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A Feasibility study for Proposing ERP in Tripoli Libya

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Abstract: This research captured the feasibility study of Electronic Road Pricing (ERP) in attempt to manage the road traffic situation in Tripoli Libya.

The theoretical foundation for this research study is being established during the literature review, which is mainly on road traffic and existing ERP. The methodology of this research work began with the review first before proceeding for the required survey. The questionnaire will be administered online. The results of the survey which is the responses of the potential customers will be finally retrieved and analyzed before conclusion is being made.

Questionnaires and Interview were administered online via google form and analyzed using SPSS. Tables 1.1-1.2 showed that most of the participants are from Libya and resides in Tripoli, which justifies that the survey captured the opinions of the right and target respondents. Table 1.3 justifies that there is actually road traffic situation in Tripoli that requires control. Figure 1.1 and 1.2 justifies that the respondents, who are citizens and / or residents, mainly the people that are directly or indirectly affected by this research are of the opinion that ERP be implemented in Tripoli Libya. The whole results showed that ERP is feasible for implementation in Tripoli based on road user's inputs in the survey.

Keywords: Electronic Road Pricing, SPSS Software, Feasibility Study, Questionnaire, google form, Statistical Analysis, Respondents.

1. INTRODUCTION

Libya is from the continent of Africa, which covers 1,759,540 square kilometers of land, making it the 17th largest nation in terms of land area. It became an independent state in 1951, after gaining its sovereignty from Turkey [11]. It is situated on the northern coast of Africa, bordering the Mediterranean Sea, 85km North of Beirut along the Mediterranean coast. Libya borders from west Algeria, northwest Tunisia, east Egypt, southeast Sudan, Chad and Niger to the south. Libya has a shoreline of 1,770 km, dominated by the Sahara Desert. Currently, the population of Libya is 6,414,893 as of Tuesday, August 1, 2017, population density of 4 per Km2 (9 people per mi2) which has raised from 6, 408, 742, based on the latest United Nations estimates [12]. This population have increase from the previous population, known to be 6, 036,914 [1; 2]. More than thirty years ago there were only a number of cars in Tripoli, and today the streets are more crowded with modern vehicles; private cars, taxis and different types of microbuses. This has led to a large volume of road traffic on the road of Tripoli than other states of Libya, being the capital city and central business area.

2. LITERATURE REVIEW

The population of Libya increases with increase in number of vehicles. For example, the population was close to 5 million and number of vehicles was less than 1million as at 1995. But, as the population raised to over 5 million, the number of

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vehicles were over 2 million [3]. Now that the population is over 6 million, the number of vehicles have equally raised along. This have resulted to a high road congestion, especially in Tripoli, the central business area, being the capital city of Libya.

The travel demand management of many capital cities in Arab countries, including Tripoli Libya, has been receiving increasing attention for its potential to improve urban transportation problems [1]. Managing urban travel demand is not only about planning the transport system but is also concerned with resolving the issues of traffic congestion, accidents and environmental pollution from the increasing use of vehicles. To cope with the urban congestion problem resulted from rapid urbanization, some cities are successfully using Electronic Road Pricing (ERP) policy as a demand management measure [4]. Singapore, Durham, London and Dubai have implemented Road User Charging (RUC) before Singapore later upgraded to ERP.

Singapore in 1975 was the first city to adopt a form of congestion pricing based on area licensing. This was combined with an increased parking fee in central areas and park-and-ride scheme to provide a suitable alternative for private motorists [5]. But, the area licensing is relatively crude. Singapore has done outstanding road pricing policies for reducing congestion. In 1975, an Area Licensing Scheme (ALS) based on road pricing concept was introduced. Under this scheme, vehicles entering the restricted zone bounded by 28 cordons in the central area during the operation hours had to display a pre-purchased license on their windshields and the license charge was S$3 per day [6; 10). In 1998, Singapore transformed its ALS into the electronic version, known as electronic road pricing (ERP). Under the EPR, drivers are charged with using smart cards and its technologies provide an easy adjustment on the charging. Singapore ERP is small and it is more rigorous because charges are paid for each entry, but not for the whole day unlimited access [10]. The ERP had effectively reduced daily traffic volume in the central area by 10-15% [10]. Major roads in Singapore were marked for installing ERP as seen in Figure 2.7. Electronic Road Pricing (ERP) is a traffic management tool to tackle localised road traffic congestion. It aims to rationalise traffic flow in targeted areas where severe traffic congestion occurs almost daily. ERP is based on the "user pays" principle, and charges are levied on vehicles using the roads in the charging areas during designated periods. The Government would conduct a feasibility study focusing on the road pricing charging area, period, mechanism, level, exemptions and technology, after collecting views during the consultation period. This was the aim of Singapore in achieving ERP.

Three different zoning schemes to deal with radial movements to the Central District were proposed and analysed in Hong Kong [8]. The three zones have peak charges for most of the day and shoulder charges are set at half the peak charge. In all three schemes, the off-peak periods without congestion- such as night-time and Sundays - are not charged [9]. The charging periods were; the morning peak period (8:00 -9:30 a.m.), the inter-peak period (9:30 am - 5:00 pm), the afternoon peak period (5:00pm - 7:00 pm) and the shoulder periods immediately before and after the morning and afternoon peak (7:30-8:00 am and 7:00- 7:30 pm). The preliminary estimate of the project cost of the ERP system was HK$ 350 million anticipating that the pilot stage would cost a tenth of that figure. In terms of standard benefit-cost analysis, the benefit-cost ratio for ERP was at least 14 to 1 [9]. In March 1983, Alan Scott (then

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Secretary of Transport) announced that the Hong Kong Government would commit itself Electronic Road Pricing System as a pilot project to limit, private car ownership in Hong Kong. The experiment would test the technical, economic and administrative viability of ERP [6]. The objectives of the study were to examine the practicability of implementing an ERP system in Hong Kong and to assess the need for such a system to meet transport objectives [7].

Figure 1.1 shows the traffic volume of road traffics within central Tripoli is circled in purple.

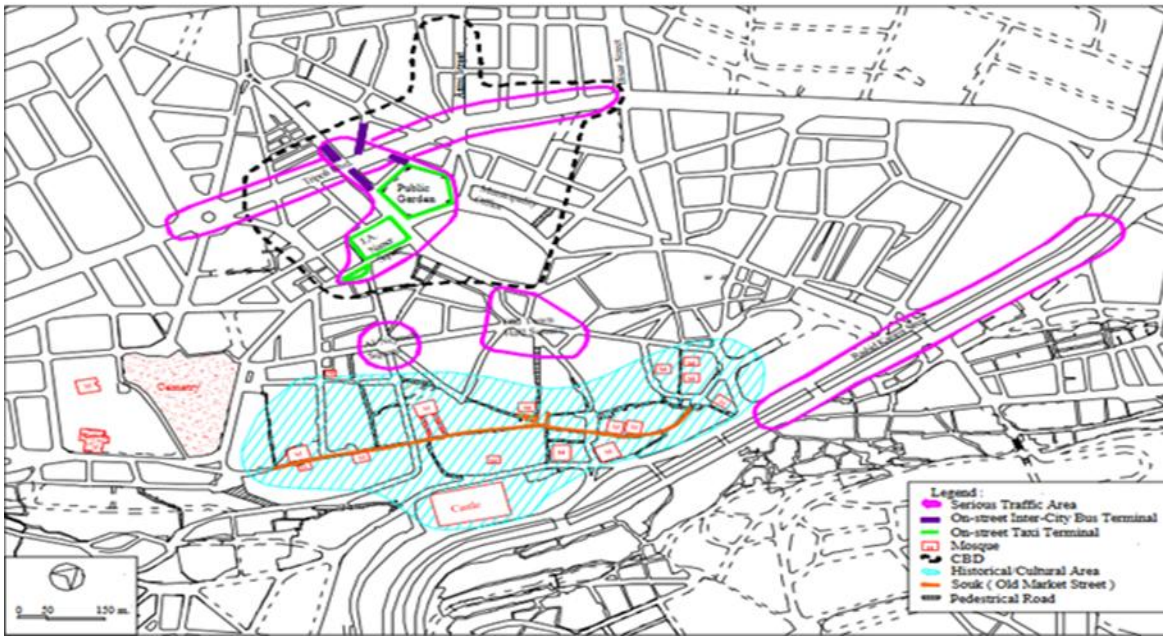

Figure 1.1: Traffic Volume Direction in Tripoli Central Area [13]

3. METHODOLOGY

To establish a feasibility for ERP's possibility in Tripoli Libya, being our primary objective, a survey is carried out, having reviewed required areas of ERP in some cities. This paper is based on the feasibility study in Tripoli Libya to see if ERP can be implemented therein. This requires more of customers' opinions, which will be retrieved via survey questionnaire.

A questionnaire will be designed using google forms to collect all primary data from road users; directly or indirectly, which constitutes the actual customers for the questionnaire administration. It will be directly for car owners and public drivers and indirectly for passengers travelling on public vehicles. The questionnaire, which will be administered to the appropriate customers, will be presented at the appendix later. This study aims at reaching minimum of 600 participants for this online survey, out of the population of Tripoli Libya. It will concern only residents of Libya, constituting citizens and those that have being in Tripoli and have witnessed the traffic situation of Tripoli. The questionnaire will investigate the demographics of the road users, experience on traffic situation and opinions on introducing ERP. Since the questionnaire is designed using google forms, it will be simply administered online to bridge distance barrier in reaching basic participants. A descriptive method of statistical analysis using SPSS will be used to analyze the response of the respondents, downloaded in spreadsheets.

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Subsequently, the primary data, which tells more of the experience and opinions of the road users, will be analyzed by tabulation and corresponding charts, granting us more insight into the research problem and granting us more confidence for the choice of research subject as required suggestion (s) is (are) being made. In the end, ERP zones will be proposed based on the Figure 1.1

4. RESULTS AND DISCUSSION

SPSS was used to analyzed the questionnaire and interview administered online and only state and country of origin and / or residence, need for traffic control and mainly if existing ERP is easier to be used and if it will help control traffic situation like it has being in Singapore and other cities of central business. Table 1.1 describes the origin of participants. It shows clearly that 99.1% were Libyans while the remaining 0.9% were citizens of other countries but resides and work in Libya hence necessary because Libya is the target country for this research work.

Table 1.1: What is your country of origin

Responses		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Libya	680	99.1	99.1	99.1
	Others	6	.9	.9	100.0
	Total	686	100.0	100.0	

Table 1.2 describes the state of residence of survey participants. It can be observed in the table that 84.4 % were from Tripoli Libya, which forms the highest participation in the survey. This answers the question "What is your state of residence". With this, the opinions of the respondents will be more reasonable since most of the participants are from Tripoli Libya, the target place for this research.

Table 1.2: What is your state of residence

Responses		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other States in Libya	107	15.6	15.6	15.6
	Tripoli Libya	579	84.4	84.4	100.0
	Total	686	100.0	100.0	

Traffic congestion in Tripoli was investigated by asking participants who are road users if Traffic congestion needs control. Table 1.3 shows that 89.8% strongly agree and 9.0% simply agree that the traffic situation in Tripoli needs control. These constitutes the highest participation and hence shows the situation would need control.

Table 1.3: Traffic congestion needs control

Responses		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agreed	62	9.0	9.0	9.0
	Disagreed	1	.1	.1	9.2
	Strongly agreed	612	89.2	89.2	98.4
	Strongly Agreed	4	.6	.6	99.0
	Strongly disagreed	7	1.0	1.0	100.0
	Total	686	100.0	100.0	

Figure 1.2 describes the fact that it will be easier to implement the ERP in use in other cities, who have used and are still using it. About 500 and over 100 participants strongly agree and agree respectively, out of 686 participants that ERP in use is easier to be used in Tripoli Libya. This constitutes the highest response in this online survey by questionnaire on this question.

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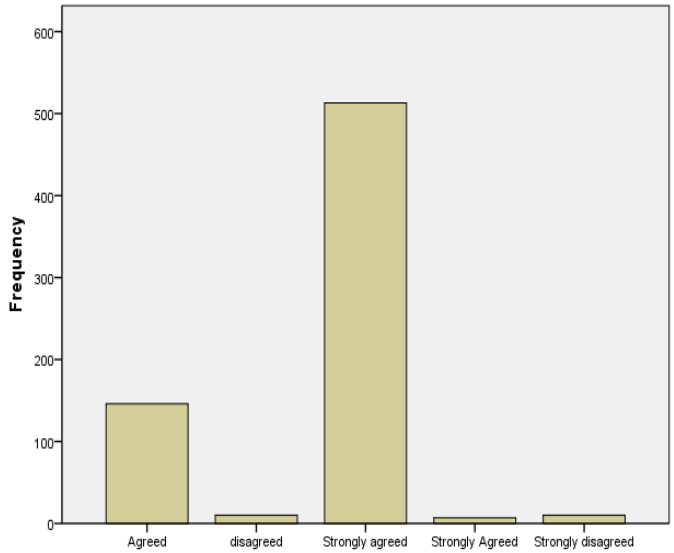

Figure 1.2: ERP being easier to use to Control Traffic

To ascertain if ERP scheme would be more effective in controlling the Traffic in Tripoli, the opinions of target customers, the participants are required. Figure 1.3 shows that over 500 participants Strongly agree and over 100 simply agree, all of which constitutes the highest participation. This shows a feasible possibility of introducing ERP in Tripoli Libya. The longest bar indicates that most people in strongly agree that ERP Scheme will be more effective in controlling road traffic congestion in Tripoli.

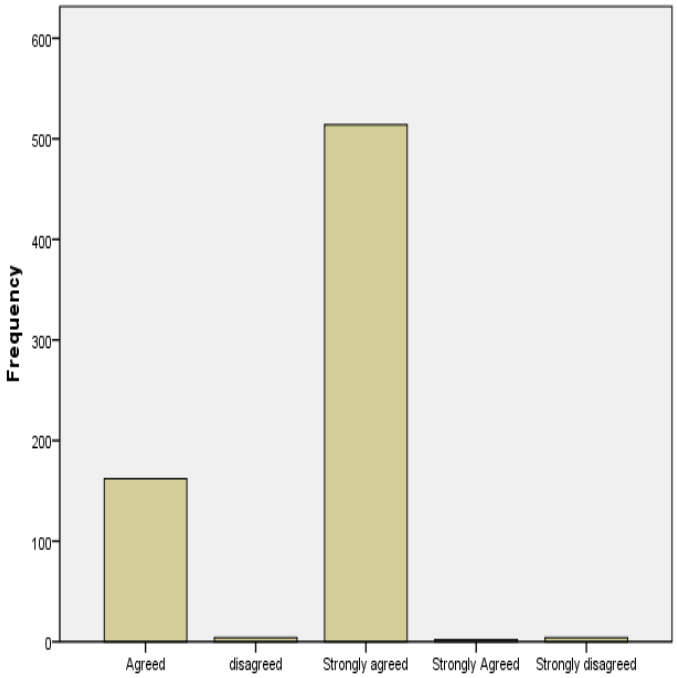

Figure 1.3: ERP Scheme being more Effective

The marked zones in Figure 1.4 are 10, which will be small ones in number without boundary tails and is based on Figure 1.1.

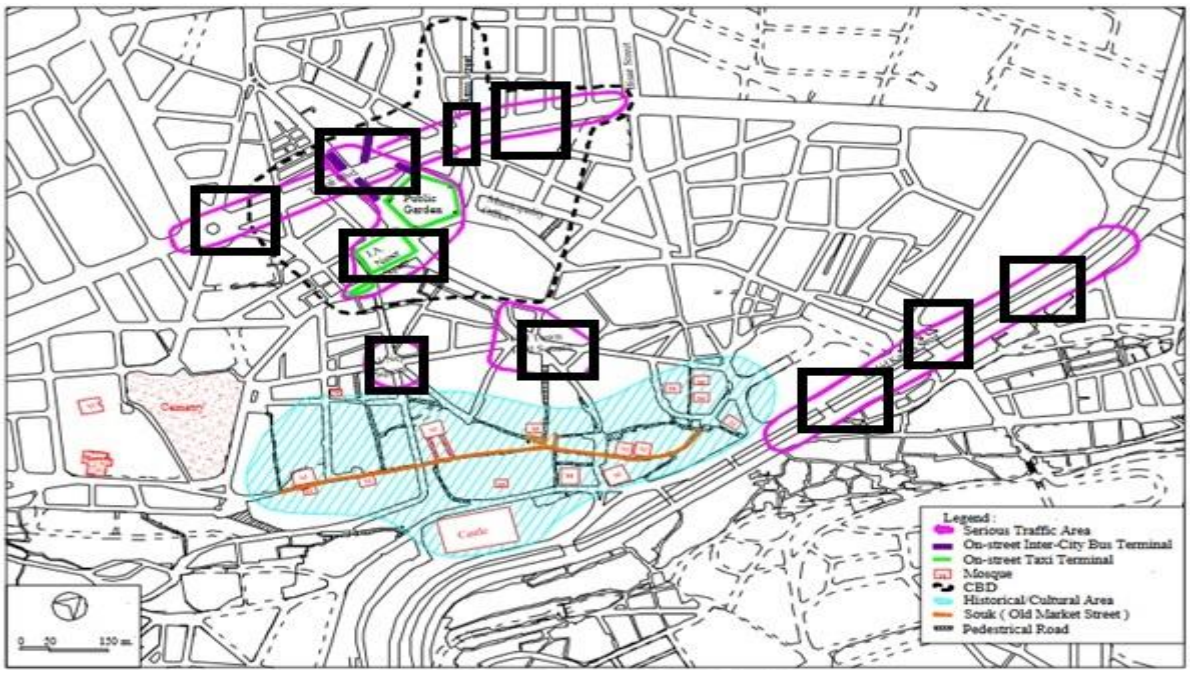

Figure 1.4: Marked ERP Points in Tripoli Libya

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5. CONCLUSIONS

Conclusively, for the fact that most of the target customers confessed that ERP is feasible for implementation in Tripoli Libya, it is therefore suggested for implementation as such.

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