Implementation of an Integrated Traffic System in Metropolitan Areas: A Case Study of Tehran, Iran

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Abstract

Each natural and human element plays an essential role in the formation the morphological structure of cities, through which transportation systems are the most important factor among human factors. An integrated transportation strategy is a sustainable transportation strategy aiming to reduce inconsistencies and divisions in the transportation service management system. As the largest metropolis in the country and the Middle East, Tehran is facing serious problems with its transportation system. However, sufficient studies have not been conducted to comprehensively identify structural barriers in the urban management system of the Tehran metropolis to implement an integrated transportation management system. The paper aims to identify structural barriers in the urban management system of Tehran and provide an overview of measures that can be taken to implement this approach in this metropolis. The used research method is the survey-analytical method and a questionnaire was employed to collect data. The identified factors have been classified through confirmatory factor analysis (CFA) and analytic hierarchy process (AHP) methods and research hypotheses have been tested by a regression method. The results show that there are no codified executive rules for the realization of urban transportation integrated management system in Tehran. Additionally, findings indicate that the necessary financial credits are not available to the municipality and there is no coordination between decision makers on the issue of handing over the management of the transportation system to the municipality. Based on results, Tehran municipality has the necessary potential to accept the responsibility of managing this system.

Keywords: Integrated, Transportation, Regression, Codified Executive Rules, Management

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1. Introduction

Each natural and human element plays an essential role in forming the spatial and morphological structure of cities, through which communication networks and transportation systems are the most important factors among human factors (Sajadi and Taghvaei, 2015). Therefore, the transportation system is one of the biggest infrastructural challenges in metropolises, known as a key factor in the competition of cities in the global economy. Transportation systems play a major role in forming the economic situation of countries as well as the daily lives of citizens. We can mention the increase in traffic volume, a significant increase in transportation time, increasing the number of accidents, noise and environmental pollution, and threats to human mental health as the most critical problems and consequences of the unsustainable transportation system in urban areas (Purhasan et al., 2015).

Sustainable transportation is a set of integrated, dynamic, continuous policies and guidelines that includes economic, social, and environmental goals. Sustainable transportation policies seek to find approaches to provide adequate access for all individuals and sections of the society and reduce financial costs and environmental pollution. An integrated transportation strategy has also been proposed as a sustainable transportation strategy, aiming to minimize inconsistencies and divisions in the transportation service management system (Ostadi. J et al.,2013).

Nowadays, various changes in the urban transportation system are constantly occurring. Some of which are due to transportation plans and some result from non-transportation and traffic decisions that affect the transportation system. Changes and effects are the essential features of this system that cannot be ignored; however, these impacts must be properly directed and controlled. Otherwise, it imposes huge costs on the city and citizens (Fallah Monshadi and Ruhi, 2016). Setting up a huge transportation system with detailed specialized study, defining a coherent and authoritative management structure, land-use changes by conducting the necessary studies, and creating a special route considering the environmental conditions are all examples of traffic plans that aim to improve the transportation system. However, if the effects are not measured before implementation and their effectiveness is not assured, they will be turned into a problematic and costly phenomenon (Załuska and Prondzyńska, 2017).

Integrated transportation determines the future urban traffic needs at a strategic level, including the overall management of passenger and freight transportation, comprehensive activities, and the quantitative and qualitative improvement of transportation methods. Accordingly, it must be acknowledged that the lack of integrated management in urban transportation and traffic can cause a lot of damage to the city. This puts the planning and management of the transportation system at the forefront of importance for urban management (Parsons, 2012).

As the largest metropolis in the country and the Middle East, Tehran is facing serious and numerous problems for its transportation system. More than 12 million population and gateway trips increase the floating population to more than 16 million people a day. Due to ignoring the importance of transportation and traffic planning for the preparation of comprehensive and detailed plans, the physical development pattern of the city looked so scattered and unplanned. Spatial differentiation created many problems in the spatial structure, economic, and social structure of the city, and in parallel, communication

networks and transportation services have lagged behind this development.

In this regard, some studies have been conducted for the case of Tehran. For instance, Makani et al. (2016) considered an economic perspective for transportation and urban traffic management to identify and prioritize the effecting factors. By analyzing the current situation in Tehran, the researcher proposed strategies, which are consistent with future growth and ensure sustainable development. According to the results, the current transportation system of Tehran is facing significant limitations, including the low share of transit, the high share of informal taxis, and inadequate structure and low quality of urban road network for pedestrians and cyclists. These factors have led to so many complications such as traffic congestion, lack of parking, increasing environmental pollution, reducing the mobility of citizens, increasing fuel consumption, and energy loss. Policies and measures taken in response to these problems have had little success, mainly due to inconsistencies in integrated planning and executive management on the one hand and a lack of comprehensiveness and foresight on the other.

Additionally, Fallah Monshadi and Soltani (2015) studied the integration of transportation systems for the case of Shiraz as a solution to achieve sustainable transportation. This study also deals with evaluating the current policies from the perspective of integrated transportation strategy criteria. This research also classified and defined the different types of integration. Furthermore, similar studies have been conducted by Salavati et al. and Mohsenifar et al. (2008) for the cases of Tabriz and Isfahan. These studies defined the appropriate criteria for public

transport usage based on supply and demand in the intra-city road network.

For a long time, transportation decision-makers in Tehran have been thinking about supervising, controlling, and managing a complex transportation system. This makes them be always aware of changes in the dynamic system and identify the phenomena that affect the performance of the transportation system and also predict the effects of the transportation system on other urban elements. Although an optimal urban transportation management system has several impacts on the social, cultural, and environmental situation and increases the social and economic costs, there is little evidence of studying structural barriers in the urban management system to implement an integrated transportation management system. Hence, this paper aims to identify structural barriers in the urban management system of Tehran and provide an overview of measures that can be taken to implement this approach. The paper is structured as follows. After an introduction in this section, the research methodology and process of data collection are described in section two. Next, sections three and four present research results and conclusions, respectively.

2. Methodology

Two hypothesis are considered for this research as following:

1. Codified executive rules have a significant effect on the realization of integrated management of the urban transportation system.

2. Intra-city transportation management has a significant impact on integrated traffic management.

Hypothesis 1: Codified executive laws have a significant effect on the realization of integrated management of urban transportation system.

Ho: $1\mu=\mu=2\mu$ H1:$2\mu \neq 1\mu \neq \mu$

H_0 Assumption: Codified executive laws do not have a significant effect on the realization of integrated management of urban transportation system.

H_1 Assumption: Codified executive laws have a significant effect on the realization of integrated management of urban transportation system.

Hypothesis 2: The financial management component on urban travel has a significant effect on integrated traffic management.

     H1: $1\neq \mu \neq 2\mu$ Ho: $2\mu = 1\mu = \mu$

H_0 Assumption: The financial management component on urban travel has no significant effect on integrated traffic management.

H_1 Assumption: The financial management component on urban travel has a significant effect on integrated traffic management.

2.1. Data Collection

The research method is survey-analytical. Survey research is a way to obtain information about the views, beliefs, opinions, behaviors, motivations, or characteristics of a group of members of a specific community (Gentile, 2011). This method is available for researchers interested in collecting original data to describe larger populations that cannot be directly observed. Due to accurate probabilistic sampling, a group of respondents can be provided whose characteristics reflect the characteristics of a larger population. It is also an appropriate approach for measuring attitudes and orientations.

In the survey process, a questionnaire is designed, firstly. Next, structures were examined through the confirmatory factor analysis (CFA) method. Then, Cochran's formula (which is one of the most widely used methods to calculate the statistical sample size) was used to determine the minimum sample size accepted by the statistical population (Kamrowska-Załuska, 2017). According to the results of Cochran's formula, the minimum sample size required for this study (according to the population of Tehran) was calculated to be 384.15 people. Around 600 transportation experts and managers were asked to respond to the questionnaire, of which 412 respondents completed the questionnaire and returned it. The reliability of the questionnaire was measured by Cronbach's alpha coefficient method on 30 studied subjects (

Table 1).

Table 1. Cronbach's Alpha Coefficients

Variables	Cronbach's alpha coefficient
Realization of integrated transportation system management	91 %
Executive Rules	86 %

The above table indicates that Cronbach's alpha coefficients of the research questionnaire and the dimensions are more than 0.7. Consequently, the research questionnaire has acceptable reliability and can be generalized in the target society.

2.2. Theoretical Foundations

Numerous studies have defined and categorized the types of integration in transportation. By discussing different views on the types of integration, this paper selected three types of integration according to the research objectives as following:

2.2.1. Integration of Urban Management

Integrated urban management is a critical issue in organizing the transportation system, which cannot be ignored. Activities carried out by public and private organizations require integrated management since they must be organized to achieve sustainable development and provide more equitable services. Integrated management aims to have comprehensive oversight on the formulation of strategies and policies and their implementation (Sausanis., 2011).

2.2.2. Organizational Integrity

Organizational integrity explains the description and scope of duties for each urban transport authority. As public transportation systems are interconnected, many overlaps can be defined in their operation and management. The purpose of organizational integration is to create coordination in cases where different transportation systems have overlap in

management and performance (Ghaderi et.al, 2020). To create perfect coordination, it is recommended to create an independent department with full power and authority to organize transportation systems for different users. Obviously, existing the executive power for decision-making along with monitoring the implementation process would be necessary for efficiency (Taghvaei et.al, 2019).

2.2.3. Integration of Rules and Sustainable Financial Resources

Any kind of management system needs funding sources to service citizens. For instance, the lack of funding sources for the municipality can result in barriers and delays in implementing urban projects. Additionally, it causes a lower quality service to users (Monshadi et al., 2017). It can be concluded that integration depends on a coherent and powerful unit to manage different sectors, while each sector is responsible for planning, organizing, directing, implementing, monitoring, and evaluating (Milakis, 2019).

3. Results

As mentioned, the statistics and information of this study were provided by presenting a questionnaire to related transportation experts, specialists, and managers in the organizations of Tehran, which is reported to be over 600 people. The organizations include the Ministry of Interior, Tehran Municipality's Deputy of Transportation and Traffic, Tehran Transportation and Traffic Organization, Tehran Transportation and Traffic Comprehensive

Studies Company, Municipalities Organization, Tehran Police deputy of traffic, Tehran Provincial Government, Tehran Urban research and planning Center, Islamic City Council of Tehran, and transportation professionals. The results are classified into eleven criteria using the fit test.

3.1. First Research Hypothesis

Considering the first hypothesis "Codified executive laws have a significant impact on the realization of integrated management of the urban transportation system", the following items are examined, and the results are shown in Table 2:

1. Implementation of integrated urban management in our country does not have sufficient legal support.

2. Articles 136 and 137 of the third and fourth five-year development plan of the country (assigning parts of the government's authority to municipalities) have not been implemented in practice so far.

3. Laws should be enacted in a way that defines the authorities that be delegated to municipalities clearly.

4. Revision and reorganization of municipal rules are one of the effective factors in achieving integrated transport management in cities.

5. Establishing integrated urban management requires an independent rule that does not exist in current rules and regulations.

6. The rules and regulations of councils must be changed in such a way to increase the authority of city councils.

7. Tehran City Council should be responsible for resolving municipal disputes with other institutions.

Table 2. Fit Test for The Items of The First Hypothesis

Items	Numerical value of test statistics	H0 hypothesis test result	Percentage of yes answers
Implementation of integrated urban management in our country does not have sufficient legal support	59.4	Hypothesis of being the same	85
Articles 136 and 137 of the third and fourth five-years development plan of the country (assigning parts of the government's authority to municipalities) have not implemented in practice so far.	44.1	Options are rejected	70
Laws should be enacted in a way that defines the authorities that be delegated to municipalities clearly.	113.9	Hypothesis of being the same	99
Revision and reorganization of municipal rules is one of the effective factors in achieving integrated transport management in cities	35.7	Options are rejected	73
Establishing integrated urban management requires an independent rule that does not exist in current rules and regulations.	32	Hypothesis of being the same	68

Items	Numerical value of test statistics	H0 hypothesis test result	Percentage of yes answers
The rules and regulations of councils must be changed in such a way to increase the authorities of city councils	14	Options are rejected	42
Tehran City Council should be responsible for resolving municipal disputes with other institutions	3	Hypothesis of being the same	-

Based on results, 85% of the respondents believe that the implementation of integrated urban management in the country does not have sufficient legal support, 9% disagree with it, and 7% have no opinion. 70% of the respondents think that "Articles 136 and 137 of the third and fourth five-years development plan of the country have not been implemented in practice so far" while 7% disagreed and 20% did not comment. 99% of the sample experts express that law should be enacted in a way that defines the authorities that be delegated to municipalities clearly, 1% did not have an opinion on this. 73% of the respondents agree with the reorganization of the municipal law in the realization of integrated transportation management in cities. 12% disagreed with the reorganization of the municipal law and 15% did not have a specific opinion on this issue.

Additionally, 68% of respondents said that the creation of integrated urban management required an independent rule, 10% opposed it, and 22% did not comment. Furthermore, 42% of the respondents favored changing the law on councils to increase the authorities of city councils, 28% were against it, and the remaining 28% were ignorant. 47% of the respondents believe that Tehran city councils should be the source of resolving disputes between the municipality and other organizations, 39%

disagree with this theory and 16% have not expressed an opinion on this issue.

From the respondents' point of view, the factors that caused the failure of integrated management of Tehran's urban transportation system, in order of priority are the lack of approved laws to specify the powers of municipalities, lack of legal support for the implementation of integrated urban transportation management, non-implementation of Articles 136 And 137, the need to reorganize the Municipalities Law, the need for an independent rule to create integrated management, and to change the rules and regulations of city councils to increase their authorities. On the other hand, they do not believe that the Tehran City Council is a reference for resolving disputes between the municipality and government organs.

3.2. Second Research Hypothesis

Considering the second hypothesis "Intra-city transportation management has a significant impact on integrated traffic management", the following items are examined, and the results are indicated in Table *3*:

1. Tehran Municipality has the necessary potential to accept the responsibility of handing over the management of Tehran traffic transportation.

2. The necessary financial credits to manage all matters related to transportation and traffic in Tehran are at the disposal of various

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organizations, none of which are accountable to the municipality.

3. If the responsibility of managing Tehran transportation is given to the municipality, all budgets of other agencies that were previously responsible for Tehran transporting system should also be given to the municipality.

4. Transportation management costs will be reduced if integrated transportation management is implemented in the metropolis of Tehran.

Table 3. Fit Test for The Items of The Second Hypothesis

Items	Numerical value of test statistics	H0 hypothesis test result	Percentage of yes answers
Tehran Municipality has the necessary potential to accept the responsibility of handing over the management of Tehran traffic transportation.	15	Hypothesis of being the same	60
The necessary financial credits to manage all matters related to transportation and traffic in Tehran are at the disposal of various organizations, none of which are accountable to the municipality	30	Options are rejected	65
If the responsibility of managing Tehran transportation is given to the municipality, all budgets of other agencies that were previously responsible for Tehran transporting system should also be given to the municipality.	42	Hypothesis of being the same	75
Transportation management costs will be reduced if integrated transportation management is implemented in Tehran metropolis.	57	Options are rejected	82

Based on results, 60% of the respondents believe that Tehran Municipality has the necessary potential to accept the responsibility of handing over the management of Tehran traffic transportation while 28% opposed it and 12% have not commented on it. 65% of the respondents agree with the fact that the financial credits for managing all matters related to transportation and traffic in Tehran are in possession of various organizations that have no obligation to the municipality, 17% disagree with this statement and 17% have not expressed any specific opinions.

What is more, 75 % of the respondents believe that if the responsibility of managing Tehran transportation is given to the municipality, all budgets of other agencies that were previously responsible for the Tehran transporting system should also be given to the municipality, 14% oppose this and 11% also did not comment. 81% of respondents agree that transportation management costs will be reduced if integrated transport management is implemented in Tehran metropolis, 5% disagree, and 14% have not commented.

Furthermore, from the respondents' point of view, the most important factor in the failure of integrated transportation management is allocating funds to other agencies responsible for transportation and their lack of responsibility for

accountability, which has caused many problems in the transportation system. According to the respondents, if the budget of other agencies is transferred to the municipality, this method can also reduce the costs of transportation management.

3.3. Regression Analysis

According to the questionnaire designed based on the 7-point Likert scale, simultaneous regression analysis is used to confirm the hypothesis. To perform this test, the regression analysis preconditions must be assumed so that the regression analysis results can be cited. Preconditions are as follows:

1. Assumptions of the existence of a correlation between the criterion variable and the predictor variable

2. Assumption of model explanation: In this assumption, it should be specified whether the predictor variable can explain the criterion variable.

3. Assumption of checking the existence of a linear relationship between the predictor variable and the criterion variable: in this presupposition, the ANOVA test is used.

Regarding the first prerequisite, the following table examines the correlation between the criterion variable and the predictor. Therefore, Pearson correlation parametric test is used for this section.

Table 4. Investigation of The Correlation Between Variables in Research Hypotheses

Hypothesis number	Predictive variable	Criterion variable	The correlation coefficient	Significance level	Prove or disprove the hypothesis
1	Integrated management of urban transportation system	Codified executive laws	0.515	0.001	Confirmation
2	Integrated management of urban transportation system	Financial management component	0.532	0.001	Confirmation

Based on Table 4, the significance level is less than 0.0. Hence, there is a significant relationship between the criterion variable and the predictor with a 99% confidence level. Therefore, the first precondition of the test is observed.

Regarding the second prerequisite, Table 5 examines the extent to which regression models are explained in research hypotheses.

Table 5. Explaining The Regression Model in The First Hypothesis Of The Research

Hypothesis	R	R Square	The R square is set	Durbin-Watson
1	0.581	0.337	0.336	1.87
2	0.515	0.265	0.263	2.017

In the above table, it can be seen that the set R is equal to 0.336, so that about 34% of the change in the variable of codified executive laws is due to changes in the variable of integrated

management of urban transportation system. Therefore, considering that this coefficient is more than 14 %, so the model is acceptable. Additionally, since the value of 'Durbin-Watson'

Test is between 1.5 to 2.5, so the assumption of independence between errors is accepted. Also, in the second hypothesis of the study, about 27% change in financial components affect urban transportation and integrated traffic management.

For the third precondition, Table **6** examines the linear relationship between the criterion variable and the predictor variable using the ANOVA test.

Table 6. Investigation of The Linear Relationship Between Criterion and Predictor Variables in The First Hypothesis of The Research

Hypothesis	Model	sum of squares	Degrees of freedom	Average squares	F	Significance level
	Regression	59.637	1	59.637	194.558	0.001
1	Remaining	117.093	382	0.307	-	-
	Total	176.73	383	-	-	-
	Regression	46.838	1	46.838	137.747	0.001
2	Remaining	129.892	382	0.34	-	-
	Total	176.73	383	-	-	-

As it turns out, the significance level is less than 0.01, so the null hypothesis that there is no linear relationship between the predictor variable and the criterion is rejected. Therefore, according to this table, the assumption of a linear relationship between the two variables is confirmed. This is true of all two research hypotheses.

Since all three conditions for using multivariate regression test were observed, a function should be presented to show the prediction rate of the criterion variable based on the predictor variables. Table 7 shows the result of the regression model, including the coefficients.

Table 7. Results of the Regression Model

	Non-standard coefficients		Statistical standard coefficients	Statistics T	Level Significance	The R square
	B	standard error	Beta			
Constant	1.334	0.156	-	15.02	0.001	
Codified executive laws	0.158	0.069	0.202	1.308	0.009	0.93
Financial management component	0.525	0.043	0.532	12.274	0.001	

According to Table 7, it can be concluded that the significance level of the constant value test is less than 0.01, so the assumption that the alpha equals zero is rejected and the constant value affects the criterion variable. Therefore, it can participate in the equation of non-standard coefficients. What is

more, the significance levels of the Codified executive laws coefficient test are less than 0.01, and they are suitable to be entered into the standard coefficient equation, or in other words, they can affect the criterion variable. While the spatial dimension cannot be entered into the

equation, its significance level is greater than 0.01. Due to the stability of external factors, codified executive laws, the management component can predict the degree of integrated management of the urban transportation system.

3.4. Confirmatory Factor Analysis

Confirmatory factor analysis method was used for determining the construct validity of the evaluation factors scale of " implementing integrated transportation and traffic management system ". As this structure includes two factors, confirmatory factor analysis of two factors was performed for the variables of this scale. The goodness-of-fit characteristics of the scale for implementing integrated transportation and traffic management system model factors are reported table 8.

Table 8. The goodness-of-fit characteristics for implementing integrated transportation and traffic management system model factors

Characteristic	Estimation
Chi-square ratio to degree of freedom (X^2/df)	1.78
The Root Mean Square Error of Approximation (RMSEA)	0.08
Confirmatory Fit Index (CFI)	0.94
Normed Fit Index (NFI)	0.90
Non-normal fit index (NNFI)	0.93

The indicators reported in Table 8 indicate that the model has good validity. The Chi-square ratio to degree of freedom (X^2/df) is equal to (1.78), which is less than (3) is desirable. Index (RMSEA) with a value of (0.08) which is less than (0.08) and is desirable. Other indicators including CFI, NFI and NNFI are respectively equal to (0.94), (0.90), (0.93) and all are more than (0.90). As a result, they are a good value. So, the scale of evaluation factors of "management model of integrated transportation and traffic system implementation" in the target community has a good validity and the questions of this scale can explain the structure. The next two tables show the factor loads of the questions and their coefficient of determination. The next two tables show the factor loads and the coefficient of determination of the questions. According to the factor loads presented in Tables 9 to 10, the importance of each of the observed variables is understood as an indicator of the evaluation factors of implementing the integrated transportation and traffic system management model. Table 9 shows the factor loads, coefficient of determination, standard error and t value of the operating questions of "codified executive rules":

Table 9. Load factor, coefficient of determination, standard error and t value of the operating questions of codified executive rules

Questions	Load Factor	Coefficient of determination	The standard error	t value
1	0.70	0.46	0.08	8.37
2	0.61	0.32	0.09	6.66
3	0.83	0.53	0,09	9.16
4	0.81	0.56	0.08	9.55
5	0.75	0.50	0.08	8.82

Questions	Load Factor	Coefficient of determination	The standard error	t value
6	0.79	0.44	0.10	7.95
7	0.56	0.26	0.10	5.75

The results of Table 9 show that in the first factor, question 4 with a factor load of 0.81 and a coefficient of determination of 0.56 is more relative than other questions. Also, question 7 is the least important with a factor load of 0.56 and a coefficient of determination of 0.26. The reported t values for the questions are greater than

(± 1.96). So, the effect of each of these questions is confirmed to explain the first factor. Table 10 shows the factor loads, coefficient of determination, standard error and t value of factor questions of the financial management component:

Table 10. Load factor, coefficient of determination, standard error and t value of factor questions of the financial management component

Questions	Load Factor	Coefficient of determination	The standard error	t value
8	0.64	0.26	0.09	7.23
9	0.83	0.57	0.09	9.75
10	0.59	0.42	0.07	7.93
11	0.72	0.38	0.10	7.36

The results of Table 10 show that in the second factor, question 9 is more important with a factor load of 0.83 and a coefficient of determination of 0.57. Also, question 8 with a coefficient of determination of 0.26 has the least effect. In addition, the reported t-values show that all the questions of this component can explain their intended structure and the effect value of these questions to explain their structure is statistically significant $(t > \pm 1.96)$.

3.4.1. Reliability of the scale of implementing integrated transportation and traffic management system model factors evaluation factors

The reliability of a tool is another feature that must be considered to achieve a good result on measurement scales. Therefore, reliability of the scale of implementing integrated transportation and traffic management system model factors evaluation factors is examined separately for each factor.

Table 11. Correlation with the total factor score and the amount of alpha obtained if any question is omitted in the factor of codified executive rules

Questions	Correlation with total factor score	Alpha if you omit the question
1	0.569	0.835
2	0.497	0.843
3	0.714	0.817
4	0.696	0.820
5	0.682	0.822
6	0.630	0.828
7	0.401	0.855
The total alpha obtained for the first factor is equal to 0.850		

In table 11, the correlation of the score of each question with the total score of that factor and the amount of alpha obtained if the question is removed is reported. If no questions are omitted, Cronbach's alpha for the first factor is 0.850.

Table 12. Correlation with the total factor score and the amount of alpha obtained if any question in the factor of the financial management component is omitted

Questions	Correlation with total factor score	Alpha if you omit the question
8	0.559	0.821
9	0.572	0.819
10	0.562	0.822
11	0.484	0.831
The total alpha obtained for the second factor is equal to 0.839		

In the table 12 the correlation of each question with the total score of the second factor can be seen. In addition, the total alpha obtained is reported if each question is omitted. It is clear that if you remove any of the questions, the total alpha of the second factor will not change much. If no questions are omitted, the second factor of Cronbach's alpha is equal to 0.839.

3.4.2. AHP Analysis

The following two table shows the results of the survey aggregation conducted in connection with the classification of important barriers identified in the urban management structure of Tehran metropolis to achieve integrated transportation management using AHP model.

In the results of the survey forms completed by managers, experts and specialists, the priority and weight of different goals were determined. The results are based on the scores 0 to 20 given in Table 13.

Table 13. Prioritization of effective criteria in system selection according to the scores given by experts

Row	Variable	No.	Average	Standard deviation	Variance	Rate
1	Implementation of integrated urban management in our country does not have sufficient legal support	100	16.88	5.967	0.784	2
2	Articles 136 and 137 of the third and fourth five-years development plan of the country (assigning parts of the government's authority to municipalities) have not implemented in practice so far.	100	12	3.612	0.635	8
3	Laws should be enacted in a way that defines the authorities that be delegated to municipalities clearly.	100	17	8.345	0.880	1
4	Revision and reorganization of municipal rules is one of the effective factors in achieving integrated transport management in cities	100	12.3	3.735	0.699	6
5	Establishing integrated urban management requires an independent rule that does not exist in current rules and regulations.	16.	12.22	3.701	0.673	7

Row	Variable	No.	Average	Standard deviation	Variance	Rate
6	The rules and regulations of councils must be changed in such a way to increase the authorities of city councils	100	11.85	3.494	0.625	9
7	Tehran City Council should be responsible for resolving municipal disputes with other institutions	100	11.5	3.125	0.618	10
8	Tehran Municipality has the necessary potential to accept the responsibility of handing over the .management of Tehran traffic transportation	100	16.5	5.259	0.750	3
9	The necessary financial credits to manage all matters related to transportation and traffic in Tehran are at the disposal of various organizations, none of which are accountable to the municipality	100	13	4.019	0.738	4
10	If the responsibility of managing Tehran transportation is given to the municipality, all budgets of other agencies that were previously responsible for Tehran transporting system should also be given to the municipality.	100	12.5	3.880	0.716	5

In the next step of the AHP method, the results were normalized to the total line and finally the weight of the goals was determined. Table 14 shows the criteria by weighted order.

Table 14. Criteria Classification by Priority

Rank	Indicators	The final score
1	Clear rules for delegating authority to municipalities, including police guidance	0.19
2	Lack of adequate support for the implementation of integrated urban management	0.18
3	Planning of other institutions involved in the management of Tehran's transportation system by the municipality	0.16
4	Interaction of Tehran City Council and Municipality with other management institutions in the country for integrated management of Tehran	0.12
5	Priority in creating integrated transportation management of Tehran metropolis	0.11
6	Reorganization of the Municipal Law based on the realization of integrated transportation management	0.11
7	Determining the budget of institutions related to transportation in Tehran, by the municipality	0.10
8	Assignment of part of the state enterprises to the municipalities	0.09
9	Reduction of transport management costs in case of integrated transport management	0.06

Rank	Indicators	The final score
10	Reducing dissent among decision-makers about achieving integrated urban management	0.04

4. Conclusion

An integrated transportation strategy has been proposed as a sustainable transportation strategy aiming to reduce inconsistencies and divisions in the transportation service management system. The main goal of this study is to identify structural barriers in the urban management system of Tehran and provide an overview of measures that can be taken to implement this approach in this metropolis. For this purpose, first, the theoretical literature related to integrated transportation management was reviewed. Next, legal obstacles and weaknesses of the urban management structure of the Tehran metropolis were identified. Then, about 600 stakeholders in transportation planning and management were asked to express their views in the form of answers to the questions of the designed questionnaire (The final database consists of 412 questionnaires).

Regarding the first hypothesis, according to the comments received from the respondents, the implementation of integrated urban management does not have sufficient legal support. Additionally, the establishment of integrated management requires independent rules and regulations, and such a management method is not included in the current rules.

Regarding the second hypothesis, the management component affects urban travel and integrated traffic management. The necessary financial credits for managing all matters related to transportation and traffic in Tehran are not available to the municipality; some of the necessary funds for this project are available to various organizations, none of which are accountable to the municipality. If managing Tehran transportation is given to the municipality, all budgets of other agencies that were previously responsible for the Tehran transporting system should also be given to the municipality. On the other hand, transportation management costs will be reduced if integrated transportation management is implemented in the Tehran metropolis.

Currently, the municipality is the most critical urban institution with the most to do with freight and passenger transportation in Tehran. This responsibility is even more important in relation to urban cargo management. Certainly, in the integrated transportation management approach, efforts are made to improve the efficiency of transportation services by reducing the inconsistencies and divisions in the management system. This coordination is achieved through the proximity of views, the integration of systems and functions, and the increase of process efficiency. Indeed, an integrated transportation approach requires exploiting the capabilities and opportunities available in all sectors, from citizens and government to quasi-government and private sector institutions. Achieving this goal is part of moving towards sustainable transportation, which can be achieved by decentralizing government structures, increasing organizational capacity and internal reforms, strengthening the coordination and interaction of organizations and institutions involved in transportation services, and with the participation of the people on a large scale.

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