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Towards reliable public bus services in Greater Cairo
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Abstract:

The complicated transport and traffic problems in Greater Cairo have negative influences on both people life and health; moreover, these problems lead to significant waste in working hours and increase air pollution levels. Private-car-ownership in Greater Cairo shows that only about 20% of the total populations are private-car-owners, while the majority have no private cars and are forced to use all available different modes of public transport, which are deteriorated and unreliable in most cases, in their daily trips. Classified traffic counts on Greater Cairo roads, streets and junctions showed that private cars represent over 80% of traffic composition with average occupancy of about 1.3. The combined effect of the higher traffic of private cars, their illegal on-street parking and the insufficient road and intersection capacities, are the main reasons of road traffic congestions. The evolution of the transport in Greater Cairo over the past three decades shows an increase in the use of passenger cars (including taxis), which is currently absorbing over one fourth (25%) of the motorized trip market. Some forms of public transport, in particular public bus services and light rail, have suffered a corresponding decline in patronage. Shared taxis, on the other hand, have aggressively increased their market share[1]. Moreover, the currently applied fare policies of the individual public transport modes do not facilitate cooperation among the various operators[2]. This research aims to study the provision of distinctive, reliable and comfortable public transport, with unsubsidized and trip dependable fare, to encourage and attract private car owners, thereby reducing traffic congestions. In the same time no changes will be introduced to regular public services fare, as their users are low-income and non-motorists. To achieve research objectives, E-mail questionnaire using a well-designed questionnaire form are performed on a randomly selected sample of about 460 private car owners from different places, ages, genders, education levels, and life styles. The purpose was to poll their opinion about key points such as; using the proposed distinctive bus services, the suitable travel fare per kilometer and if they have other suggestions. The analysis showed that private car owners strongly encouraged the idea, and they see that 0.5 LE/km is a fair fare for its use.

Keywords: Transportation system, road network, traffic Congestion, Public transport.

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Introduction:

It is obvious that Greater Cairo transport system suffers from a lot of problems such as traffic congestions due to insufficient traffic capacities of road and intersections, insufficient on-street parking spaces and illegal parking particularly due to inadequate traffic enforcement and the enormous increase in private car traffic as subsequences of the currently inefficient, unreliable and governmentally subsidized public transport system. The trend of income growth in developing countries drives the motorization trend causing road congestion, which in turn slows down the motorization. The congestion on the other hand reduces the attractiveness of on-road public transport, which increases car use (in the absence of rapid transit[3].) The Egyptian Authority for Metro ECM and the Cairo Transportation Authority CTA carry a combined 1.7 billion passenger per year, yet the streets of downtown Cairo are still heavily congested. Approximately two-thirds of Egypt's gross domestic product GDP is attributable to the Cairo metropolitan area. The annual growth rate of the Egyptian economy increased from 3.2% in 2003 to 8.8% in 2008. Nonetheless, the intense congestion resulting from high numbers of cars and people in the central city presents a barrier to continued economic growth and investment. The congestion is a by-product of the growth in population and increasing levels of car ownership, as well as a lack of sufficient capacity on the public transport system. A pedestrian environment is nearly nonexistent in the city, and traffic regulations appear to be little enforced[4]. Cairo may be seen as similar to many other cities in developing countries, in which high-income groups tend to be located close to the central area, while lower-income; high density areas are located further out. Low-income travelers may be faced with high transport costs (both in absolute terms, and notably as a proportion of disposable income[5].) The economic structure of of Greater Cairo population showed that the majority is low-income and non-car-owners; which forces Cairo governorate to subsidize public transport. The current attributes of currently subsidized public transport services are fully utilized by non car owners, which represents the vast majority of Greater Cairo population and those have almost no influences on traffic congestions, delay and emissions, as classified traffic counts on Greater Cairo roads and streets showed that the traffic share of all public transport modes, shred taxi, etc is about 20%, while, the traffic share of private cars is about 80%, with average occupancy of 1.3. This raises an important question; why Greater Cairo private car owners, which represent only 20% of Greater Cairo population, are using their cars in their all daily trips and cause traffic congestions of roads, streets and intersections, as well as parking problems? And the answer is that the current attributes of public transport do not provide the same reliability, safety, and comfort that their private cars do. This research focuses on providing a distinctive, reliable, comfort, safe and non-subsidized public bus services to attract and encourage Greater Cairo private-car-owners to use it in their daily trips instead of their private-cars, which will release traffic congestions, delays, and also will omit the stresses they are currently facing due to driving in congested roads and due to the dilemma of finding parking spaces at the end of each trip.

Research Objectives:

This research aims to; a) Proposing of a distinctive, reliable, safe and unsubsidized public bus services to attract Greater Cairo private car owners. b) Decrease traffic congestion and emissions as a subsequence of switching the private car owners to distinctive, reliable, safe and environmental friendly public bus services. c) Try to suggest an accepted trip distance

dependable fare for the proposed service. To achieve these desire objectives , E-mail questionnaire using a well-designed questionnaire-form (as in Appendix A) is performed on a randomly selected sample of about 460 private car owners from different places , ages, genders, education levels, and life styles. The purpose was to poll their opinion and recommendations about key points such as; using the proposed distinctive bus services, the suitable travel fare per kilometer and if they have other suggestions.

The questionnaire form consists of twelve questions. Most of questionnaire questions are multiple choice questions to be easy for the participant, and to facilitate the analysis of collected data. A brief introduction describing the questionnaire and its purpose is written in each sent E-mail.

Research Methodology:

Figure (1) summaries the research methodology which include ; review of recent research efforts pertaining to research subject, designing of the questionnaire form to poll the opinions about the proposed distinctive public transport service, performing E -mail questionnaire on a randomly selected sample of Greater Cairo population, analysis of the collected data and inte rpretations of results to extract research conclusions and recommendations.

Research findings, conclusions and recommendations

Analysis of the collected questionnaire forms and interpretation of results

Data collection which include; the design of the questionnaire form, performing E mail questionnaire on a random sample greater Cairo population

Evaluation of CTA, Review of previous research efforts and identify research objectives
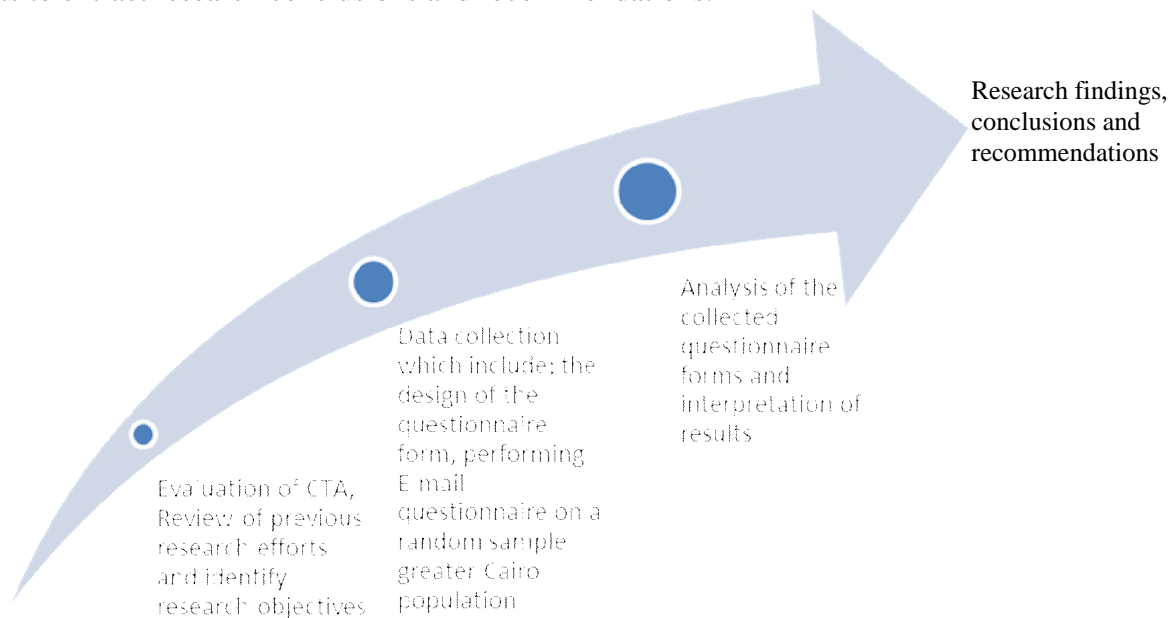
Figure (1) Research methodology

A statistical and graphical analysis performed on the collected questionnaire forms. The following section presents the performed analysis on t he collected questionnaire sample.

Insight on Public Transport within Greater Cairo

Public transport services in Greater Cairo can be divided into what is called formal and informal sectors. Formal urban public transport services are provided by the publi c sector, including Cairo Transport Authority CTA and its subsidiary Greater Cairo Bus Company GCBC. In addition to busses, CTA operates light rail services (tram and Heliopolis metro) as well as the

Nile ferries. Other key organization of the formal ur ban public transport sector include the Cairo Metro Organization CMO, which provides urban heavy rail services (Cairo underground Metro) and the Egyptian National Railways ENR, sponsor of suburban commuter rail services. The CTA belongs to Cairo Governorate, while CMO and ENR work under the jurisdiction of the Ministry of Transport MoT.

The informal sector consists of route -specific shared taxis operated by the private sector and using microbuses or minibuses with a passenger carrying capacity of 11-30 passengers. Shared taxi services are licensed by Cairo Governorate under the jurisdictional umbrella of the CTA, Giza Governorate and Qalyobeya Governorate. The shared taxi routes are licensed on an origin destination basis between defined shared taxi termi nals.

Half of all motorized vehicles in Egypt operate in Cairo, at one of the fastest growing motorization rate in MENA counties (4% per year, reaching more than 2.5 million by 2022). Greater Cairo is also the preeminent transport center of Egypt accommod ating over 20 million motorized person trips and 7 million non-motorized trips daily[6]. Figure (2) shows Greater Cairo and its neighbors.
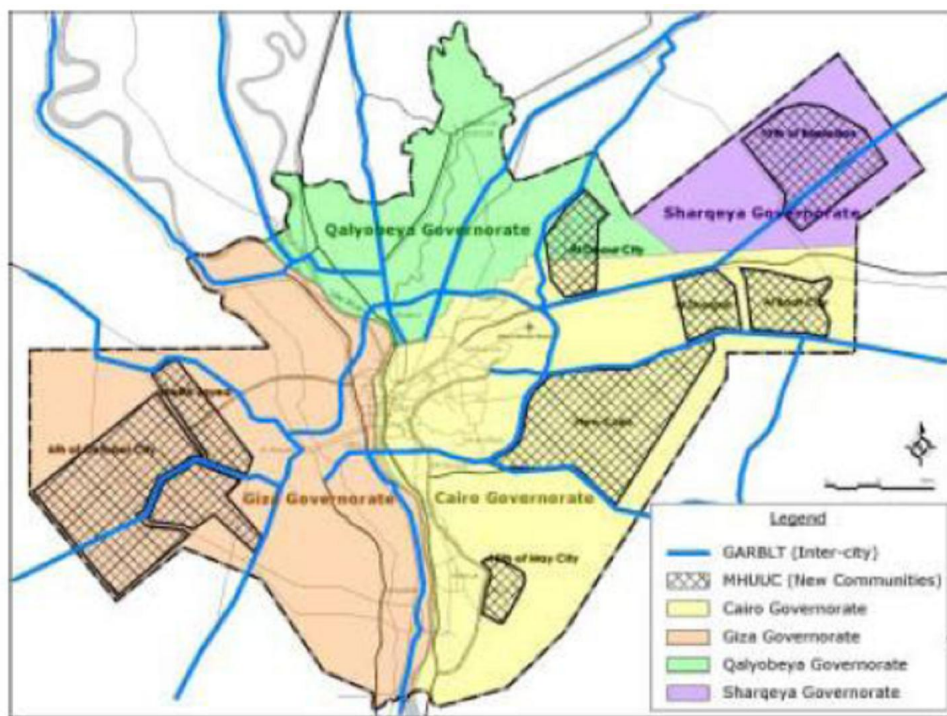

Figure (2) Greater Cairo and its neighbors
Source: Greater Cairo Urban Transport Strategy. JICA study team based o n the information from governmental sources, April 2009

It is important to mention that both formal and informal transport sectors transport almost non - car owners, as car-owners are reluctant to use the offered unreliable services.

Cairo Transport Authority CTA

Cairo Transport Authority CTA has huge fleets of buses, air conditioned buses, minibuses, trams, metro, and Nile Ferries which transport about 4914230 passengers per day[7]. Figure (3) shows photos of CTA fleets and Table (1) shows the available CTA fleet characteristics, travel fair, and the daily number of passenger transported by different transport modes . Figure (4) shows passenger shares of the different modes of CTA. It is recognized that buses have the maximum share (about 80.43%) followed by minibuses (about 11.66%), air conditioned buses (about 2.70%) trams (about 2.47%), metro (2.18%) and the lowest share is for Nile ferries (about 0.57%).

Buses and Air conditioned busses		CTA Minibuses
CTA Tram and Metro transport		CTA Nile Ferries
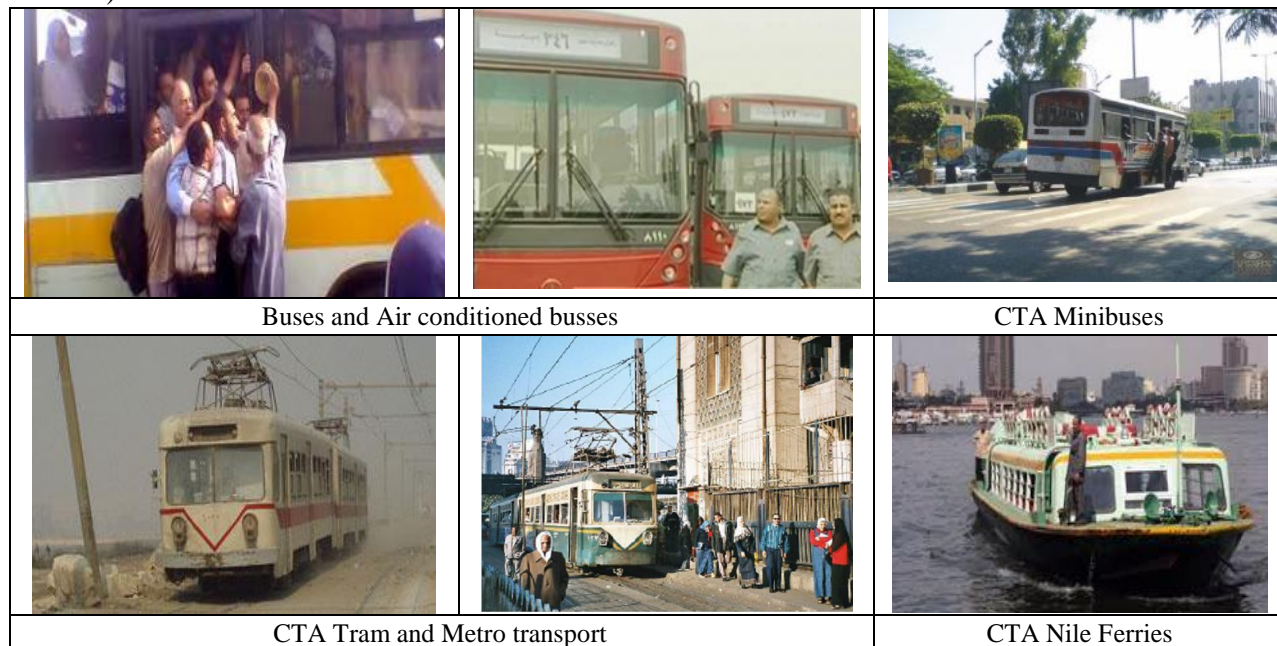
Figure (3) CTA fleets

Table (1) CTA fleet characteristics and daily passengers

Transport mode	Fleet		Daily passengers	Fare (Piasters)*
	Total	Actually working		
Buses	608399	490039	3952450	50/75/100/200
Air conditioned buses	50606	35622	132630	100/125/200/250
Mini-buses	180786	157450	572930	50/100
Tram	13138	8834	121400	50
Metro	9593	5732	107000	50
Nile ferries	8760	6870	27820	25/50/100/500
Total CTA daily passengers			4914230	

* CTA travel fares are governmentally subsidized.
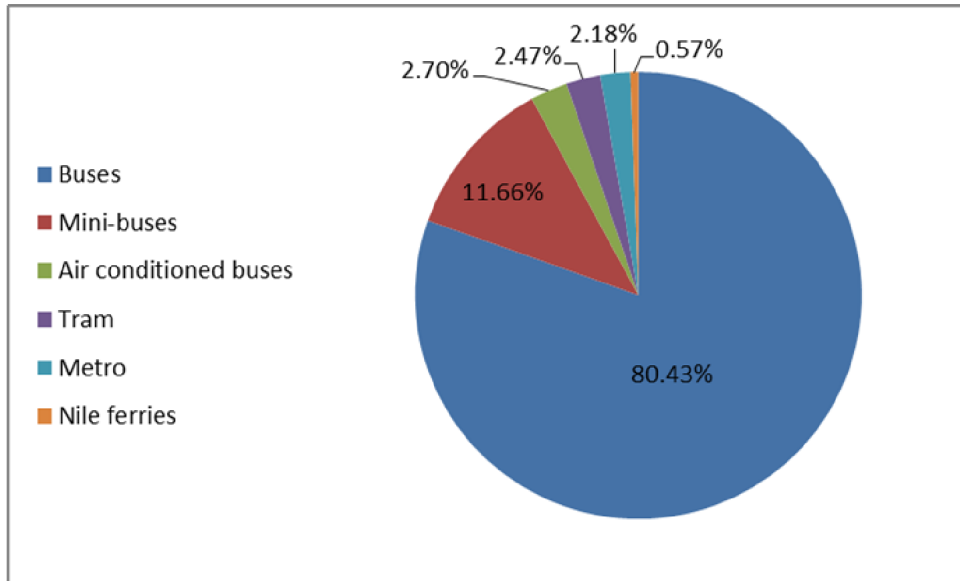Source: CTA 2011.

Figure (4) shares of different CTA transport modes

From Figure (4), it is obvious that CTA public buses is the mass transport mode as it transports about 3.96 out of 4.91 million passengers per day. Figure (5) shows CTA modes of transport sorted by the daily number of passengers and fleet sizes.
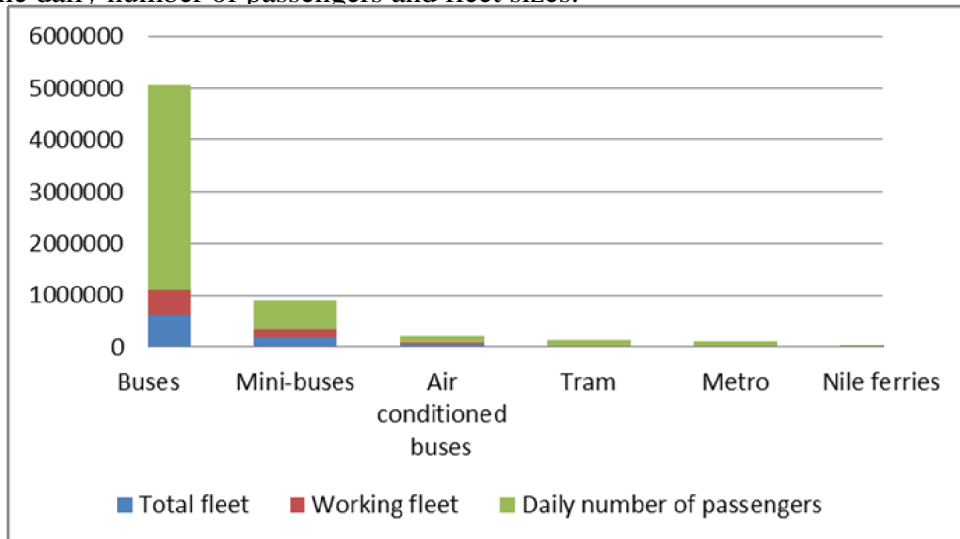

Figure (5) CTA Fleet sizes and daily number of passengers

Data collection

As mentioned in research methodology, d ata collection included the design of the questionnaire form, performing E-mail questionnaire on a random sample greater Cairo population . The following section shows the questionnaire sample as well as analysis of collected questionnaires.

Characteristics of questionnaire sample

The questionnaire was distributed and sent to about 500 persons. The rate of return was high enough, as 460 persons replied and filled the survey. Participants were chosen to represent the whole society sectors. Figures (6) through (8) show the sample characterization.

Figure (6) shows that 65% of the participants were males and 35% were females and Figure (7) shows that the ages of the participants were distributed as follows: 44% are between 16-25 years old, 26% are between 30-40 years old, 16% are between 25-30 years old, and 14% are between 40-50 years old. Figure (8) shows that 55% of the sample has average income from 1000- 3000 LE, 19% has no income, 18% has average income from 3000-6000 LE, and 8% has average income greater than 6000 LE per month.
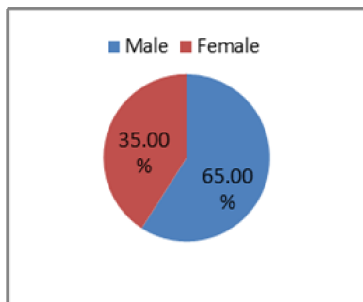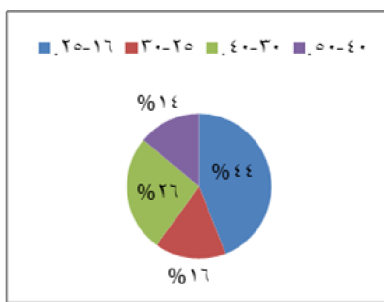
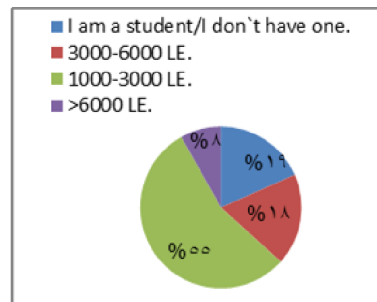Figure (6) Gender   Figure (7) Age categories   Figure (8) Average monthly incomes

Analysis of key questionnaire results:

The survey results will be presented below for each individual question where the question will be stated and the obtained results will be presented.

Question 7:**What is your average one-way trip length in km?**

Figure (9) shows the results, it is obvious that 41% of the participants do long trips 16-32 km, and then 26% do relatively long trips 8-16 km. The long trip distance reflects also the intensive traffic problems they face every day.
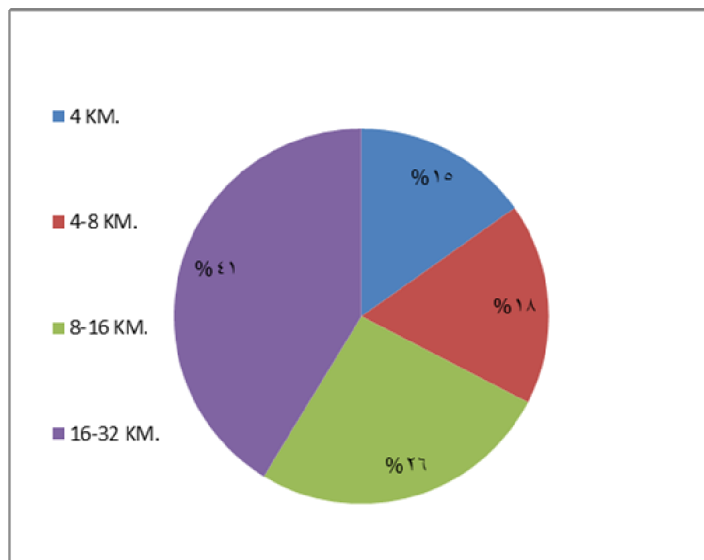
Figure (9) Trip lengths in questionnaire sample

Question 8: **What are the obstacles that prevent you from using current public transport system?**

Figure (10) shows the result, it is recognized that 43% chose (all of the above) answer to the obstacles they face, 19% chose (No reliable schedule) answer and other 19% chose (Always Congested) answer. Participants pay attention to bus-schedule and the uncongested-buses more than other factor.
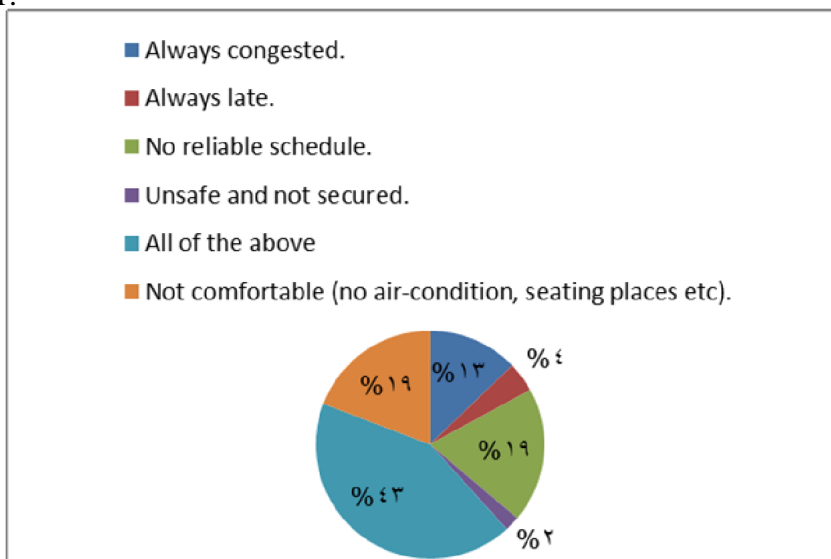

Figure (10) obstacles that prevent the usage of current public transport system

Question 9: **What is your opinion if the travel fare is defined based on the trip length (e.g. 0.25-0.5 LE per km with a minimum fare of 1 L.E / trip)?**

Figure (11) shows the result, it is recognized that high percentage of the participants agree the idea (69%) and said that they will use it in case that it will be deployed. 22% of the participants said that they will use it sometimes; and only 9% said that it is expensive.
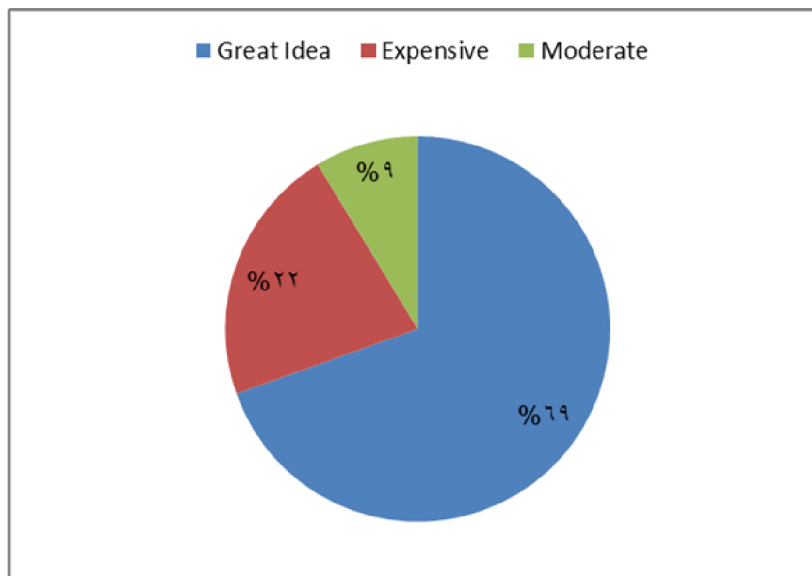
Figure (11) what is your opinion if the travel fare is defined based on the trip length (e.g. 0.25 0.5 LE per km with a minimum fare of 1 L.E / trip)?

Question 10: **What is the most service that you expect the new bus line will provide?**

Figure (12) shows the result. It is recognized that most of participants said that they concerned a lot that the new bus service will provide them with dynamic and reliable schedule more than any other factor and they also concerned about non congested new buses.
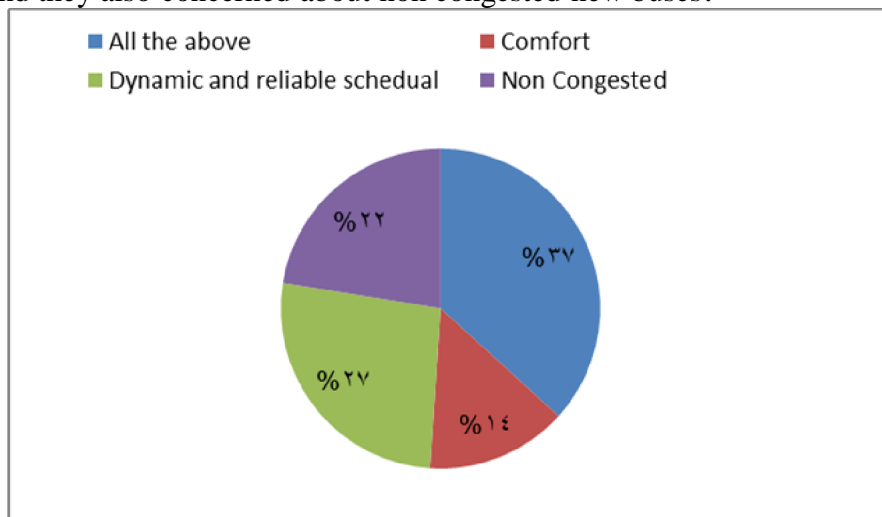

Figure (12) what is the most service that you expect the new bus line will provide?

Question 11: **How often do you use these types of public transport?**

Figure (13) shows the result, it is recognized that a high percentage of the survey sample don`t use the different types of public transit except over long times and this is due to its many obstacles.
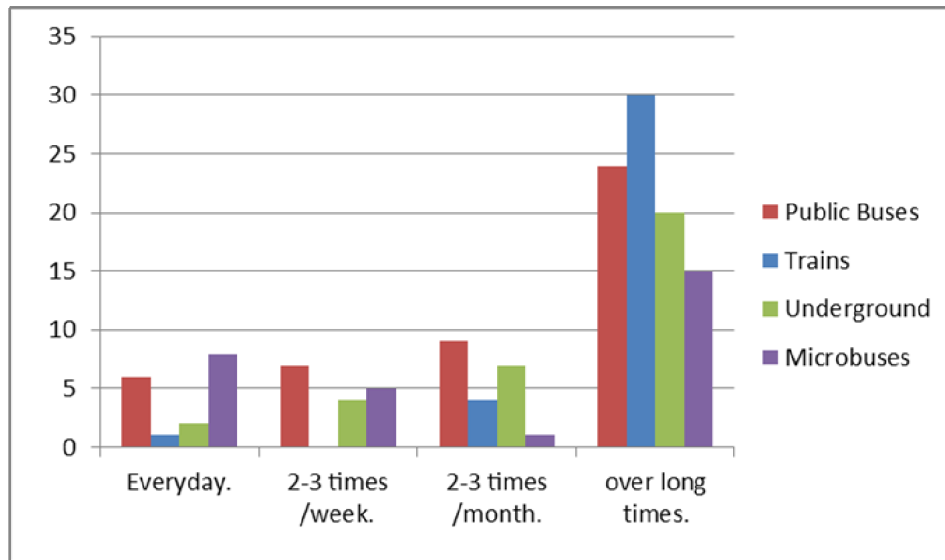
Figure (13) how often do you use these types of public transport?

The above analysis showed that questionnaire sample recommends the idea of introducing a new distinctive unsubsidized bus services and the majority of motorists will switch to this new service in case it will be deployed. Also, most of them agree the proposed travel fare to be 0.5 LE per km with minimum travel fare of 1 LE. This travel fare should be competitive particularly if compared with taxi. In Cairo, taxi the travel fare per km is 1 LE with minimum fare of 2.5 LE. Figure (14) shows the relation between travel cost ratio of new bus service and taxi and travel distance. It is recognized that the cost ratio vary from 0.40 for short trips to lower than o.49 for long trips. Which promote the use of the new proposed distinctive public bus service even if compared with taxi.
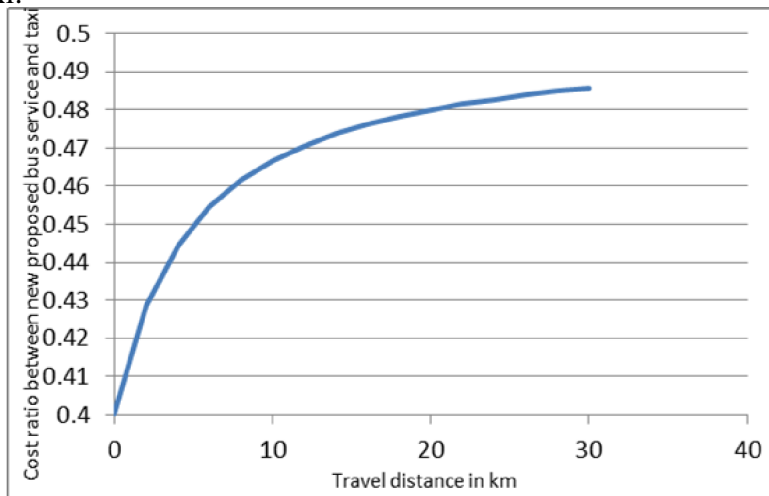

Figure (14) relation between travel cost ratio of new
bus service and taxi and travel distance.

Conclusion:

It is obvious from the performed statistical analysis that most of the participates agree on providing a distinctive, reliable, safe, and unsubsidized and travel distance dependable fare public bus services and said they will use it in their daily trips instead of using their own private cars. This conclusion match the main objective of the research which aims at attracting and encouraging private car owners in Greater Cairo to switch to the new proposed distinctive public bus services and leave their own cars, consequently reducing traffic congestions, reducing parking problems and enhancing the air quality by reducing emissions. One of the unforeseen side benefits from switching car owners to the new proposed public bus service is the expected reduction in the consumption of already subsidized private car fuel, where Egypt subsidizes the prices of all fuel by different percentages. Also most of the surveyed sample agreed on the idea of adding a first class wagon for the underground with unsubsidized fare and intended to use it when it is deployed.

It is found that the percentage of participant candidates who depend on different modes of public transport is really limited as it was focused solely on private car owners in the survey; however, the survey covered many slices of society. In answering what are the problems that participants facing when using public transport, most of participants chose all of the above choices, and 20% chose no dynamic and reliable schedule and then the congestion choice, which reflects the unaccepted public transport with its currently attributes.

Recommendations:

- A cost-benefit analysis of the new proposed distinctive public bus services should be implemented to promote and prove its feasibility. Then Cairo governorate can call for investors to develop and operate this service using either BOT or PPP approaches.

- The routes of the new distinctive bus services should be carefully selected to cover more areas, public micro-buses can also be used to access narrow crowded zones.

- Parallel to the implementation of the new proposed bus service, and innovative solutions for traffic congestions, such as fleet management, bus priority lane, etc, should be applied to promote public transport and limit the use of private cars.

- Media campaigns should be planned and exec uted to promote the use of the new distinctive public transport services.

- The currently subsidized public transport that serve 80% of Greater Cairo population should be remained and upgraded as it provide travel services to the people who are not able to use the new proposed distinctive public transport services.

- The new proposed public transport services can also applied to the underground metro by providing first class wagons with unsubsidized travel fare to attract and encourage private-car-owners to leave their cars near metro stations and use underground metro in the busy down town (park and ride technique). This proposal is already applied in Dubai Metro, UAE; where each metro has unsubsidized travel fare wagon called "golden wagon" this provision this service attracted a significant portion of car owners and in turn contributed in reducing traffic congestions in Dubai urban streets.

- There should be an integration between all modes of public transport with reliable and dynamic time schedule for each m ode of transport, furthermore, unique time -framed travel tickets can facilitate the efficient use of all modes of public transport

- Upon the completion of all needed countermeasures for enhancing public transport, and to reduce private car traffic in downto wns and heavy crawdad areas, a means of restriction such as congestion pricing techniques should be applied to promote public transport services.

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7. Cairo Transport Authority data base, 2011.

Appendix (A) The used questionnaire form

Table 1 Sample of the used questionnaire form

Questionnaire form on a scientific research aims to develop a distinctive, reliable, safe and comfort pu blic bus services

I am a transportation researcher conducting a sample questionnaire aims at providing a distinctive, reliable, safe, and comfo rt public bus services to encourage motorists to switch to this new proposed and leave their cars. We are looking for your support in answering the below questionnaire.

1- Name

2- Job

3- Age

○ 16-25.

○ 25-30.

○ 30-40.

○ 40-50.

4- Gender

○ Male.

○ Female.

13

5- Do you have a private car or have access to private car? If yes: How lo ng do you drive your car per day for your normal daily activities?

○ <1hour.

○ 2-3 hours.

○ >3 hours.

○ I don`t have a private car.

○ Others please specify: [_____]

6- Average monthly income

○ I am a student/I don`t have one.

○ 1000-3000 LE.

○ 3000-6000 LE.

○ >6000 LE.

7- What is your average one way trip length in km?

○ 4 KM.

○ 4-8 KM.

○ 8-16 KM.

○ 16-32 KM.

○ Others, please specify: [_____]

8- What are the obstacles that prevent you from using current public transport system?

○ No reliable schedule.

○ Not comfortable (no air-condition, seating places etc).

○ Always late.

○ Always congested.

○ Unsafe and not secured.

○ Others, please specify: [_____]

9- What is your opinion if the travel fare is defined based on the trip l ength (e.g. 0.25-0.5 LE per kilometer with a minimum fare 1L.E / trip)?

◉ Great idea if it fulfill all the services that aren`t present now in the current public transport system.

○ Expensive (please suggest another Price in other slot).

○ I will use it sometimes. (please specify how many days per week in other slot)

○ Others, please specify: [_____]

10- What is the most service that you expect the new bus line will provide?

○ Dynamic and reliable Schedule.

○ Comfort and air-conditioned.

○ Non-congested.

○ Safe.

○ No stresses result from using my own vehicle.

○ Others, please specify: [   ]

11- How often do you use this Public transportation?

	Every day.	2-3 times /week.	2-3 times /month.	every 2-3 months.	over long times.
Public Buses.	○	○	○	○	○
Trains.	○	○	○	○	○
Underground.	○	○	○	○	○
microbuses.	○	○	○	○	○

12- What do you think about applying this idea to other modes of public transport s uch as underground metro by providing a first class unsubsidized metro wagon in each metro?

Add any other comments or notes you feel it is not included in the questionnaire