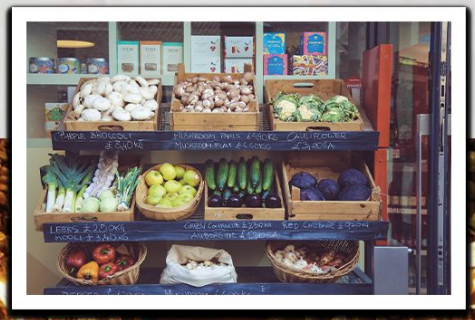
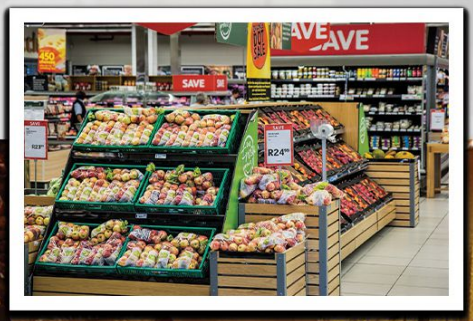
FUZZY VIKOR METHOD APPLICABILITY OF THE IN FOOD AND BEVERAGE BUSINESSES PRODUCTION MANAGEMENT

Mehmet SARIOĞLAN
Cevdet AVCIKURT





LIVRE DE LYON
2023

Tourism

FUZZY VIKOR METHOD APPLICABILITY OF THE IN FOOD AND BEVERAGE BUSINESSES PRODUCTION MANAGEMENT

Mehmet SARIOĞLAN
Cevdet AVCIKURT

LIVRE DE LYON
Lyon 2023

FUZZY VIKOR METHOD APPLICABILITY OF THE IN FOOD AND BEVERAGE BUSINESSES PRODUCTION MANAGEMENT

Mehmet SARIOĞLAN
Cevdet AVCIKURT

LIVRE DE LYON
Lyon 2023

Fuzzy Vikor Method Applicability of The in Food and Beverage Businesses Production Management

Authors • Prof. Dr. Mehmet SARIOĞLAN
• Orcid: 0000-0003-4343-1225
• Prof. Dr. Cevdet AVCIKURT
• Orcid: 0000-0002-9169-9767
Cover Design • Motion Graphics
Book Layout • Motion Graphics

First Published • November 2023, Lyon

ISBN: 978-2-38236-632-5

Publisher • Livre de Lyon
Address • 37 rue marietton, 69009, Lyon France
website • http://www.livredelyon.com
e-mail • livredelyon@gmail.com

PREFACE

Since food and beverage businesses are a labor-intensive field of activity, human-related successes and mistakes are directly reflected in the relevant businesses. Especially in the food and beverage production process, production losses may arise due to labor errors in indispensable elements such as supply and production. When considered in terms of supplier selection criteria, it is of great importance as a factor that directly affects the entire process of businesses, from the production process to consumer satisfaction. In this study, the applicability of the Fuzzy VIKOR method in food and beverage businesses was determined as the main objective and focused on the benefits it would provide if applied. In this context, it has been determined that the fuzzy VIKOR phenomenon is largely applicable and can provide great benefits to businesses if implemented correctly. It is assumed that the study can make a significant contribution to food and beverage businesses, academicians and students.

November 2023, Balıkesir Prof. Dr. Mehmet SARIOĞLAN
Prof. Dr. Cevdet AVCIKURT

CONTENTS

INTRODUCTION

Growing and developing day by day, food businesses are service businesses established to meet people's eating and drinking needs. The capacities of businesses operating in the food industry have increased in response to rapidly increasing demand, and this has led to intensified competition among food and beverage businesses. In addition, technological developments have also led to changes in the production methods of businesses. With the phenomenon of globalization, a significant part of the assumptions of traditional competition have become invalid. It is no longer enough for companies to simply take new technology and quickly transform it into physical values in order to gain success and competitiveness. Increasing competitive conditions inevitably force businesses to make some changes in the management techniques they apply. Multi-criteria decision making (MCDM) methods are seen as one of the best tools for the right choice. For this purpose, previous studies on the subject are examined and the usage areas of the fuzzy VIKOR method, which is one of the multi-criteria decision-making methods and can be effective in food and beverage businesses in the decision-making process, are evaluated (Rostamzadeh et al., 2015).

Multi-criteria decision-making methods have been successfully applied in many fields. Methods that use many qualitative and quantitative data are used in calculations that take into account different performance criteria and weights. These are multi-criteria decision-making methods called Topsis, Electre, Fuzzy Topsis, Ahp, Fuzzy Ahp, Factor Score Method, Anp, etc. It can be summarized as (Wang at al., 2021). Topsis and Vikor methods are used in the literature as multi-criteria

decision-making tools in choosing among various alternatives that take into account multiple criteria. Food and beverage businesses have to act strategically in order to survive in today's competitive environment. Food and beverage businesses, which are the most important part of the service industry, should plan step by step, from the establishment stage until they reach the customer, and the effective decisions they will make for the business. The existence of decision-making methods is very important in food and beverage businesses to serve the purpose of establishment and to make the best decision that can be beneficial to the business on many issues that have alternatives (Rathore at al., 2021).

Choosing the appropriate storage location for food and beverage businesses is of strategic importance. Warehouse location selection is a decision problem for which businesses must develop effective solutions. Therefore, it has become imperative for businesses to accurately evaluate and choose existing or potential warehouse locations in order to compete. The warehouse location chosen by taking all these factors into consideration will be of great benefit to the business. By highlighting the variables among many alternatives, an accurate and reliable result will be obtained. Alternatives in the selection made using the fuzzy VIKOR method is a strategic decision that will strengthen its position. The personnel selection process in food and beverage businesses is also a complex but important process, and these decisions are made in an uncertain environment. Many conflicting quantitative and qualitative criteria must be taken into account simultaneously. Using fuzzy logic theory in effective personnel selection in food and beverage businesses, it creates a compromise solution that maximizes group benefit for the majority and minimizes individual regret

for the competing option. It is thought that the fuzzy VIKOR method will benefit future studies with quantitative and qualitative research on the applicability of the fuzzy VIKOR method in food and beverage businesses. In addition, increasing competitive conditions inevitably force businesses to make some changes in the management techniques they apply. In this respect, it is thought that this study will provide business managers with a perspective on the possibilities of using the VIKOR method, one of the multi-criteria decision making (MCDM) methods, in their businesses (Meksavang at al. 2019; Awasthi at al, 2018).

It is seen that supplier selection problems are handled in four steps and the application is carried out according to these steps. In the first stage, the supplier selection problem is expected to be defined. Issues such as whether existing suppliers will be changed, how many different sources will be supplied, which suppliers are needed or not, are discussed and decisions are made accordingly. In the second stage, the criteria in the supplier selection steps are tried to be formulated and classified. In the third stage, which is another stage, a preliminary selection is made among potential suppliers. In the fourth and final stage, the best supplier companies that passed the preliminary screening in the previous stage are selected and the necessary supplies are made. As in classical multi-criteria decision-making techniques, it is assumed that the weights of the criteria are known exactly in the VIKOR method. However, it becomes difficult to obtain accurate data in many real-life problems. Human decisions involving preferences are often uncertain, making it difficult to express them with precise numerical values. In such problems, the decision maker must also take into account imprecise or ambiguous information. One

method of incorporating imprecise or ambiguous information into the solution is to use linguistic considerations (Shemshadi at al., 2011).

VIKOR METHOD

The use of the VIKOR method was first introduced and used by Serafim Opricović towards the end of the 1990s. VIKOR method is a method based on the "combination function" that can be used in situations where contradictions may occur in determining the criteria on the same scale and can reach the closest solution with the best solution. The combination function in question aims to measure the closeness to the best solution by creating a ranking index. The use of the VIKOR method will be useful in mandatory situations where decision makers cannot make clear choices or cannot fully determine their preferences. In addition, the VIKOR method is also used to create a ranking index based on the degree of "closeness" of all alternatives to the best alternative (with the best values according to the evaluation criteria) (Soba, 2016).

Using more than one method in solving Multi-Criteria Decision Making (MCDM) problems is an approach that increases the validity and reliability of the results obtained. When the studies in the literature are examined, it is seen that AHP and VIKOR methods are used integratedly in many decision-making problems. One of the most important reasons for using these two methods together is that they complement each other. The superiority of the AHP method in determining criterion weights and the ability of the VIKOR method to reach a compromise solution under the specified weights have enabled these two methods to be used together many times in studies in different fields (Vahabzadeh at al., 2015). Vikor method, one of the MCDM methods, is known as a method widely used in selection and ranking problems as well as in performance evaluations. For example, Wu et al. (2009) used fuzzy Vikor and

Topsis methods in their study, ranked banks according to their performance and made some determinations to move banks to the desired level. VIKOR method determines the consensus ranked list and compromise solution by performing "multi-criteria ranking index" based on "closeness to the ideal". In this case, the use of MCDM techniques comes to the fore as an effective and soluble decision-making tool in solving problems that may arise in food and beverage businesses.

The Vikor method starts with the creation of the performance matrix (decision matrix). In the matrix, all alternatives (countries) are evaluated in terms of each criterion. The performance matrix is normalized to eliminate unit differences of the criteria. A ranking index is created by weighting the normalized matrix to reflect the superiority or priority of the criteria. VIKOR method is a method developed for multi-criteria optimization of complex systems. It is based on making a ranking and selection among the alternatives selected depending on different qualities (Bag, 2016). This method determines the consensus ranking, consensus solution and weight stability ranges for the preference stability of the consensus solution obtained with the determined weights. It offers a multi-criteria ranking index based on the measure of closeness to the ideal solution, focusing on the ranking and selection from a set of alternatives in the presence of conflicting criteria (Obricovic&Tzeng, 2004). While the Vikor method searches for a solution close to the ideal, it produces ranking indices that take into account maximum group benefit and minimum regret. In addition to this feature, it is also a method used in the optimization of multi-criteria complex systems. In this method, a compromise ranking list or compromise solution is decided. With the VIKOR method, it becomes easier to choose or rank between conflicting criteria

in research (Yıldırım&Önder, 2015). After the alternatives, criteria and scores of the alternatives are determined according to the criteria, the scores are converted into a decision matrix.

In the VIKOR method, by evaluating the decision-making criteria of each alternative determined and comparing the closeness values of each criterion to the ideal alternative, a compromise ranking, that is, closest to the ideal solution, is reached (Opricovic&Tzeng, 2007). A compromise solution is the appropriate solution closest to the ideal, and compromise means agreeing on mutual acceptance.

It is possible to list the reasons for choosing the VIKOR method as follows:

- VIKOR method is a new method that is also used by practitioners.
- There is a simple, easy and understandable comparison structure to obtain a compromise ranking among the alternatives.
- The VIKOR method is different from other methods because the maximum group benefit and therefore the minimum regret of the opponents affects the result.
- It has the feature of helping the decision-making group to be effective on the result.

The main purpose of the VIKOR method is to make a ranking for the determined set of alternatives. Adding or removing any alternative to this alternative set affects the resulting result. General features of the VIKOR method (Ertuğrul&Karakaşoğlu, 2008):

- In resolving disagreements encountered in the VIKOR method, compromise must be acceptable.

• The decision maker must be willing to accept the solution closest to the ideal solution.

• There must be a linear relationship between the benefit desired to be obtained and each criterion function.

• Alternatives must be evaluated one by one for all specified criteria.

• The decision maker's preferences are expressed with weights.

• Although in the VIKOR method the decision maker is responsible for approving the final solution, the method begins without the interactive participation of the decision maker and the decision maker can include his own preferences in this final solution.

FUZZY VIKOR METHOD

Maintaining the first step of the supply chain, it plays an important and major role in what is intended and sold. From a business perspective, supplier selection is known as a multi-criteria decision-making problem where many qualitative and beautiful criteria are not specified. One of the new divisions used to solve such problems is the Fuzzy VIKOR method. So much so that with a correctly selected supplier, there is a benefit in the competitiveness of the entire chain (Özel&Özyörük, 2007). Fuzzy set theory has been proposed and designed to be used in incomplete and comprehensive analyses. The fuzzy logic method has been adapted and implemented to different methods in the multi-criteria decision-making literature. Multi-criteria decision making is the process of achieving the best possible performance according to established rules. Real-life problems often contain constraints that cannot be expressed on the same scale and conflict with standards. Therefore, it is very difficult to reach a solution that satisfies all the selection criteria. In such problems, a compromise solution is generally sought within predetermined rules. Other annual payments are included in some payments due to the price selection process and incomplete or ambiguous information. Fuzzy VIKOR method is used because classical multi-criteria decision-making techniques are considered insufficient to include such products and expenses for solution purposes (Vahdani et al., 2010).

As in classical multi-criteria decision-making techniques, the VIKOR method is based on the assumption that the weights of the criteria are precisely known. However, it becomes difficult to obtain accurate data in many real-life problems. Human

decisions involving preferences are often ambiguous, making it difficult to express them in precise numerical values. In such problems that arise, the decision maker must also take into account imprecise or ambiguous information. One of the other methods of incorporating imprecise or ambiguous information into the solution is to use linguistic evaluations. Fuzzy VIKOR method is the application of fuzzy logic to the VIKOR method. The method offers rational and systematic processes in finding the best solution and compromise solution, taking into account linguistic considerations. The steps followed in this process are as follows (Chen&Wang, 2009: Moeinzadeh&Hajfathaliha, 2009). In classical multi-criteria decision-making techniques, it is assumed that the criterion weights and evaluations are known precisely. However, in real life, it is not possible to use precise statements in some situations.

The following steps are followed in the application phase and solution process of the Fuzzy VIKOR Method (Zhang&Wei, 2013).

Step-1: Establishing the decision-making group, determining evaluation criteria and alternatives
Step-2: Evaluation of criteria and alternatives
Step-3: Converting linguistic evaluations into fuzzy numbers
Step-4: Calculation of fuzzy weights for criteria
Step-5: Creating a fuzzy decision matrix for alternatives
Step-6: Determination of fuzzy best and worst values
Step-7: Calculating the distances of the alternatives to the best and worst value
Step-8: Calculation of alternative values
Step-9: Clarifying fuzzy numbers and ranking alternatives
Step-10: Determining the compromise solution

Linguistic variables are the variables that determine the properties of the elements of this fuzzy logic set. The numerical value of such linguistic expressions is determined by fuzzy set and fuzzy number definitions. In fuzzy decision methods, decision makers evaluate the importance of decision criteria and alternatives by using linguistic variables. As is the case with many situations encountered in daily life, the comments and evaluations that arise during decision-making processes in businesses may not be definitive. If absolute numerical values or clear judgments cannot be used in the evaluation of relevant units in decision-making problems, verbal expressions are used. In addition, exact values may be insufficient to model situations encountered in reality. In real-life problems, there are situations where it is not possible to obtain accurate data under all circumstances. Fuzzy logic stands out with its superiority in terms of its ability to explain uncertainties (Sahu at al. 2016).

APPLICABILITY OF THE FUZZY VIKOR METHOD IN FOOD AND BEVERAGE BUSINESSES

Today, food and beverage businesses have to make an effective choice among decision-making methods on critical issues related to the business in order to increase their profitability, minimize their costs and remain permanent in the sector. Making the most appropriate decisions for the business means the growth of the business. However, it is quite difficult to determine the appropriate method among many alternatives to increase efficiency. At this point, multi-criteria decision-making methods have been developed to solve these problems (Sezen, 2021; Dinç&Türkmen, 2021).

In the study of Yıldız and Deveci (2013), the personnel selection process based on the fuzzy VIKOR method was examined and in this process, five candidates were evaluated by three decision makers according to five criteria and a ranking was made according to the calculated results. The study showed that the fuzzy VIKOR method can be used as an effective method in personnel selection.

Again, in the study conducted by Sarıoğlan (2016), the feasibility of the fuzzy VIKOR method, which has been applied for a long time in industrial enterprises, as a new supplier selection technique in food and beverage enterprises, was investigated and it was concluded that the fuzzy VIKOR method can be effectively applied in food and beverage enterprise supplier selection. In addition, it has been determined that the application of the VIKOR method can increase the level of

efficiency in choosing the right supplier for food and beverage businesses.

Competition, which brings about serious changes in every sector today, also makes itself felt in the service sector. Businesses that meet customer demands and needs immediately and completely are one step ahead of the competition. At this point, location selection has become an important issue for service businesses that are in constant contact with the customer (Sezen, 2018). This problem becomes even more important in food and beverage businesses, which have an important place among service businesses. In the literature review, it was seen that studies on this subject were examined under certain headings, but not much work has been done on its implementation in food and beverage businesses. There is only one study in the literature where the fuzzy VIKOR method was used in food and beverage businesses.

In the study conducted by Sarıoğlan (2016), the applicability of the fuzzy VIKOR method, which has been applied in industrial enterprises for a long time, as a new supplier selection technique in food and beverage enterprises, was investigated. Supplier selection is a multi-criteria decision-making problem that requires food and beverage businesses to take into account many qualitative and quantitative criteria. By establishing an effective decision-making community, it can be chosen which suppliers will be more useful to meet the needs of the Business and which will produce better business quality among suppliers with similar goods. Considering the stages of the fuzzy VIKOR method, the levels of the criteria are determined according to their importance, evaluated between suppliers and compromise solutions can be reached.

It is possible to classify the important points to be considered when choosing the tools and equipment to be supplied to use

the Fuzzy VIKOR method in the food and beverage production process, as shown below (Gökdemir, 2009).

- Diversity of the menu,
- Width of the working area,
- Advantage of energy and fuel to be used,
- Number of portions to be prepared,
- The characteristics of the business,
- The way food items are purchased,
- Service technique and duration,
- The experience and qualifications of the personnel,
- It will be possible to classify it as the budget allocated for materials. Knowing these basic criteria will facilitate the application of the method.

PRODUCTION MANAGEMENT IN FOOD AND BEVERAGE BUSINESSES

Production of food and beverages is one of the most basic and important functions in food and beverage business. In other words, food and beverage production is the largest and most important part of the operation. If the food and beverages produced are not prepared in accordance with the standards, even a well-planned menu, effective purchasing, qualified service (presentation) and a good control system will be insufficient to create a good food and beverage operation; This means that it will prevent the entire operation from being successful (Ekinci, 2018).

The food and beverage production system and technique must be decided at the planning stage. During this process, it should also be determined which customer group or groups will be addressed. The long-term success of the food and beverage operation depends on better execution of the food and beverage production planning activities before and after. In cases where there is no or insufficient production planning, problems such as unnecessary stocking, idle capacity formation, high labor costs, long-running production systems, overtime, and insufficient demand will arise. Therefore, financial losses are expected to occur over time. In order to prevent errors, sufficient time should be allocated to the production planning phase, capital should be used effectively and special effort should be made. On the other hand, paying attention to points such as hygiene and sanitation rules, storage methods and preparation methods in food and beverage production are among the points that should not be

neglected during the production phase. In food businesses, the production process begins with purchasing control, receiving, storing, removing materials from the warehouse, the cost control process, which is defined as a process that continues with production and sales control, analysis of income and expenses, determining and maintaining standards, pricing, preventing waste, errors and frauds. It aims to minimize the risk and inform the management on this issue. Any negativity that occurs in any of the cost control processes in food businesses will reduce the efficiency of cost control and prevent the analyzes from giving accurate results, which will negatively affect the decision-making process during this period (Sarıoğlan&Arslan, 2020; Sarıoğlan&Bostan Sarıoğlan, 2012).

As in every sector, the competitive environment that brings about serious changes is felt in the food and beverage sector. Businesses that meet the demands and needs of customers or consumers immediately and completely are one step ahead in the competition. In this context, suppliers become an important issue for service businesses that are in constant contact with customers. This problem has become even more important in food and beverage businesses, which have an important place among service businesses. Supplier selection, which is described as the area where a business can achieve its goals in the long term and provide the lowest cost and highest profit, is not only important from a commercial perspective, but also includes dimensions that may arise as a result of criteria such as income distribution, regional development differences, environmental factors and incentive measures, and clustering (Aytekin&Kaygın, 2005).

When choosing a supplier, the current situation as well as changes that will occur over time should be taken into

consideration. Choosing a suitable workplace has become one of the most important issues for the food and beverage industry, especially due to increasing the capacity utilization rate and thus improving the return on investment performance. The importance of the subject has increased the interest of academic circles and businesses. On the other hand, the importance of the issue increases even more when it is taken into consideration that the choice of facility location has strategic effects since it is a long-term decision regarding the use of resources. It is also considered one of the most effective factors on the operational performance of food and beverage businesses (Yang&Lee, 1997).

The basis of production is economic activities aimed at meeting human needs. Economic activities begin with production, continue with production and end with production. There is a close and interconnected relationship between the economic development of a country and production. Economic development of a country as a result of economic activities is only possible by increasing business income as a result of the production of goods and services. In underdeveloped and developing countries, existing resources are scarce, there is not enough income for investment, and production must be carried out in the right areas in order to use existing resources efficiently. In underdeveloped and developing countries, areas where production investments can be made should be determined, and correct production techniques that can maximize production increase among alternative investments should be used. The ability to carry out production processes depends on the quality of the materials used, as well as the training of the personnel and the possession of the necessary equipment. In addition to the opportunities provided by technological developments,

the skills and experience of production managers in using equipment will prevent losses that may occur at this stage. It covers all the processes related to controlling the food during the production phase, preparing standard recipes and arranging the production accordingly, determining standard portions and cooking techniques (Fu at al., 2011; Sarıoğlan, 2011). In this context, the production stages in the kitchen are as follows (Aktaş&Özdemir, 2012):

- Purchasing food supplies,
- Receiving food supplies,
- Storage of food materials,
- Removing food from the warehouse,
- Preparing food materials for production,
- Cooking food ingredients,
- Portioning the food and finally serving it,
- Additionally, post-production cleaning work also forms a part of production

There are various principles of food production. These principles are stated below (Sökmen, 2014).

- In food and beverage production, care should always be taken to select quality food ingredients. Food ingredients prepared with the highest quality products do not mean the most expensive meal.
- It is necessary to ensure that the food used in production is clean and suitable for human health.
- Food preparation must be carried out in accordance with the rules and official procedures that must be followed.

- During food and beverage production, care should be taken to use the products in the appropriate and correct order of flavorings (spices, etc.).
- Care should be taken to use standard prescriptions and staff should be informed.
- Food should not be cooked in larger amounts and/or more than the required amount and this should be avoided.
- Food should be served without waiting after production.
- Foods that need to be served hot should be served hot, and foods that need to be served cold should be served cold.
- The presentation of each produced dish must reflect different characteristics.

SUPPLY PROCESS OF FOOD AND BEVERAGE MATERIALS

Supplier selection problem, which is one of the most basic problems faced by businesses, is very important for businesses to work with the right suppliers in providing services or obtaining external resources used in the production of products according to the areas and sectors in which companies operate. In competitive market conditions, businesses need to turn towards the solutions that can be provided to meet the needs, requests and demands of the customer types they target in order to continue their activities. In this context, supplier selection constitutes one of the most important activities for most companies and has a significant impact on the effectiveness of the entire supply chain. Supply chain theory refers to the set of concepts, models and relationships that define the connections between manufacturers and distributors in the context of the production of a good (Smith&Xiao, 2008).

Supply Chain Management (SCM) can be defined in the literature as the management philosophy of all flows in the line, from the first supplier to the end customer. The basic idea is to view the line as a whole in order to understand it as a real system. All members in the line directly or indirectly affect other line members and line performance (Dağdeviren et al. 2006). In this process, many problems are encountered in supply chain management. By solving these problems, more effective and efficient use of raw materials will be ensured and a more sustainable food and beverage industry will emerge. The problems that need to be addressed from this perspective have led to studies on customer services, cost control, partnership

relationship management, chain division, invisibility and coordination difficulties. A smooth and effective supply chain management can be defined as delivering the right product in the right quantity and condition, under the right conditions, with the right documents, at the right place and time, at the most affordable price. Businesses' use of these methods not only provides benefits in terms of cost, but also offers other benefits (Anvar, 2013). Some of the other benefits other than cost are expressed by The Council of Supply Chain Management Professionals as follows;

- Improved delivery performance
- Decrease in stocks
- Shortening of cycle time
- Increased prediction accuracy
- Increased efficiency throughout the chain
- Reduced costs throughout the chain
- Increasing capacity realization rate (Özdemir, 2004).

Waste and deterioration of raw materials used and supplied in the food and beverage industry in this process have negative effects on both businesses and the sustainability of assets in the future. Increasing competitive environment in global world markets; It forces businesses to make their products better, prepare them faster and deliver them faster. However, the complexity of the operations within the organization and the entire supply chain in food and beverage businesses makes it difficult to do all of these at the same time. The competitive environment constantly brings with it new markets, new products, new processes, new factories and facilities, new threats and new opportunities. The problem is that businesses

think about how to increase market share and profitability in these difficult moments (Doğdubay, 2006).

As a philosophy, the basic element in food and beverage supply chain management is to portray the supplier, producer, distributor and customer elements that make up the process as a single integrated system, and to develop management techniques in this respect and to focus on the compatibility of these techniques. In this respect, it is necessary to abandon production-based marketing models and focus on a service-based model in SCM. The reason for this is argued that even when consumers purchase tangible goods, they want to obtain the services that these goods provide for them (Bastos, 2013).

THE IMPORTANCE OF SUPPLIER SELECTION

Suppliers, which form the starting point of the supply chain, are of vital importance for businesses in terms of achieving the goals of the business (Akyüz, 2012). Supply selection constitutes one of the most important problems in the management of the supply chain and the adaptation of suppliers to the system (Shin, at al., 2000). Supply chain management, which works to transfer materials and information in the most effective way during the purchasing, distribution and production process, which is an ongoing process from suppliers to the consumer, also aims to constantly control and correct the design of a network that includes manufacturers, suppliers, distribution channels and customers. It is possible to say (Özyörük, 2008).

Nowadays, companies are obliged to produce quality and low-cost products or services, and it is seen that companies are forced to meet these requirements with the increasing globalization of competition conditions as well as rapidly developing technological developments. It can be stated that the most logical supplier selection is to evaluate the success of the suppliers (Özder& Eren, 2016). Supplier selection, which directly affects the selection of the products supplied, also ensures that the efficiency and quality are of the desired quality, and is one of the most important factors in selecting the suppliers that supply the products (Baynal&Yüzgüllü, 2013).

Supplier selection problems can be addressed in four steps. In the first stage, the supplier selection problem is expected to be

defined. In the second stage, issues such as whether the existing suppliers will be changed, how many different sources will be supplied, and whether suppliers are needed are discussed. In the third stage, which is another stage, an evaluation is made among potential suppliers and a preliminary selection is made. In the fourth and final stage, the best supplier companies that passed the pre-selection in the previous stage are selected (Acar&Çapkın, 2017).

Selection of suppliers, which is an important decision in achieving the companies' future goals; It can be affected by various factors such as finance, customer satisfaction and quality. For this reason, it is very important for businesses to make correct decisions in the supply selection process with an objective approach. Supplier selection is a multi-criteria decision-making problem in uncertain environments. Many criteria conflict with each other in the supplier selection process. For this reason, decision-making criteria in the supply selection process are confusing (Raosaheb, 2014).

Supply selection constitutes one of the most critical activities in the process of finding the right supplier that can provide products or services to businesses at the right quality, in the right quantity and at the right time. On the other hand, being a multi-criteria group decision-making problem that usually involves a number of conflicting situations in which the decision maker's information is unclear and uncertain creates a disadvantage in terms of supplier selection (Boran et al., 2009). A buyer's range of choices in trade is expanding with globalization and internet opportunities. Constantly changing customer demands and preferences require a faster and wider supply selection. Many different studies have been conducted to improve and support the supplier selection process (Hsu, at al. 2014).

Supplier selection criteria: Identifying the most suitable suppliers in line with the needs and demands of businesses is one of the Multi-Criteria Decision Making problems that are constantly in conflict with each other in supplier selection and also include many abstract and concrete criteria (Özdemir, 2010). The effective supplier selection process, known as one of the most valuable criteria for the long-term survival and sustainability of service providers, also affects the size of the investments made and the increasingly competitive environment.

In supplier selection problems, in addition to determining the criteria that will be the source of selection, these criteria are arranged and grouped by taking into account their contribution to the results and in order to increase the efficiency of the application model. Criteria are defined as main criteria and sub-criteria that are in the process of interacting with these criteria. Determining suppliers is one of the most basic practices for the purchasing methods of the supply chain, due to the important role played by the supplier in achieving the main objectives of the supply chain, such as service, delivery, quality and cost performance. The supplier selection process is of great importance in determining the future and interests of the business (İnce&İmamoğlu, 2016).

The supplier selection problem is known as a multi-criteria decision-making problem in which more than one evaluation criterion is taken into account. When we look at the percentage of purchasing costs in all costs, it is seen that it reaches up to 70%. Thus, the positive impact of supplier selection on the success of the business can be understood more clearly and its importance can be realized (Şahin&Supçiller, 2015). The most important criteria that should be evaluated in line with the

decisions taken by businesses to determine suppliers are listed below.

- Purchased materials form the basis of most products.
- The role of suppliers has a very important place in the purchase of quality products and raw materials.
- Supplier selection is of vital importance.
- Businesses attach great importance to their suppliers when making investments.
- Making rational supplier selection choices instead of trying to benefit from competitive discounts will be advantageous for businesses.

RECEIPT OF FOOD AND BEVERAGE PRODUCTS

The next stage after purchasing in the production management of food and beverage businesses is receiving. In other words, it is the realization of consolation. Receiving can be considered as an activity that is complementary to the purchasing process, starting at the point where the purchasing activity ends. During this period, it is checked whether all the activities carried out during the purchasing phase and all the issues that need to be taken into consideration are as required. Some basic operations that are required and mandatory for receiving delivery: It is the checking by the personnel that the desired product is delivered in the desired quality, in the ordered quantity and at the ordered price. In large businesses, there may be a separate receiving officer for this, or people in the kitchen department can be authorized to carry out this process, as in purchasing. In the receiving process, as in purchasing, it is important that the responsible person who will use the received material, whether authorized or not, is present in the delivery area during the process in order to ensure correct controls (Khandwani at al., 2023).

In production management, the receiving phase is the process of counting, measuring and weighing the food and beverage materials ordered after the purchasing phase, in line with the policies of a food and beverage business, by the receiving personnel or a kitchen staff, checking the quality and accuracy of the desired product and receiving it. means in general terms. Receipt process means receiving the requested materials by counting, measuring and weighing them during delivery to

the business, and it is an important management element for fast and accurate production in the business. Since the area where the delivery takes place is an independent area, it is the place where transactions are carried out regarding the quantity of the ordered material and the received material, whether it is of the desired quality or not, and whether it is purchased at the determined price, before the materials enter the business. It is important that the procedures regarding delivery are carried out under the responsibility of a unit (Wang et al., 2013)

Food materials arrive at the business after being purchased according to certain specifications (such as quantity, quality). At this stage, the delivery process has started. Food supplies that arrive at the facility upon delivery may sometimes change hands. For this reason, in order to obtain the expected benefit from the receiving operations, necessary checks should be made on the food materials arriving at the facility. If the receiving operations will be carried out by a receiving personnel affiliated with the purchasing department in large establishments, the presence of the head chef is important for the kitchen-receiving relationship, even though the food is not received very frequently. The person who will be responsible for the delivery must perform the following procedures (Lu&Yi, 2014).

- To ensure the accuracy of the quantities and prices of food ingredients by comparing them with the order form and the invoice held by the delivery person.
- To evaluate the quality of purchased materials according to the purchasing specifications form.
- Organizing the required forms during delivery and delivering copies of them to the accounting and warehouse personnel.

- Contacting the seller about missing ingredients and making the necessary corrections, and informing the accounting and kitchen about this issue,
- To deliver food products to the kitchen and related warehouses and place them in a certain order.

Receiving activities are generally carried out by the purchasing department. Receiving activities are generally carried out in the back of the businesses, and there is a large area in this area where food and beverage items can be easily accepted. In order to carry out receiving activities, businesses must have a sufficiently large receiving area and the necessary equipment for the receiving process in this area. Food and beverage items are classified as perishable and non-perishable when accepted by the receiving unit. Perishable food and beverage items are sent directly to the kitchen. However, it is extremely important that the receiving area is close to the kitchen and warehouses, that it is clean and that its physical conditions are suitable for receiving (Chiu&Hsieh, 2016).

STORAGE OF FOOD AND BEVERAGE PRODUCTS

Warehouse serves as a connection between the planning and production areas and sales departments of a business and is defined as open or closed areas where the materials purchased for the food and beverage business are kept ready for use in case they are needed. In production management, warehouses include all sections with different physical conditions (such as heat, humidity, light and ventilation) and facilities in a planned and organized manner, helping to preserve all kinds of food and beverage materials in businesses for a long time. In other words, it is possible to define warehouses as open and/or closed areas where the received materials are protected, maintained and recorded in appropriate conditions for use when needed (Görçün, 2013). Storage is a kitchen service performed to eliminate deterioration and decay in order to maintain the quality of the purchased and delivered materials. In other words, precautions must be taken to ensure production and to prevent food and beverage spoilage and theft. It covers all the receiving, storage, stocking and distribution activities carried out to prevent customer complaints from being wasted in vain and to prevent customer complaints by pre-determining the stocks that may occur depending on customer demand (Scanlon, 1993).

The storage method can be carried out in locked warehouses under the responsibility of business managers, or in unlocked warehouses. The main purpose of storage is to be prepared for production by ensuring that supply is adapted to demand. However, this cannot be realized in food and beverage

businesses as in other sector businesses. The short storage and stocking times of food and beverages make long-term stocking difficult. It is not possible to preserve produced, ready-to-serve food for a long time. Therefore, stocking and storage in food and beverage businesses can be carried out in a more limited way. Storage of products supplied to the business at great cost and effort is of great importance both in terms of quality product production and costs (Reynold&DiPietro, 2008).

No matter how difficult it is to obtain a product, if it is not stored properly, the product will have no value or feature. For this reason, it is of great importance to store the product correctly in order to produce it in accordance with its purpose. In addition, correct and functional positioning of warehouses in production management is effective in reducing unnecessary workforce and is also important in fulfilling hygiene rules. For example, having cold storages close to the product entry aisles will prevent heat loss and minimize the risk of cross-contamination (Anshori, 2012).

In terms of production management, the warehouses of the food and beverage business are important for the proper protection of business resources. Materials used in food and beverage businesses (Suryawan, 2020);

- The products are not durable,
- The quality of the materials used in food and beverage production decreases when they are not used,
- They are products that may threaten human health due to deterioration,
- The materials may cause economic damage to the business due to deterioration,
- There is a significant need for warehouses due to the risk of materials being stolen.

The location of warehouses is of great importance in food and beverage businesses. In this respect, great care should be taken when choosing a location for warehouses. These factors should be taken into consideration, especially when setting up a business kitchen. It is important for businesses to take all necessary precautions to ensure the best protection of food and beverage materials to be stored in warehouses. Warehouses must be located on the same floor as the kitchen and as close to the kitchen as possible. Thus, it provides an advantage in terms of saving time and personnel in transporting the received food and beverage materials to the warehouse in a short time and transferring them to the kitchen when necessary (Barlan-Espino, 2017).

In order for food and beverages stored in warehouses to be stored without spoiling, there are certain features that warehouses must have. These features (Gordon&Brezinski, 1999):

- The floors and walls of the warehouses must be made of reinforced concrete or metal,
- Ventilation equipment in warehouses must work well and continuous air circulation must be ensured,
- Doors and windows must receive light,
- The ideal temperature of warehouses other than deep freezers and cold storages should be between +10 C and +15 C,
- Warehouses must have a moisture-free air environment, and warehouse walls and floors must be insulated against moisture,
- The humidity level of the warehouses must be constantly kept under control and monitored,

- It is necessary to pay attention to the ventilation of warehouses,
- Warehouses should be kept clean and easily cleaned, and warehouses should be used accordingly,
- It is necessary to have adequate lighting systems in warehouses,
- There must be a slope suitable for liquid fluidity in the tanks, and in case of a sudden downpour, necessary precautions must be taken in the tanks against the danger of flood by creating mechanisms such as drains,
- It is important for warehouse use to have sufficient shelves and similar storage areas, to place the shelves on the wall at 5 cm intervals and to have a height of 20-25 cm from the ground,
- Having sufficient cold rooms in warehouses,
- Having enough refrigerators in warehouses,
- Warehouses are arranged to allow easy movement,
- Necessary precautions against fire have been taken in warehouses,
- Ensuring security against all kinds of theft in warehouses,
- It is necessary to ensure that the cold room doors in the warehouses can be easily opened from the inside and that there is a help button in case of being trapped inside.
- Keeping the coolers in the warehouses in working order at all times and taking necessary precautions against power cuts,
- It is possible to list the storage areas as being away from sewer pipes.

In order to effectively manage production, warehouse location selection is a decision problem that businesses need to develop effective solutions for. Therefore, it has become

mandatory for businesses to accurately evaluate and choose existing or potential warehouse locations in order to compete. The warehouse location chosen by taking all these factors into consideration will be of great benefit to the business (Kseniia, 2014). By highlighting the variables among many alternatives, an accurate and reliable result will be obtained. Warehouses show some diversity according to their usage types and purposes. Dry warehouses; These are areas where food and beverages are stocked, also called pantries. Food and beverages should not come into direct contact with the floor in these areas. Because products that come into contact with the ground may deteriorate quickly. The shelves should be arranged at least 10 cm above the floor surface and the design should be made this way. In addition, food and beverages should be placed away from wastewater and normal water pipes. Chemical substances such as detergent and disinfectant and food and beverages should never be in the same warehouse. Perishable foods such as nuts, tea, flour and oil should be stored in warehouses with a temperature of +10 to +15 degrees; Food products that spoil more quickly, such as tomatoes, okra and watermelon, should be stored in warehouses with temperatures between +5 and +8 degrees. Cold stores; These are warehouses where perishable food and beverage materials are stored. There are two types within itself; Warehouses with temperatures between 0 and +2 degrees, used for short-term preservation and production (meat, chicken, fish, milk and dairy products, etc.) and -20 degrees, used for long-term preservation and production (chicken, meat, fish, etc.). It is possible to classify them as warehouses used for foods that need to be preserved by freezing at temperature (Wang, 2008).

PRODUCTION OF FOOD AND BEVERAGE PRODUCTS

While the preparation of food and beverages has different characteristics and requires a long process and detailed kitchen equipment, beverages can be prepared directly or with small mixtures and easily presented to customers. In this context, especially foods need to go through some preliminary preparation processes before cooking. However, before this, it will be necessary to determine the foods that the business will prepare for production. For this purpose, the amount that can be sold is determined by making predictions about the past sales of the foods to be prepared and the current situation and preliminary preparations are made. Preparation for food consists of different stages: One of these stages is the preliminary preparation of the food, cooking it and making it ready for service. Preliminary preparation process can be done by following the following steps for some products (Blech, 2009):

Washing: After the vegetables are washed in plenty of water, the roots of the root vegetables are first cut, the tubers and carrots are washed and cleaned of their soil, and then they are peeled. However, one thing to be aware of is that leaving vegetables in water for a long time while washing them may cause their nutritional values to decrease.

Sorting: Vegetables are separated by stems, awns, leaves, etc. It is the separation of such places from each other. Since the vitamins in peeled vegetables are usually close to the bottom of the peel, care should be taken to peel the peel as thinly as possible. Since vegetables such as celery and artichoke may

darken when exposed to air during the peeling period, keeping them in lemon or vinegar water will prevent darkening. As for potatoes, they should be kept in water without lemon.

Chopping: The sorted vegetables should be chopped without waiting. Green leafy vegetables, whose stems, leaves and stems are used, should be chopped close to cooking as they mostly contain water.

While special tools and equipment are needed to carry out preliminary preparations, establishing an effective control system for healthy production management depends on personnel and equipment that will minimize material losses. Management of products and equipment may vary depending on the equipment used, people and their habits. In addition to insufficient personnel, failure to comply with the standards at this stage may also lead to cost increases. On the other hand, making the preliminary preparation in a different place and taking it to another place for the final preparation (cooking and getting ready for service) is another factor that increases the costs (Camillo, 2021).

In general, the following issues should be taken into consideration when preparing food (Raspor, 2008):

- Obligation to have various materials depending on the number of food and beverages,
- Some materials are not durable,
- Considering the easy perishability of ready-made food,
- Availability of fast-converting foods; For example, preparing and serving a frozen meal immediately,

- The customer often has to come to the business for purchasing,
- Production management must be carried out by taking into consideration issues such as using different preparation methods and production must be carried out accordingly

After cooking, food is brought to an easily edible and digestible state. Possible organisms harmful to human health are destroyed and thus the storage period of food is extended. In addition, cooking makes foods more appetizing by improving their color, aroma, smell and taste. Some changes may occur in foods during cooking, which can be classified as structural changes in the structure of the food, aesthetic changes in their appearance, and changes in their nutritional values (Özdoğan, 2014).

METHOD

The fuzzy VIKOR method is a multi-criteria decision-making method and determines maximum group benefit and minimum individual regret and creates a compromise solution. In this application, the applicability of the fuzzy VIKOR method in the production management of a food and beverage business is discussed. In this process, five alternatives (supply, delivery, storage, production, marketing) are determined by five decision makers (employee, middle level manager, senior manager and business owner) according to five criteria (patisserie, scullery, hot kitchen, cold kitchen, ala carte kitchen) and ranking them according to the calculated results express the main purpose of the research.

In scientific research, the main goal is to collect data suitable for the purpose of the studies and to reach correct findings and conclusions from these data (Büyüköztürk et al., 2018). In this context, it is important to use the universe size for scientific research. Therefore, the population of this study consists of all food and beverage managers operating in Turkey. However, after determining the universe in scientific studies, difficulties and limitations are experienced in reaching the entire universe. The studies are completed by selecting smaller groups within the universe. These small groups; It is defined as a sample and provides convenience in terms of accessibility (Baltacı, 2018; Büyüköztürk et al., 2009: 4). Since there are limitations in reaching the entire population in this research, 404 people were reached by using the simple random sampling method. However, since 13 of the completed surveys were marked incorrectly, 391 survey data were evaluated within the

scope of the research. The interviews were held face to face with five decision makers between April 2023.

The data intended to be used for the research were provided in a two-stage process. In the first stage, within the framework of the literature review, multi-criteria decision-making processes, fuzzy vikor, and food and beverage businesses were examined from secondary sources. In the second stage of the study, survey technique was used as a data collection tool for the application part. The survey form used in the research was prepared as a new scale by applying scale development processes. Scale expressions were arranged within the scope of academicians' opinions. The first part of the survey includes a closed-ended question to learn about the participants' positions in the enterprises. In the second part of the survey form, interval scale expressions were included in order to determine five alternatives such as supply, delivery, storage, production and marketing, based on five criteria (patisserie, scullery, hot kitchen, cold kitchen, a'la carte kitchen).

The data obtained within the scope of this research scale was analyzed using the Statistical Package for the Social Science (SPSS) program. Skewness and Kurtosis values were examined in order to analyze the research data and analyze the normality distribution of the data. As a result of the results obtained, it was determined that the data showed normal distribution. In order to determine the construct validity and reliability of the survey form, Cronbach's Alpa value was examined. Frequency and percentage analysis was performed on the scale used to determine demographic characteristics. One-way analysis of variance was used to test the applicability of the fuzzy VIKOR method in the production management of a food and beverage business.

FINDINGS

The primary data collected within the scope of this study was obtained using the survey technique. The collected data were transferred to the computer environment, a database was created and the targeted analyzes for the study were carried out. In order to determine the demographic characteristics of the participants, frequency and percentage analysis were first conducted.

Within the scope of data analysis, the results in Table 1 were obtained within the framework of skewness and kurtosis coefficients in the context of determining whether the data set had a normality distribution or not.

Table 1. Skewness and Kurtosis Test Results

Scale	n	Min.	Max.	Mean	Standard Deviation	Skewness		Kurtosis	
						Statistic	Standard Error	Statistic	Standard Error
Fuzzy VİKOR	391	1	5	3,67	1,131	-0,570	0,123	-0,411	0,246

In this research, skewness and kurtosis coefficients for the fuzzy VİKOR multi-criteria decision making method; It was determined as -0.570 and -0.411. Since the Skewness and Kurtosis values were in the range of (-+) 1, it was decided as a result of the analysis that parametric tests could be used in the study (Hair et al., 2013; Tabachnick and Fidel, 2013). In this context, “One Way ANOVA” results were examined for groups with more than two variables (supply, delivery, storage, production, marketing) in order to evaluate food and beverage businesses in the fuzzy VİKOR multi-criteria decision-making process.

In scientific research, it is very important to analyze the skewness and kurtosis values, as well as to test the construct validity and reliability of data sets (Chiristensen, Johnson and Turner, 2015: 154). Therefore, exploratory factor analysis was used in this research. In explanatory factor analysis, the Bartlett value ($p<0.05$ or $p<0.01$), which shows the suitability of the data obtained as a result of the field study for factor analysis (Hair et al., 2010: 99), and the Kaiser-Meyer-Olkin (KMO) variable set. The value used as an indicator of how common it is is important. Based on the Kaiser-Meyer-Olkin (KMO) value, it can be determined how many factors the data set consists of by taking into account the factors with eigenvalues greater than 1 (Erdoğan, 2003: 358).

In this research, the Varimax Rotation Method, one of the vertical (orthogonal) rotation methods that provides ease of interpretation when applying factor analysis, was used. In social science studies, the cumulative variance ratios of the dimensions resulting from factor analysis are expected to be in the range of 0.40-0.60 (Tavşancıl, 2002, 48-50). Therefore, the KMO ratio must be 0.5 or above 0.5. Those below the specified value are not considered suitable for examination (Hair et al., 2010: 99). For this study, the KMO value was determined as 0.90 and the Bartlett value was determined as $p=0.00$ ($p<0.05$).

The reliability coefficients of the statements prepared in order to evaluate the alternatives regarding the fuzzy VİKOR in the second part of the survey form were analyzed. For reliability analysis, Cronbach Alpha coefficient was evaluated (Özdamar, 2004; Erkuş, 2009) and it was determined whether the expressions in the scale were homogeneous or not. Churchill and Gilbert (1979) defined the reliability levels of the Cronbach Alpha coefficient as "$0.00 \leq \alpha < 0.40$" is unreliable, "$0.40 \leq \alpha$

<0.60" is low reliability, "0.60 ≤ α <0.80" They determined that it is quite reliable and if "0.80 ≤ α <1.00", the reliability is high.

It was observed that the fuzzy VİKOR scale explained 66.490% of the total variance and the overall reliability coefficient of the scale was α = 0.86. Kalaycı (2010: 405) stated that the reliability of the scales used in the research has a value of "0.80 ≤ α <1.00 = high reliability". Based on the alpha coefficients, it is possible to say that the scale is quite reliable (Akgül and Çevik, 2003: 436).

At this stage of the study, the results of one-way variance analysis of the data obtained for the applicability of the fuzzy VİKOR method in the production management of the food and beverage business are included. In this process, the analysis results, in which five alternatives (supply, delivery, storage, production, marketing) were evaluated according to five criteria (patisserie, scullery, hot kitchen, cold kitchen, a'la carte kitchen), were first carried out for the patisserie. The relevant results are shown in table 2.

Table 2. Applicability of Fuzzy Vicor Method in Patisserie

View	Position	n	$\bar{x}$	σ	F	p
Supply	Employee	59	3,81	1,420	9,632	**0,000***
	middle manager	66	3,12	1,089		
	senior manager	102	3,45	0,981		
	business owner	151	3,92	1,023		
Consolation	Employee	59	1,00	,000	1779,822	**0,000***
	middle manager	66	2,00	,000		
	senior manager	102	3,00	,000		
	business owner	151	4,33	,472		
Storage	Employee	59	3,71	1,340	3,963	**0,004***
	middle manager	66	3,30	1,265		
	senior manager	102	3,65	,908		
	business owner	151	3,89	0,977		
Product	Employee	59	3,44	1,405	4,681	**0,001***
	middle manager	66	3,62	1,134		
	senior manager	102	3,55	1,030		
	business owner	151	3,97	,955		
Marketing	Employee	59	3,49	1,318	7,275	**0,000***
	middle manager	66	3,36	1,118		
	senior manager	102	3,31	1,126		
	business owner	151	3,94	0,918		

Table 2 shows the results of one-way analysis of variance conducted to determine the applicability and relationship of the fuzzy VİKOR method among five alternatives in the patisserie for five decision makers. As a result of the one-way analysis of variance of the decision makers with five alternatives, it was determined that there was a significant difference in all variables ($p < 0.05$). This situation seems possible to express the idea that choosing the most appropriate one among the alternatives by using multi-criteria decision-making methods in the patisserie

can be both feasible and beneficial. In his study, Akyüz (2012) found that the fuzzy VİKOR method applied in the procurement process to select the supplier that best suits the company's goals and objectives is beneficial in the decision-making process and application, thus making it easier to choose the most suitable supplier for the company's goals.

Table 3 shows the results of one-way analysis of variance for the applicability of the fuzzy VİKOR method in the dishwashing house. The relevant table is detailed below.

Table 3. Applicability of the Fuzzy Vikor Method in the Dishwasher

View	Position	n	$\bar{x}$	σ	F	p
Supply	Employee	59	3,39	1,427	5,899	**0,000***
	middle manager	66	3,12	1,183		
	senior manager	102	3,43	1,095		
	business owner	151	3,85	1,082		
Consolation	Employee	59	3,76	1,489	6,101	**0,000***
	middle manager	66	3,47	,948		
	senior manager	102	3,25	1,105		
	business owner	151	3,87	0,982		
Storage	Employee	59	3,97	1,389	7,933	**0,004***
	middle manager	66	3,32	1,192		
	senior manager	102	3,28	1,181		
	business owner	151	3,86	1,096		
Product	Employee	59	4,14	1,152	9,647	**0,001***
	middle manager	66	3,29	1,286		
	senior manager	102	3,52	1,175		
	business owner	151	4,01	0,986		
Marketing	Employee	59	3,76	1,418	4,099	**0,003***
	middle manager	66	3,45	1,205		
	senior manager	102	3,46	1,021		
	business owner	151	3,91	1,002		

In Table 3, the results of one-way analysis of variance, which was conducted to reveal the applicability and relationship of the fuzzy VİKOR method among five alternatives in the dishwashing house, are given for five decision makers. As a result of the one-way analysis of variance of the decision makers with five alternatives, it was determined that there was a significant difference in all variables ($p < 0.05$). In this context, it is possible to say that it is feasible to choose the most suitable one among the alternatives by using multi-criteria decision-making methods in the dishwasher. The fuzzy VİKOR method focuses on the selection of the most appropriate and beneficial alternative by ranking alternatives under conflicting criteria (Oprivicić & Tzeng, 2004: 447). Therefore, it would be correct to say that it would be reasonable to use this method in the dishwasher, which is one of the production stages of food and beverage businesses in the research.

Table 4 shows the results of one-way analysis of variance for the applicability of the fuzzy VİKOR method in the hot kitchen. The relevant table is examined below.

Table 4. Applicability of Fuzzy Vikor Method in Main Kitchen

View	Position	n	$\bar{x}$	σ	F	p
Supply	Employee	59	3,90	1,335	7,520	**0,000***
	middle manager	66	3,39	0,975		
	senior manager	102	3,48	1,031		
	business owner	151	3,95	0,965		
Consolation	Employee	59	3,81	1,332	11,604	**0,000***
	middle manager	66	3,18	1,176		
	senior manager	102	3,23	1,004		
	business owner	151	3,91	0,996		
Storage	Employee	59	4,00	1,313	10,810	**0,000***
	middle manager	66	3,45	1,230		
	senior manager	102	3,31	1,072		
	business owner	151	3,98	0,934		
Product	Employee	59	3,34	1,254	8,362	**0,000***
	middle manager	66	3,44	1,229		
	senior manager	102	3,11	0,900		
	business owner	151	3,61	1,089		
Marketing	Employee	59	3,15	1,271	10,371	**0,000***
	middle manager	66	3,36	1,118		
	senior manager	102	2,93	1,027		
	business owner	151	3,71	1,105		

Table 4 shows the results of one-way analysis of variance, which was conducted to examine the applicability and relationship of the fuzzy VİKOR method among five alternatives in the hot kitchen of five decision makers. When Table 4 is examined, it is seen that there is a significant difference between the variables as a result of one-way analysis of variance with five alternatives of the decision makers (p

<0.05). In this context, it is possible to say that choosing the most suitable one among the alternatives by using multi-criteria decision-making methods in the hot kitchen can be useful and feasible. Hot kitchens are the kitchens where work intensity is at the highest level in both food and beverage establishments and accommodation establishments. Considering that the main course and other hot side dishes are prepared in this kitchen, choosing the most appropriate application among the alternatives may be the solution to facilitate the daily routines of both staff and employers. In their research, Gök Kısa and Perçin (2017) examined the difficulties experienced by more than one manager in businesses while trying to keep the process under control and examined the problems of machinery, etc. In order to solve the indecisiveness in the selection of equipment, they decided to choose the most suitable one among the alternatives by using fuzzy VIKOR and another decision-making method, DEMATEL.

Table 5 shows the results of one-way analysis of variance for the applicability of the fuzzy VİKOR method in the cold kitchen. The relevant table is examined below.

Table 5. Applicability of Fuzzy Vikor Method in Cold Kitchen

View	Position	n	$\bar{x}$	σ	F	p
Supply	Employee	59	3,02	1,252	8,861	**0,000***
	middle manager	66	3,09	1,160		
	senior manager	102	3,02	1,099		
	business owner	151	3,68	1,111		
Consolation	Employee	59	3,83	1,476	11,666	**0,000***
	middle manager	66	3,15	1,206		
	senior manager	102	3,03	1,085		
	business owner	151	3,85	1,134		
Storage	Employee	59	3,90	1,423	16,858	**0,000***
	middle manager	66	3,35	1,116		
	senior manager	102	3,24	1,064		
	business owner	151	4,14	0,872		
Product	Employee	59	3,10	0,977	0,826	0,509
	middle manager	66	3,17	0,796		
	senior manager	102	2,99	0,917		
	business owner	151	3,06	0,881		
Marketing	Employee	59	3,31	1,038	2,387	0,051
	middle manager	66	3,08	1,362		
	senior manager	102	3,55	1,149		
	business owner	151	3,44	1,325		

Table 5 shows the results of one-way analysis of variance, which was conducted to examine the applicability and relationship of the fuzzy VİKOR method among five alternatives in the cold kitchen of five decision makers. In the relevant table, as a result of one-way analysis of variance with five alternatives of the decision makers, it was seen that there was a significant difference between the variables supply, delivery and storage

($p < 0.05$). However, no significant difference was detected in production and marketing variables ($p > 0.05$). In this context, it is seen that it is useful and applicable for employers of food and beverage businesses to use multi-criteria decision-making methods in cold kitchens in supply, receiving and storage units in choosing the most suitable one among the alternatives. In food and beverage businesses, apart from supply, delivery and storage, deciding to choose the best among the alternatives in terms of production and marketing can also affect the profit of the business. It is inevitable to state that not seeing a significant difference in this regard is seen as a contradiction.

Table 6 shows the results of one-way analysis of variance for the applicability of the fuzzy VİKOR method in a la carte kitchens. The relevant table is detailed below.

Table 6. Applicability of the Fuzzy Vikor Method in A'la Carte Kitchen

View	Position	n	$\bar{x}$	σ	F	p
Supply	Employee	59	3,00	1,218	1,536	0,191
	middle manager	66	3,20	1,268		
	senior manager	102	3,31	1,258		
	business owner	151	3,09	1,224		
Consolation	Employee	59	2,76	1,023	1,585	0,178
	middle manager	66	2,65	1,143		
	senior manager	102	2,75	1,076		
	business owner	151	2,96	1,038		
Storage	Employee	59	2,69	1,263	2,625	**0,034***
	middle manager	66	3,03	0,992		
	senior manager	102	2,82	0,979		
	business owner	151	2,93	1,118		
Product	Employee	59	2,71	1,084	0,675	0,610
	middle manager	66	2,94	1,006		
	senior manager	102	2,86	1,099		
	business owner	151	2,95	1,038		
Marketing	Employee	59	2,90	1,062	1,069	0,372
	middle manager	66	2,97	0,859		
	senior manager	102	2,90	0,980		
	business owner	151	3,13	0,989		

Table 6 includes the results of one-way analysis of variance, which was conducted to examine the applicability and relationship of the fuzzy VİKOR method in five alternatives in a la carte kitchens with those in decision-making positions in food and beverage businesses. In the relevant table, as a result of the decision makers' five alternatives and one-way analysis of variance, it was seen that there was a significant difference

between only the storage variables ($p<0.05$). In a food and beverage business, the storage part of the products supplied is as important as the production. Warehouse checks of products must be carried out, inputs and outputs must be controlled, and if this process is carried out in another center affiliated with the enterprise, appropriate conditions must be created. In this context, by using the fuzzy VİKOR method, improvements can be made in terms of wastage and loss by minimizing the negativities that may occur. In order to apply the fuzzy VİKOR method, no significant difference was detected in the supply, delivery, production and marketing variables ($p>0.05$).

CONCLUSION AND RECOMMENDATIONS

Fuzzy MCDM methods were developed due to uncertainty in the relative importance of criteria and the performance rating of alternatives. Uncertainty can arise from various reasons: unmeasurable information, incomplete information, unobtainable information, etc. To solve this difficulty, fuzzy set theory is used in the decision-making process. In classical multi-criteria decision-making methods, there is an assumption that the decision maker evaluates the criteria relative to each other and evaluates the alternatives under the criteria precisely. However, in real life, decision makers cannot make definitive evaluations on some problems. In particular, comparing criteria with each other is a relative situation. In addition, if the values obtained by the alternatives under the criteria are not numerical values, it is very difficult to compare the alternatives with each other under the criteria in precise terms. The selection of alternatives using the Fuzzy VIKOR method is a strategic decision that will strengthen the position of the business.

Suppliers, which form the first link of the supply chain, play an important role in ensuring efficiency. For this reason, supplier selection has become a subject of great emphasis both in practice and in the academic world. Supplier selection problems are multi-criteria decision-making problems affected by many qualitative and quantitative factors. Many real-life applications involve uncertainty, making it difficult for decision makers to express their preferences and opinions with precise numerical values. From a business perspective, supplier selection is a multi-criteria decision-making problem that requires taking

into account many qualitative and quantitative criteria. One of the relatively new methods used to solve such problems is the Fuzzy VIKOR method. Supply chain is an integrated structure that includes forward and backward activities, where many units and operations are intertwined. In order to gain competitive advantage, the supply chain strategy to be structured must be chosen in a way that takes customers into consideration as well as establishing appropriate supply and distribution networks.

On the other hand, when there is more than one decision maker, it is common for opinions and preferences to differ and conflict. The fuzzy VIKOR method contributes to the solution of such problems in two ways. First, it incorporates into the solution the uncertainty and ambiguity inherent in the decision-making process; The second maximizes group benefit by seeking a compromise solution. In particular, businesses need to use their resources correctly and on time in order to exist in a competitive environment and to survive in the developing and changing business world. At this point, the human resources units of the enterprises have important duties and are of great importance. The fuzzy VIKOR method reaches a solution that maximizes the group benefit. Under the influence of intense competition, organizations; They are expected to create a structure that provides low cost, high service level, fast delivery, increased flexibility and uses advanced technology. However, in practice, it is not possible to realize all of these requests. In this regard, the Fuzzy VIKOR method is used to realize the requests. In terms of supply chain operations, outsourcing is considered an important approach that can increase the competitiveness of companies in terms of both providing cost advantages and allowing the business to concentrate on its own activities.

In order to continue the supply chain operations at the desired efficiency, it is a preferred option to use outsourcing at the

stages deemed appropriate by making need-oriented analyzes. Outsourcing decisions in the field of procurement should be made considering the goal of long-term partnership, not as one-time service purchases. After selection of the appropriate company and conclusion of the contract, planning should be made to control the partnership requirements and a system to measure performance should be developed. In future studies, a more precise analysis can be made by increasing the number of evaluation criteria and alternatives, and the models and their results can be compared by examining the problem with other fuzzy multi-criteria decision-making methods. Additionally, the models created can be used to solve different decision-making problems. In addition, in future studies, solutions can be found with more criteria and alternatives for different problems. At the same time, the application can be made by combining different multi-criteria decision-making techniques with the Fuzzy VIKOR method. The Fuzzy VIKOR method can also be used as a solution method in studies such as project selection, facility location selection, supplier selection, personnel selection, and different strategic choices.

This study was carried out to evaluate the applicability of the fuzzy Vikor method in food and beverage businesses. The results of the research show that the fuzzy Vikor method can be an effective decision support tool in the production management processes of these enterprises. The findings can be summarized as follows:

1. Applicability of Fuzzy Vikor: The main result of the study is that the fuzzy Vikor method can be effectively applied in multi-criteria decision-making processes in food and beverage businesses. This method can help businesses make the most appropriate choice among alternatives in different business

departments. It is recommended to use this method for decision-making processes especially in different departments such as patisserie, dishwasher, hot kitchen, cold kitchen and a'la carte kitchen.

2. Effective Use in Procurement and Storage Processes: Research results show that the fuzzy Vikor method can be effectively applied in the procurement and storage stages. Using this method at these stages may have the potential to reduce product losses. By using fuzzy Vikor in these processes, businesses can minimize product losses and thus increase business profits.

3. Potential Applicability in Other Production Stages: Other production stages, namely delivery, production and marketing, were also evaluated with the fuzzy Vikor method. Although a significant difference was detected in the supply and storage stages, no difference was detected in the other stages. This result shows that using the fuzzy Vikor method at these stages may be useful and applicable.

Based on the results of this study, the following recommendations can be made for food and beverage businesses:

1. Use of Fuzzy Vikor: Businesses should consider the fuzzy Vikor method in multi-criteria decision-making processes. This method can make the process of making the most appropriate choice among alternatives more systematic and effective. In particular, it can be considered to integrate this method into decision-making processes in different business departments.

2. Improvement of Storage Process: The use of turbid Vikor during the storage stage has the potential to reduce

product losses. By applying this method at this stage, businesses can optimize warehouse management and increase their profits.

3. More Research and Education: More research and education is required for the Fuzzy Vikor method to become more accepted in businesses. Businesses should invest in staff training to learn how to use this method.

4. Evaluation in Other Operational Phases: The research focused only on the supply and storage phases. Future studies may help us further understand the applicability of the fuzzy Vikor method across the business by covering other production stages.

5. Application in Different Sectors: The applicability of the Fuzzy Vikor method should also be evaluated in different sectors. This study applies to the food and beverage industry focused, but it is important to evaluate whether this method is also useful for businesses in other sectors.

In conclusion, this study evaluated the applicability of the fuzzy Vikor method for food and beverage businesses and showed that it can be used as an effective decision support tool at various stages. By using this method, businesses can improve their decision-making processes and increase business performance. In future studies, it is important to examine the applicability of this method in more sectors and business stages.

REFERENCES

Acar, M. & Çapkın, A. (2017). Analitik Ağ Süreci ile Tedarikçi Seçimi: Otomotiv Sektörü Örneği. Adnan Menderes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 4 (2), 121-134.

Akgül, A. & Çevik, O. (2003). İstatistiksel Analiz Teknikleri, SPSS'te İşletme Yönetimi Uygulamaları. Ankara: Emek Ofset Ltd. Şti.

Aktaş, A. & Özdemir, B. (2012). Otel İşletmelerinde Mutfak Yönetimi (Üçüncü Baskı), Ankara: Detay Yayıncılık.

Anshori, M.Y. (2012). Improving The Restaurant Product Sale: A Case Study at a Hotel in Surabaya, International Research Journal of Business Studies, 5(3).

Akyüz, G. A. (2012). Bulanik VIKOR yöntemi ile tedarikçi seçimi. Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 26(1), 197-215.

Anvar, M. M. (2013). Supply Chain Integration Model: Practices And Customer Values, Doktora Tezi, Noya De Useda Üniversitesi, Portekiz.

Awasthi, A. Govindan, K. Gold, S. (2018). Multi-tier Sustainable Global Supplier Selection Using A Fuzzy AHP-VIKOR Based Approach, International Journal of Production Economics, 195, 106-117.

Aytekin, A. & Kaygın, B. (2005). Bilgisayar Destekli İşletme Kuruluş Yeri Seçimi. Gazi Üniversitesi Orman Fakültesi Dergisi, 5 (2), 213-226.

Bag, S. (2016). Fuzzy VIKOR Approach For Selection of Big Data Analyst in Procurement Management: Origional Research, Journal of Transport and Supply Chain Management, 10(1).

Baltacı, A. (2018). Nitel araştırmalarda örnekleme yöntemleri ve örnek hacmi sorunsalı üzerine kavramsal bir inceleme. Bitlis Eren Üniversitesi Sosyal Bilimler Dergisi, 7(1), 231-274.

Barbara R. L. (1989). Quality in The Service Sector: A Review, International Journal of Bank Marketing, 7(5), 4- 12.

Barlan-Espino, A. G. (2017). Operational Efficiency and Customer Satisfaction of Restaurants: Basis for Business Operation Enhancement, Asia Pacific Journal of Multidisiplinary Research, 5(1), 122-132.

Bastos, W. (2013). Can Purchases Make Us Happier? Perhaps, If We Tell Others About Them Doktora Tezi. Arizona Üniversitesi, Amerika Birleşik Devletleri.

Baynal, K. & Yüzügüllü, E. (2013). Tedarik Zinciri Yönetiminde Analitik Ağ Süreci İle Tedarikçi Seçimi Ve Bir Uygulama. Istanbul University Journal Of The School Of Business Administration, 42(1), 77-79.

Blech, Z.Y. (2009). Kosher Food Production, Wiley Publishing.

Boran, F. E., Genç, S., Kurt, M. ve Akay, D. (2009). A Multi-Criteria İntuitionistic Fuzzy Group Decision Making For Supplier Selection With Topsis Method. Expert Systems With Applications, 36(8), 11363-11368.

Bucak, T. (2016). Yiyecek İçecek İşletmelerine Genel Bakış (Edt. Sezerel, H., Doğdubay, M.), Yiyecek İçecek Yönetimi, Eskişehir: Anadolu Üniversitesi.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2018). Eğitimde Bilimsel Araştırma Yöntemleri. Ankara: Salmat Basım Yayıncılık.

Camillo, A. (2021). Strategic International Restaurant Development From Concept to Production, Business Science Reference.

Chen, L.Y. & Wang, T. C. (2009). Optimizing Partners' choice in IS/IT Outsourcing Projects: The Strategic Decision of Fuzzy VIKOR, International Journal of Production Economics, 120(1), 233-242.

Chiristensen, B. L., Johnson, R. B. Turner, L. A. (2015). Research Methods, Design and Analysis (12thEdition). London: Pearson Education Limited.

Chiu, J.Z. & Hsieh C.C. (2016). The Impact of Restaurants Green Supply Chain Practices on Firm Performance, 8(1)

Churchill, Jr. & Gilbert, A. (1979). A Paradigm for Developing Better Measures of Marketing Constructs, Journal of Marketing Research, *16*(1), 64-73.

Considine, D.M. (2012). Foods and Food Production Encyclopedia, Springer, USA.

Çakın, E. (2013). Tedarikçi Seçim Kararında Analitik Ağ Süreci (Anp) Ve Electre Yöntemlerinin Kullanılması ve Bir Uygulama. Yayımlanmamış Yüksel Lisans Tezi, Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü, İzmir.

Dağdeviren, M., Dönmez, N. & Kurt, M. (2006). Bir İşletmede Tedarikçi Değerlendirme Süreci İçin Yeni Bir Model Tasarımı ve Uygulaması. Gazi Üniversitesi Mühendislik Mimarlık Fakültesi Dergisi, 21(2), 247-255.

Dinç, Y. & Türkmen, B. M. (2021). Literature Review on The Usage Areas of The Fuzzy Vikor Method in Food Beverage Enterprises. New Searches And Studies in Social And Humanities Sciences, 77.

Doğdubay, M. (2006). Büyük Ölçekli Otellerdeki Yiyecek-İçecek Departmanlarının Üretim Kayıplarını Önlemeye Yönelik Olarak Üretim Planlaması ve Kontrol Sistemlerinin Uygulanabilirliği. Balıkesir Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 8(14), 82-106.

Ekinci, A. (2018). Yiyecek ve İçecek Yönetimi, Yedinci Bölüm (Üretim). Ankara: Detay Yayıncılık.

Erdoğan, İ. (2003). Pozitivist Metodoloji: Bilimsel Araştırma Tasarımı İstatistiksel Yöntemler Analiz ve Yorum. Ankara: ERK.

Erkuş, A. (2009). Davranış Bilimleri İçin Bilimsel Araştırma Süreci. Ankara: Seçkin Yayıncılık.

Ertuğrul, İ. & Karakaşoğlu, N. (2008). Banka Şube Performanslarının Vikor Yöntemi ile Değerlendirilmesi. Endüstri Mühendisliği Dergisi, 20(1), 19-28.

Fu, H.P. Chu, K.K. Chao, P. Lee, H.H. Liao, Y.C. (2011). Using Fuzzy AHP and VIKOR for Benchmarking Analysis in The Hotel Industry, The Service Industries Journal, 31(14). 2373-2389.

Gök Kısa, C. & Perçin, S. (2017). Bütünleşik Bulanık DEMATEL-Bulanık VIKOR Yaklaşımının Makine Seçimi Problemine Uygulanması. Yaşar Üniversitesi E-Dergisi, 12(48), 249-256.

Gökdemir, A., (2009). Mutfak Hizmetleri Yönetimi. Ankara: Detay Yayıncılık.

Görçün, Ö. F. (2013). Depo ve Envanter Yönetimi, İstanbul: Beta Yayıncılık.

Grewal, D. & Levy, M. (2017). Marketing, Fifth Edition. New York: McGraw-Hill Education.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. & Tatham, R. L. (2013). Multivariate Data Analysis: Pearson Education Limited.

Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010). Multivaiıate Data Analysis: A Global Perspective (7th Edition). Pearson Education, Upper Saddle River.

Hsu, C.W. Kuo, T.C. Shyu, G.S. Chen, P.S. (2014). Low Carbon Supplier Selection in The Hotel Industry, Economic and Business Aspect of Sustainability, 6(5). 2658-2684.

Hudson, S. (2007). Tourism And Hospitality Marketing: A Global Perspective. English: Sage Publications Ltd.

İnce, H. & İmamoğlu, Z. S. (2016). Destek Vektör Regresyon ve İkiz Destek Vektör Regresyon Yöntemi ile Tedarikçi Seçimi. Doğuş Üniversitesi Dergisi, 17(2), 241-253.

Kalaycı, S. (2010). SPSS Applied Multivariate Statistical Techniques (5th ed.). Ankara: Asil Publication.

Khandwani, M.F. Lanke P. Harne, P. Sapkal, A. Adhao, A. (2023). Literature Review on Restaurant Management System, International Research Journal of Modernization in Engineering Technology and Science, 5(5). 513-516.

Kotler, P. (2015). Pazarlama, Pazar Yaratmak, Pazar Kazanmak Ve Pazara Egemen Olmak. (A., Özyağcılar, Çev.) İstanbul: Agora Kitaplığı.

Kotler, P., Burton, S., Deans, K., Brown, L., & Armstrong, G. (2015). Marketing. Pearson Higher Education AU.

Kseniia, P. (2014). Development of a New Product in Tourism Business Case: Restaurant 'Tsaari' in Tampere Region, Thesis, Imatra Faculty of Tourism and Hospitality Degree Programme in Tourism.

Lu, L. Yi D. (2014). Supply Chain Manegemet Risks in a Sushi Restaurant, Bachelor's Thesis in Industrial Management, University of Gavle.

Meksavang, P. Shi, H. Lin. S.M. Lui H.C. (2019). An Extended Picture Fuzzy VIKOR Approach for Sustainable Supplier Management and Its Application in the Beef Industry, Journal of Symmetry, 11 (4).

Moeinzadeh, P. & Hajfathaliha, A. (2009). A Combined Fuzzy Decision Making Approach to Supply Chain Risk Assessment, World Academy of Science, Engineering and Technology, No.60, ss.519-535.

Opricovic, S. & Tzeng, G. (2004). Comprimise Solution by MCDM Methods: A Comparative Analysis of Vikor and

Topsis, European Journal of Operational Research, 156, 445-455.

Opricovic, S. & Tzeng, G. H. (2007). Extended VIKOR Method in Comparison with Outranking Methods. European Journal of Operational Research, 178(57), 514- 529.

Özdamar, K. (2004). Paket Programlar ile İstatistiksel Veri Analizi-I (Genişletilmiş 5. Baskı). Eskişehir: Kaan Kitabevi.

Özdemir, A. (2010). Ürün Grupları Temelinde Tedarikçi Seçim Probleminin Ele Alınması ve Analitik Hiyerarşi Süreci İle Çözümlenmesi, Afyon Kocatepe Üniversitesi İ.İ.B.F. Dergisi, 12(1), 55-84.

Özder, E. H. & Eren, T. (2016). Çok Ölçütlü Karar Verme Yöntemi ve Hedef Programlama Teknikleri ile Tedarikçi Seçimi. Selçuk Üniversitesi Mühendislik Fakültesi Dergisi, 4(3), 196-207.

Özdoğan, O. N. (2014). Yiyecek stilistliği ve fotoğrafçılık. O. N. Özdoğan (Ed.), Yiyecek içecek endüstrisinde trendler: kavramlar, yaklaşımlar ve başarı hikayeleri (s.167–188) içinde. Detay Yayıncılık.

Özel, B. & Özyörük, B. (2007). Bulanık Aksiyomatik Tasarım İle Tedarikçi Firma Seçimi, Gazi Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi, 22(3), 415-423.

Özyörük, B. (2008). Tedarik Zincirinde Ürün Dağıtımı İçin Üçüncü Taraf Kullanımı (3pl) ve Firma Seçimi. Süleyman Demirel Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi, 13(2), 65-73.

Raosaheb V. L. (2014). Fuzzy Multi-Objective Supplier Selection Problem For Multiple Items İn A Supply Chain. International Journal Of Innovative Research İn Computer Science & Technology, 2(5), 2-4.

Raspor, P. (2008). Total Food Cahin Safety: How Good Practices Can Contribute, Trends in Food Science&Technology, 19(8). 405-412.

Reynold, D. & DiPietro R.B. (2008). Chain Restaurant Management, Handbook of Hospitality Operations and IT (Edt. Jones P.&Pizam A.) Impirint of Elsiver, UK. 367-384.

Rostamzadeh, R.,, Govindan, K. Esmaeili, A. Sabaghi, M. (2015). Application of Fuzzy VIKOR for Evaluation of Green Supply Chain Management Practices, Ecologial Indicators, 49 (2). 188-203.

Rathore, R. Tahakkar, J.J. Jha, J.K. (2021). Evaluation of Risks in Foodgrains Supply Chain Using Failure Mode Effect Analysis and Fuzzy VIKOR, International journal of Quality&Reliability Management, 38(2), 551-580.

Sahu, A.K. Datta, S. Mahapatra, S.S. (2016). Evaluation and Selection of Resilient Suppliers in Fuzzy Enviroment: Exproration of Fuzzy-VIKOR, Benchmarking: An ınternational Journal, 23(3). 1467-1471.

Sarıoğlan, M. & Arslan K. (2020). Yiyecek-İçecek İşletmelerinde MOORA Yöntemi ile Tedarikçi Seçiminin Uygulanabilirliği, Elektronik Sosyal Bilimler Dergisi, 19(3), 254-270.

Sarıoğlan, M. (2016). Yiyecek-İçecek İşletmelerinde Satın Alma Müdürlerinin Tedarikçi Seçim Yöntemleri Bilgi Düzeylerinin Belirlenmesine Yönelik Bir Araştırma. Igdir University Journal of Faculty of Economics and Administrative Sciences, 1 (1), 13-30.

Sarıoğlan, M. & Bostan Sarıoğlan, A. (2012). The Effect of Underwater Fauna Diversity in The Agean Sea on Ayvalık Region Culinary Culture and Gastronomy Tourism, Underwater Values and Tourism.

Sarıoğlan, M. (2011). Konaklama İşletmelerinde Tedarik Zinciri Yönetimi Kapsamında Tedarikçi Seçim Kriterleri Üzerine Görgül Bir Araştırma, Balıkesir Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 14(25). 239-253.

Scanlon, N. (1993). Restaurant Management, John Wiley&Sons, Canada.

Sezen, T.S. (2021). Gastronomi Nedir, Gastronomide Geçmiş, Bugün Gelecek (Edt.Shipman D.), Detay Yayıncılık, Ankara.

Sezen, T. S. (2018). Gastronomi Kurumları, Gastronomi ve Yiyecek Tarihi (Edt. Akbaba A. Serçeoğlu, N.), Detay Yayıncılık, Ankara.

Shemsadi, A. Shirazi, H. Toreihi, M. Tarokh, M.J. (2011). A Fuzzy VIKOR Method for Supplier Selection Based on Entropy Measure for Objective Weighting, 38(10). 12160-12167.

Shin, H., Collier, D. A. & Wilson, D. D. (2000). Supply Management Orientation And Supplier/Buyer Performance. Journal Of Operations Management, 18(3), 317-333.

Smith, S. L. J. & Xiao, H. (2008). Cullinary Tourism Supply Chains: A Preliminary Examination. Journal of Travel Research, 46(3), 289-299.

Soba, M., Şimşek, A., Erdin, E. Can, A. (2016). AHP Temelli VIKOR Yöntemi İle Doktora Öğrenci Seçimi. Sosyal Bilimler Dergisi, 50, 113–125.

Sökmen, A. (2014). Yiyecek İçecek Hizmetleri Yönetimi ve İşletmeciliği (Yedinci Baskı), Ankara: Detay Yayıncılık.

Suryawana, I. N. (2020). Management Success Factor In Managing Restaurant Business, Journal of Economi (e-JE). 25(3).

Şahin, Y. & Supçiller, A. (2015). Tedarikçi Seçimi İçin Bir Karar Destek Sistemi. Mühendislik Bilimleri ve Tasarım Dergisi, 3(2), 91-104.

Tabachnick, L.S. & Fidell, B.G. (2013). Using Multivariate Statistics (6th ed.) Pearson, Boston.

Tavşancıl, E. (2002). Tutumların Ölçülmesi ve SPSS ile Veri Analizi. Ankara: Nobel Yayıncılık.

Tayyar, N. & Arslan, P. (2013). Hazır Giyim Sektöründe En İyi Fason İşletme Seçimi İçin AHP ve Vikor Yöntemlerinin Kullanılması, Celal Bayar Üniversitesi Sosyal Bilimler Dergisi, 11 (1), 340-358.

Türksoy, A. (2015). Yiyecek ve İçecek Hizmetleri Yönetimi. Ankara: Detay Yayıncılık.

Tzeng, G. H., & Huang, J. J. (2011). Multiple attribute decision making: methods and applications. CRC press.Akgül, A. ve Çevik, O. (2003). İstatistiksel Analiz Teknikleri, SPSS'te İşletme Yönetimi Uygulamaları. Ankara: Emek Ofset Ltd. Şti.

Vahabzadeh, A.H. Asiaei, A. Zailani, S. (2015). Green Decision-Making Model in Reverse Logistiscs Using Fuzzy-VIKOR Method, Resources, Conservation and Recycling, 103, 125-138.

Vahdani, B., Hadipour, H., Sadaghiani, J.S. & Amiri, M. (2010). Extension of VIKOR Method Based on Interval-Valued Fuzzy Sets, International Journal of Advanced Manufacturing Technology, 47(9-12),1231- 1239.

Wang, A.N., Nguyen, N.A.T. Dang, T.T. Lu A.M. (2021). A Compromised Decision -Making Approach to Third-Party Logistics Selection in Sustainable Supply Chain Using Fuzzt AHP and Fuzzy VIKOR Method, journal of Mathematics, 9(8).

Wang, Y.F. Chen S.P. Lee, Y.C. Tsai, C.T. (2013). Development Green Management Standart for Restaurants: An Application of Green Supply Chain Management, International Journal of Management, 34, 263-273.

Wang, L. (2008). Energy Efficiency and Management in Food Processing Facilities, CRC Press (Taylor&Francis Group), USA.

Wu, H.Y., Tzeng, G.H. & Chen, Y.H. (2009). A Fuzzy MCDM Approach for Evaluating Banking Based on Balanced Scorecard, Expert Systems with Application, 36, 10135-10147.

Yang, J. & Lee, H. (1997) An AHP Decision Model for Facility Location Selection, Facilities, 15, 241-254.

Yıldırım, F. B. & Önder, E. (2015). Çok Kriterli Karar Verme Yöntemleri, Bursa: Dora Yayıncılık.

Yıldız, A. & Deveci, M. (2013). Based on Fuzzy VIKOR Approach to Personnel Selection Process. Ege Academic Review, 13 (4), 427-436.

Yücenur, G.N. & Demirel, N. Ç. (2012). Group Decision Making Process for Insurance Company Selection Problem with Extended VIKOR Method under Fuzzy Environment, Expert Systems with Applications, 39 (3), 3702-3707.

Zhang, N. Wei, G. (2013). Extension of VIKOR Method for Decision Making Problem Based on Hesitant Fuzzy Set, Applied Mathematical Modelling, 37(7), 4938-4947.