THE IMPACT OF SMART TRANSPORTATION ON THE IMPROVEMENT TRANSPORTATION SERVICES THROUGH THE YASSIR APPLICATION. A CASE STUDY OF THE NEW CITY OF ALI MENJELI – CONSTANTINE (ALGERIA)

NAIM ABDELMALEK[*1], LOUARDI KHERROUR[**], MOKHTAR GUERFI[***]

Key-words: Smart transportation, Yassir application, transportation services, transportation efficiency, transportation technology.

Abstract. This study examines the impact of smart transportation, specifically the Yassir ride-hailing application, on improving transportation services in the new city of Ali Menjeli in Constantine, Algeria. Using a questionnaire distributed to 151 residents, the research analyses the extent of smart transportation use and transportation service quality in relation to service improvement. Statistical analysis, including regression models, has revealed a significant positive effect of both smart transportation use and service quality on improving overall transportation services. The Yassir application was found to contribute to increased efficiency, reduced waiting times, improved safety, and decreased traffic congestion. The study highlights the growing acceptance and benefits of smart transportation technologies in urban mobility, particularly in newly developed cities. The findings suggest that integrating such applications can lead to enhanced transportation experiences and urban quality of life.

1. INTRODUCTION & LITERATURE REVIEW

Urban transportation systems are crucial for the economic and social functioning of cities (Muhasen, Shahin, 2019). However, traditional transportation systems often struggle with issues like traffic congestion, pollution, and inefficiency. In recent years, smart transportation has emerged as a promising solution to addressing these challenges (Figueiredo, 2021). Smart transportation refers to the use of advanced technologies, such as artificial intelligence, Internet of Things (IoT), and big data analytics to improve the efficiency, safety, and sustainability of transportation systems (Zhuhadar *et al*, 2017).

The concept of smart transportation is closely linked to the broader idea of smart cities. Müller-Eie and Kosmidis (2023) define smart cities as urban areas that leverage technological solutions to enhance the management and efficiency of the urban environment. Smart transportation is considered one of the six key components of smart cities, alongside smart governance, economy, environment, living, and people (Müller-Eie, Kosmidis, 2023).

Smart transportation systems offer numerous potential benefits; they can help reduce traffic congestion through real-time traffic management and route optimization (Gharehbaghi, 2019). These

[*] PhD student, Laboratoire ville régionale gouvernance territoriale, Faculty of Earth Sciences Geography and Urbanization, Department of Geography and Urban Development, Houari Boumediene University of Science and Technology, 1600 Algiers, Algeria, anaim@usthb.dz. abdelmaleknaim.ing@gmail.com.

[**] Lecturer "A", Laboratoire ville régionale gouvernance territoriale, Faculty of Earth Sciences Geography and Urbanization, Department of Geography and Urban Development, Houari Boumediene University of Science and Technology, 1600 Algiers, Algeria, lkherrour@usthb.dz.

[***] Professor, Laboratoire ville régionale gouvernance territoriale, Faculty of Earth Sciences Geography and Urbanization, Department of Geography and Urban Development, Houari Boumediene University of Science and Technology, 1600 Algiers, Algeria, mguerfi@usthb.dz.

[1] Corresponding author

systems can also improve safety by providing real-time alerts and implementing advanced driver assistance systems (Mäkinen, 2021). Furthermore, smart transportation can contribute to environmental sustainability by promoting the use of public transport and reducing emissions through a more efficient traffic flow (Zhuhadar *et al.*, 2017).

One of the key enablers of smart transportation is the proliferation of ride-hailing applications. These apps, such as Uber, Lyft, and local variants like Yassir in Algeria, have transformed urban mobility by providing on-demand transportation services (Tirachini, 2020). Ride-hailing apps can potentially reduce private car ownership, increase vehicle occupancy rates, and provide last-mile connectivity to public transport systems (Jin, 2018).

However, the implementation and impact of smart transportation systems can vary significantly depending on the local context. While much research has focused on developed countries and major metropolitan areas, there is a need for more studies examining the adoption and effects of smart transportation in developing countries and newly developed urban areas (Neves, 2020).

This study aims to address this gap by examining the impact of smart transportation, specifically the Yassir ride-hailing application, on transportation services in the new city of Ali Menjeli in Constantine, Algeria. Ali Menjeli is a planned city developed as part of Algeria's urban expansion strategy, providing an interesting case study of smart transportation adoption in a newly developed urban area.

The research objectives of this study are:

1. To assess the extent of smart transportation use through the Yassir application in Ali Menjeli.
2. To evaluate the quality of the transportation services provided by the Yassir application.
3. To analyse the impact of smart transportation on improving overall transportation services in the city.

Based on these objectives, the following hypotheses have been put forward:

1. H1: The extent of smart transportation use has a significant positive effect on the improvement of transportation services in Ali Menjeli.
2. H2: Transportation service quality has a significant positive effect on the improvement of transportation services in Ali Menjeli.
3. H3: The use of smart transportation and transportation service quality collectively have a significant positive effect on improving transportation services in Ali Menjeli.

By examining these hypotheses, this study aims to contribute to the understanding of smart transportation impacts on newly developed urban areas in developing countries, potentially informing policy and planning decisions for similar contexts.

The concept of intelligent transportation: Smart transportation is one of the most important tools for organizing traffic in the city. It works to improve the efficiency of transportation and traffic networks while using modern technologies and communications in the fields of electronic visual, as well as audio communication and computer programs to analyse and process data in traffic management centres. The aim is to solve traffic problems in the city (Abdelwahad, 2018, p. 11).

The definition of intelligent transportation: The use of computer, electronic, communication, and control technologies to address many of the challenges facing surface transportation, such as improving traffic safety, productivity, and public mobility in the face of worsening congestion, persistent safety hazards, and tight transportation agency budgets (Al Mashhadani, 2019, p. 2260).

The definition of Intelligent Transportation Systems (ITS): Intelligent transportation systems are the natural evolution of the infrastructure of the transportation sector through its modernization in order to keep up with information. This is very important because as the demand for transportation increases, intelligent transportation systems help to absorb a large capacity with higher efficiency, without relying entirely on the establishment of new transportation facilities. Furthermore, intelligent transportation systems apply modern technologies in the field of monitoring, information collection, control, communication and computer programs so as to maximize the absorption capacity of the road network and other means of transportation. Additionally, the basics of intelligent transportation systems are divided into three sections, which are as follows (Al Mashhadani, 2019, p. 2261).

Table 1

Basics of Intelligent Transportation Systems

Data collection methods	**Data processing technology**	**Command and control and information transfer**
Devices that collect the appropriate data, such as traffic control and development on highways, city roads, and surveillance cameras in parking lots and public transportation.	The software and hardware that process data and respond to changes in these systems.	The technologies involved in bringing the results of data processing to reality and coordinating them with public transportation.

The purpose of the transportation sector is no longer simply to move people and goods from one place to another, but to achieve economic, social, and environmental sustainability. Given the complexity of transportation systems, governments and cities must manage conflicting demands to provide safe, efficient, reliable, and environmentally friendly transportation systems.

Technology has been playing a major role in shaping transportation systems since the dawn of time. This is evident when analysing the evolution of transportation systems from a historical perspective, as technological innovations have introduced structural and profound changes to transportation systems around the world; the following are some of the major inventions and innovations that have shaped the history of transportation (United Nations, 2021).

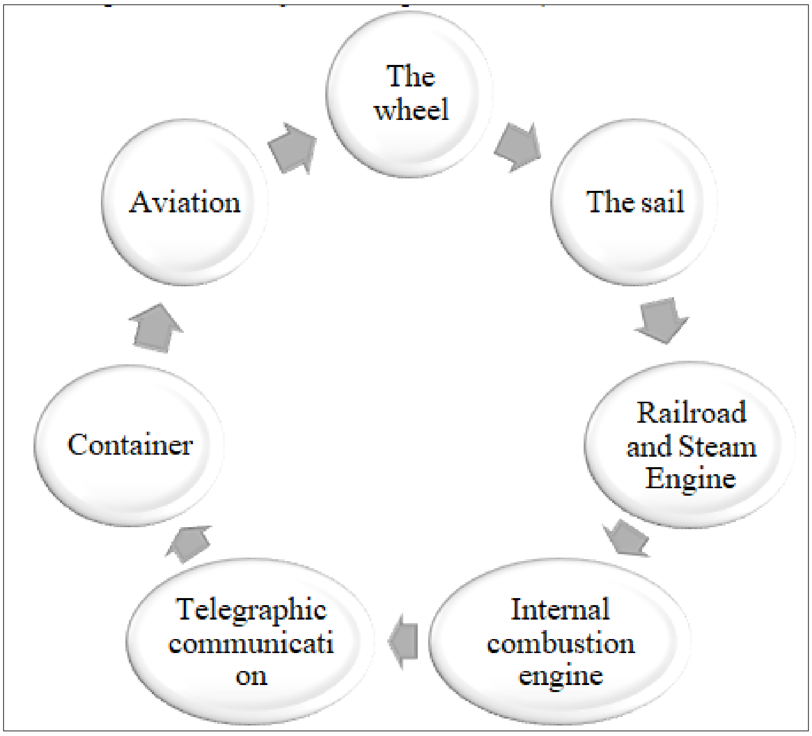

Fig. 1 – Some of the major inventions and innovations that have marked the history of transportation.

Given the critical importance of ITS, several countries have been working to implement them. In the table below are some of the applications being pursued by various countries (Boulkouas, 2014, p. 161):

Table 2

Applications of Intelligent Transportation Systems for Public Transportation Development

Intelligent Transportation Systems Applications	Definition
Automatic roads	A means of achieving the goal of the most technically challenging long-range intelligent system, a complete road and vehicle system that is operationally complete and automates the driving process. On the other hand, the introduction of an automated road system improves traffic safety by minimizing human error as the main cause of accidents, and improves road efficiency by automatically controlling vehicles and regulating their speed and the distance between them.
Surveillance cameras in front of traffic lights	It has already been proven to reduce accidents at the intersections where they are set up.
Geographic Information System (GIS) utilization and information management technology	It is a mechanism used by direct drivers to find out the location of bottlenecks, speed up their resolution, and notify drivers through 100 billboards and digital screens on the road.
Smart information organizer	It balances traffic volume between regular ways and highways, removes critical traffic bottlenecks, and provides traffic information.
Global Positioning System (GPS)	This technology is considered the most widely used, and this system represents a navigation system consisting of a network of satellites installed in specific orbits in outer space. In 1980, the US government allowed it to become available for civilian use. It is a system that can, for example, pinpoint the location of the vehicle in the event of an accident. This system can detect everything that is both moving and static, as the satellite detects and sends the result of the detection to the receiver (the information analysis centres).

The importance of technology emerges as one of the vital components that work to develop the transportation sector, and is manifested in the manufacture and renewal of modes and spare parts, the continuation of basic and complementary equipment for transportation and transportation, the use of electronic computers and satellites, the introduction of self-control systems, and the increase in capacity, and control leading to more savings and cost reduction. These activities are as follow. (Lakhdar, 2019, p. 709).

The role of ITS in improving transportation:

– Smart technologies improve transportation by enhancing safety, efficiency, and user experience, as well as by reducing congestion and pollution. This contributes to boosting the quality of life and well-being of society as well as the following:
– Improving safety and security: Smart technologies, such as sensors, help improve the monitoring and early detection of safety issues, such as traffic accidents, helping to prevent them, enhancing user safety, and protecting lives.
– Improving efficiency and productivity: Smart technologies, such as automated control systems and artificial intelligence, improve enhance efficiency, reduce costs, increase productivity, and save energy.
– Improving user experience: Smart technologies such as connected car apps, and audio and entertainment systems enhance the user experience in transportation, providing a higher level of comfort and well-being.
– Improving urban mobility: Smart technologies help improve urban mobility and reduce road congestion, such as navigation applications and intelligent transportation systems in buses, trains, and subways.
– Reducing pollution: Smart technologies help improve vehicle performance and fuel efficiency, reducing pollution from tailpipe emissions.

2. METHODOLOGY

2.1. Study area

According to the European Commission, smart cities are "cities that use technological solutions to improve the management and efficiency of the urban environment", but also "go beyond the use of information and communication technologies to use resources and reduce emissions". A smart city has six components: Smart Government, Smart Economy, Smart Environment, Smart Living, Smart Mobility, and Smart People. From a strategic perspective, an approach that covers all six dimensions can be seen as an overarching strategy and goal for a smart city. Smart cities have been characterized by tools such as smart technology and IOT, open data, public-private collaboration, competition, and user engagement, claiming that automatically collected data and competition between cities can lead to societal benefits, convenience, and better resource allocation. Key stakeholders in a smart city are the city government, the planners, politicians, policymakers, technology and consulting firms, knowledge organizations, and the residents (Müller-Eie, Kosmidis, 2023, p. 2).

- **The New City of Ali Menjeli – Constantine**:

Creation: Named after Ali Menjeli, a mujahid of the Algerian Liberation Revolution, the new city is an urban pole in the wilaya, according to Algeria's policy on new cities within the general strategy of the National Urbanization Plan implemented by Law No. 87/03 of January 27, 1987 on urbanization. This project was confirmed by the master plan for the urbanization of Constantine by Decree No. 83/98 of 25/02/1998 and inaugurated by Presidential Decree No. 217/2000 of 5/8/2000 (Ministry of Housing, Urbanization and City, 2024).

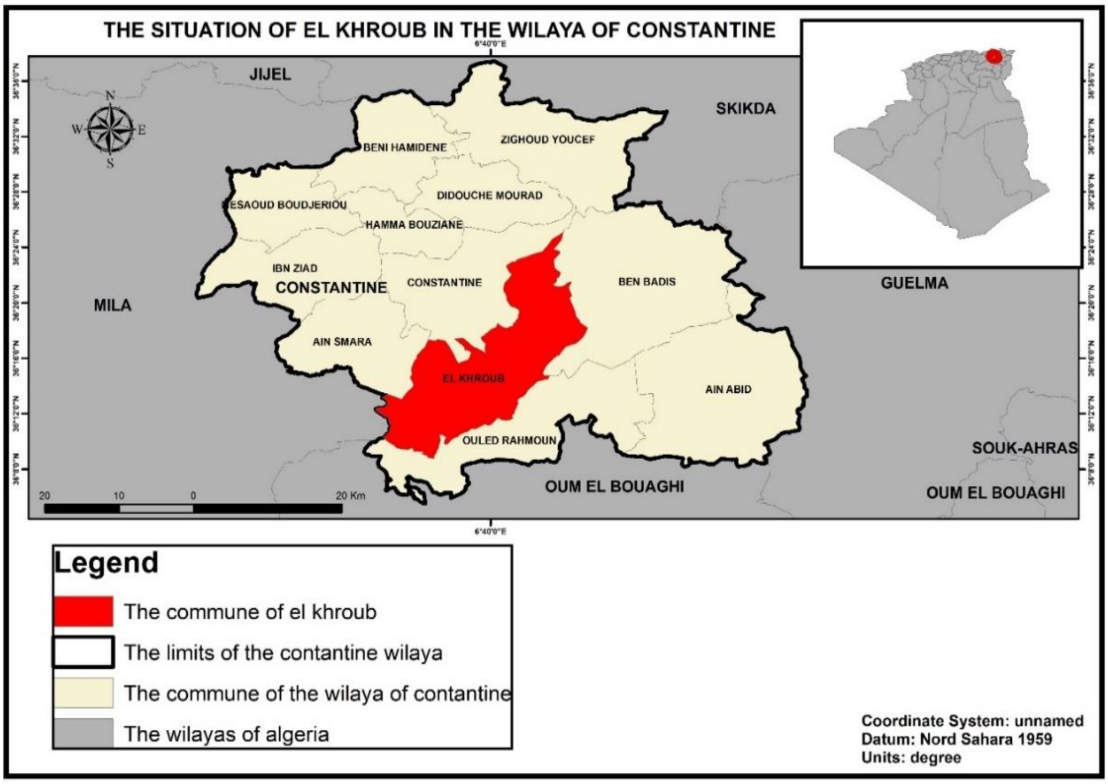

Fig. 2 – Situation of Khroub – the new city of Ali Menjeli – Constantine Governorate.

Location and borders: This new city – Ali Menjeli – is located on the surface of Ain El Bey, which can be found about 13 km south of Constantine, near the city centre and the municipalities of El Kharroub and Ain El Samara. The total area of the city is estimated at 2341 hectares, consisting of 20 neighbourhood units with a 120-hectare multi-activity zone: 1500 hectares, where the western expansion is 384 hectares, the southern expansion is 287 hectares, and the University City is 170 hectares (Fadel, 2021, p. 409). According to Prof. Salma Mesbah 2006, Human and City Laboratory, Montouri University, Constantine, it extends north to the borders of the east-west highway, northeast to the borders of Mohamed Boudiaf Airport, west to the foothills of the Ain al-Bay plateau, south to the Aifour foothills, and south to the Aish train. On the other hand, it can be found in state and municipal documents and associations that extend to include the Aish train and Salih Darraji in the south (Rachidi, Fallahi, 2020, p. 148). The map provides the following overview:

This new urban settlement is organized into a dense, multifunctional main centre (District Units 6 and 7), around which are 20 adjacent neighbourhood units, numbered from 1 to 20, whose formation and urbanization process has gone through three major moments. The first, from 1985 to 1999, saw the city's area increase from 0.03 to 0.51 km. The urban expansion during this period took the form of Neighbourhood Unit 6 and a small part of the business park to the north of the town. During the second stage, from 1999 to 2010, the built-up area grew steadily, reaching 7.12 km with an extremely high annual growth rate of 118.53%. The local authorities launched several large-scale projects and facilities, which led to the revitalization of several neighbouring units that make up the new town. Thirdly, the built-up area accelerated sharply from 2010 to 2019, reaching more than 11.84 square kilometres. In addition, urbanization expanded on the southern and western extensions, which were merged (Benhenni, Alkama, 2024, p. 210).

- **The Yassir application:** Yassir is a private Algerian startup that is a "platform or app" that connects customers with drivers online. Created in 2017 by "**Noureddine Tibi**" in Palo Alto, California, it offers VTC services via a mobile app available on iOS and Android. Various services can be accessed, including instant rides, reservations, airport packages, multi-stop rides, and hourly driver services. It is available in six countries around the world (Algeria, Côte d'Ivoire, France, Morocco, Senegal, and Tunisia) and has more than 5 million users. The company covers about 80% of the on-demand transportation market in the Maghreb. The startup's core values are:
  - We are committed to delivering unparalleled quality products, setting the standard for excellence.
  - Our team's boundless ambition drives us to innovate, grow, and reach new heights.
  - Open communication and transparency are the cornerstone of our relationships, fostering trust and cooperation.

The app's logo looks like this:

Fig. 3 – Yassir app logo.

To use Yassir services, you need to create a personal account on the mobile app, after downloading it from the App Store, and then simply enter your name, surname, email address, and mobile number. Once your account is created, you can order your first ride; here are the steps to make the order:

- Enter your delivery address.
- Choose the vehicle class you want along the corresponding fare.
- Choose between requesting an instant ride and a pre-booking.
- Click "Request Now" to confirm the ride. You will then receive a notification with the driver's details (driver's name, phone number, car type, and license plate). You can track the driver's location in real time on the app. You have 5 minutes after confirmation to cancel the ride at no charge (Yassir, 2024).

2.2. Data and tools

2.2.1. Study tools

The study was conducted through the questionnaire, one of the primary data collection tools, to determine the impact of smart transportation as represented by a simple application in improving transportation services in the new city – Ali Menjeli – in the state of Constantine, divided into three axes, namely:

- **The first axis**: contains statements related to the demographic characteristics of the sample members.
- **The second axis**: contains statements related to the independent variable (smart transportation).
- **The third axis**: contains statements related to the dependent variable (improving transportation services).
- **The fourth axis**: measures the effect of the independent variable on the dependent variable (the effect of smart transportation on improving transportation services).

Initially, the five-point "**Likert"** scale was used to measure the attitudes of the sample members towards the questions of the questionnaire, and the gradation in the scale used was taken into account as follows:

Table 3

Gradient in the scale used

Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
5	4	3	2	1

To determine the length of the pentagonal Likert scale (lower and upper limits), the range (5-1=4) was calculated, meaning the difference between the highest value and the lowest value of the pentagonal Likert scale, as well as to obtain the correct category length, which is the range divided by the number of Likert categories (3), which is (4/3 = 1.33). Then, this value was added to the lowest value in the scale, which is the correct one, to determine the upper limit of this category. Consequently, the category length becomes as follows:

[1–2.33] The degree of agreement is weak.
[2.34–3.67] The degree of agreement is moderate.
[3.67–5] The degree of agreement is high.

2.2.2 The population and study sample

The population of the current study is the population in the new city of Ali Menjali – Constantine, where a simple random sample of 151 residents was taken, and the questionnaire was distributed electronically, collecting data from January to April 2024.

2.2.3. Statistical treatment

To test the hypotheses of the study, a set of statistical analysis tools was used, in addition to the statistical program SPSS (version 25) in order to perform the necessary statistical analyses:

- **Percentages**: To present the characteristics of the demographic variables.
- **Arithmetic mean**: To know the average attitudes of the respondents regarding the questionnaire paragraphs, and to determine the degree of their acceptance.
- **Standard Deviation**: To know the amount of dispersion in the opinions of the respondents concerning each paragraph of the questionnaire.
- **Pearson's correlation coefficient (r)**: To measure the degree of relationship between the dependent variable and the independent variable.
- **Coefficient of determination (R2)**: To know the proportion by which the independent variable affects the dependent variable.
- **Simple linear regression model**: To test the relationship between the independent and dependent variables.

2.2.4. Stability of the study

This refers to the cohesion of the stability coefficient, meaning that is does not contradict itself, providing the same results if it is reapplied to the same sample after a short period of time. In this case, we point out that the closer the values of Cronbach's alpha are to one, the higher the stability, and vice versa. The following table shows Cronbach's alpha values for the axes of the study.

Table 4

Cronbach's alpha test

Axes	Number of paragraphs	Cronbach's alpha axes
Independent Variable (Smart Transportation)	08	0.611
Dependent variable (improving transportation services)	08	0.845
The effect of the independent variable on the dependent one (impact of smart transportation on improving transportation services)	08	0.867
The questionnaire as a whole	24	0.901

From the table above, we can see that Cronbach's alpha coefficients are all acceptable, as they are greater than 0.60, which is a high level of stability and, therefore, the reliability of the questionnaire being evaluated.

Analysing the results of the study

a. Descriptive analysis of demographic data:

Table 5

Distribution of the study sample according to demographic characteristics

Sample characteristics		Repeats	The ratio
Gender	Male	52	34.4%
	Female	99	65.6%
Age	18 to 25 years old	48	31.79%
	25 to 60 years old	103	68.21%
Educational level	Intermediate	01	0.7%
	Secondary	02	1.3%

Table 5 (continued)

	Higher education	148	98.00%
Professional status	Student	50	33.1%
	Employee	72	47.7%
	Daily worker	1	0.7%
	Unemployed	26	17.2%
	Retired	2	1.3%
Yassir Application usage time	Morning	34	22.5%
	Midday	32	21.2%
	Evening	75	49.5%
	Night	10	6.6%

It is clear from the results of the descriptive analysis of the study sample, according to its demographic characteristics, that most of the sample members are university degree holders, as many as 98.00%, which helps in understanding the phrases of the questionnaire and thus giving credibility to the results of the field study. The sample members are young, as the percentage of those aged between (25–60 years) reached 68.21%, while those aged between (18–25) years made up 31%. Through the descriptive analysis of the sample members, we note that men amounted to 34.4%, while the percentage of women reached 65.6%. As for the professional status of the customer, we note that the majority of users of the Yassir application are employees (47.7%), and then students (33.1%). The remaining percentage, rather low, indicates that the users of the Yassir application are the educated group that uses technology in their personal lives.

Three statements were used to facilitate this study descriptively:

– "The extent of use of smart transportation".
– "The quality of transportation service".
– "The impact of smart transportation on improving transportation services".

b. Descriptive analysis of the phrase "the extent of use of smart transportation"

Table 6

Descriptive statistics for the statement "The extent of use of smart transportation"

No.	Ferries	Sample size	Arithmetic mean	Standard deviation	Direction
01	Citizen uses smart transit for safe access	151	4.08	1.017	High
02	A citizen prefers to use smart transit over urban transit.	151	3.93	1.083	High
03	The individual uses smart transit to speed up his/her arrival	151	4.56	0.617	High
04	The customer prefers Yassir over other apps	151	4.04	0.993	High
05	Customers find it very easy to use the app	151	4.32	0.788	high
06	Being able to use technology enhances the use of smart transportation	151	3.77	0.918	high
07	Internet connectivity is a prerequisite for using smart transit.	151	4.73	0.577	high
08	Lack of transportation causes the need to use smart transportation	151	4.66	0.701	high
Extent of use of smart transportation			4.2632	0.44327	high

We note from Table 6 that the arithmetic mean of the statements regarding the extent of using smart transportation is 4.26 with a standard deviation of 0.44327 (there is no dispersion in the responses of the sample members). Since the arithmetic mean of the statements regarding the extent of using smart transportation is significantly different from the degree of neutrality (hypothetical mean = 3) and exceeds it by 1.26, the attitude of the sample members is high, and they agree with the statements regarding the extent of using smart transportation.

c. Descriptive statistics for the phrase “quality of transportation service”:

Table 7

Descriptive statistics for the phrases “Quality of transportation service”

No.	Ferries	Sample size	Arithmetic mean	Standard deviation	Direction
01	Transportation meets all the requirements of the citizens in the new city	151	3.76	1.269	High
02	The customer uses public transportation for all his movements	151	3.71	1.214	High
03	Transportation covers the entire territory of the new city	151	3.59	1.333	High
04	Transportation provides all the comfort requirements for commuters	151	3.46	1.399	High
05	The new city of Ali Menjeli is characterized by traffic congestion	151	4.44	0.763	high
06	The customer finds it difficult to access transportation	151	4.02	1.042	high
07	Mobility reaches its destination in the shortest time	151	3.68	1.283	high
08	Transportation offers many services at a lower cost	151	3.81	1.145	high
Quality of transportation service			3.8088	0.82813	high

We note from Table 7 that the arithmetic mean of the transportation service quality statements is 3.8088 with a standard deviation of 0.82813 (there is no dispersion in the responses of the sample members), and since the arithmetic mean of the cognitive dimension of Algerian tourists towards the Turkish tourist destination is significantly different from the degree of neutrality (hypothetical mean=3) and exceeds it by 3.8, the attitude of the sample members is high, and they agree with the quality of the transportation service.

d. Descriptive statistics for the phrases “the impact of smart transportation on improving transportation services”

Table 8

Descriptive statistics for the statements “The impact of smart transportation on improving transportation services”

No.	Ferries	Sample size	Arithmetic mean	Standard deviation	Direction
01	Smart transportation contributes to safer transportation	151	4.12	1.026	High
02	Smart transportation contributes to mobility at a lower cost	151	3.66	1.376	High
03		151	4.53	0.671	High
04	Smart transportation can increase accessibility	151	4.52	0.720	High
05	Smart transportation provides services more quickly	151	3.70	1.200	high
06	The new city of Ali Menjeli is characterized by the availability of the Internet to facilitate the use of smart transportation	151	3.52	1.500	high
07	The use of smart transportation reduces air pollution	151	3.85	1.325	high
08	Smart transportation services offer solutions to eliminate traffic congestion	151	3.59	1.348	high
The impact of smart transportation on improving transportation services			3.8088	0.82813	high

We can see from Table 8 that the arithmetic mean of the statements regarding the impact of smart transportation on improving transportation services is 3.9346 with a standard deviation of 0.84973 (there is no dispersion in the responses of the sample members). Since the arithmetic mean of the statements regarding the impact of smart transportation on improving transportation services differs from the degree of neutrality (hypothetical mean = 3) and exceeds it by 0.93, the attitude of the sample members is high, and they agree with the statements regarding the impact of smart transportation on improving transportation services.

3. RESULTS AND DISCUSSIONS

Based on the presentation of the field results obtained following this study, and on the appropriate statistical tests for each of the study's hypotheses, we will try to answer the latter, as well as interpret and analyse these results.

3.1. Testing the first sub-hypothesis

There is a statistically significant effect at the level of significance (a≤0.05) regarding the extent of **using smart transportation** to **improve transportation services**, and Table 9 showcases the results of the simple linear regression test for the first sub-hypothesis:

Table 9

Summary of the results of the regression and variance analysis to test the first sub-hypothesis

Independent variable **Using smart transportation**	Dependent variable **Improving transportation services**.						
	Correlation coefficient **r**	Coefficient of determination $\mathbf{R^2}$	Adjusted coefficient of determination	Independent variable coefficient **B**		Fixed part **a**	
				Independent value	Significance level	Constant value	Significance level
	0.431	0.186	0.180	0.826	0.000	0.413	0.498
Estimated equation: **Y_1= 0.413 + 0.826 X** Where: X: Using smart transportation. Y_1: Improve transportation services.				Analysis of Variance ANOVA			
				F test for the model		**t** test for the model	
				F coefficient value	Significance level	Coefficient t	Significance level
				33.987	0.000	5,830	0.000

- **Evaluating the use of smart transportation to statistically improve transportation services:**

a. Partial Significance (Significance of Parameters): Partial significance is expressed through the significance of the estimated parameters:

- **Constant (a):** It is the significance that is determined at a value of 0.05 for all other variables, and in this case the coefficient of the constant is 130.4, at a significant value of 0.498, which is greater than 0.05, which indicates that the constant is not significant and is not statistically significant.
- **Parameter of the independent variable (use of smart transportation):** It is the significance that relates to the effect of using smart transportation on the dependent variable (improving transportation services). Based on the model, we find that the slope (B) reached a value of 0.826, at a significant value of 0.000, which is below the significance level of 0.05, which indicates that the slope is significant and statistically significant. That is, the variable of using smart transportation has a significant and statistically significant effect on improving transportation services.

b. Overall Significance (Model Significance): Based on the data in Table 9, we find that the reliability of the model depends on the level of significance of the F coefficient. If the value of the significance level is under 0.05, the model is considered significant. Based on our data, the significance level of the F coefficient is 0.000, which is significantly below 0.05, which means that the model is highly significant.

The computed exact Fisher's value is the value of the F coefficient given by the analysis of variance, which is estimated from the F data: 33.987. Therefore, the calculated Fisher's value is 33.987, which is a significant value and indicates that the model is highly significant.

Based on the data, the model is highly significant where the significance level of the F coefficient is 0.000, and the calculated Fisher's value is 33.98, it can be said that the model takes a linear form, where there is a statistically significant effect of using smart transportation to improve transportation services.

c. Explanatory power (goodness of fit): The explanatory power of the model is tested using:

- **Correlation coefficient**: The correlation coefficient (r) ranges between -1 and 1, with values close to 1 or -1 indicating a strong correlation, and values close to 0 indicating no correlation. In the model, the correlation coefficient between using smart transportation and improving transportation services is 0.431, which is statistically significant at the 0.05 significance level. Since the model is statistically significant at the 0.05 significance level, this means that there is a correlation between the use of smart transportation and its impact on improving transportation services statistically significant.
- **Coefficient of Determination** R^2: 0.186, meaning that the independent variable of using smart transportation contributes to explaining the variations of the dependent variable to improve transportation services by 18.6%, which is a rather weak percentage. It means that there are other factors (81.4%) that contribute to explaining the identified variations of transportation service improvement, indicating that the model could be more accurate if other independent variables were included.

Based on the analysis of the results in Table 9, the hypothesis that "there is a statistically significant effect at the level of significance (a≤0.05) regarding the extent of using smart transportation to improve transportation services" was accepted for the following reasons:

- **The significance level for Fisher's F is 0.000**: Since the significance level is under 0.05, it indicates that the model is highly significant and that there is a significant linear relationship between the independent and dependent variables.
- **Correlation coefficient r = 0.431**: indicates that there is a moderate direct correlation between the use of smart transportation and the improvement of transportation services.
- **Coefficient of determination R^2 = 0.186**: Indicates that the use of smart transportation contributes to explaining about 18.6% of the variations in improving transportation services, and although this percentage is not very high, it does prove that there is an actual effect.
- **Coefficient value of t = 5.830**: It shows that the effect of the independent variable (use of smart transportation) is significant in relation to the dependent variable (improving transportation services).

3.2. Testing the second sub-hypothesis

There is a statistically significant effect at the level of significance (a≤0.05) regarding **transportation service quality** on **improving transportation services**, and Table 7 showcases the results of the simple linear regression test for the second sub-hypothesis:

Table 10

A summary of the results of regression analysis and the analysis of variance for testing the second sub-hypothesis

Independent variable **Transportation service quality**	Dependent variable **Improving transportation services**.						
	Correlation coefficient **r**	Coefficient of determination $\mathbf{R^2}$	Adjusted coefficient of determination	Independent variable coefficient **B**		Fixed part **a**	
				Independent value	Significance level	Constant value	Significance level
	0.698	0.487	0.484	0.716	0.000	1.207	0.000

Estimated equation	Analysis of Variance ANOVA			
	F test for the model		t test for the model	
	F coefficient value	Significance level	Coefficient t	Significance level
Estimated equation: $\mathbf{Y_1 = 1.207 + 0.716\ X}$ Where: X: transportation service quality. Y_1: Improve transportation services.	141.43	0.000	11.893	0.000

- **Evaluating transportation service quality for statistically improving transportation services:**
  a. **Partial Significance (Significance of Parameters):** Partial significance is expressed through the significance of the estimated parameters:
    – **Constant (a):** It is the significance that is determined at a value of 0.05 for all other variables, and in this case the coefficient of the constant was 1.207, at a significance value of 0.000, which is under 0.05, which indicates that the constant is significant and statistically significant.
    – **Independent Variable Parameter (Transportation Service Quality)**: It is the magnitude that relates to the effect of transportation service quality on the dependent variable (improving transportation services). Based on the model, we find that the slope (B) reached a value of 0.716, at a significant value of 0.000, which is below the significance level of 0.05, which indicates that the slope is significant and statistically significant. That is, transportation service quality has a significant and significant effect on improving transportation services.
  b. **Overall Significance (Model Significance):** Based on the data in Table 10, we find that the significance of the model depends on the level of significance of the F coefficient, as the calculated Fisher's value is estimated based on the data F: 141.432, which is a significant value and indicates that the model is highly significant, so it can be said that the model takes a linear form, where there is a statistically significant effect of transportation service quality on improving transportation services.
  c. **Explanatory power (goodness of fit):** The explanatory power of the model is tested using:
    – **Correlation coefficient**: The correlation coefficient (r) ranges between –1 and 1, with values close to 1 or -1 indicating a strong correlation, and values close to 0 indicating no correlation. In the model, the correlation coefficient between transportation service quality and transportation service improvement is 0.698, which is statistically significant at the 0.05 level of significance. Since the model is statistically significant at the 0.05 level of significance, this means that there is a statistically significant correlation between transportation service quality and transportation service improvement.
    – **Coefficient of determination $\mathbf{R^2}$:** 0.487, meaning that the independent variable of transportation service quality contributes to explaining the variations of the dependent variable to improve transportation services, with a percentage of 48.7%, which is a normal

percentage. It means that there are other factors (51.3%) that contribute to explaining the variations in improving transportation services.

Based on the analysis of the results in Table 10, the hypothesis "There is a statistically significant effect at the level of significance (a≤0.05) regarding transportation service and the improvement of transportation services" that is accepted for the following reasons:

– **The significance level of Fisher's coefficient F is 0.000**: Since the significance level is under 0.05, it indicates that the model is highly significant and that there is a significant linear relationship between the independent and dependent variables.
– **Correlation coefficient r = 0.698**: It is a high value indicating that there is a strong correlation between transportation service quality and the impact of smart transportation on improving transportation services. The correlation is also statistically significant at the 0.05 significance level, which reinforces the acceptance of the hypothesis.
– **The coefficient of determination R² = 0.487**: Indicates that transportation service quality explains about 48.7% of the variations in transportation service improvement. This percentage reflects the good explanatory power of the model and supports the studied hypothesis.
– **Coefficient value of t = 11.893**: Indicates that the effect of the independent variable on the dependent variable is significant.

3.3. Testing the main hypothesis

There is a statistically significant effect at the level of significance (a ≤ 0.05) regarding the extent of **using smart transportation** and **transportation service quality** to **improve transportation services**, and Table 11 showcases the results of the multiple regression tests for the third sub-hypothesis:

– The independent variables: (using smart transportation), (transportation service quality).
– The dependent variable: (improving transportation services).

Table 11

Summary of the results of the regression and variance analysis to test the main hypothesis

Independent variable **Using smart transportation and transportation service quality**	Dependent variable **Improving transportation services.**						
	Correlation coefficient r	Coefficient of determination R^2	Adjusted coefficient of determination	Independent variable coefficient B		Fixed part a	
				Independent value	Significance level	Constant value	Significance level
	0.709	0.502	0.496	0.268	0.034	0.316	0.508
				0.650	0.000		

Estimated equation: **Y_1= 0.316+ 0.268 X_1+0.650 X_2** Where: X_1: using smart transportation. X_2: transportation service quality. Y_1: Improve transportation services.	Analysis of ANOVA Variance			
	F test for the model		t test for the model	
	F coefficient value	Significance level	Coefficient t	Significance level
	74.710	0.000	5.830	0.000

- **Evaluating the "use of smart transportation" and the "transportation service quality" in statistically determining "transportation service improvement":**
  a. **Partial Significance (Significance of Parameters):** Partial significance is expressed through the significance of the estimated parameters:
     – **Constant (a):** It is the significance that is determined at a value of 0.05 for all other variables, and in this case the coefficient of the constant is 0.316, at a significant value of 0.508, which is greater than 0.05, which indicates that the constant is not significant and is not statistically significant.
     – **The parameter of the independent variables (use of smart transportation, quality of transportation service)**: It is the significance that relates to the effect of these independent variables on the dependent variable (improving transportation services). Based on the model, we find that the slope (B1) at the first independent variable (use of smart transportation) amounted to 0.268, at a significant value of 0.034, which is below the significance level of 0.05, which indicates that the slope is significant and statistically significant. We alsowe also find that the slope (B2) at the second independent variable (quality of transportation service) amounted to 0. This indicates that the slope is significant and statistically significant, which means that the use of smart transportation and the quality of transportation services have a significant impact on improving transportation services.
  b. **Overall Significance (Model Significance):** Based on the data in Table 11, we find that the significance of the model depends on the significance level of Fisher's F. This test is used to establish whether the multiple regression model as a whole is statistically significant. In this case, we find that Fisher's F value is estimated at F. 74.710, at a significance level of 0.000, which is a good value and indicates that the test results and the model as a whole provide a statistically significant explanation for the variance in the dependent variable (improving transportation services) based on the independent variables (use of smart transportation and transportation service quality).
  c. **Explanatory power (goodness of fit)**: The explanatory power of the model is tested using:
     – **Correlation coefficient:** The correlation coefficient between transportation service quality and transportation service improvement is 0.709, which is statistically significant at the 0.05 level of significance. Since the model is statistically significant at the 0.05 level of significance, this means that there is a statistically significant correlation between the use of smart transportation and transportation service quality and transportation service improvement.
     – **Coefficient of determination R^2**: 0.502 meaning that the independent variables contribute to explaining the variations of the dependent variable, with a percentage of 50.2%, a rather high percentage. This means that there are other factors (49.8%) that contribute to explaining the variations in determining the improvement of transportation services.

Based on the analysis of the results of Table 8, the hypothesis that "there is a statistically significant effect at the level of significance ($a \le 0.05$) regarding the extent of **using smart transportation** and **transportation service quality** to **improve transportation services**" is accepted for the following reasons:

– **The significance level of Fisher's coefficient F is 0.000**: Since the significance level is under 0.05, it indicates that the model is highly significant and that there is a significant relationship between the independent and dependent variables.
– **Correlation coefficient r = 0.709**: It is a high value, indicating that there is a strong correlation between the independent variables and the dependent variable. The correlation is also

statistically significant at the 0.05 significance level, which reinforces the acceptance of the hypothesis.

- **Coefficient of determination $R^2 = 0.502$**: It indicates that transportation service quality explains about 50.2% of the variations in transportation service improvement, this percentage reflects the good explanatory power of the model and reinforces the studied hypothesis.
- **Coefficient value of $t = 5.830$**: It indicates that the effect of the independent variable on the dependent variable is significant.

4. CONCLUSIONS

Through this study, we have tried to identify the impact of intelligent transportation on the improvement of transport services through the Yassir application in the new city of Ali Menjeli-Constantine. A questionnaire was used to collect data from the users of the application, which were then analysed using SPSS V.25 in order to obtain a set of theoretical and statistical results. This was based on a statistical analysis and the testing of the hypotheses of the study as mentioned above.

The results showed that the Yassir application significantly contributes to improving transportation efficiency, as users can book trips quickly and easily, which reduces waiting time, thus achieving user satisfaction. This confirms the existence of general user satisfaction with the services of Yassir, especially in terms of accuracy and reliability. Yassir has helped reduce traffic congestion by improving the distribution of trips and encouraging the use of shared transportation.

The results confirmed that the use of smart technology increases the safety of transportation services by accurately tracking and locating vehicles. It also reduces costs, as smart transportation applications can reduce operations and maintenance costs by optimizing schedules and cutting down on idle time.

Smart applications work in conjunction with other transportation systems, such as trains and buses, to improve overall mobility in cities. The Yassir app saw a significant increase in the number of users during the study period, indicating a high level of community acceptance of the technology. The time taken by users to reach their destinations was significantly reduced using the app, contributing to increased productivity and an improved quality of life.

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