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Development of an evaluation tool after the sustainable urban transport project.
Constantine tramway case.

تطوير أداة التقييم بعد مشروع النقل الحضري المستدام .دراسة حالة مؤسسة ترام قسنطينة

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Abstract :

The introduction of a new means of transport such as the tramway in Constantine would improve the conditions of movement and the quality of the image of the city by giving it a new effect through the qualitative urban development on its route. The realization of a transport infrastructure such as a "tramway line" is an operation requiring the cooperation and interaction of several actors and specialists, these teams cannot work without a good management. Our research consists in developing a decision support tool in a logic of sustainable and participative development, in a multi-criteria and multi-actors context and this after the realization of a sustainable urban transport project by an a posteriori evaluation of the effects of this mode of transport on the urban system of the human settlement of Constantine. Finally, we can say that we must now live in harmony with the tramway in operation. In summary, it is necessary to launch educational and preventive activities as well as promotional activities, which would inform, train and encourage desirable behaviors of citizens.

Keywords : Project, urban transport, tramway, decision support tool, evaluation, Constantine human settlemen

ملخص :

ان الهدف من إدخال وسيلة مواصلات جديدة مثل الترامواي في قسنطينة هو تحسين ظروف الحركة ونوعية صورة المدينة بإعطائها تأثيراً جديداً من خلال التطور العمراني النوعي على مسارها. إن تحقيق البنية التحتية للنقل مثل "خط الترامواي" هو عملية تتطلب تعاون وتفاعل العديد من الفاعلين والمتخصصين، ولا يمكن لهذه الفرق العمل بدون إدارة جيدة. يتمثل بحثنا في تطوير أداة لدعم القرار في منطق التنمية المستدامة والتشاركية، في سياق متعدد المعايير ومتعدد الجهات الفاعلة وهذا بعد تحقيق مشروع النقل الحضري المستدام من خلال تقييم بعدي لمؤثرات هذا النوعمن النقل على النظام الحضري للتجمع البشري في قسنطينة. أخيرًا، يمكننا القول إنه يجب علينا من الآن أن نعيش في وئام مع خط الترام الدي هوقيد التشغيل. باختصار، انه من الضروري إطلاق أنشطة تثقيفية ووقائية وكذلك أنشطة ترويجية من شأنها إعلام وتدريب وتشجيع السلوكيات المرغوبة للمواطنين.

الكلمات المفتاحية: المشروع، النقل الحضري الترام، أداة دعم القرار، تقييم، التجمع الحضري لقسنطينة.

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INTRODUCTION:

Mobility is today a key factor in urban and economic development (Amar, 2004). Moving from one's home to one's workplace, having access to health, educational or leisure equipment, going to find something to meet one's basic needs are all challenges linked to mobility (Yves, 2016).Today, cities are running towards urban development and growth, generating an increasingly important sprawl (Gallez, 2013), a synergy between the different urban functions "The city as a social laboratory». Our research addresses the concept of diagnosis (Alkama, 2020) in the assessment process (Bachelet, 2006). We will then focus on the various indicators for evaluating a sustainable transport project, namely the tramway that we have deemed relevant insofar as they provide us with information on the parameters to be identified (Wiel, 2005). Sustainable transport which obeys the famous environmental, societal and economic trilogy (Baouni, 2017).

As a result, our thesis should focus more on the evaluation of medium and long-term impact studies (Boufendi,2014) The lessons that can be drawn from this diagnosis should help define a program of in-depth studies intended to organize the said procedure (Beaucire, 1996). This is by setting precise objectives for the evaluation, by re-using existing data and by targeting, the additional investigations to be carried out so that the budget and the deadlines for carrying out the a posteriori evaluation will be controlled (Berion, 2007).First and foremost on board, any adequate transport system is based on appropriate legislation (Kaufman, 2003), to establish a homogeneous framework in harmony with the cultural character of the place.

This research, we provide some general regulations on the procedure and content of these a posteriori evaluations (also called ex-post evaluations) specific to the country context for the construction of our evaluation approach itself, which is devoted to the 'development of a regulatory system by recognition of evaluations corresponding to the nature of our data (Soler, 2000). A transport infrastructure produces effects continuously, and over periods exceeding five years after its inauguration (Bochet, 2003). This is why a process of continuous observation of transport and mobility, of monitoring rather than of assessment is recommended (Zembri, 2012).

The ex post evaluation of transport infrastructure is thus a relatively old subject, but which remains unknown in the national context (Boufendi, 2018), and even beyond, compared to socio-economic evaluations economic ex ante or ex post (Bouyssou,. 2006). At European level (Passalacqua, 2009), the commitment to clean modes of transport that are alternatives to private cars (Faivre, B., 2008) has notably resulted in recent years in the adoption of laws known as "Grenelle 1 and

2". New professions are emerging to support the development of non-polluting transport (Stambouli, 2005), which is to be understood by anticipation rather than undergoing them (Quinet, 2013), the urban question no longer defines an isolable domain (Saint-Gérand, 2010). It is not everything, but it is everywhere" (Levy, 2006).

1-Urban Context

In order to meet the objectives set by our research, it is essential to know the territorial context of the study area. The tram is one of the projects supposed to remedy the congestion and suffocation that the Constantine road network has experienced in recent years. The line forms a North-South axis it connects the hyper center of the city from the station Ben Abdelmalek, also called Ben Boulaid, to the peri-urban area of Zouaghi; passing through the El Amir Abdelkader mosque and several campuses of the Mentouri University of Constantine (Central FAC, paramedical institute, architectural institute and the Zouaghi campus), it crosses the Oued Rhumel by a viaduct to be built between the industrial zone Rhumel and Mentouri University, see figure N°(01).

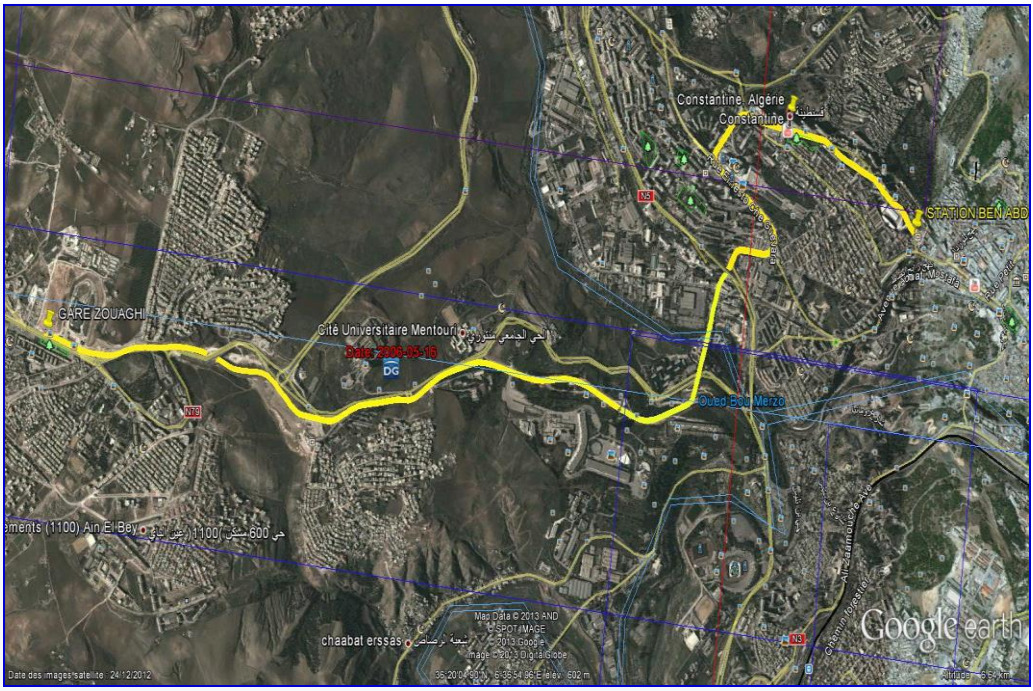
In addition to the construction of the viaduct, standard works of art will be necessary for :

- The Che Guevara hopper
- Crossing the ring road
- The passage of the industrial zone RHUMEL, for the crossing of the road of the Z. I
- Crossing the RN 79.

The construction of several retaining walls in order to stabilize the embankments to free and guarantee the necessary grip on the track The first line of the Constantine tramway should include 11 stations (including the future station at Ain ElBey), spread over 8 kilometers ; and three hubs and two relay parks ; the following figure shows the route of the Constantine tram line. The 11 stations have two side platforms. The stations are 45 m long (excluding ramps).

- A sheltered waiting area on each platform allows travelers to wait before a train arrives at the station. This area can be used by the operator to display network maps, transit times, pricing, the nearest point of sale .Our site is located near the city center of Constantine. It has an area of 233,291 m².

Figure N° 1. Map of the Constantine's tram line



Source : Metro of Algiers, 2016.

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This project was put into service on 04 July 2013; the Italian group Alstom-Pizzarrotti Today employing 465 employees, the Constantine tramway, carried it out. (Table N° 01) falls within the framework of the beautification of the city and the development of its infrastructures within the framework of the Modernization Plan of the ConstantineMetropolis". The urban study area brings together various activities including commercial, financial, university and socio-educational, so in order to clarify our targeted research, we will refine our study area using criteria deemed exhaustive on our part.

Table N°1.Modeling and the spatio-temporal framework

	Short term <5 years	Middle term 5 to 15 years	Long term> 15 years
District	-A- Negligible Interactions	-B-	
Zoned	-A-B-	-B- Partial consideration of interactions between urban sub-systems	-B-C
Agglomeration	-B-	-B-C	-C- Interactions are important for the distant future

Source Author, 2017.

2-Methodological Approach

2-1- The sample and the survey design

Our analysis of quality and customer satisfaction in the Wilaya of Constantine is based on a survey we conducted among travelers using a questionnaire.

The objective of the survey is to highlight and understand the perception of Quality by public transport users at the Palma exchange hub in Constantine.The field survey was carried out in December 2018, face to face, with a sample of 250 people at the Zouaghi Slimane exchange center in Constantine, using a questionnaire comprising 25 questions.

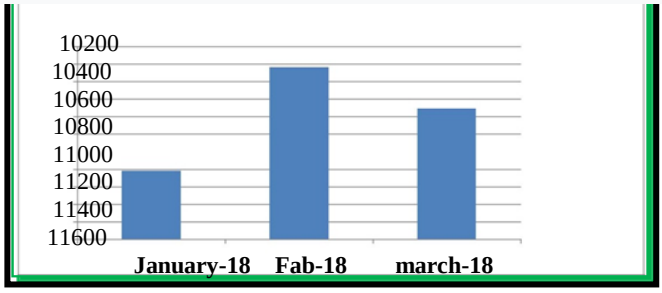
2-2-The conduct of the investigation

We can notice that the **number** of travelers en route to the city center using the tram in the first half of the year 2018. According to the graph, we note that the highest month of the destination of travelers from the Zouaghi pole to the center - City is the month of February with 24,328 travelers.

Figure N ° (02) shows the evolution of the number of passengers between the origin Stade Ben Abdelmalek and the destination Zouaghi during the first three months of the year 2018. According to the curve of the graph, we note that the largest month concerning the number of passengers in the direction of Zouaghi is February "12164 travelers", but this does not mean that the number of travelers in January and March is small because there is constant in these two months a significant number of travelers also "January: 10981 travelers, March: 11,692 travelers".

We can notice from table (No.01) that there is a growth in the mobility of travelers using the tram in the first half of the year 2018 is high in relation to the number of passengers using the buses and taxi this only due to avoid road traffic and save time. According to the graph, we note that the highest month of travelers is February with 36,492 travelers.

Figure N° 2.Number of tram passengers : Number of travelers recorded during the 1st quarter of 2018



Source: survey author, 2017.

The number of people who use the means of public transport in the Zouaghi pole to move is divided into 03 groups, in the first three months of the year 2018 the total of travelers who prefer to travel by bus especially for safety are 110,269 travelers, 169,302 travelers who prefer taxis and 104,510 people use the tram.

The study shows that the age category that uses the Palma trading hub the most is between 20 and 30 years old with a rate of 36%, followed by the fourth category of 30 to 40 years old with a rate of 26 %, then the second category (from 10 to 20 years) with a rate of 20% then the fifth category (over 40 years) and finally, people from 1 to 10 years with only 6%.

From this it can be noted that the Palma exchange center is used mainly by people between 20 and 30 years old who represent the active category who always have to travel, especially for studies or work.

The members of the sample are divided according to their educational level into 05 categories : people without education (6%), primary (8%), middle (20%), secondary (32%) and academics or more (34%), see figure (N ° 02) and table (N ° 02).

Table N°2.Comparison of the number of travelers between the different modes

Different modes	Jan-18	feb.-18
By bus	35609	34854
By car	52296	48537
By tramway	32942	36492

Source : survey author, 2017.

2-3- Development of the survey questionnaire

The last category is dominant because these people generally occupy positions and responsibilities that require them to move, such as university teachers, directors and managers as well as employees who do periodic training at central management level. This influences the results of the study and gives them more reliability and credibility.

Table N°3.Rate of movements

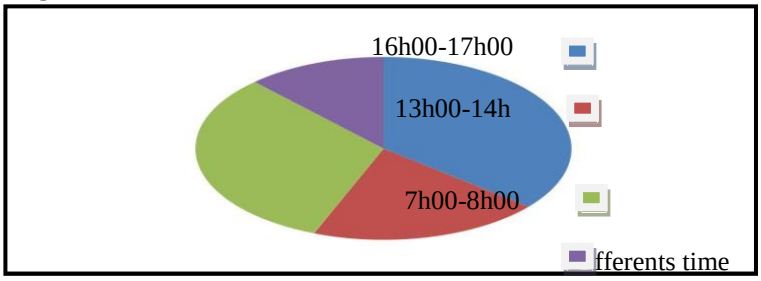
Reason for movements	Reason for movements %	Workforce
Job	48%	120
Purchases	26%	65
Studies	10%	25
Others	16%	40

Source: Author ,2019.

For this question, respondents were given multiple answer choices ordered from highest frequency to lowest. 50% of the sample travels several times a week (daily), 30% travel once a week, 14% travel once per me or 12 times per year, 6% of travelers travel infrequently.

These statistics show that half of the travelers in figure (No. 02) and table (No. 03) use public transport (bus / taxi).

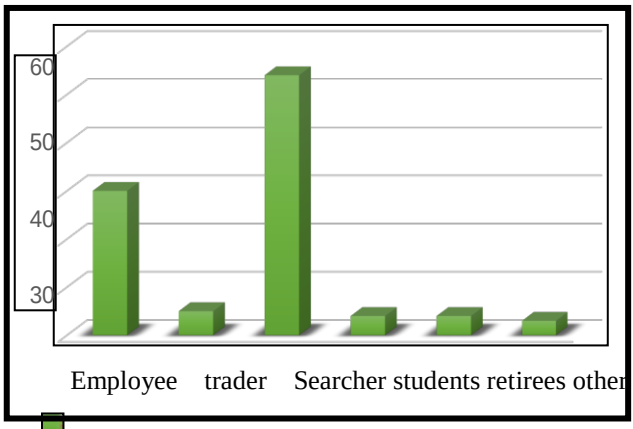
Figure N° 3. Travel time of travelers



Source : Author, 2019.

From the figure (No. 03). There are 36% of travelers who travel in the morning period (7:00 a.m. to 8:00 a.m.), 20% of travelers who travel in the midday period (1:00 p.m. to 2:00 p.m.), 32% of travelers who travel in the evening period (4:00 p.m. - 5 :00 p.m.) and the others move around at different times of the day. As according to the survey, the critical days are the days of the week (Sunday to Thursday), see table (N ° 03).

Figure N° 4.Tram users.



Source: survey, 2017.

The figure (N ° 04) shows that the use of the tram is dominated by the student class with a percentage of 54%, since the route of the tram passes through the faculty of science of the earth and the universe and of the geography (Zouaghi Slimane station), Ahmed Hamani "Zarzara" campus (Kheznadar station), Mentouri University (Mentouri residence station and Mentouri university station) and El Emir Abdelkader University (El Emir Abdelkader station).

Noting that these sites indicated above include university housing estates.In the second part, employees with a percentage of 30%.

This category of users travels to reach workplaces located all along the tram route, in particular, the Palma industrial zone (Palma station), the city center (Ben Abdelmalek station).Traders (5%), students (4%), retirees (4%) and others occupy the third part with 3% (unemployment, lawyer…).This reduced percentage is due to the no need to travel by using the tram (personal vehicle for traders, school bus for students).

3. Results and discussions

These statistics show that half of travelers use public transport (bus / taxi), see table (N ° 04).

Table N°4.Reason for using the tram

Source : Author, 2018

Reason for use of the tram	Use of the tram %	Workforce
Ecological	4%	10
Economic	6%	15
Comfortable	14%	35
Modern	16%	40
Adapt to my needs	12%	30
To secure	18%	45
Own	12%	30
Fast	10%	25
Others	8%	20

Works in strategy abundantly evoke the theory of options. However, the impact of this theory on the reasoning of managers is limited if we stick to the computational aspect of option pricing. "Real options arose out of the shortcomings of traditional investment valuation methods.

The main drawback of these methods lies in the deterministic and linear view they promote "(Savage, L. J. 2009).

However, setting up a real options approach is not easy. It can only be envisioned with simpler versions of the tool, easy-to-use software that can shape the complexity of investments.

Respect for the range of service is not homogeneous and regular, this is more true to the extent that it is empiric. Likewise, for the reception complaint rate, which depends on the attitude of the different categories of users, the remainders of the titles are at the max.

We present to you the essential criteria for the case study, which is a necessary step to fix on the main relevant criteria in order to proceed with the development of the assessment tool.

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The choice of criteria is dictated by the degree of importance of each component, which has a primordial role in the development of the decision-making tool (Courbon J.-C., 1982).

The criteria inform us about several parameters that we consider important in the evaluation
(Damarts. D & al) among others the hourly flow (capacity of a line), the commercial speed (fluidity of descents and ascents), line length, travel time, investment costs.

Table N° 05 : Different calculation indicators

I	SI	SSI	Heading	Threshold	Février				
					du 01 au 10	du 11 au 17	du 18 au 24	du 25 au 28	Le Mois
I1			Regularity, Punctuality of rotations	95%	**99.68 %**	**99.40 %**	**99.40 %**	**99.16 %**	**99.16%**
I2			Respecting the range of services	0	**10**	**7**	**7**	**4**	**28**
I3			Reception and uniforms worn by staff	95%	**91.17 %**	**96.24 %**	**92.83 %**	**93.64 %**	**93.47%**
	I3 A		Home		83	93.33	86.667	89.00	**88.08**
		I3 A1	Rate of complaints about reception		50	80	60	67	**64.25**
		I3 A2	Availability of sales agents		100	100	100	100	**100**
		I3 A3	Service agent availability		100	100	100	100	**100**
	I3 B		Uniform worn by staff		99.00	99.14	99.00	98.29	**95.00**
		I3 B1	Uniform worn by MPAs		95.00	95.00	95.00	95.00	**97.50**
		I3 B2	Uniform worn by drivers		98	99	98	95.00	**100**
		I3 B3	Uniform worn by the AMS		100	100.00	100	98.00	**100**
		I3	Uniform worn		100	100	100	100	**100**

		B4	by controllers						
		I3 B5	Uniform worn by sales agents		100	100	100	100	**100**
		I3 B6	Uniform worn by security officers		100	100	100	100	**100**
		I3 B7	Uniform worn by maintenance workers		100	100	100	100	**100**
I4			Quality of information in stations/racks	95%	**99.51 %**	**98.99 %**	**98.04 %**	**98.91 %**	**98.86%**
I4A			In-station information		99.01	98.99	99.08	99.08	99.02
	I4 A1		System availability (sound)		100	100	100	100	100
	I4 A2		Line plan		98.32	97.80	98.5	98.5	98.28
	I4 A3		Operating regulations		98.50	98.30	98.5	98. 5	98.45
I4A 4			Station names		99.22	99.50	99.3	99.3	99.33
I4B 1			Information in the trains		100.0 0	99.08	97	98.75	98.71
I4B 2			Availability of the sound system on the trains		100	100	100	100	100
I4B 3			System availability (information terminal)		100	100	100	100	100
I4B			Line plan		100	98.05	97	100	98.76
I5			Operating regulations		100	98.27	91	95.00	96.07
I6			Static information quality in degraded mode	95%					**#valeur !**
I7			Clean and tidy stations	90%	**80.23 %**	**81.22 %**	**81.21 %**	**72.98 %**	**78.91%**

I8			Cleanliness of trains		88.43 %	91.87 %	86.07 %	92.19 %	**89.64%**
I9			Cleanliness of roads	90%	**94.82 %**	**93.84 %**	**94.82 %**	**95.35 %**	**94.71%**
I10			Quality of service of the ticketing system			**99.89**			
I9			System availability						**99.52**

Source : Setram, 2018.

We consider it interesting to formulate our approach of choosing criteria as well as their grouping as follows:

- Criteria related to performance and services rendered:

-Capacity, -Frequency, - Commercial speed, - Punctuality, - Footprint, - Reliability, - Accessibility.

Criteria related to costs: a) Investment cost.

b) Operating cost.

3-1Technical criteria

3-1-1 Capacity

The characteristics that we will note are therefore related to the mobility of the population:

- Population with low (or no) mobility: (also called latent mobility7), made up of young children and the elderly, represents 11.89% of the population

- Population with average mobility:

It groups together people of schooling and retirement age58, trips in this category are characterized by reasons generally linked to shopping, family visits and leisure activities. This segment of the population represents 30.57%.

- Highly mobile population: this category includes more than half of the population with 57.54%. The movements of the population in this category are almost stable in terms of frequency. Their travel is for studies (high school - university students) and work. The estimate of passenger traffic is based on the results of the evening rush hour traffic model (4.30 p.m. to 5.30 p.m.). This model makes it possible to establish that by 2018, the average load on the line will be 8,200 passengers / hour / direction. Maximum attendance of 11,700 passengers / hour / direction is reached at Mentouri University, in the meaning Zouaghi → Constantine. Only a higher load affects the Mentouri station. For this station, demand would be taken into account in degraded conditions (passenger density greater than 6 passes / m², waiting at the platform). In the longer term, demand is growing by 7% with an average load of 4,500 passengers / hour / direction.However, the load is more homogeneous over the entire route, the maximum load being estimated at 6,300 passengers in the Constantine-Zouaghi direction. The sizing load of 6000 passengers / hour / direction remains compatible with the demand forecast on the tram line. The observation of passenger transfers at the terminuses leads to further reflection in

the medium term on extensions allowing all travelers to continue their journeys beyond the terminuses. The frequency for the same request, a material of 300 passes imposes a frequency of passage of the tram 3 minutes.This frequency constitutes the limit for an intersection management giving priority to the tram.

3-1-2 Frequency

Traffic statistics make it possible to draw up an assessment of the number of travelers using the tram service. The attendance is measured daily from data from access control equipment. This data is collected every night by the central ticketing management and supervision system (SAD).

Table N ° 6.Presentation of attendance January 2016/2015

Period considered	January 2017	January 2016	Annual variation
Number of travels	**2331228**	1 388 977	**+ 67,8%**

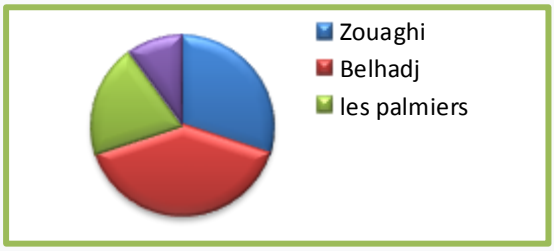
Source: Setram Constantine.

Attendance is analyzed monthly by comparing the total passenger load over one month compared to the previous month, see table N ° 06).In addition, a focus can be made on the day with the highest traffic in order to measure that the peak load is in line with the proposed transport offer.

The demand for transport linked to the area where the tram is located, that is to say the central south axis, is the second greatest demand in the city after the demand on the north-east central axis, the demographic statistics of the new city Ali Mendjeli are increasing due to the rapid urbanization of the area and the displacement of the population from the slums to this new city, foresees a significant increase in demand on this axis, therefore the axis in question (south center) was the most opportune to place the new transport offer which is the tram.

The shortening of the journey time is one of the strengths of this new mode of transport, indeed a journey from the Zouaghi city to the city center by bus takes on average around 40 minutes and 35 by taxi, the journey is only in 27 minutes by tram this is due to its location on its own site and also to the priority it has at crossroads, this makes it invulnerable in the face of the vagaries of road traffic unlike other public transport modes.

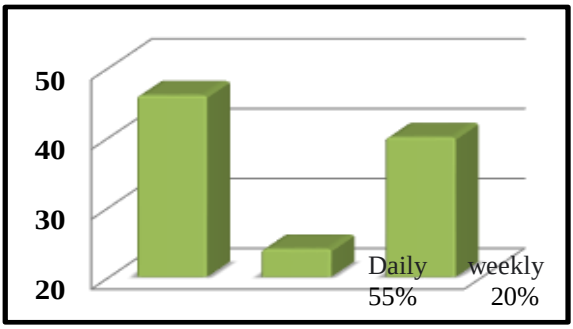
Figure N ° 5. Residence of tram users



Source: Survey, 2019.

The influence of the tram on the districts of the city of Constantine gives us an idea of its impact on urban dynamism (figure N ° 05).There is also poor tram coverage in some neighborhoods such as Sonatiba or the 1,100 housing units, where residents have to walk up to 1.5 km to reach the nearest stop, Zouaghi.The dominant tramway use is daily with 55%, see figure n °, given the use dominated by students and employees who have a daily travel schedule. The second place is occupied by occasional attendance with 40%, which was recorded among users who travel using the tram for the acquisition of an accidental need, which is in a point of the route of the tram and outside of his usual travel schedule.The weekly attendance acquired the lowest percentage with 20%, this category travels using the tram for a need on a weekly basis, such as the market, and the mosque which is located in points on the route of the tram (for example : the mosque of El Emir Abdelkader, Ibn Al Arabi mosque).

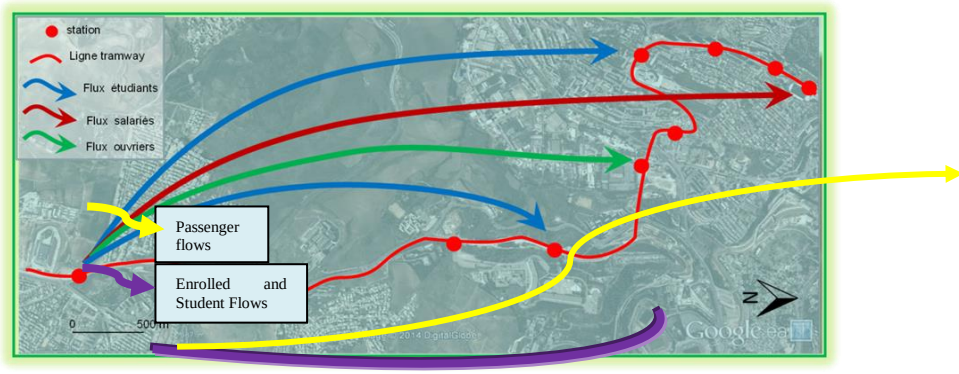
Figure N °6.Tramway attendance rate



Source: Author 2018.

There is also a correspondence between the socio-professional classes and the destinations of the travelers see figure (N ° 06), the relation between these two elements enlightens us on the way in which the tram is used, the main flows and destinations are illustrated in the following diagram:

Figure N °7.Socio-professional flows of users



Source : Author, 2018

The frequency of use of this means of transport varies according to socio-professional categories and the reasons for travel, the working population records daily use two to four times a day, student's record daily but less frequent attendance. We can then see that the urban dynamism of the south of the city of Constantine has been well balanced by the new mode of transport (tram) introduced in the city according to the following table N ° (VI, 07).

Table N ° 7. Number of travelers during the first semester of 2018.

PASSENGERS PER SEMESTER

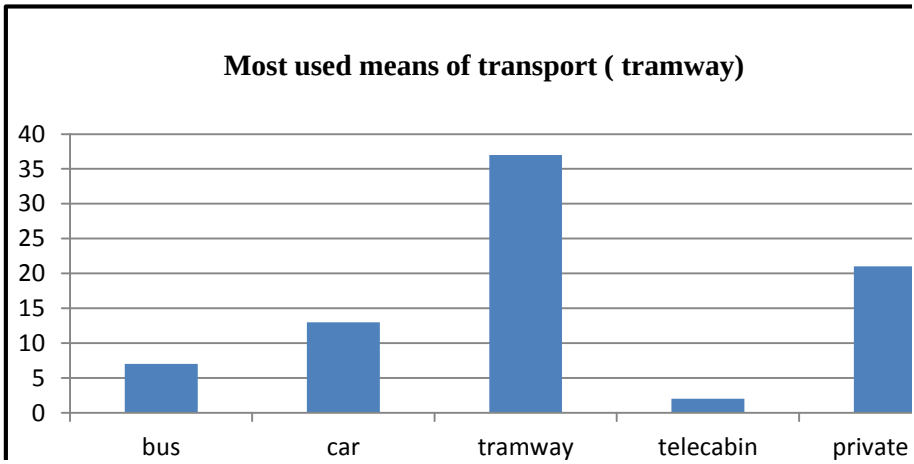
Month	Jan	Feb	Mar	Apr	May	Jun	Total
Number of passengers personne	561.906	454.143	545.528	471.425	478.530	433.911	294.5443

Source: Cetram,2019.

The new mode of transport has a great influence on the whole public transport network, which is proved by the number of average daily users, the tramway has a number of 10,971 passengers per day, which makes 18,053 users per day for the whole, this figure illustrates the contribution of the new mode of transport in the urban transport offer in the city of Constantine. The districts influenced (Figure N^0 01) by the modern transport mode are the most important in terms of demography, on a north-south axis, but districts with the same demographic weight in the east and west are not affected at all by this new project.

The data mining process reveals the dominance of the tramway on the central-southern axis with 37 users, compared to the taxi and bus, which are only used in areas not well covered by the tramway, but we note that private cars remain popularly used with 21 tramway users who think that the private car is indispensable. For comparison, we present the following figure, see figure (N° 08).

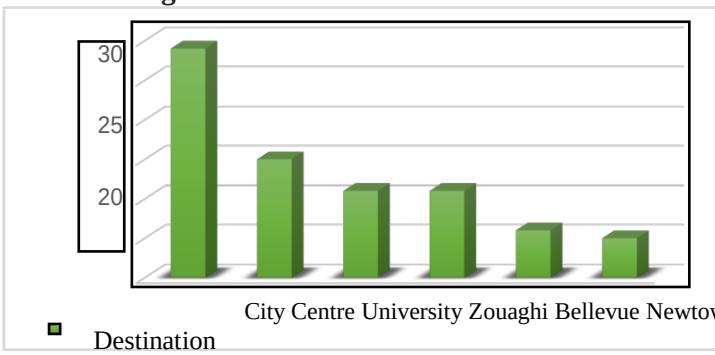
Figure N °8. Most used means of transport



Source : Author, 2018

The most used means of transport is the tramway, given its technological and human capacities (important social mix).

Figure N^0 9. The usuel destination



Source: Author 2018.

The usual destination of most of the users questioned (35%) is the city centre (Ben Abdelmalek station). In second place, the Mentouri University with 25% (cite Mentouri station and Fac Mentouri station), Zouaghi with 20% (Zouaghi station) and Belle Vue with 11% (Fadhila Saadane, El Emir Abdelkader, Ciloc and Kaddour Boumeddous stations).

In addition, the third category includes Ville Nouvelle with 10%, and Palma with 5%, see figure (N° 09).

3-1-3 Commercial speed

Commercial speed is defined as the speed at which vehicles travel during service. The calculation includes running time and stopping time (passenger boarding and alighting). Stopping times, (stopping times at terminals) are not taken into account. It represents the travel speed felt by the passenger, according to CERTU.

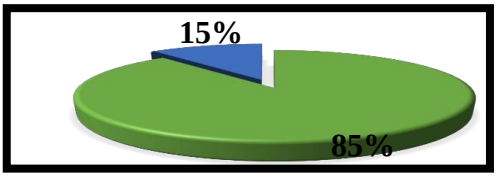
$$Vc = l / Tt.$$

Vc: commercial speed, l: line length, Tt: total travel time.
The commercial speed informs us about the efficiency of a transport system, which is a major part of its reliability, and is an indicator of choice for the transport service. The commercial speed for surface transport systems, notably the tramway, is around 18-20 km/h, which is accepted as a preliminary objective at the beginning of a TCSP project, for the Constantine project is 20.6 km/h, at this stage we are talking about the average commercial speed. The degraded commercial speed (Dupuy G, 1991,) cannot be calculated, it depends on the degree of seriousness of the problem encountered, such as train breakdown, derailment, accident, etc. As far as intervals are concerned, we have: For working days from Sunday to thursday: 4 minutes. For Saturday days: 4/5 minutes. For Friday days: 5 minutes.

3-1-4 On-time performance

The on-time performance is calculated as follows:

Figure N °10. Service satisfaction



Source: Author, 2018.

Number of early/late trips less than 3 minutes) i (Total number of trips made) (1) Cetram - Constantine activity report: monthly activity report - January 2017, see table (No.08).

Table N ° 8. Punctuality rate in January 2017

Month	Total number of races completed	Total number of races with a delay of less than 3 minutes	Punctuality rate
January 2017	13634	13578	99,59%

Source: Author, 2017.

A departure is considered to provide normal regularity if the maximum deviation between the previous and the next departure does not exceed 50% of the interval of the planned operation. The target for this indicator is to ensure a normal regularity rate of 98%.
Calculation formula: Gap between two terminus departures:
I 1= Departure time of the second train - departure time of the first train.

3-1-4 Soil criteria

The insertion principles adopted for the tramway insertion study follow the recommendations of Certu in its "Guide d'aménagement de voirie pour les

transports collectifs" considering the most constraining dimensions of rolling stock. Maximum width 2.65m, train length 40m -Maximum gradient: 10%, recommended minimum radius: 25m. Two insertion modes are considered for the positioning of the bi-directional platform on an existing road.

The central insertion reinforces the visual impact and clearly marks the urban landscape, notably by a large platform area, which is why it will be chosen on wide avenues. It does not interfere with side accesses or accesses to the surrounding area. The obstacle limit gauge in straight alignment with lateral posts or façade attachment is taken to be 6.40m. The methodology followed in this research is based on the choice of a suitable design to ensure constant commercial speeds, irrespective of road traffic conditions. The differentiation between the platform and the passenger lane can be only visual by marking or changing the road support, but also materialized in order to delimit the exclusive right-of-way. Lateral insertion is chosen because in some tramway passages the streets are narrower (only one remaining passenger lane). The project right-of-way is cleaned up to eliminate any uncontrolled deposit of materials of any kind (scrap metal, various carcasses, unexploded ordnance, piles of earth, etc.),materials of any kind (scrap metal, various carcasses, unexploded ordnance, piles of earth and various materials, boulders, etc.).

The cleaning products will be loaded and disposed of in and disposed of in a landfill site, or possibly stored for reuse at the request of the (e.g. in the case of boulders).

The cleaning of the price of the right-of-way is included in the market prices and inparticular in the prices for clearing, site installation and various demolitions.

3-1-5 Reliability

Reliability is the ability of an entity to perform the required functions under given conditions for a given time. It is characterised by the probability R (t) that the entity E will perform these functions, under the given conditions during the time interval [0; t], knowing that the entity is not faulty at time 0.

R (t) = Probe {E not failing on [0; t]}

There are three (03) methods of assessing reliability (Bellaouar, 2014):

a) The estimated or intrinsic assessment: It is the reliability measured during specific tests carried out within a fully defined test programme.

b) Predictive assessment: It is obtained from a mathematical model knowing the estimated reliability of these components (deductive models). The properties of the complete system are deduced from a detailed knowledge of the properties of its components.

c) Operational evaluation: This is the reliability measured on devices in normal operation. It depends on the actual conditions of use and logistic support. Unreliability increases after-sales costs (warranties, legal fees). Building devices that are more reliable increases design and production costs. The total cost takes into account these two constraints.

The reliability of a machine tends to decrease with the number of its components or their complexity. The control of reliability therefore becomes more delicate, which makes it possible to check the performance of the company.Generally speaking, the research carried out by various organisations and researchers (Ippoliti 2011, B. Faivre d'Arcier 2012, Hervé Baptiste, 2003 and 2011), have mentioned the performance indicators10 in their following the particularity of each study object and its immediate environment. A very high quality of each component does not necessarily lead to a high reliability. After assembly, interactions between the components reduce the capacity of the whole.

High reliability under certain conditions does not imply high reliability under other conditions (e.g. a synthetic motor oil designed for modern engines (multi-valve and turbo) is not necessarily suitable for a more rudimentary engine (lawnmower, worn engine, old car). There are also quantities associated with operational safety, which are a function of time, the quantities presented below characterise average durations.Reliability depends on many factors such as:

-The length of time the mode has been in existence since its inception,

-The number of cities where the mode is found, - The interruption in the operation of the system since its inception. In this point, we have a study Reliability Maintainability Availability Safety Analysis, FMDS; it encompasses all the performance criteria of the system as well as its subsystems (reliability, maintenance, availability, safety).Table No. 09, below, shows:

-The purpose of the study of the Traffic Plan of the city of Constantine is to implement

-The purpose of the study is to implement a plan of technical and regulatory actions aimed at improving general traffic conditions. To do this, it is planned to first establish a diagnosis of traffic conditions in the agglomeration. The analysis of the structure of the road network and its functioning, as well as the current traffic conditions in Constantine, show that the problems experienced are due, on the one hand, to the mismatch between supply and demand, but also to the current operation of the road network. The second phase, which has already been submitted, concerns the processing and formatting of all the data and information collected, as well as that from the field survey campaign. The analysis of the results, in the third phase, combined with the observations and expert reports carried out in the field, will enable the formulation of a diagnosis of the traffic conditions.The purpose of the diagnosis is to highlight the malfunctions and shortcomings of the road network, as well as the causes at the origin.

The partial saturation observed at the city's main junctions is not due to geometric characteristics (relatively high capacity), but is largely due to functional dysfunctions.

Table N ° 89.Reliability

Characteristic Network	Network length	Number of lines	Nbr of cars	Applicability's	Interruption
Bus	**709**	**62**	**1.136**	**64.883**	No
Taxis	**Any destination urban area**	**3.729**	**14,916**	**/**	No
Tramway	**8.1**	**01**	**27oars**	**6.000Trav /h**	No
Cable car	**1.5**	**01**	**33cabins**	**2.000 Trav /h**	**Yes**
Train	**22**	**01**	**01**	**/**	No

Source: DTW, 2018.

3-1-6 ACCESSIBILITY

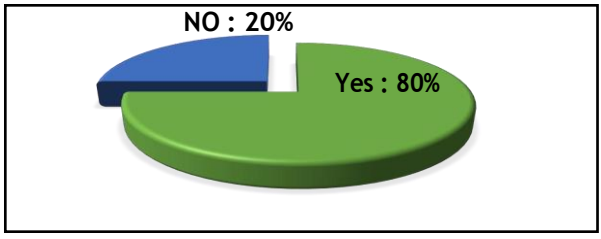
It is recent and meets the main requirements of the law and the road order to which it relates. The configuration of the tramway stations takes into account the slope of the accesses to the stations (≤ 5%), the pedestrian paths (≥ 1.40m), and the alertness strip present along the length of the station platform. Tramway stations are generally accessible.

We have a total of 11 passenger stations, one of which is located on the viaduct with a height difference of almost 15m, for which two lifts and escalators are provided to assist disabled and elderly passengers, the other stations are equipped with ramps.

Reaching the tramway stations is not easy for all the users, 20% of the interviewees have a problem to reach the landing platforms, referring to their places of residence, these are the people who use the tramway as a second means of transport (they are not supplied by the tramway line), the inhabitants of :

Boussouf, Ville Nouvelle, El Khroub, Ain Smara, Zighoud Yousef, Sidi Mabrouk, Bentélis.

Figure No. 11: Acceleration rate.



Source: Author, 2019

. 3-1-7 Cost-related criteria

Once the route variant has been decided, the budgetary envelope will be refined in the more detailed studies of the project, on the one hand on the options relating to the tramway system and on the other hand on the details relating to its insertion (land acquisitions, network diversions, roadway development, etc.) (Attal P-E, and al, 2016). The costs are based on the costs of recent urban tramway projects and

take into account the differences in cost levels between investments made locally (in dinars) and investments made in foreign currency (imports).It is important to note that the prices actually observed at the time of the calls for tender can be very significantly influenced by local or circumstantial contexts. This is particularly the case for roadworks or network diversion services, where the implementation of an exceptionally large-scale project may saturate the market.The same applies to rolling stock, which, due to the trend towards reduced competition, and the significant increase in demand at international level, has seen significant inflation in recent years. "The tramway adds value to the development of the city and modernises its means of transport" (Vanco.F and al, 2011).

3-1-8 Investment costs

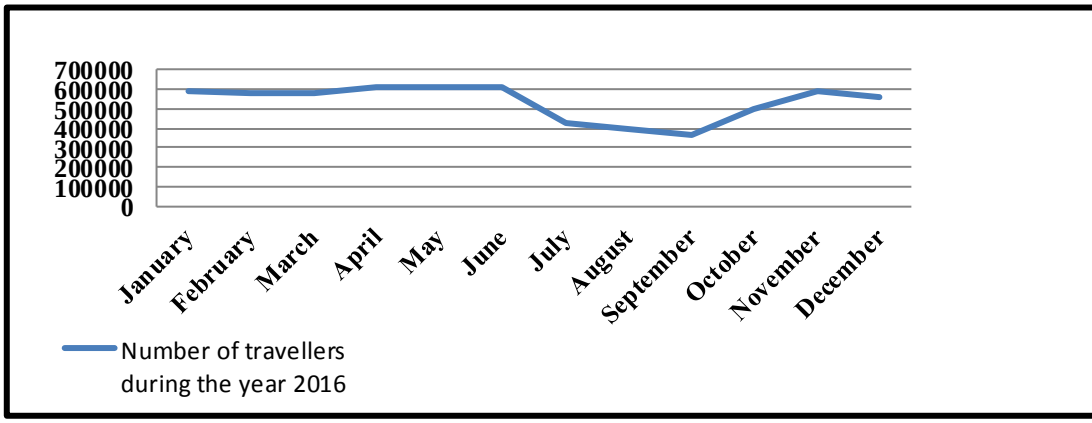
As a reminder, the Constantine tramway project, which was launched at the beginning of 2007, is valued at 17.5 billion dinars with a capacity of 160,000 users per day. It is scheduled to start operating in 2009.To do this; the sum of just over 86 billion centimes has been earmarked for the project.

According to information gathered from those in charge of the work, 74,700 million centimes have been earmarked for the first stage of the work .Entrusted to the Italian company Pizzarotti for an amount of 308 million euros, local officials estimate that this is a new viable and reliable means of transport that "doesn't care" about traffic jams in a city whose tentacles extend more than 25 km from the city centre. That is to say, as far as Ali-Mendjeli, a new agglomeration to which, in a few years' time, nearly 300,000 inhabitants are promised. Twenty-seven (27) minutes will be enough to link, over nearly 9 km (as a first phase), the Ben Abdelmalek station to the city centre, the peri-urban zone of Zouaghi, thus serving the main residential, commercial, cultural, sports, medical and educational centers.

3-1-9 Operating costs

The tramway has a high transport capacity and is installed where the potential ridership is too high to be absorbed by a bus. It also plays an important role in the creation of jobs related to its management and maintenance, helping to develop the local economy. One of the main advantages of the tram is that the cost of transport is affordable and much cheaper than travelling by private car11 (full tank).

Figure N^0 12.Number of passengers in 2016



Source: Author, 2017.

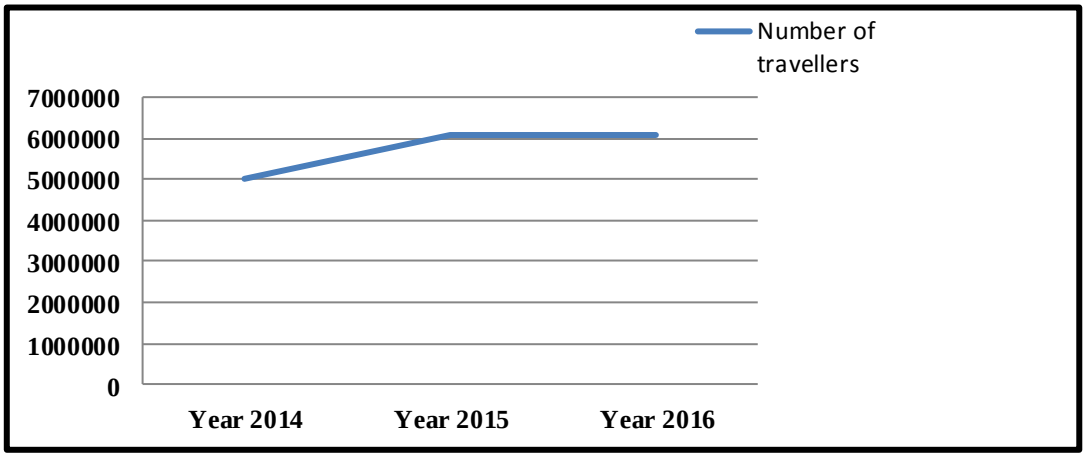
The results of the operation of the first line of the Constantine tramway (city center - Zouaghi district) in 2016 clearly show that the operation was defined as the upward trend shown in the table and the statement, where more than 6 million passengers and more than the year 2015 were estimated at: 148,798 passengers see figure (No. 12).

The number of subscriptions of all types in 2016 was estimated at 30, 947, and the emergence of a new culture in the mobility of the urban fabric of the city of Constantine among citizens, especially from the city centre.

This would demonstrate the pressure on the road network and help solve the traffic jam dilemma. A new subscription system was introduced in the last triennium of 2016 (23 October 2016) under the instructions of HE the Minister of Public Works and Transport. The unified ticket is the ETUSC-Tramway bus.

This system makes it possible to acquire a unified monthly subscription card allowing its passengers to travel with the same ticket, worth 1,500 dj/month, during which 316 units were sold at the level of the commercial agencies of Tramway Constantine (Setram). Concerning the problems, there are some defects in the design of the line, which means that during rainy weather the trains are blocked, especially on the crossroads of the industrial zone where puddles completely prevent the trains from passing, but for the users the main problem remains the high price for the users, see figure (N° 13).

Figure N^0 13. Number of travelers



Source: Author, 2017.

4-Conclusion

The field of research into indicators for the ex-post evaluation of a transport service is almost non-existent, and several types of indicators are applied in different fields. These indicators applied to the transport field are very revealing. They allowed us to measure the quality of service provided by the operator Cetram.

Public transport by bus presents a very negative image of transport in the city of Constantine with relatively low prices but with very unsatisfactory services, taxi transport presents the opposite of bus transport, with satisfactory services but with unreasonable prices.

Dealing with the content and container of a transport system involves the study and analysis of the network and the vehicles used for this purpose. Transport, as content and container, is very complex, one influences the other.

With the introduction of this new mode of transport (tramway) in the city of Constantine, this situation has changed on the north-south axis of the city of Constantine, with arelatively good quality of service and reasonable prices overall, despite some details that can be easily resolved.

If before the tramway, public transport vehicles served even the city centre of Constantine, today with the advent of this project, public transport has new geographical limits that must not be crossed. The project is currently undergoing an extension of its first line towards the new town of Ali Mendjeli.

This new configuration of the network will push the citizens to new practices (the use of the future tramway lines), and will thus allow a new form of connection between Constantine and Ali Mendjeli.

Our survey revealed the advantages and disadvantages of this new mode of transport and allowed us to understand the changes in the urban dynamism and their role in the transport offer in the city of Constantine.

Complex and strategic projects require special attention at the organisational level

and organisational level and require a specific approach to steering the project and managing the risks and risks and opportunities.

In order to manage this type of project respecting the predefined objectives (deadlines, duration, cost, quality) it is necessary to have knowledge of its complex environment (organization, life cycle, contractual, political, financial framework, etc.), to identify the risks and opportunities, to analyse them and to define the key success factors in order to achieve the objectives and reduce the undesirable effects.

In order to manage risk in these projects it is necessary to define a method of approach and adaptive evaluation that best meets the constraints to which the project is subject.

For projects with a high level of interdependence between members of a multidisciplinary team, we considered it appropriate to use the organised and systemic method of risk analysis, which was chosen for its quality in terms of understanding the different dimensions of a project, more specifically the organisational dimension and its relationship with the resource and time dimensions.

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