Science and Research Branch (IAU)

Identification and Ranking Effective Factors in Increasing Personnel Satisfaction with Intuitionistic Fuzzy Data in Steel and Rolling Unit of Saba (Mobarakeh Steel Company)

E. Asgharizadeh *, M. Lotfi †‡, M. Hosseinzadeh §, H. Amoozad Mahdiraji ¶, S. Salahshour ‖

―――

Abstract

The main purpose of this study was to investigate employees and managers' satisfaction of transportation system in the steal and rolling Units of Saba in Mobarakeh Steel Company using the intuitionistic fuzzy data. The statistical population included the personnel of Saba Steel and Rolling Units from Mobarakeh Steel Company including 1800 people. The sample size included 325 people. In this study, a new method was used to defuzzifying the intuitionistic fuzzy numbers so that the equivalent of every intuitionistic fuzzy number was a real number. This method was also used to rank intuitionistic fuzzy numbers. In this regard, features of the proposed method have been investigated for defuzzyfying and ranking. To measure satisfaction with such data, a questionnaire containing 26 questions was used for collecting field data with a reliability coefficient of 0.95. To analyze the results, one-sample t-test, binomial test and Friedman test were used.

Keywords : Fuzzy numbers; Personal satisfaction; Intuitionistic fuzzy numbers; Defuzzification.

―――

1 Introduction

One of the most important goals of transportation services is to provide satisfaction and comfort to the employees requiring observance of many items such as using modern and appropriate vehicles, observance of principles and attention to driving rules by the driver, compliance with car safety standards and insurance coverage. These factors affect delivery of services and should be complied with by the service provider. Various studies on transportation services showed that ignoring this issue reduces employee satisfaction. Employees lack of satisfaction has a direct impact on the quantity and quality of their work. The provision of appropriate services by transportation services is a factor in reducing employee concern and, while increasing productivity, improves one commitment to the goals of the organization [2].

―――――――――――――――

*Department of Management, University of Tehran, Tehran, Iran.

†Corresponding author. lotfi_mahmood@yahoo.com, Tel:.

‡Department of Industrial Management, Kish International Campus, University of Tehran, Kish, Iran.

§Department of Management, University of Tehran, Tehran, Iran.

¶Department of Management, University of Tehran, Tehran, Iran.

‖Young Researchers and Elite Club, Mobarakeh Branch, Islamic Azad University, Mobarakeh, Iran.

The steel and rolling units of Saba in Mobarakeh Steel Company is a leading organization in Iran industry with all the merits, advantages and achievements in various fields which necessitate attention to satisfaction and motivation of its human resources. In order to achieve this goal, we can point to role of transportation system (heavy transport) for employees. The present study aimed at optimizing the heavy transportation system in the continuous steel and rolling units of Saba Mobarakeh Steel Company. A large number of personnel in this organization are scattered in Isfahan and surrounding area as well as adjacent neighborhoods. High fuel costs and high cost of using personal vehicles and transport fares, on the one hand, and timely and coherent presence of employee, on the other hand, lead to the fact that employees tend to use transportation services to go to work. This requires existence of a heavy transportation system to provide the most suitable form of personnel relocation from place to place and vice versa and minimize the cost for the company.

According to the above, this study attempted to provide a model for heavy transportation system of steel and rolling units of Saba in Mobarakeh Steel Company to bring about satisfaction of personnel and organization. In other words, it incurs the lowest cost for the company and the highest satisfaction for the personnel. It is hoped that the research results will be a positive step towards achieving this goal. Since all above mentioned indexes have inaccurate and qualitative natures to investigate and increase the level of satisfaction of employees in transportation, considering these indexes as definite would prevent us from reaching the desired result.

Fuzzy intuitionistic numbers were also used to gauge the indicators and data. Given the ambiguity, you can pay attention to the degree of importance (membership) and the degree of insignificance (no membership). Considering such numbers in the design of questionnaire and then data analysis, it is expected that achieve more realistic answers in assessing satisfaction of the personnel in the field of transportation. One of the most important issues in intuitionistic fuzzy systems is defuzzifying and ranking ambiguous numbers. There are structural differences in comparison with the real numbers ranking. For this reason, many researcher-made methods have been introduced in this area, each with advantages and disadvantages [10, 11, 12, 13, 14, 15] One of the most important goals of transportation services is to provide satisfaction and comfort to the employees requiring observance of many items such as using modern and appropriate vehicles, observance of principles and attention to driving rules by the driver, compliance with car safety standards and insurance coverage.

These factors affect delivery of services and should be complied with by the service provider. Various studies on transportation services showed that ignoring this issue reduces employee satisfaction. Employees lack of satisfaction has a direct impact on the quantity and quality of their work. The provision of appropriate services by transportation services is a factor in reducing employee concern and, while increasing productivity, improves one commitment to the goals of the organization [2].

The steel and rolling units of Saba in Mobarakeh Steel Company is a leading organization in Iran industry with all the merits, advantages and achievements in various fields which necessitate attention to satisfaction and motivation of its human resources.

In order to achieve this goal, we can point to role of transportation system (heavy transport) for employees. The present study aimed at optimizing the heavy transportation system in the continuous steel and rolling units of Saba Mobarakeh Steel Company. A large number of personnel in this organization are scattered in Isfahan and surrounding area as well as adjacent neighborhoods. High fuel costs and high cost of using personal vehicles and transport fares, on the one hand, and timely and coherent presence of employee, on the other hand, lead to the fact that employees tend to use transportation services to go to work. This requires existence of a heavy transportation system to provide the most suitable form of personnel relocation from place to place and vice versa and minimize the cost for the company.

According to the above, this study attempted to provide a model for heavy transportation system of steel and rolling units of Saba in Mobarakeh Steel Company to bring about satisfaction of per-

sonnel and organization. In other words, it incurs the lowest cost for the company and the highest satisfaction for the personnel. It is hoped that the research results will be a positive step towards achieving this goal. Since all above mentioned indexes have inaccurate and qualitative natures to investigate and increase the level of satisfaction of employees in transportation, considering these indexes as definite would prevent us from reaching the desired result. Fuzzy intuitionistic numbers were also used to gauge the indicators and data. Given the ambiguity, you can pay attention to the degree of importance (membership) and the degree of insignificance (no membership). Considering such numbers in the design of questionnaire and then data analysis, it is expected that achieve more realistic answers in assessing satisfaction of the personnel in the field of transportation.

One of the most important issues in intuitionistic fuzzy systems is defuzzifying and ranking ambiguous numbers. There are structural differences in comparison with the real numbers ranking. For this reason, many researcher-made methods have been introduced in this area, each with advantages and disadvantages [10, 11, 12, 13, 14, 15]

2 The conceptual definitions of variables

2.1 Transportation Management:

Transportation management carries out the following tasks in the organization: reducing the cost of light and heavy vehicles with the proper management of costs, replacing costly and low-efficient vehicles and increasing productivity in this field, raising the responsibility and accountability of accountable people for management of traffic and delivery and transformation of vehicles, macro management of costs and capital by keeping accurate information.

Travel safety:

So far, many definitions of travel safety have been presented. Safety is not absolute and will never actually be achieved. It is called relative safety against dangers [6]. A trip is considered safe when the risk of death, injury, or other problems for passengers is low. Convenience and availability of services:

The convenience and availability of services refers to the following: suitability of heating and cooling system, flexibility of the seats, suitability of distance of the employee home to the stations, the short waiting time for employee at the stations, short duration of travel from work to place of

Professional Ethics:

Professional ethics means ethics in the profession. Professional ethics refers to two distinct but related issues: Occasionally, professional ethics is considered in business, executive management, and the objective environment of the profession, and ethical performance in the business is examined and sometimes referred to as that branch of human knowledge that systematically and methodically grows in educational and research centers [7].

Health of Services:

Health of Services refers to the following: having clean seats, trash cans, clean curtains, interior and exterior cleaning of services, smoking prohibition in services and etc.

Dignity:

Dignity refers to the status of a person or group according to the distribution of it in a social system. This term has some synonyms with identity, name and reputation, respect and attention, reverence, magnitude, admiration, greatness. [3].

Satisfaction:

Satisfaction typically refers to employee attitudes. Employee satisfaction has many dimensions and indicate a general attitude toward the job or return only to parts of the job [4]. Employee satisfaction has a dynamic nature; due to this dynamism, various theories have been introduced over time about this concept. This suggests that modern management systems and technologies must be created in the workplace that can be managed and organized in accordance with the dynamic nature of the concept.

Research hypotheses:

The present study seeks to test the following hypotheses based on intuitionistic fuzzy data. Main hypothesis: The employee and managers of steel and rolling unit of Saba Mobarakeh Steel Company are satisfied with the transportation services.

Hypothesis 1) Transportation management has a significant effect on the satisfaction of employee and managers of the Saba Mobarakeh Steel Company.

Hypothesis 2) Travel comfort and availability of services have a significant effect on the satisfaction of the employees and managers.

Hypothesis 3) Travel safety has a significant effect on the satisfaction of employees and managers.

Hypothesis 4) The professional ethics of drivers has a significant effect on the satisfaction of the employees and managers.

Hypothesis 5) Transportation service health has a significant effect on the satisfaction of employee and managers.

Hypothesis 6) Observance and dignity have a significant effect on the satisfaction of employee and managers.
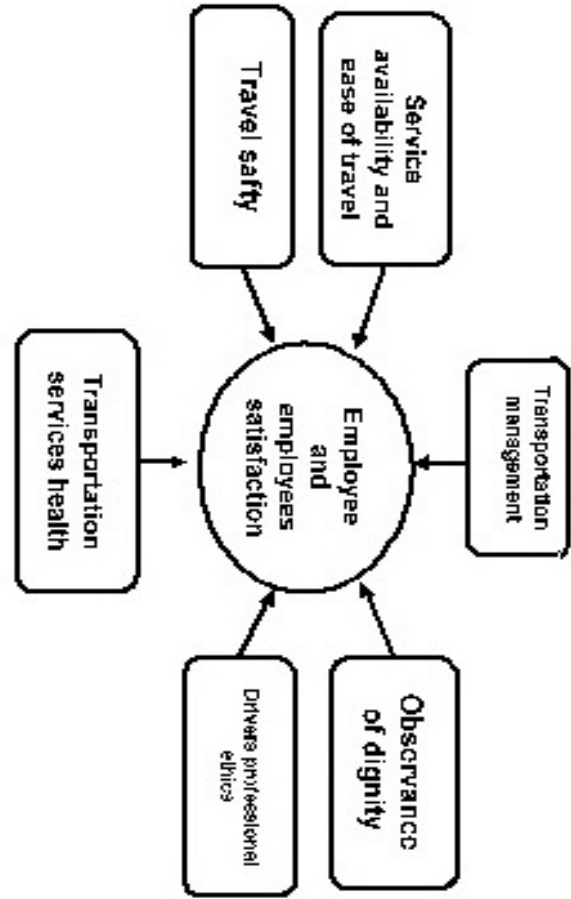
2.2   Conceptual model of research:

The following conceptual model has been suggested for assessing employees' satisfaction [1].

2.3   Ranking of Intuitionistic Fuzzy Numbers [8, 9, 10, 11, 12, 13, 14, 15]:

Consider the fuzzy number

$$A = \{(x, \mu, \nu)| \ \mu + \nu \leq 1\}.$$

Then, consider the following fuzzy number types for membership μ and non-membership degrees ν:

$$\begin{cases} \tilde{A}_1 = \{(x, \mu)| \ 0 \leq \mu \leq 1\} \\ \tilde{A}_2 = \{(x, \nu)| \ 0 \leq \nu \leq 1\} \end{cases}$$

Now, for the fuzzy numbers $\tilde{A}_1$ and $\tilde{A}_2$ (in terms of the cut-α), consider the following real numbers.

$$\begin{cases} S(\tilde{A}_1) = \int_0^\mu A_1^R(\alpha) - A_1^L(\alpha) \ d\alpha \\ S(\tilde{A}_2) = \int_0^\nu A_2^R(\alpha) - A_2^L(\alpha) \ d\alpha \end{cases}$$

Figure 1: Conceptual model of research.

Where

$$\begin{cases} \tilde{A}_1 = [A_1^L(\alpha), A_1^R(\alpha)] \\ \tilde{A}_2 = [A_2^L(\alpha), A_2^R(\alpha)] \end{cases}$$

Finally, the following real number is suggested for the intuitionistic fuzzy number $\tilde{\tilde{A}}$:
$$S(\tilde{\tilde{A}}) = S(\tilde{A}_1) - S(\tilde{A}_2)$$

Using the equation (2.3), we can propose a new ranking for intuitionistic fuzzy numbers. Consider two intuitionistic fuzzy numbers $\tilde{\tilde{A}}$ and $\tilde{\tilde{B}}$.
Then,

$$\begin{cases} \tilde{\tilde{A}} \leq \tilde{\tilde{B}} \ \Leftrightarrow \ S(\tilde{\tilde{A}}) \leq S(\tilde{\tilde{B}}), \\ \tilde{\tilde{A}} \geq \tilde{\tilde{B}} \ \Leftrightarrow \ S(\tilde{\tilde{A}}) \geq S(\tilde{\tilde{B}}), \\ \tilde{\tilde{A}} = \tilde{\tilde{B}} \ \Leftrightarrow \ S(\tilde{\tilde{A}}) = S(\tilde{\tilde{B}}). \end{cases}$$

2.4 Features of proposed ranking:

Consider the intuitionistic fuzzy numbers $\tilde{\tilde{A}}, \tilde{\tilde{B}}, \tilde{\tilde{C}}$ then

1) if $\tilde{\tilde{A}} \leq \tilde{\tilde{B}}$ and $\tilde{\tilde{B}} \leq \tilde{\tilde{C}}$ then $\tilde{\tilde{A}} \leq \tilde{\tilde{C}}$,

(2)if $\tilde{\tilde{A}} \leq \tilde{\tilde{B}}$ and $\tilde{\tilde{B}} \leq \tilde{\tilde{A}}$ then $\tilde{\tilde{A}} = \tilde{\tilde{B}}$,

3) if $\tilde{\tilde{A}} \leq \tilde{\tilde{B}}$ and $\tilde{\tilde{C}} \leq \tilde{\tilde{D}}$ then $\tilde{\tilde{A}} + \tilde{\tilde{C}} \leq \tilde{\tilde{B}} + \tilde{\tilde{D}}$,

4) if $\tilde{\tilde{A}} \leq \tilde{\tilde{B}}$ and $r > 0$ then $r\tilde{\tilde{A}} \leq r\tilde{\tilde{B}}$.

2.5 Features of equation (2.3):

Suppose that $\tilde{\tilde{A}}, \tilde{\tilde{B}}$ are two intuitionistic fuzzy numbers, then;

$$S(\tilde{\tilde{A}} + \tilde{\tilde{B}}) = S(\tilde{\tilde{A}}) + S(\tilde{\tilde{B}}).$$

Example 2.1 *For $\tilde{\tilde{A}} = (1, 3, 5; 0.6, 0.3)$ we will have*

$$\tilde{\tilde{A}}_1 = (1, 3, 5; 0.6) \to \tilde{\tilde{A}}_1(\alpha) = [1 + \frac{10}{3}\alpha, \ 5 - \frac{10}{3}\alpha],$$

$$0 \leq \alpha \leq 0.6$$

$$\tilde{\tilde{A}}_2 = (1, 3, 5; 0.3) \to \tilde{\tilde{A}}_2(\alpha) = [3 - \frac{20}{3}\alpha, \ 3 + \frac{20}{3}\alpha],$$

$$0 \leq \alpha \leq 0.3$$

$$\begin{cases} S(\tilde{A}_1) = \int_0^{0.6}(5 - \frac{10}{3}\alpha) - (1 + \frac{10}{3}\alpha) \ d\alpha = 1.2 \\ S(\tilde{A}_2) = \int_0^{0.3}(3 + \frac{20}{3}\alpha) - (3 - \frac{20}{3}\alpha) \ d\alpha = 0.6 \end{cases}$$

Then, we have

$$S(\tilde{A}) = S(\tilde{A}_1) - S(\tilde{A}_2) = 1.2 - 0.6 = 0.6 \quad (2.1)$$

3 Applications and project results:

In this study, the satisfaction of employees and managers from elements of the model and, in general, the transportation system (heavy transportation) as well as which elements of the model are more important from employee and managers view, will be determined using intuitionistic data (with the help of the proposed ranking for intuitionistic fuzzy numbers).

Also, the steps which should be taken to promote motivation and performance of the employee are considered. In fact, the results of this study will show what factors affect satisfaction of employee and managers (steel and rolling unit of Saba in the Mobarakeh Steel Company) of heavy transportation services, using intuitionistic data, and the order of importance (with the help of the proposed ranking).

3.1 Population and sample:

The research population included employees and managers of the steel and rolling units of Saba from Mobarakeh Steel Company which were $1,800$ people according to the statistics. Sampling method was stratified sampling. According to the Morgan formula, the sample size was considered to be 325 people.

3.2 Defuzzifying in Likert scale used in the questionnaire based on the proposed ranking:

The following table relates to the questionnaire with fuzzy intuitionistic data:

Completely disagree No idea agree Completely disagree agree

The following process was performed based on the ranking of intuitionistic fuzzy data of the defuzzifing process. For example, the process of defuzzifing for the completely disagree C was as follows:

$$[1 + 10\alpha, 3 - 10\alpha], \quad 0 \leq \alpha \leq 0.1$$

$$\tilde{\tilde{C}}_1 = (1, 2, 3, 0.1, 0.8),$$

$$\tilde{\tilde{C}}(\alpha) = [\tilde{\tilde{C}}_1^L(\alpha), \tilde{\tilde{C}}_1^R(\alpha)],$$

$$\alpha = 0 \to [1, 3], \ \alpha = 0.1 \to [2, 2] = 2,$$

$$\tilde{\tilde{C}}_1^L(\alpha) = [1 + 10\alpha, 3 - 10\alpha], \quad 0 \leq \alpha \leq 0.1,$$

$$\tilde{\tilde{C}}_1^R(\alpha) = [-5\alpha + 6, 5\alpha - 2], \quad 0.8 \leq \alpha \leq 1,$$

$$\frac{y - 1}{x - 1} = \frac{0.8 - 1}{2 - 1} = \frac{-2}{10} \to y = \frac{-2}{10}x + \frac{12}{10},$$

Completely disagree	No idea	agree	Completely disagree	agree
(1,2,3,0.1,0.8)	(3,4,5,0.2,0.7)	(5,6,7,0.45,0.45)	(7,8,9,0.7,0.2)	(9,10,11,0.8,0.1)

$S_1(\tilde{\tilde{C}}_1) =$

$\int_0^{0.1} (3-10\alpha)-(1+10\alpha)\, d\alpha = 2\alpha-10\alpha^2]_0^{0.1} = 0.1,$

Indeed, $S_1(\tilde{\tilde{C}}_1), S_2(\tilde{\tilde{C}}_1)$ calculated by:

$$S_2(\tilde{\tilde{C}}_1) = 0.8.$$

As a result:

$$S(\tilde{\tilde{C}}) = 0.1 - (0.8) = 0.7.$$

For other parts, a definite number was obtained according to the following table:

4   Test of research hypotheses:

In this section, analyzes of field research are statistically evaluated. Considering that the data must be normal before testing the assumptions, therefore, Kolmogorov Smirnov test (K-S) has been used to check the normality. The table below shows the results of this test. The above table indicated that the level of significance of the Normality test for indicators was more than 0.05. Therefore, these indices were normal and parametric tests can be used to test the hypotheses. Nonparametric tests can be used for indicators with a significant level of less than 0.05.

Regarding Hypothesis 1:

Transportation management has a significant effect on satisfaction of the employees and managers. To test this hypothesis, a single-sample t-test was used. The results are presented in the table below.

Considering the lower level of significance than 0.05, it is concluded that the mean is not the tested value and the above hypothesis is accepted. The upper and lower limits are positive, so the mean is about that variable is more than the test value. The mean of responses by the statistical sample on the effect of transportation management on satisfaction of employee and managers was based on the Likert scale of 0.0029 from 0.7. If this mean is generalized to the population, the mean of responses is in the domain of -0.0317 to 0.0376.

Regarding Hypothesis 2:

The convenience of travel and availability of services have a significant effect on the satisfaction of employees and managers. Considering that the significance level was lower than 0.05, it is concluded that the mean of the sample was not the tested value and the above hypothesis is accepted. The upper and lower limits are both positive, so the mean is more than the test value about that variable. The mean of responses provided by the statistical sample about the effect of travel convenience and availability of services on satisfaction of employee and managers based on the Likert scale was 0.1428 of 0.7 . If this mean is generalized to the population, the mean of responses is in the range of 0.1215 to 0.1642 .

Regarding Hypothesis 3:

Travel safety has a significant effect on the satisfaction of employees and managers. To test this hypothesis, a single-sample t-test was used. The results are presented in the table below. Considering that the significance level was lower that 0.05, it is concluded that the mean of sample is not the tested value and the hypothesis is accepted. The upper and lower limits are both positive, so, the mean is more than the test value about that variable. The mean of the responses provided by the statistical sample on the effect of travel safety on satisfaction of employee and managers based on the Likert scale was 0.0864 from 0.7. If this mean is generalized to the population, the mean of responses ranges from 0.0576

Completely disagree	No idea	agree	Completely disagree		
-0.7	0.5	0	0.5	0.7	Definite number

Table 1: Results of the Kolmogrov-Smirnov test

	Transportation management	Travel convenience and availability of services	Travel safety	Drivers professional ethics	Health of transportation services	Observance of the dignity of employee
Abs. max. value	1.025	1.023	1.03	1.003	0.997	0.996
K-S value	0.578	0.576	0.672	0.206	0.101	0.464
Sig.	0.051	0.051	0.195	0.000	0.000	0.000

Table 2: Results of single-sample T-test to investigate the effect of transportation management on employee and managers' satisfaction.

	T	Sign(2tailed)	Mean	Confidence	level 0/59
				Lower band	**Upper band**
Transportation Management	19.859	0.000	0.0029	-0.0317	0.0376

Table 3: Results of a single sample T test on the effect of travel convenience and availability of services on the satisfaction of employees and managers.

	T	Sign(2tailed)	Mean	Confidence level	
				Lower band	Upper band
Travel convenience and availability of services	37.412	0.000	0.1428	0.1215	0.1642

to 0.115.

Regarding Hypothesis 4:

Professional ethics of drivers has a significant impact on satisfaction of the employees and managers. To test this hypothesis, the binomial test has been used. The results are presented in the table below.

The results show that our assumption is confirmed at the three-star level (the significance level of 0/000) and it can be argued that professional ethics of drivers affects employee and managers satisfaction. Meanwhile, the mean of re-

Table 4: Single-sample T-test results to investigate the effect of travel safety on employees and managers' satisfaction with their services.

	T	Sign(2tailed)	Mean	Confidence Lower band	level Upper band
Travel safety	26.247	0.000	0.0864	0.0576	0.115

Table 5: Binomial test results to examine the effect of professional ethics of drivers on employee satisfaction.

Drivers	N	Observed	Tested	Sig	Probability Professional	ethics probability	probability value	
First group	71	0.22	0.50	0.05	0.000	26.247	0.000	
second group	254	0.78						
Total	325	1.00						

Table 6: Descriptive results obtained from the binomial test for the fourth hypothesis.

Total	M	SD	Min	Max
325	0.2336	0.8	-0.7	0.7

sponses provided by the statistical sample about the effect of professional ethics of drivers on the satisfaction of employee and managers based on the Likert scale was 0.2336 of 0.7.

Regarding Hypothesis 5:

Health of transportation has a significant impact on the satisfaction of employees and managers. To test this hypothesis, a binomial test was used. The results are presented in the table below. Given that the test probability was less than 0.05, the zero assumption is rejected. Health of transportation services has a significant effect on satisfaction of employees and managers. Meanwhile, the mean of responses provided by the statistical sample about the effect of transportation service on the satisfaction of employees and managers based on Likert scale was 0.1621 of 0.7.

Regarding Hypothesis 6:

Observance of dignity have a significant effect on the satisfaction of employees and managers. To test this hypothesis, binomial test has been used. The results are presented in the table below.

Given that the probability of test was less than 0.05, the zero assumption was rejected. In other words, their observance of dignity have a significant effect on the satisfaction of employees and managers. Meanwhile, the mean of responses provided by the statistical sample about the effect of observance on the satisfaction of the employees and managers based on the Likert scale was 0.175 from 0.7.

Main hypothesis:

The employee and managers of the steal and rolling units of Saba in Mobarakeh Steel Company are satisfied with the transportation services. In order to investigate the main hypothesis,

Table 7: Descriptive results obtained from the binomial test for the fifth hypothesis.

Total	M	SD	Min	Max
325	0.1621	0.7162	-0.7	0.7

Table 8: Binomial test results to assess the effect of observance of dignity on the satisfaction of employees and managers.

Drivers ethics	N	probability	Observed probability	Test Sig	Probability value	
First group	140	0.43	0.50	0.05	0.015	
second group	185	0.57				
Total	325	1.00				

Table 9: Descriptive results obtained from the binomial test for the sixth hypothesis.

Total	M	SD	Min	Max
325	0.175	0.7159	-0.7	0.7

Table 10: The result of Friedman test for prioritizing qualitative research components.

Rank	Mean rank	Indicators
6	-0.161	Transportation management
4	0.133	Travel convenience and availability of services
5	0	Travel safety
1	0.476	Drivers professional ethics
3	0.255	Health of transportation services
2	0.343	Observance of employees dignity

the qualitative factors of study including management of transportation, observance of employee's dignity, travel safety, travel convenience, professional ethics of employee, health and availability of services were analyzed using inferential statistics (Single sample T-test and binomial test). The results of statistical analysis indicated that employees and managers have moderate satisfaction regarding these components. Subsequently, the significance of each of the components was examined using the Friedman test. The result is presented in Table 10.

5   Discussion and Conclusion:

The results of the intuitionistic fuzzy data indicated that the employee and managers are con-

cerned with the components of transportation management, travel safety, convenience and availability of services, professional ethics of drivers, observance of dignity and health of services and have a moderate satisfaction of them. The result of Friedman's test showed that professional ethics of drivers is the most important factor and the importance of other dimensions is as follows: Observance of dignity of employees, the health of transportation services, the convenience and availability of services, travel safety and transportation management Transportation management is effective on the satisfaction of employees and managers, and employee perceptions of management efforts to continuously improve the transportation system is considered as the most important factor of this component. Travel comfort and availability of services affect the satisfaction of employees and managers. The short waiting time for employee at stations is considered as the most important factor in this component. Travel safety is affecting the satisfaction of employees and managers. The emphasis on the implementation of traffic rules and regulations with periodic visits is considered as the most important factor in this component. The professional ethics of drivers affect the satisfaction of employees and managers. The timely availability of service drivers at the designated time at the start station is considered as the most important factor in this component. Health of transportation services affects the satisfaction of employees and managers. The prohibition of smoking inside buses is considered as the most important factor in this component. Observance of employee dignity affect the satisfaction of employees and managers. Good behavior and attitudes of drivers towards employees are the most important factor in this component. It is hoped that the results of this research will help to optimize the system of transportation for the employees and managers of the steel and rolling units of Saba in Mobarakeh Steel Company.

6   Suggestions and recommendations

According to the field research and the employee comments, the following suggestions were presented to increase satisfaction of employee and managers:

(i) Monitoring and improving the cooling and heating system,

(ii) Coordination of internal services with services that transfer employee to Saba Steel.

(iii) Reducing the distance between stations to homes in some of the daily services

(iv) Providing a new city map and creating new routes

(v) Strengthening services in small towns and villages

(vi) Refusing to pick up strangers, especially those of the contractor companies to the personnel buses

(vii) Creating a system of feedback and criticism on a telephone and written

(viii) Replacing worn and inappropriate services on the routes between Saba and Mobarakeh (most of these services are poor in terms of employee with inadequate chairs and poor heating and cooling systems)

(ix) Creating a canopy in the terminals

(x) Drivers' behavior should be continuously investigated

(xi) Increasing services on some routes that are lacking due to the fact that employees encounter problems during overtime work.

References

[1] A. Aghaei, Assessing the satisfaction of employee members of the Navy's headquarters with the services of the city (with emphasis on interurban routes), *Journal of Management Development and Human Resources and Support* 24 (2012) 105-81.

[2] A. A. Chenani, M. Akbari, A Survey on the satisfaction of employee members of Amin University of Law Enforcement of Services in the 2014, *Amad Andisheh Quarterly* 51 (2014) 168-143.

[3] Sh. Hosseinian, A. Fahimi, Investigating the Factors Affecting the Social Status of transportation Police (Case Study of Ardabil Province), *Quarterly Journal of Traffic Management Studies* 13 (2009) 34-11.

[4] M. Khadayari Fard, Measurement of job satisfaction of employees and satisfaction of customers of Saderat of Iran and providing a pattern of psychological intervention in order to improve it, *Report of the research project of SADERAT BANK* (2009).

[5] A. Ravarri, T. Mirzaie, Z. Vanaki, Zohreh, The nature of the concept of job satisfaction: review study, *Quarterly Journal of Nursing Management* (2012) 71-61.

[6] M. Pham, Engineering Safety, *(Seventh Edition) Fanvaran Publications* (2011).

[7] A. Qaramlaki, Porfessional Ethics, *(Fourth Edition) Magnum Publishing*, (2014).

[8] K. Kumar, H. Garg, TOPSIS method based on the connection number of set pair analysis under interval-valued intuitionistic fuzzy set environment, *Computational and Applied Mathematics* 37 (2018) 1319-1329.

[9] E. Roghanian, B. Ghorbani, M. Alipour, Application of intuitionistic fuzzy numbers in SWOT analysis, *International Journal of Industrial and Systems Engineering* 28 (2018) 152-165.

[10] V. Lakshmana Gomathi Nayagam, G. Venkateshwari, G. Sivaraman, Ranking of intuitionistic fuzzy numbers, *IEEE International Conference on Fuzzy Systems (IEEE World Congress on Computational Intelligence)*, 2008, Hong Kong, China.

[11] G. Uthra, K. Thangavelu, S. Shunmugapriya, Ranking Generalized Intuitionistic Fuzzy Numbers, *International Journal of Mathematics Trends and Technology _(IJMTT_)* Volume 56 Issue 7 April 2018.

[12] A. Keikha, H. M. Nehi, Operations and Ranking Methods for Intuitionistic Fuzzy Numbers, a Review and New Methods, *I.*

J. Intelligent Systems and Applications 1 (2016) 35-48.

[13] D. Feng Li, J. Yang, A Difference-Index Based Ranking Method of Trapezoidal Intuitionistic Fuzzy Numbers and Application to Multiattribute Decision Making, *Math. Comput. Appl.* 20 (2015) 25-38.

[14] Sh. Wan, F. Wang, L. LianLin, J. Jing Dong, Some new generalized aggregation operators for triangular intuitionistic fuzzy numbers and application to multi-attribute group decision making, *Computers and Industrial Engineering* 93 (2016) 286-301.

[15] Sh. Ping Wan, J. Ying Dong, Power geometric operators of trapezoidal intuitionistic fuzzy numbers and application to multi-attribute group decision making, *Applied Soft Computing* 29 (2015) 153-168.

Ezzatollah Asgharizadeh, is currently a faculty member and an associate Professor at Faculty of Management, University of Tehran, Iran. He received his Ph.D. in Engineering and Operations Management from University of Queensland, Australia in 1997. His main interest areas of research are : Warranty, Maintenance, multiple Attribute decision making and Project Management.

Mahmoud lotfi, Ph.D., is currently a faculty member and an instructor at University of Islamic Azad, Faculty of Management. He received his Ph.D. in operation and manufacturing management from University of Tehran in 2019. His main interest areas include productivity, quality control, time and work study and design industrial management systems. He has published 4 research papers in journals, he has published 2 researches in international conferences; furthermore he has designed several systems for big companies

in Iran and co work with certificate bodies the same as SGS,TUV,MIC,ALLIANCE and so on

Mahnaz Hosseinzadeh is currently Assistant Professor at the University of Tehran, Faculty of Management- Department of Industrial Management, where she has been working as a faculty member since 2016. Her research interests lie in the area of System Dynamics, MCDM, Soft Operations Research, and mathematical programming and modeling. She has published many papers in high index journals.

Hannan Amoozad Mahdiraji, Ph.D., is currently a faculty member and an Assistant Professor at University of Tehran, Faculty of Management. He received his Ph.D. in operation and manufacturing management from University of Tehran in 2012. His main interest areas include optimization, multiple-criteria decision making methods and supply chain management. Since 2012 he has published 29 research papers in famous international journals; furthermore, he has published 20 researches in international conferences.

Soheil Salahshour is an Assistant Professor of Applied Mathematics at Mobarakeh Branch (IAU). As a mathematical Researcher, Soheil has developed a passion for multi- and interdisciplinary research. He not only pursues fundamental research in fuzzy applied mathematics, especially fuzzy differential equations of arbitrary order, but also develops innovative applications in the applied sciences like as mechanical and chemistry engineering. He is a prolific author, with a bibliography comprising over 80 peer-reviewed journal papers, 6 book chapters, and 15 contributions to conference proceedings, accumulating close to 1560 Google Scholar citations (h-index 19). Soheil actively serves the research community, in particular as a member of the editorial board of several o journals, including Advances in Mathematical Physics, Journal of Grey Systems; Theory and Applications, and Progress in Fractional Differentiation and Applications; An International Journal.