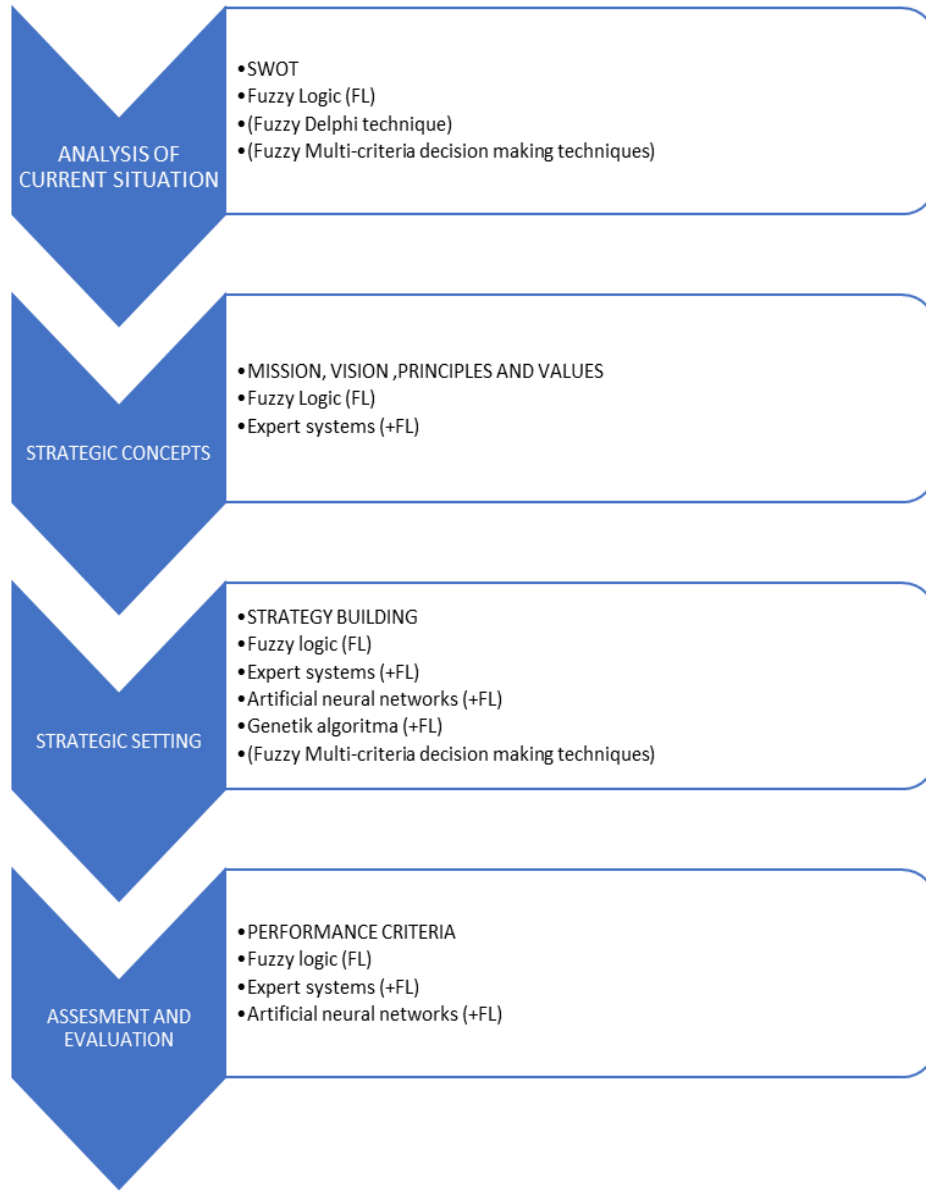


Figure 4. The model of the application of AI techniques in strategic planning

Current Situation Analysis with Artificial Intelligence

Although the current situation analysis is carried out with many methods, only SWOT analysis is considered in this study because it is a frequently used method during strategic planning and it is a much studied analysis in the literature.

Classical SWOT analysis can lead prepared questions to wrong strategies (Valentin, 2001, p.54) and due to the importance of participant quality, collecting data with Delphi technique can minimize these negativities. Since SWOT analysis generally reveals strength, weakness, opportunities and



threats, organizations have difficulties deciding which strategies to focus on. Organizations should set criteria by considering the application areas and should make the SWOT analysis based on these criteria. This method was developed by Karatop et al. (2018, p.1316) and is used in the literature as Sectional SWOT (SSWOT). It is said by the authors that it gives more effective results compared to the classic SWOT.

At the same time, the fact that SWOT is mainly composed of linguistic expressions and has uncertainties also causes difficulties for the decision maker in building a strategy. Due to the presence of uncertainty and linguistic expressions, the most appropriate (optimum) evidence for strategy determination can be presented with fuzzy logic. In addition to these, prioritizing the evidence presented in the SWOT analysis by weighting provides absolute benefit to the decision maker. Therefore, it will be useful to use multi-criteria decision making techniques (fuzzy multi-criteria decision making techniques) together with fuzzy logic.

Determination of Strategic Concepts by Artificial Intelligence

Mission, vision, values and principles that we define as strategic concepts form the basis of the strategic plan. In determining strategic concepts, the knowledge of the expert group including the management level of the organization should be used. The use of expert systems software with this information will be of benefit to the determination of the strategic concept effectively. Expert systems create a general framework for the decision maker by making inferences and will facilitate decision making.

At the same time, performance indicators of strategic concepts should be determined, and their performance should be monitored. Often organizations neglect this. However, every organization wants to know how much they realize their strategic concepts.

Strategy Setting with Artificial Intelligence

Decision making is a science that develops methods to improve the quality of people's social life and the quality of their decisions in organizations at all levels (Hall, 1988, p.638). Setting a strategy is also a decision-making problem. However, the subject discussed here is AI techniques that will help experts to make decisions about strategy, As Von Krogh (2018, p.404) mentioned in her/his study, it is beyond our scope that AI takes over the decision-making authority of organizations.

The strategy setting stage is the place where the node of the current situation analysis and the strategy concepts determined by the company is solved. The direction and method in which the organizations will proceed is determined from the evidence provided by these concepts and analyzes. It is also an evidence-based estimation. For this reason, expert systems using the experiences of experts in their fields and fuzzy logic in which linguistic expressions can turn into mathematical results should be used in strategy setting. As Raikov (2020, p.147) suggests in her/his cognitive model, the



genetic algorithm can be used in decision making. The author proposes to analyze the qualitative factors with networked experts and to develop a cognitive model by mapping on the relevant big data. And he reports in his article that with the reverse problem solving with the genetic algorithm, there are effective strategic decisions and at the same time the risk of decision making is reduced. Also, it can be said that ANN will give the most appropriate results as strategy determination is a estimation event. The learning function of the ANN software is activated in order to produce ready-made solutions to similar types of problems. However, there is need for a lot of data entry for it. In addition to these, using genetic algorithm, expert systems and ANN together with fuzzy logic will give more effective results.

Measurement and Evaluation with Artificial Intelligence

Both incorrectly measuring/ evaluating a well-defined job and correctly measuring/evaluating a wrongly defined job leads the organizations to the wrong path. Therefore, the determination of performance criteria, up to measurement and performance evaluation process, each stage of the strategic plan should be defined and decided in the most appropriate way based on end-to-end data. This is a necessary condition for the assessment phase of the strategic plan.

Using many expert and much more stakeholder opinions in solving real life problems brings the most appropriate result. The use of AI techniques ensures that the most appropriate decisions are reached. Making evaluations with AI techniques in strategic plans will first of all contribute to organizations to use their resources and opportunities more effectively and efficiently. ANN or fuzzy ANN can be used to predict the performance of the organizations.

Conclusion

Organizations have to plan strategies that ensure their future positioning in increasing competition conditions. However, feasible plans should be supported by sustainable control and performance evaluations and focus on strategies that care about the wishes of stakeholders. It is also important that the strategic plan includes the strategic concepts of the organization and the knowledge of stakeholders. Strategic plans are a solution method designed to solve real life problems of organizations. The most prominent features of real-life problems are that they are multi-criteria, complex and unclear. It is stated in the literature that the most appropriate results are obtained by using AI techniques in the solution of such problems. In addition to these reasons, a strategic planning model using AI techniques is proposed in this study in order to minimize human-induced errors during strategic planning and to support decision makers.

AI is used as a tool that supports decision making, facilitates work, and saves time and costs. Rapidly developing AI moves beyond being a tool that facilitates the work of societies and organizations and solves their problems



and comes to a leading and shaping position (Ünal & Kılınç, 2020, p.73). In this context, it is recommended to use AI techniques for strategic planning, which is a plan that shapes the future of organizations.

The proposed model has a flexible structure. By examining the application examples in the literature, it is suggested to use AI techniques at every stage of the strategic plan from end to end. One or more of these techniques can be used at the same time.

The benefits to be achieved by using AI techniques at all stages of strategic planning can be summarized as follows.

- Converts the linguistic expressions that SWOT analysis offers to create strategies into mathematical proofs. The decision maker determines the most appropriate strategies in the light of this concrete information.
- Strategic concepts (mission, vision, principles and values) are defined with measurable criteria.
- Strategic concepts and SWOT analysis have a counterpart in strategies and performance criteria are instantly determined.
- It is ensured that all of the information is included in the decision process.
- Performance measurement of all defined parameters can be done easily.
- Performance analysis and calculation can be provided in real time.
- The whole process can be followed in real time.
- Problems encountered and / or anticipated are resolved faster.

As a result, making the strategic plan, which is of vital importance for organizations, with AI techniques from beginning to end, minimizes human-induced errors and ensures the formation of the most appropriate strategies and the establishment of the right performance system.

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