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İnceleme/ Review Article

DETERMINATION OF PERSONALITY ANALYZES OF VOCATIONAL SCHOOL STUDENTS BY FUZZY LOGIC METHOD: CASE OF MERZIFON VOCATIONAL SCHOOL

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ABSTRACT

When business life, which has an important place in human life and which is continuous throughout life, is preferred according to the characteristics and personality skills of people, people live more lovingly and positively. There are many studies in the literature about occupational choice which is very important for people. When the literature is examined, "Holland's Vocational Preference Inventory" developed by Holland (1996) is applied to individuals during occupational preference and occupations suitable for personality types are suggested. In this study, "Holland Occupational Preference Inventory" which is used for determining occupational preference and personality type which is important for individuals is designed using fuzzy logic. In the design, especially in the survey, if the high scores are more concentrated in "Does not matter/Any", the personality type of the young person is still not clear. It is determined whether fuzzy logic method is different from classical method when 'Does not Matter/Any' values are taken consideration. According to the results, normal personality, weak personality and strong personality were evaluated according to each personality type and presented to the participants. Different and realistic results were obtained with fuzzy logic method. This study shows that fuzzy logic method can be used in studies in Education.

Key Words: Vocational Preference Inventory, Fuzzy Logic, Personality, Personality Types, Holland Typology

MESLEK YÜKSEKOKULU ÖĞRENCİLERİNİN KİŞİLİK ANALİZLERİNİN BULANIK MANTIK YÖNTEMİ İLE TESPİTİ: MERZİFON MESLEK YÜKSEKOKULU ÖRNEĞİ

ÖZ

İnsan yaşamında büyük bir yere sahip olan iş hayatının bireylerin karakteristik ve kişilik özelliklerine göre tercih edilmesi, daha verimli olmalarının yanısıra sevgi dolu ve pozitif yaşamalarına da destek olabilmektedir. İnsanlar için çok önemli olan meslek tercihi konusunda literatürde birçok çalışma bulunmaktadır. Literatürdeki çalışmalardan birisi Holland (1996) tarafından geliştirilen ve kişilik tiplerine uygun meslekleri öneren "Holland Mesleki Tercih Envanteri"dir. Bu çalışmada bireyler için önemli olan meslek tercihinde ve kişilik tipi belirlenmesinde kullanılan "Holland Mesleki Tercih Envanteri" bulanık mantık kullanılarak tasarlanmıştır. Tasarımda özellikle anket çalışmasında "Yüksek puanlar daha çok 'Farketmez'de yoğunlaşmışsa gencin kişilik tipi hala belirginleşmemiştir." ifadesinden hareket edilerek farketmez değerleri hesaba katıldığında bulanık mantık yönteminin klasik yöntemden farkı olup olmadığı tespit edilmiştir. Çalışmaya Merzifon Meslek

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Yüksekokulu'nda öğrenim gören 209 öğrenci katılım sağlamıştır. Katılımcılara uygulan Holland Mesleki Tercih Envanteri ile öncelikle öğrencilerin klasik yöntemde kişilikleri tespit edilmiştir. Daha sonra oluşturulan bulanık mantık metodu ile kişilik tespiti yapılmış ve farklılıklar gözlemlenmiştir. Bulanık mantık yöntemi ile tasarlanan yöntemde bireylerin her bir kişilik tipi analizi yapılarak tüm tiplere ait sonuçlar "güçlü- normal- zayıf" olarak ortaya konulmuştur. Bulanık mantık yöntemi ile elde edilen sonuçlarda daha farklı ve başarılı sonuçlar elde edilmiştir. Bu uygulama sonrasında bulanık mantık yönteminin eğitim alanında da kullanılabileceğini göstermiştir.

Anahtar Sözcükler: Mesleki tercih envanteri, bulanık mantık, kişilik, kişilik tipleri, Holland tipoloji

1. INTRODUCTION

Business life constitutes a large part of the life of individuals. While people spend part of their life on education to have a job, then they spend a large part of the work they find. For this reason, it is accepted that people prefer occupations that are appropriate for their personalities in terms of job satisfaction (Sarı, 2011). Personality; it is an important factor that influences people's choice of work and profession, their relationship and communication with other individuals and directs their lives. Therefore, recognizing people's personalities is an important phenomenon for professional orientation (Özdemir et al., 2019)

Holland, based on his experiences during vocational counseling, has reached the idea that people can be grouped in terms of their characteristics and that they will be successful in appropriate occupations and environments according to these group characteristics (Kuzgun, 2014). Holland—in his study in 1996—classified people according to six personality types. He defined these personality types as realistic, investigative, artistic, social, entrepreneurial and traditional. He revealed the characteristics of each of these personality types and indicated the occupations appropriate for each type. In addition, the relationship between each personality type by expressing the relationship between the types of personality and revealed the distance (Yılmaz, 2011).

Fuzzy logic provides the ability to work with that processing human-specific information into machines and taking advantage of the machine's experience and intuitive features. Unlike other software, symbolic expressions are used instead of numerical values in order to gain this ability (Güler & Yücedağ, 2017). These expressions are hot-cold, low-very low-high.

In this study, it is aimed to find out whether there is a difference by using fuzzy logic method by going beyond the normal analysis in determining the occupations suitable for them by conducting occupational personality analyzes of vocational school students. In this context, Occupational Preference Inventory - developed by Holland in 1996 - was applied to 200 students at Amasya University Merzifon Vocational School, firstly interpreted with classical method and then examined with fuzzy logic method.

1.1. Holland Vocational Personality Theory

In Holland Vocational Personality Theory, the personalities of individuals are different from each other and they differ with each other in the works they will perform (Sarı, 2011). Acting on this theory, Holland, as a result of his experiences in 1996, divided people into six different typologies.

According to J. Holland's Vocational Personality Model, personality types were identified as Traditional, Researcher, Artist, Social, Entrepreneur and Realist (Kamaşak & Bulutlar, 2010). The distinctive characteristics of the personality types defined by Holland and their occupations suitable for the personality type are shown in Figure 1.
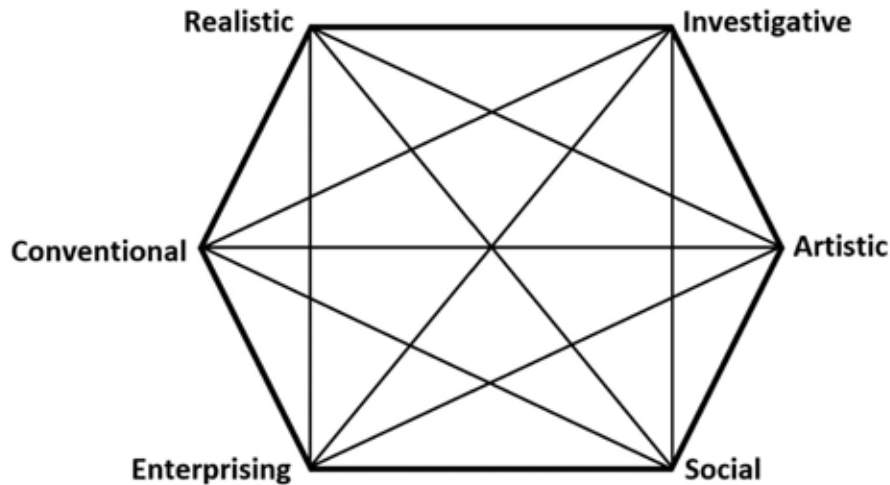

REALISTIC
People with mechanical and athletic abilities, like working outdoors with tools and objects; prefer dealing with things rather than people.

INVESTIGATIVE
People with math and science abilities, like working alone and solving complex problems; like dealing with ideas rather than people or things.

CONVENTIONAL
People with clerical and math ability; prefer working indoors and organizing things; like to deal with words and numbers rather than people or ideas.

ARTISTIC
People with artistic ability and imagination enjoy creating original work; like dealing with ideas rather than things.

ENTERPRISING
People with leadership and speaking abilities like to be influential; interested in politics and economics; like to deal with people and ideas rather than things.

SOCIAL
People with social skills; interested in social relationships and helping others solve problems; likes dealing with people rather than things.

Figure 1. Holland's Vocational Personality Model (Holland, 1996)

The distinction of Holland's six typologies involves the harmony between the individual's personality and the work he or she does. According to the typology defined by Holland, personality types and the environment in which individuals live are classified into six different categories. In this context, the success of the people depends on the harmony of the environment with the personality types (Kamaşak & Bulutlar, 2010). Holland (1996) grouped the six-person structure defined in the typology according to the activities of the professions. The three building blocks of this theory are as follows (Robbins, 2005):

- There are internal differences between individuals' personalities.
- There are different types of jobs.
- It is expected that the job satisfaction level of the people in the work environment suitable for the personality types will be higher than the ones working in the jobs that are not suitable for their personality and they are less likely to quit voluntarily.

The relationship between personality types and the relationship of proximity and distance are shown in Figure 2 as direct, mutual and cross relations with each other.


Figure 2. Holland's Hexagon Model: RIASEC (Cronbach, 1990)

In other words, an individual with realistic type personality is prone to researcher and traditional personality types (Demirci, 2017; Kahraman, et al., 2014). It is stated that the possibility of the emergence of personality types that are in remote contact with each other is low and people with this possibility should be evaluated separately.

1.2. Fuzzy Logic

The concept of Fuzzy Logic was first described in an article published by Zadeh in 1965 (Dilsiz, 2005; Sabah, et al., 2017). This approach is actually a logic against the classical style approach logic known as Boolean logic ((Biçen et al., 2016). In the fuzzy logic approach, the results are advantageous in obtaining healthier results by taking values between these two values instead of just 0 or 1 values (Korkmaz, et al., 2017; Timuçin, et al., 2017). The result of a proposition made in the classical logic is either true or false; the fuzzy logic method makes an evaluation with the values that may occur between them without making definite judgments. Instead of the classical judgments such as true/false, yes/no, high/low, it presents the results that may occur between the two values (Gültekin, et al. 2015; Atagün, et al. 2018). Today, fuzzy logic-based applications – as an artificial intelligence-are used extensively; medical, environmental, engineering, psychology and economic fields (Bayrakdar, et al. 2015).

The Fuzzy Inference System consists of five sub-interfaces: fuzzy logic designer, membership function editor, rule editor, rule viewer and surface viewer. These interfaces are shown in Figure 3.
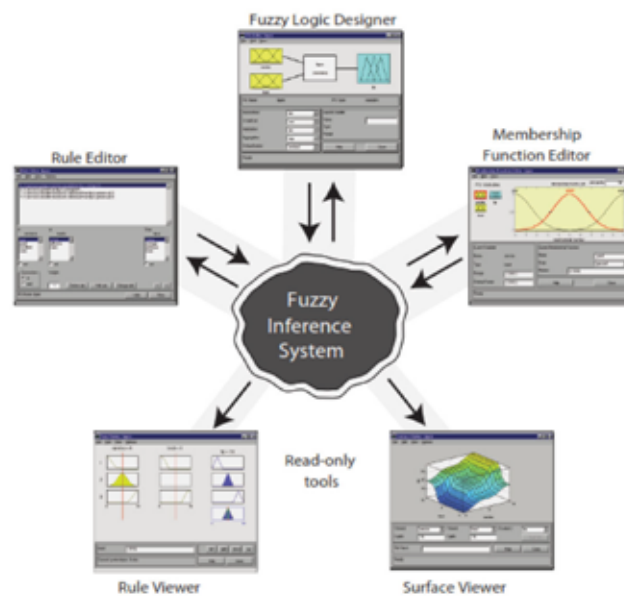
Figure 3. Fuzzy Inference System (Mathworks, 2019)

Fuzzy Logic Designer is the screen where the input variables are on the left side, the names of the output variables on the right side, and the fuzzy logic inference method used in the middle part. The Membership Function Editor allows you to view and edit all membership functions associated with the input and output variables in the application. Based on the description of the input and output variables defined by the Fuzzy Logic Designer, The Rule Editor allows you to automatically create rule statements (Mathworks, 2019). Rules are logical tests written to reach the output value according to the input values. These tests are of the if-else query type. With these rules, each input variable is linked to the output variable (Güler & Yücedağ, 2017). The Rule Viewer displays a roadmap of the entire fuzzy subtraction process. This is based on the fuzzy inference diagram described in the previous section. The Surface Viewer is equipped with drop-down menus X (input), Y (input) and Z (output) that allow you to select any two inputs and any output for drawing. Below these menus are X grids and Y grids with two input fields that allow you to specify how many x-axis and y-axis grid lines you want to add. This feature allows you to keep the calculation time reasonable for complex problems (Mathworks, 2019).

2. METHOD

The aim of this study is to scrutinize the results of Holland's vocational preference assessment by using fuzzy logic methodology, and to define differences from the ordinary results of the survey. In this direction; in particular, in the survey study, "If high scores are more concentrated in 'Any, the personality type of the young person is still unclear" and it will be determined whether fuzzy logic

method is different from classical method when "doesn't matter" answers are taken into consideration. Thus, it is aimed to eliminate the lack of the survey text. In this direction;

- The personalities of the students will be determined in the classical method. Then, personality determination will be made with the fuzzy logic method that we have created and the differences will be observed.

- Personality type analysis of individuals with fuzzy logic method will be performed and the results of all types will be revealed as "strong- normal- weak".

The sample of the study consists of students who continue their education at Merzifon Vocational School. Holland's "Occupational Preference Inventory was applied to 209 students from four different departments.

2.1. Working Group

A total of 209 students from Amasya University Merzifon Vocational School participated in the study.

2.2. Characteristics of the working group

The demographic information of the students participating in the study is given in Table 1. When the data in Table 1 is examined, it can be said that there is a homogeneous distribution in terms of gender. 48.33% of the respondents were male and 51.67% were female. In the same table, 30.62% of the participants are 20 years old when the distribution by age is taken into consideration. The second place is 21 years with 25.36%. 19-year-olds ranked third with 20.10%, while 22-year-old participants ranked fourth with 10.05%.

Table 1. Demographic information of the participants

Gender	f	%	Age	f	%
Male	101	48,33	19	42	20,10
Female	108	51,67	20	64	30,62
Total	209	100	21	53	25,36
			22	21	10,05
			22	11	5,26
			Other	18	8,61
			Total	209	100

The Presents the participants' programs in the study is given in Table 2. When Table 2 is examined, it is seen that 46.41% of the participants are the students studying in the Civil Air Transportation Management program. Office Management and Executive Assistant rank second with 25.84%, while Occupational Health and Safety rank third with 23.44%. In the last place, the students are studying

Computer Programming with 4.31%. The difference in the distribution consisted of the number of students enrolled in the programs.

Table 2. Participants' programs on Merzifon Vocational School

Program Name	f	%
Civil Aviation Management	97	46.41
Occupational Health and Safety	49	23.44
Computer Programming	9	4.31
Office Management and Executive Assistance	54	25.84
Total	209	100.00

3. FINDINGS

In this study, firstly, Holland Personality Inventory results are examined in classical method and then the results prepared in Fuzzy Logic system are mentioned.

3.1. Holland Personality Inventory Results

The results obtained by the classical method in the Holland Personality Inventory applied to the participants are given in Table 3. When Table 3 is examined, it is seen that 49.28% of the participants have social personality. In second place, the researcher personality type is 23.44%, in third place is entrepreneurial personality with 8.61% and in the fourth place is artistic personality with 7.66%. Realistic personality took the fifth place with 5.74% and traditional personality took the last place with 5.26%.

Table 3. Holland Personality Inventory results of the Participants

| Personality Type	f	%
Investigative	49	23.44
Artistic	16	7.66
Social	103	49.28
Enterprising	18	8.61
Conventional	11	5.26
Realistic	12	5.74
Total	209	100

The information and design stages of the program which was created in order to find Holland Personality Inventory by Fuzzy Logic method are given below. First of all, information about Fuzzy Logic design Screen, Membership input-output information, Rule Table, rule viewer and surface viewer are included.
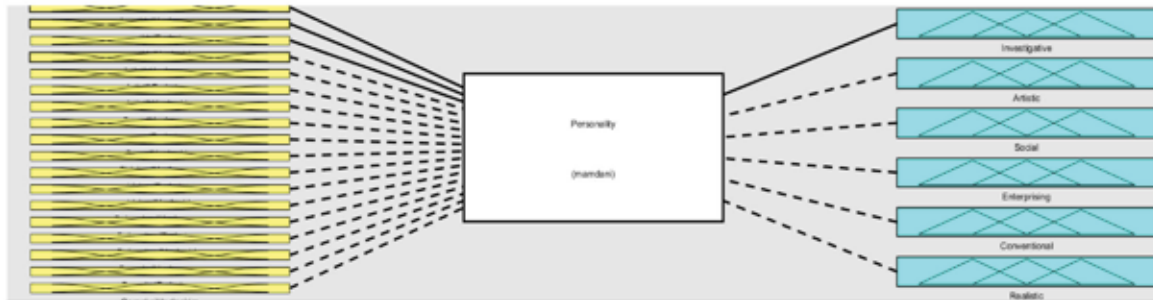
Figure 4. Fuzzy logic design screen of the application

Figure 4 shows the fuzzy logic design screen developed for the application. In design, each personality type has 18 entry memberships to identify dislike-not matter-like types and 6 output members to examine outputs of each personality type. Each exit membership; weak personality, normal personality and strong personality are divided into three categories and when the information is entered to the participant according to each personality type of the person displays the characteristic feature.
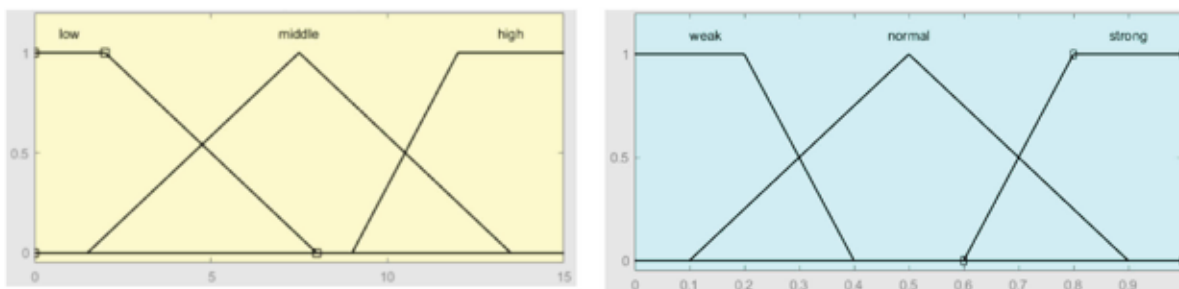
Figure 5. The membership login functions and membership exit screens used in the application

Figure 5 shows the membership login functions and membership exit screens used in the application. Three different functions were selected for each entry membership as low-medium-high. These entries are divided by taking into consideration the questions of each personality type. On the output screen, a section of the outputs to be obtained as a result of fuzzy logic is displayed in the application. For each exit membership, there are three definitions: weak-normal-strong, and according to personality types, the personality result of each participant is displayed on the screen. In this definition, each membership is examined in equal dimensions.

Figure 6. Rule table of the application

Figure 6 shows the table of rules prepared to access the results of the application. A total of 162 rules have been defined. As a result of the relations between these defined rules and input variables, the user is defined as to what degree he/she has personality type.

Figure 7. The rule viewer screen of application

The rule viewer screen obtained by matching the rules prepared in the application is shown in figure 7. The values entered in the application show the result of each of the exit memberships after 18 status and rules in the entry membership.
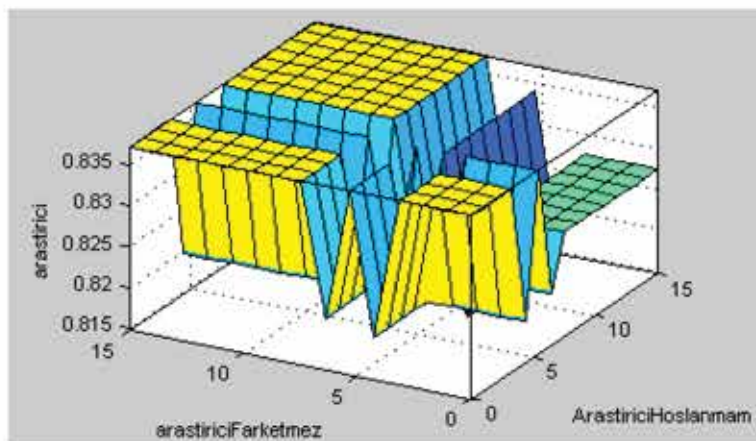
Figure 8. Application Surface Viewer Screen

Figure 8 shows a section from the surface imager obtained as a result of the rules prepared. Differences occur in the surface imager according to the rules defined between each member input and another member input and member output.

The data obtained as a result of Fuzzy Logic Method personality analysis subject to our study are as follows; the method used to obtain the data; the answers given by the participants were listed according to "dislike", "any/not matter" and "like" options. then the "any /not matter" options which are not included in the Holland Personality Inventory and which we will examine whether it will affect the personality results in our study were also included in the evaluation and the results were determined. The results were evaluated as "Weak", "Normal" and "Strong" personality according to each personality type. In the results, the participants were given not only one result but also results according to each personality type. The results obtained by Fuzzy Logic method are given in Table 4.

Table 4.Interpretation of Holland Personality Inventory results by Fuzzy Logic Method

Personality Type	Weak personality		Normal personality		Strong personality	
	f	%	f	%	f	%
İnvestigative	23	11.00	39	18.66	147	70.33
Artistic	60	28.71	37	17.70	112	53.59
Social	7	3.35	9	4.31	193	92.34
Enterprising	28	13.40	36	17.22	145	69.38
Conventional	89	42.58	45	21.53	75	35.89
Realistic	40	19.14	102	48.80	67	32.06

According to Table 4, 70.33% of the participants were researcher personality type, 53.59% were artistic personality type, 92.34% were social personality type, 69.38% were entrepreneur, 35.89% were Traditional and 32.06% Realistic personality types were strong. While the highest ratio was Social personality with 92.34% strong personality type, the lowest personality type was Realistic personality type with 32.06%.

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

In order to make the study accurate and reliable, the students were asked to complete the Holland Professional Vocational Inventory scale face to face and as a result, it was stated that it was a study in which they could obtain information about their personality types. For this reason, students were provided to answer sincere and realistic. Many studies have been conducted with the determination of personality types of people to play a significant role in business life. In most of these studies, it was

seen that Occupational Preference Inventory developed by Holland in 1996 was used. The differences between the developed method and the classical method were determined.

Differences between the determination of Holland personality inventory by classical method and Fuzzy Logic method;

- While only "dislike" and "like" options are considered in the classical method, "Any/Not matter" option is also considered in the Fuzzy Logic method and it has been found to affect the results.

- In the classical method, only personality types and similar personality types are listed, and with fuzzy logic method, it gives "weak", "normal" and "strong" results according to each personality type.

As a result of the data obtained in the study, differences were observed in the results obtained by taking into account the "Any / Not matter" option mentioned in the Holland Personality Inventory. In the new method which was created by using fuzzy logic, results were created in each personality type so that one could see himself / herself in each personality type. The researcher personality type which was 23.44% in classical method was found to be 70.33% strong personality type with fuzzy logic method. In the classical method, 49.28% of the social personality reached 92.34%. Traditional personality type with the lowest value of 5.26% gave a strong personality result with fuzzy logic method 35.89%. The fact that the "any / not matter" option and weak, normal and strong results in every personality type played an important role.

In the classical method, results are obtained according to certain parameters. In fuzzy logic method, rule tables are created for each case, mathematical functions are created for each rule and the results corresponding to these operations are created. With this system, all parameters were taken into account and more beneficial results were obtained.

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