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Employing Exploratory Factors Analysis to Determine the Causes of the Traffic Congestion Crisis from the Viewpoint of Small Vehicle Drivers

-A Case Study in the Municipality of Medea-

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Abstract:

The The study aimed identifying the main determinants of traffic congestion from the viewpoint of small car drivers at the level of the municipality of Medea, The study sample consisted of (100) drivers selected using a simple random method. Hence, their opinions about the causes of traffic congestion were investigated by a questionnaire consisting of (36) items. The researcher used the exploratory factor analysis to derive the important factors.

The results of the study came with 14 factors, 7 saturated ones, which are: the driver with a co-variance of 13.863%, the car with a variance of 8.056%, the road with a variance of 7.272%, weather with a variance of 5.785%, the priority with a variance of 5.153%, %, the distance with a variance of 4.584%, and the speed with a variance of 4.091%.

Keywords: traffic congestion crisis; driver; road; small vehicles; exploratory factor analysis.

1. INTRODUCTION

The development of transportation embedded in the organization and sophistication of roads and the movement of economic activity

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has resulted in the creating a regulation of traffic. With the industrial development and urban expansion of cities, the importance of transportation and the movement of people became more than apparent. Traffic congestion has also become a daily challenging issue.

Traffic congestion is a versatile topic; it is related to aspects related to city life. It is a global phenomenon that is known in any country as a normal result of the urban and cultural expansion, the increase in the population, as well as the infrastructure remaining almost constant or with slight development.

Despite the creation of a set of traffic laws, queues of vehicles are still seen wherever we go, particularly at rush hours. This calls for the necessity setting a group of alternatives and options to alleviate the traffic congestion crisis.

Problem of the study

What are the reasons behind the traffic congestion crisis from the viewpoint of drivers of small vehicles in the municipality of Medea?

Study hypotheses:

- The behavior of the driver of the vehicle is the main factor causing traffic congestion.

- The quality of the road is the main factor behind traffic congestion.

Objectives and importance of the study:

The importance of the study lies in the exacerbation of the traffic congestion crisis on the roads, particularly in recent times. The study also aims at trying to diagnose the apparent and hidden causes of the traffic congestion crisis.

The adopted methodology:

In order to answer the problem of the study, the descriptive analytical method was used in the theoretical part to define the various concepts related to the traffic congestion crisis. The descriptive exploratory methodology was relied on in the practical aspect.

Previous studies

- Study of Wissam Mutiib Muhammad, Saeed Fadel Ahmed (2017), entitled: "***Traffic congestion in the main streets of the city of Baakuba***." This study aimed at determining the causes of the traffic congestion problem in the city of Baakuba and the effects and consequences that resulted from it, as well as the means and procedures necessary to address or mitigate the problem, a questionnaire was given to vehicle drivers in the city. After statistical analysis,

Study of Issa Marazqa, Abdul Razzaq Tolmit (2017) entitled "***Traffic Congestion: Its Causes, Effects and Management Strategies***".

This study dealt with the most important causes that lead to the emergence of traffic jams and their effects, and the development of traffic policies to manage urban traffic jams. After analysis, the researchers concluded that the problem of traffic jams has multiple causes. It is not due to one cause, but there is more than one reason; a number of factors that lead to traffic congestion in our streets were combined, and the reasons have differed in their importance, effects and nature. As for the system of indicators that explain traffic congestion, some of them are secondary, and some stem from a past history and previous circumstances.

1. What is the traffic congestion crisis?

2.1 Definition of the traffic congestion crisis:

A crisis is the cessation of organized and expected events and the disruption of habits and custom, which requires rapid change to

restore balance to form new, more appropriate habits.(1)

Crisis management is a purposeful activity based on gathering the necessary information. This enables businesses to predict the locations and trends of the expected crisis,(2)

Traffic congestion is defined as: a bottleneck that appears in all or part of the road network that affects or prevents the movement of road users in the required manner for any reason(3), meaning severe suffocation, noise and delays of long duration that frequently appear during rush hours.

- Definition of (Ortuzar and Willumsen: 1994): Traffic congestion begins when demand levels approach the capacity of the system and the time required for its use "crosses" beyond the average during use in low demand(4)

- As for (Thomson and Bull) they refer to it as: The situation that occurs when a new vehicle enters the traffic, increasing as such the length of time for transportation, especially vehicles in cities(5), which leads to a weak capacity of the road network(6).

2.2 Characteristics of the Traffic Congestion Crisis:

One of the most important characteristics of the traffic congestion

(1) Kahina Recham - The Relationship of Exchange Rate Systems to Financial Crises - MAAREF journal Year Ten - Issue 18 - University of Bouira - June 2015 - p. 157 in
(2) Jonathan Bundy-Crises and Crisis Management Integration – Journal of Management Arizona State University -2017-p02.
(3)-Rahane, S.,& Sharkar ,U.(2014).Traffic Congestion-Causes and Solutions : Astudy of Talegaon Dabhade city. *3*(1), p163
(4)-Al-Jamasi , A., Siraj , Y., & Al-Masry, E. (2021, 11 8). *Traffic Situation in Rafah Governorate - Analytical Study, p92*. Retrieved fromfile:///C:/Users/Sony/Downloads/41-105-1.
(5)- Samraei , M. (2015). *Contemporary Transportation Geography and its Computer Applications.* Jordan: Al-Yazuri Publishing and Distribution House, p249.
(6)-Boudjemaa , K. (2017). *Introduction to the Management of Civilizational Techniques.* Algeria: office of University Publications, p79.

crisis is that it[1]appears in a frequent and sudden way;

- it accumulates and multiplies over time and lastss for a temporary period of time;
- is a global phenomenon that various countries suffer from;
- it appears in varying proportions, differing from one city to another;
- And the driver of the vehicle is the main cause, the actual element and the motor of the crisis.

2.3 Causes of the traffic congestion crisis

Among the reasons that contribute to the aggravation of this crisis are:

- many insisting on driving their vehicles themselves instead of sharing with others or using transportation, searching for places to park vehicles and increasing the number of vehicles

- Natural conditions, such as: rain, snow and hail; and Economic booms that contributed to the increase in the demand for the purchase of vehicles[2].

3. A theoretical introduction to factor analysis

This method appeared at the beginning of the twentieth century with the scholars (Carl Pearson) and (Charles Spearman) to define and measure intelligence. The development in the field of calculators led to an increase in interest in the method of factor analysis. In the second half of the twentieth century, (Raymond Cattell) used factor analysis to reduce a list of more than 4,500 factors of personality

(1)-Ali , S. (n.d.). Traffic Accident in Egypt,2 facteur on traffic accient in Egypt(human,place,time). *Engineering science*, *36*(2), p491.

(2)-Vencatataya, L., Pudaruth , S., Diripal , G., & Narain, V. (2018). Assessing the causes & Impacts of Traffic Congestion on the society ; Economy and individual :Acase of Mauritius As an Emerging Economy. *studies in Beusiness and Economies, 13*(3), pp. 232-233

factors to 16 traits, and Cattell called this study "The Test of Sixteen Personality Factors" (Encyclopedia).

3.1 Definition of Factor Analysis:

Factor analysis is: summarizing the multiplicity of measured variables and reducing them to one or two latent variables, or a small number of latent variables (Johny R.J). It is also defined as: a statistical method aimed at interpreting positive correlation coefficients - which have statistical significance between the various variables. In other words; The factor analysis is: a mathematical process that aims to simplify the correlations between the various variables involved in the analysis, to reach the common factors that describe the relationship between these variables and their interpretation(1), and the meaning of the factors stems from within the set of relationships between the variables, when given An explanation of the resulting factors must be derived from the characteristics of the set of relationships between the variables under analysis(2).

3.3 Conditions for using factor analysis:

The conditions for using factor analysis are summarized in the following points(3)

- It is required that the variables be normally distributed, and that their distribution is not severely skewed or multimodal;

(1)-Abbassi , S. (2017). Outline of the work of the study days in the methodology of scientific research. *Laboratory of Economics and Management Sciences*. University of Biskra, p85.
(2)-Belboukhari, S. (2009). The use of factor analysis of variables in analyzing marketing questionnaires. *an applied study on some research*, 44. Department of Commercial Sciences, Faculty of Economics, Commercial Sciences and Management Sciences, Batna University,p44
(3)-Johny R.J, F. (2015). *Exploratory Factor Analysis.* in Encyclopedia of Social measurement-Journal & Books ;science Direct, p7

• The sample should not be small in size or unrepresentative of the target population, nor should it be biased;

• The process of interpreting the factors depends on the number of statistically saturated variables, which must not be less than three variables. All statistical programs indicate that the statistically significant saturation is not less than 0.6.

3.4 Types of Factor Analysis:

A distinction can be made between two types of factor analysis, which are as follows(1):

- Exploratory factor analysis: used in cases where the relationships between variables and factors are not latent;

Confirmatory factor analysis: It is used to test hypotheses about whether there is a relationship between the variables and the underlying factors or not.

3.6 Factor Analysis techniques:

Researchers in this field have suggested a number of techniques, some of which we will address as follows(2):

- **R-technique**: This is the traditional method followed in most research. The original raw data for starts from the scores of the individuals that make up the rows, while the columns consist of the variables, and the correlation coefficients between the variables (columns) are calculated and then analyzed factorially and factors specific to the variables are extracted from them;

- **P technique**: It is the factor analysis of the correlation coefficients between a group of variables, but the important thing in this method is that all the data are derived from one individual. the

(1)-Salman, T. (2021, 11 8). *Factorial Analysis - its concept - methods of analysis - criteria for determining the number of factors - and an illustrative example of how to extract it using SPSS*. Retrieved from http://kotobgis.blogspot.com.
(2)- Salman, T. (2021, 11 8). Op cit,p99.

reason for which ***Butler et al*** call it natural data analysis, which is a type of factor analysis in which the behavior of the individual is represented. During multiple periods of observations are applied to psychotherapeutic interviews.

3.7 Process of rotation and interpretation of factors:

When factor analysis is used for a relational matrix, for example, and by any of the factorial methods, it will be possible to derive certain factors, and these factors are orthogonal axes that represent the saturations of the variables and their coordinates, which are determined in a random way. This determination of the axes varies from one factor method to another.

There are two types of rotation depending on the angle separating the reference axes, namely: orthogonal rotation and oblique rotation; in the orthogonal rotation, the factors are managed together (two of them, for example) while maintaining the orthogonality between them. As for the oblique rotation, the axes are managed without maintaining the orthogonality and are left to take the appropriate slope for them.

3.8 Interpretation of Factors:

This is done by determining the major, medium and zero saturations; There are several ways to determine the value of these saturations; (Overuloclet) sees that the significant saturation is more than (0.35), while (Gorsch) believes that the common value in most research is (0.30), while others use statistical tests to determine the significance of each saturation by comparing it with its standard error, which is greatly affected by the size of The sample(1).

4 . Using exploratory factor analysis to determine the causes of the traffic congestion crisis

After presenting the theoretical side of this study, we will try to

(1)-Awwad, M. (2020). *Statistics and Probability.* Syria: The Virtual University, p99

determine the causes of the traffic congestion crisis using the exploratory factor analysis as follows:

4.1 Methodology of the field study:

To achieve the objectives of the study, 150 questionnaires were distributed to drivers of small vehicles in the municipality of Medea. 50 questionnaires were not retrieved were excluded and 100 of them were relied upon, using the survey method in collecting primary data by means of a questionnaire consisting of two parts:

- The first part is related to personal data, and it consists of 3 questions in order to know some personal aspects of the driver of a small vehicle;The second part is related to the causes of the traffic congestion crisis, and it consists of 36 questions. The measurements were encoded based on the order of the questions in the questionnaire preceded by the letter X, and were entered into the Statistical Package for Social Sciences (SPSS.24).

4.2 Descriptive characteristics of the study sample:

The results contained in Table No. 01 show the distribution of the study sample according to personal variables:

Table 01: Distribution of the study sample according to personal variables

Age				Years of experience					Gender	
40years and above	From 20 to under 30 years	From 20 to under 30 years old	Less than 20 years	15 years and above	10to 15 years	5to 10 years	From 2 to less than 5 years	less than 02 years	female	male
%12	%24	%60	%4	%13	%11	%25	%35	%16	%10	%90

Source: Prepared by the researcher based on the outputs of the SPSS.24

Table01 shows that:

The study sample members are distributed between males and females at rates in which males outnumber females by 90%, and this is due to the actual characteristics of the society. As for the years of

experience, they are arranged as follows: 35% for leadership, ranging from 2 to less than 5 years of experience, 25% for leadership, ranging from 5 to less than 10 years of experience, 13% of those who practiced driving for more than 15 years, and 11% of those whose driving experience ranged from 10 to 15 years, and this distribution and difference in percentages is due to the response of the study sample members to answer the questionnaire questions. As for the age aspect, the age ratios were arranged as follows: 60% for those aged 20 to less than 30 years, 24% for those aged 30 to less than 40 years, 12% for more than 40 years, and 4% for less than 20 years, which means the possibility of benefiting from this The difference in determining the causes of the traffic congestion crisis.

4.3 Steps to conduct a factor analysis of the causes and effects of traffic congestion from the viewpoint of drivers of small vehicles in the municipality of Medea

These steps are as follows:

4.3.1 Ensuring that the data (the correlation matrix) is capable of factor analysis: we have marked the statistics that we want to judge according to the following indicative criteria:

- ✓ The absolute value of the determinant of the correlation matrix, which is required to be greater than (0.00001), which indicates that there are no very high correlations, or the absence of linear dependence between the variables;
- ✓ That the (Bertlett) test is statistically significant (i.e. alpha without 0.05), which indicates that the correlation matrix is not a "relationship-free" unit matrix, but rather has the minimum number of relationships;
- ✓ That the (KMO) test for all matrix is higher than 0.5 according to the (Kaser) criteria, which is a general measure of assignment efficiency, and also indicates that the correlations are generally at the level;

✓ The MSA module for each variable must also be higher than 0.5, which indicates that the level of correlation between each variable with the other variables in the correlation matrix is sufficient to perform the factor analysis.

4.3.2 determining the methods of factor extraction: We have chosen the principal components method, which is the most widely used method.

4.3.3 Interpretation of the factors:

that is, searching for the meaning of the factors by rotating the factors or axes, and we used the orthogonal rotation method, which leads to an increase in the variance of the factor saturations square on all the variables.

With this, we have finished preparing the instructions, now we move on to reading the output.

4.4 Reading the results of a factor analysis of the causes of the traffic congestion crisis

This reading is done by going through the following sub-stages:

4.4.1 Examination of the Applicability of the Correlation Matrix to Factor Analysis:

After performing the previous steps, we obtained a table showing the correlation matrix in the upper half of it, and the statistical significance of the correlation coefficients in the second half (a matrix consisting of 14 rows and 14 lines), and most of the correlation coefficients were statistically significant, and a large proportion of these correlations are equal to or higher than the level of (.20), and the matrix is also free of these high correlation coefficients from the first condition, as for the second condition, which requires that the absolute value of the determinant of the correlation matrix be greater than (0.00001) to indicate that there are no very high correlations, the value of the determinant has reached (.191) It is higher than 0.00001, so the

correlation matrix does not appear to be a matrix that does not have the problem of high exaggerated correlation between variables.

With regard to the third condition, which requires that the (Bertlett test) be statistically significant, Table No. 2 shows the results obtained after conducting this test.

Table 02: Bertlett and KMO test results

Kaiser-Meyer-Olkin index for measuring sampling quality.		,518
Bartlett's sphericity test	Khi-deux approx.	1284,16
	Ddl	630
	Signification	,000

Source: by the researcher based on the outputs of the SPSS. 24

From Table No. (2) We note that (Bertlett's test) is statistically significant, and therefore the correlation matrix is not a unity matrix (without relationships), but rather has the minimum number of relationships.

And when examining the extent to which the fourth condition is met, which requires that the (KMO test) for all the matrix be higher than 0.5 according to the (Kaiser) criteria, which considers that the values of this indicator, which range from "0.5 to 0.7" are good enough, and the values that range from "0.7 to 0.8" is good, values ranging from "0.8 to 0.9" are very good, and values above "0.9" are excellent (Tegza, 2012, p. 89), we find that the value of KMO shown in Table No. (02) equals (0.518), which is a good value. This means that this result enhances our confidence that the sample size is sufficient to perform the factor analysis.

The fourth condition also requires that the (MSA scale) for each variable (a paragraph in the resolution) be higher than 0.5, which appeared in the diagonal cells of the correlation coefficients in the lower rectangle of the correlation matrix table, and it seems that most of them exceed the value 0.5.

4.4.2 Extraction, rotation and naming of factors: After using the principal components method to reduce the number of measured variables (resolution paragraphs) to a limited number of latent variables that will replace the measured variables in subsequent uses:

4.4.2.1 Factors Extraction: The following table shows the latent roots of the factors in the column entitled (total). The table shows the amount of the explained variance of the latent root in the form of percentages of the explained variance for each component (factor), and the percentages of the cumulative explained variance.

Table 03: The results of factor extraction (latent variables)

Total variance explained									
	Initial eigenvalues			Sums extracted from the load square			Sums of rotation of the load square		
	Total	% of variance	% cumulated	Total	% of variance	% cumulated	Total	% of Variance	% cumulated
1	4,991	13,863	13,863	4,991	13,863	13,863	3,630	10,083	10,083
2	2,900	8,056	21,919	2,900	8,056	21,919	2,290	6,361	16,443
3	2,618	7,272	29,191	2,618	7,272	29,191	2,059	5,718	22,162
4	2,083	5,785	34,977	2,083	5,785	34,977	1,834	5,096	27,257
5	1,855	5,153	40,129	1,855	5,153	40,129	1,786	4,961	32,219
6	1,650	4,584	44,713	1,650	4,584	44,713	1,784	4,954	37,173
7	1,555	4,318	49,031	1,555	4,318	49,031	1,739	4,832	42,005
8	1,473	4,091	53,122	1,473	4,091	53,122	1,712	4,757	46,762
9	1,429	3,969	57,091	1,429	3,969	57,091	1,698	4,717	51,479
10	1,287	3,574	60,665	1,287	3,574	60,665	1,679	4,664	56,143
11	1,225	3,404	64,069	1,225	3,404	64,069	1,611	4,476	60,619
12	1,113	3,092	67,160	1,113	3,092	67,160	1,516	4,210	64,829
13	1,039	2,887	70,047	1,039	2,887	70,047	1,471	4,087	68,916
14	1,029	2,859	72,906	1,029	2,859	72,906	1,436	3,990	72,906
Extraction method: Principal component analysis.									

Source: Prepared by the researcher based on SPSS .24 outputs.

From Table No. 3 we note that: The latent roots of the components (factors) in the column entitled (total) show that there are 14 latent roots higher than the right one, and it indicates the size of the variance extracted or explained by each component or factor, and the table also shows the amount of explained variance The latent root is in

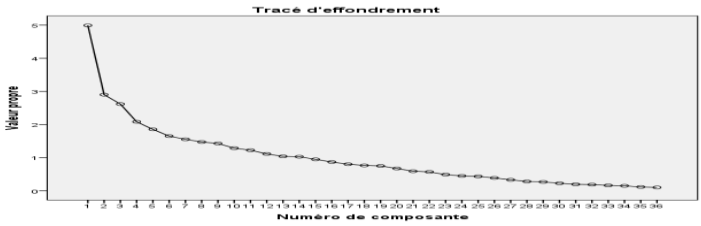
the form of percentages of the explained variance for each component (factor), and percentages of the cumulative explained variance; For example, we find that the latent root of the first factor explains (4.991), and explains a percentage of the total variance of (13.863%).

It is also noted that rotation distributes the proportions of variance distributed among the factors in a relatively balanced manner, and does not make it centered on the first factor or two factors, and this is evident when comparing the sixth column and the ninth column.

As for the commonality values after extraction shown in Table 05, they are more than 0.8 (ranging from 10 to 36 measured variables), in addition to that, the average commonality values (0.798) are greater than 0.6, and therefore the two previous cases that indicate the accuracy of using the Kaiser criterion are available. , so we use the slope curve method to find out

whether the number of extracted factors is stable? It is shown in Figure 01

Figure 01: Slope curve



Source: by the two researchers based on SPSS.24 outputs.

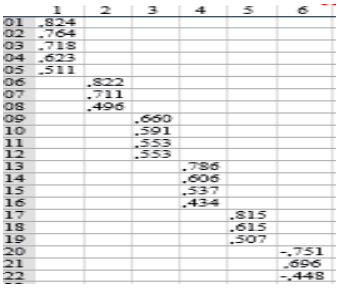
We note that the previous slope curve shown in Figure 01 shows a slowdown after the first four factors, then a second slowdown for the eleventh factor, using the criterion of meaning or theoretical significance of the combination of factors, and the use of the explained variance ratio. Since many researches did not agree on the estimations of saturation, which indicates the value separating the significant saturation (the intensity is appropriate) and the unimportant

saturation (the intensity is low and insufficient). We relied on the minimum frequently used in references and estimated by (0.4), and after deleting the expressions that contributed to the satisfaction of an axis from the origin of the phrase or two statements from tables of saturation of expressions on factors after rotation, the number of axes has been reduced to 14.

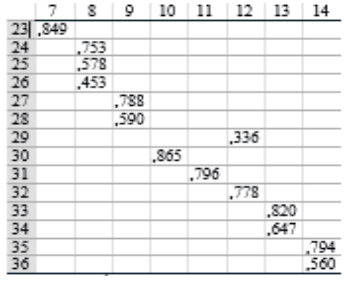
4.4.2.2 Factors rotation: The following table shows the matrix of components (factors) after orthogonal rotation by the (Varimex) method.

Table 03: Matrix of factors after rotation

Component matrix rotation



	1	2	3	4	5	6
01	,824					
02	,764					
03	,718					
04	,623					
05	,511					
06		,822				
07		,711				
08		,496				
09			,660			
10			,591			
11			,553			
12			,533			
13				,786		
14				,606		
15				,537		
16				,434		
17					,815	
18					,615	
19					,507	
20						-,751
21						,696
22						-,448



	7	8	9	10	11	12	13	14
23	,849							
24		,753						
25		,578						
26		,453						
27			,788					
28			,590					
29						,336		
30				,865				
31					,796			
32						,778		
33							,820	
34							,647	
35								,794
36								,560

Source: by the researcher, based on the outputs of the SPSS.24

From Table No. 4, we notice that most of the expressions in the components matrix after rotation are saturated on the first factor, and the least number of expressions, that is 1, is saturated on the seventh, tenth and eleventh factor.

4.4.2.3 Analysis of the projection of variables at factors levels: This analysis is carried out by analyzing the circle of correlations and the quality of the representation of the variables on them. To determine the correlations between the eight factors, we can use the following matrix shown in Table No. 04.

Table No. 04: Matrix of correlations between factors

Component transformation matrix														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14

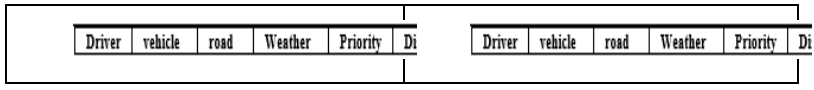
1	,726	,247	-,041	,317	,269	,120	,104	,224	,219	,252	,079	,089	,142	,126
2	-,453	,617	,211	,148	,153	,335	-,344	,023	,028	,084	,146	,067	,110	,217
3	,182	-,001	,557	-,046	-,254	-,025	,272	-,123	-,436	-,158	,355	,217	,254	,217
4	,007	-,384	,592	,146	,088	,282	-,143	,068	-,007	,377	-,092	-,405	-,100	-,209
5	-,047	,336	,219	,247	,387	-,486	,229	-,265	-,260	,040	-,341	-,011	-,174	-,229
6	-,128	,055	,105	-,093	,029	,406	,505	,356	,026	-,082	-,139	,358	-,502	-,083
7	-,237	-,160	,001	,187	,370	-,218	,213	,518	-,006	-,354	,252	-,368	,125	,211
8	,097	,161	,087	-,613	,330	-,054	,110	-,237	,231	,087	,473	-,229	-,245	-,058
9	-,161	-,144	-,136	,463	-,015	,261	,406	-,586	,282	-,061	,180	-,120	-,016	,115
10	-,245	,041	-,008	,182	-,367	-,430	,144	,221	,180	,564	,361	,128	-,113	-,083
11	,111	,335	,295	,024	-,432	-,089	,053	,085	,492	-,413	-,134	-,273	,064	-,273
12	-,082	-,066	,196	-,251	-,016	-,170	,165	-,042	,310	,204	-,459	-,017	,082	,688
13	-,205	,004	-,051	-,236	,155	,134	,348	,042	,074	,202	-,119	,086	,714	-,396
14	-,055	-,322	,283	,085	,299	-,186	-,272	-,069	,429	-,217	,098	,589	,037	-,118

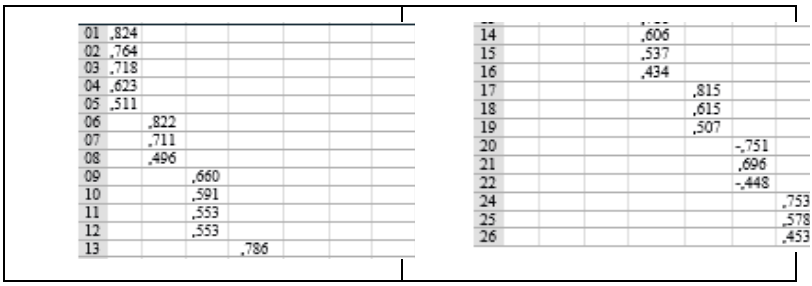
Source: by the researcher, based on the outputs of the SPSS program

The matrix of correlations between the factors represented above shows the extent of the correlation of the factors, and most of them are moderately correlated. Most of the correlations are less than 0.05 and greater than 0.8, otherwise this is considered evidence of the lack of differentiation of the factors and that they all dissolve in one factor, instead of differentiating to 14 factors jut as it is provided by this matrix.

4.4.2.4 labeling the factors: The following is a matrix of saturations of the paragraphs to identify the causes of the traffic congestion crisis when using the (SPSS.24) package on its factors using the exploratory factor analysis, and after rotation using the Varimax method. Table No. 06 illustrates this.

Table 06 :labels of Factors





01	,824					
02	,764					
03	,718					
04	,623					
05	,511					
06		,822				
07		,711				
08		,496				
09			,660			
10			,591			
11			,553			
12			,553			
13				,786		

14			,606			
15			,537			
16			,434			
17				,815		
18				,615		
19				,507		
20					-,751	
21					,696	
22					-,448	
24						,753
25						,578
26						,453

Source: by the researcher, based on the outputs of the SPSS program

We note that the matrix shown in Table No. 06 included all the high, medium and low saturationsthat were adopted in determining the factors. Based on the common meaning between the variables (resolution paragraphs) that are saturated with the factor, the 14 extracted factors can be named as follows:

- **The first factor - the driver**: the first factor to be extracted, it alone explains 13.863% of the variance; That is, what corresponds to this percentage of the network of correlations between the variables is due to this factor. This factor has attracted the largest number of variables, as their number reached 5 according to their numbers in the questionnaire, which are: 25, 26, 24, 27, 28. They refer to the questionnaire's paragraphs that came in succession: reckless driving for young people, driving "beginners" with modern licenses holders, "fearful" women driving, an increase in the use of private vehicles instead of public transport, and in our view this may be due to: driving quality; we find that both new driving licenses holders and women who tend to walk slowly at first, unlike impulsive young people who are eager to drive, they take secondary roads or twisted maneuvers to get rid of the traffic crisis. In addition to taxi drivers who, because of their work and their connections with customers, tend to use speed in the city center. Many people use their own vehicles to the point; they cannot replace them with bicycles, public transport, or walks and never think of escorting others with their vehicles to the same destination.

- **The second factor_ the vehicle**: This factor consists in 3 variables according to their numbers in the questionnaire, which are: 14, 13, 16, which explain 8.056% of the variance, and refer to the questionnaire items that came in succession: random parking and stopping, old and worn out vehicles, an increase in the number of vehicles and population. This is due to: Inappropriate stopping and parking, which obstructs traffic, whether that is because of not knowing the destination, or because of acquiring some necessities. Sometimes we find many city residents insisting on keeping their old and worn out vehicles that break down in the middle of the road without warning. What increased the severity of the traffic crisis was the fact of trying to keeping pace with the development in the modern industries of vehicles of all colors, shapes, designs and brands. This increased the demand on vehicles, whether new or used ones, with the spread of specialized sites for buying and selling used vehicles, and the facilities granted in the recent years for buying vehicles by installment sale, bank loans, social services, and as an inevitable result, the number of vehicles increased to the point where one family owned more than two vehicles.

- **The third factor - the Road:**This factor contains 4 variables according to their numbers in the questionnaire, which are: 03, 02, 11, 10, which explain 7.272% of the variance, and refer to the paragraphs of the questionnaire that came in succession: the old roads, the holes in roads and the random parking of vehicles on the side of the roads, and. We can say that this is due to: the fact that every obstacle on the road causes the crisis, such as: the old roads dating back to the French colonial era, and even the flagrant potholes in the roads, not to mention the lack of vacant places to park vehicles, and the spread of the phenomenon of parking on both sides of the road.

- **The fourth factor- weather condition**: This factor contains 4 variables according to their numbers in the questionnaire, which are: 22, 21, 30, 29, and they explain the rate of 5.785% of the variance, and

refer to the paragraphs of the questionnaire embedded in: heavy rain, hail, snow, poor visibility due to fog, and fear of slipping due to the accumulation of ice, due to bad weather, especially in winter as the city is situated in high plateaus with low temperature, and snowy weather. The region is also famous for icy roads and foggy mountains; this fact pushes drivers to slow down their speed and then block traffic as such.

- **The fifth factor_Priority**: This factor contains 3 variables according to their numbers in the questionnaire, which are: 36, 35, 34, they explain 5.153% of the variance, and refer to the paragraphs of the questionnaire: the passage of ambulances, police, gendarmerie and civil protection, motorcades of personalities such as ministers, governors and presidents, university transport traffic, and others who have have the right in traffic priority, forcing the rest of the vehicles to wait and opening the way for those with priority according to the customary traffic law.

- The sixth factor_distance: This factor contains 3 variables according to their numbers in the questionnaire: 05, 20, 10, and it explains 4.584% of the variance, and refers to the paragraphs of the questionnaire: the absence of places to park vehicles, the accumulation of vehicles near From each other, random trash located in one place.

From our perspective, this is due to: the concentration of many schools and administrations in the city center, the lack of spaces for parking vehicles, with many preferring to park their vehicles near the destination in order to avoid walking, which leads to crowding to find a vacant space on the edge of the roads. This creates a sort of lack of safety distance between vehicles, as well as when approaching the timers spread in an attractive way.

- **The seventh factor - speed**: This factor contains 3 variables according to their numbers in the questionnaire, which are: 31, 15, 19, and it explains 4.091% of the variance, and refers to the paragraphs of the questionnaire: excessive speed immediately after the congestion is over, the overruns dangerous driving on the edge of the road, slow driving without a reason. In our view, this is due to: the tendency of many to use

speed, especially if time rushes them during traffic, due to their connections, especially during peak hours, work and study, and sometimes some prefer secondary roads or overtaking on the edge of the road. When others have to slow down in the event of a elevated road or a slope, or to lift a load, or say hello, and talk to others while driving the vehicle, or for any other reason that is unknown to the rest of drivers.

The rest of the statistically unsaturated factors were not explained because they contain less than three variables, such as: the phone, the passengers, the irrational use of the vehicle, the time, the psychological and health status of the driver, blocking the road, highway robberies and disrespecting the right of passage.

5. CONCLUSION

Our study, which aims at searching for the apparent and hidden causes of the traffic congestion crisis, came in two parts, a theoretical part revolving around the concepts of traffic congestion crisis and exploratory factor analysis, and an applied one in which we used factor analysis to identify the causes of the traffic congestion crisis.We came up with a set of results that enabled us to answer the hypotheses of the study:

- The first cause is: the driver's behavior;
- The second cause: the vehicle;
- The third cause: the quality of the road, in addition to the weather condition, priority, distance and speed.

Suggestions:

As an attempt to mitigate the severity of this crisis, we suggest the following:

- Varying the daily working hours of ministries, public institutions and companies;
- Creating different bridges and underground passages;

- studying of the double sidewalk system;
- organizing lines and crossing areas for pedestrians in the street at major intersections and establishing car parks;
- development of public transport services; by providing air-conditioned buses equipped with a comfortable internet network that attracts citizens;
- Educating drivers about the importance of using GPS when using the road for the first time;
- raising awareness of the consequences of traffic congestion and its economic costs on the citizen and the state through press seminars and national and international forums;
- Contributing to the preservation of roads from deterioration and their continuous restoration, and benefit from global expertise and experience in this field;
- Expanding streets and entrances around cities and residential areas.

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