Analysis of the Causes of Hybrid Cars' Rarity in Saudi Arabia. Medina as a Case study

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Abstract : *Hybrid car nowadays are spreading around the world in various forms. In terms of design, quality, prices, the dual engines and other feature. Basically, hybrid cars are cars that work on both fuel and electricity and they are very effective. This investigation will conduct an important key words such as awareness of the people, environment, renewable energy, economic issues, fuel consumption., prices. The methodology of this work includes two main items, the first is a questionnaire to the public and the second interviews with local cars dealerships mangers. The result analysis showed that many people in the Kingdom of Saudi Arabia think that hybrid cars should be in the open market with a verity of options such as the class of the cars and prices. In terms of environment 70% of the people think that hybrid cars are much better than gasoline cars for many reasons include environment. Also, 70% of people expect that there will be a trend to buy hybrid cars where vision of Saudi Arabia 2030 focused in alternative and safe energy resources.*

Keywords: *Hybrid Cars, Environment, 2030 Vision, Questionnaire*

I. INTRODUCTION

The Kingdom of Saudi Arabia is considered one of the most Middle East countries in the use of traditional cars, which depend on fuel as a source of energy, and the percentage of owners of cars among the citizens and residents forms one of the highest rates in the world. In view of the bad environmental impacts of burning fuel used by these vehicles and because of its economic impact, the Kingdom's 2030 vision came, and one of its most important priorities is to focus on new sources of energy, especially renewable energy, as well as to move towards the use of hybrid cars or cars that do not depend primarily on fossil fuels.

A hybrid car is one that uses more than one means of propulsion. At the moment, that means combining a normal petrol or diesel engine with an electric motor [1]. Hybrid cars have problems that may make people repel them and benefits that may attract people to own them. The problems that may make people repel owning a hybrid car are: higher initial cost, maintenance, safety, the low power, the poor interior space and the extra weight [2]. Usually hybrid cars have a higher initial cost than petrol cars (of the same class) . Maintenance is difficult because a lot of today's mechanics are not trained to repair hybrid cars. Also, the maintenance will cost more in terms of the dual engine and the complex system of power conversion. Safety is a critical challenge when it comes to hybrid cars. In case of an accident, the high voltage present inside the batteries can prove lethal for the passengers [3]. Also, in elevated temperature climate or over usual usage of the car, batteries temperature will increase which may cause an ignition. In comparison to petrol cars, hybrid cars have a lower acceleration and less maximum speed. The requirement of batteries and motors will decrease the interior space and will increase the weight of the car [4]. Although hybrid cars have problems, they have a lot of benefits that may make people prefer them and own them [5]. The benefits of a hybrid car are: the excellent rate of fuel consumption, the low noise, the low air pollution and the long time between maintenance periods. The rate of fuel consumption in hybrid cars is less than petrol cars because of the electrical motor that replace the gasoline engine in low speeds. Hybrid cars has less noise than any other car due to the gasoline engine isn't running all the time, and the motor is noiseless. Hybrid cars burn less gasoline, so it has nearly no air pollution. Gasoline engine doesn't work all the time due to the cooperation between it and the motor. So, that will reduce the usage of the gasoline engine which means less maintenance. as shown above, there is good advantages of owning a hybrid car.

Many researchers were conducted the hybrid cars benefits and rarity, [6] Pollet et al, 2012 conducted the current status of hybrid, battery and fuel cell electric vehicles from an electrochemical and market point of view the impact of these technologies on consumers.

[7] Satti and Kola, 2013, discussed the diffusion of Hybrid electric technology in vehicles the potential to reduce fossil fuel use in hybrid vehicles to decrease pollution. They also suggested many technologies like regenerative braking, electric motor drive to make them as good as conventional vehicles. [8] Yizao 2014. evaluated consumers' willingness to pay for hybrid vehicles by estimating the demand of hybrid vehicles in the U.S. market. The obtained results show that the households' willingness to pay for hybrids ranges from $963 to $1718 for different income groups when taking the fuel costs savings of

hybrid vehicles into consideration. [9] Rakan A. Alshaye,2015 carried out an economic study of the best alternative of environmentally hazardous sources of energy to demonstrate the importance of electric auto development in Saudi Arabia. they found that an increase of strategies and incentives toward renewable energy to replace fossil fuels and they concluded that adoption of electric auto development methods offers the best and low cost alternative petroleum-based auto development. [10] Khalid Alzahrani ,2017 applied the theory of Planned Behaviour to analyse more than 800 questionnaire responses to identify factors that might facilitate the behaviour change from adopting internal combustion engines to hybrid vehicles. The reported results show that attitude, subjective norm and perceived behavioural control are all significant in explaining the intention to adopt hybrid vehicles.

[11] Mancini 2017 presented the hybrid vehicle routing problem which is an extension of the classical vehicle routing problem in which vehicles can work both electrically and with traditional fuel. [12] Ahmed Al-Samari, 2017 found that the electric vehicles increasing rapidly in the automobile markets. The software Autonomie used to simulate the parallel hybrid vehicles. The results show that the fuel economy can be improved to 68% on real-world driving cycle. [13] Hamamoto 2019 suggested the main factors influencing consumers' choices concerning the purchase of hybrid electric vehicles . They suggested that the consumers who are more interested to fuel economy may be inclined to choose hybrid vehicles

[14] Janardan etal, 2091. discussed the scope and opportunities of electric vehicles in India. They studied the various case studies from around the world on adopting electric vehicles and reported how India could implement the benefits from these studies at the national and local levels.

From these previous studies in can be concluded there is previous work conducted the potential of utilizing the hybrid vehicles in Medina city in Saudi Arabia which is the motivation for this work. Therefore, the main objectives of this work is to investigate the availability of hybrid cars in the Saudi market especially in Medina city, investigate the People's Awareness of hybrid cars benefits, comparing hybrid cars with petrol cars in terms of many specifications and to analyse the causes of repelling hybrid cars by people

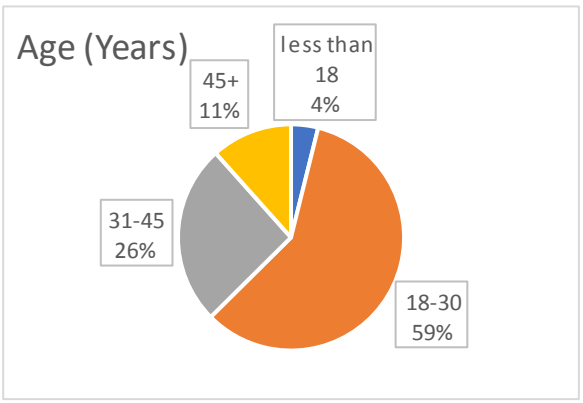
II. METHODOLOGY

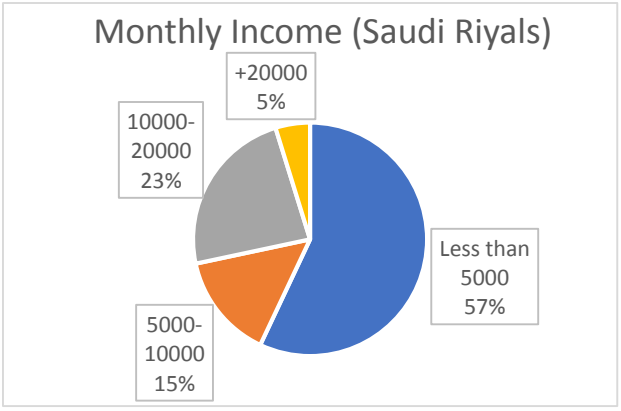
Two kinds of methods will be applied in this study to Analyse the problem of hybrid cars' rarity in Saudi Arabia. Firstly, a questionnaire to the public. It will include general personal questions and specific questions about hybrid cars and how much they know about them. The questionnaire must be submitted from all segments of society to have a full picture of the problem. Secondly, interviews with local cars dealerships mangers in Saudi Arabia. The interviews will be conducted to know about hybrid cars' sales number in comparison to petrol cars from the same class. Also, dealerships mangers will be asked about the causes of this problem and how they are trying to overcome it. Finally, a discussion and Analysis of the results will be carried out.

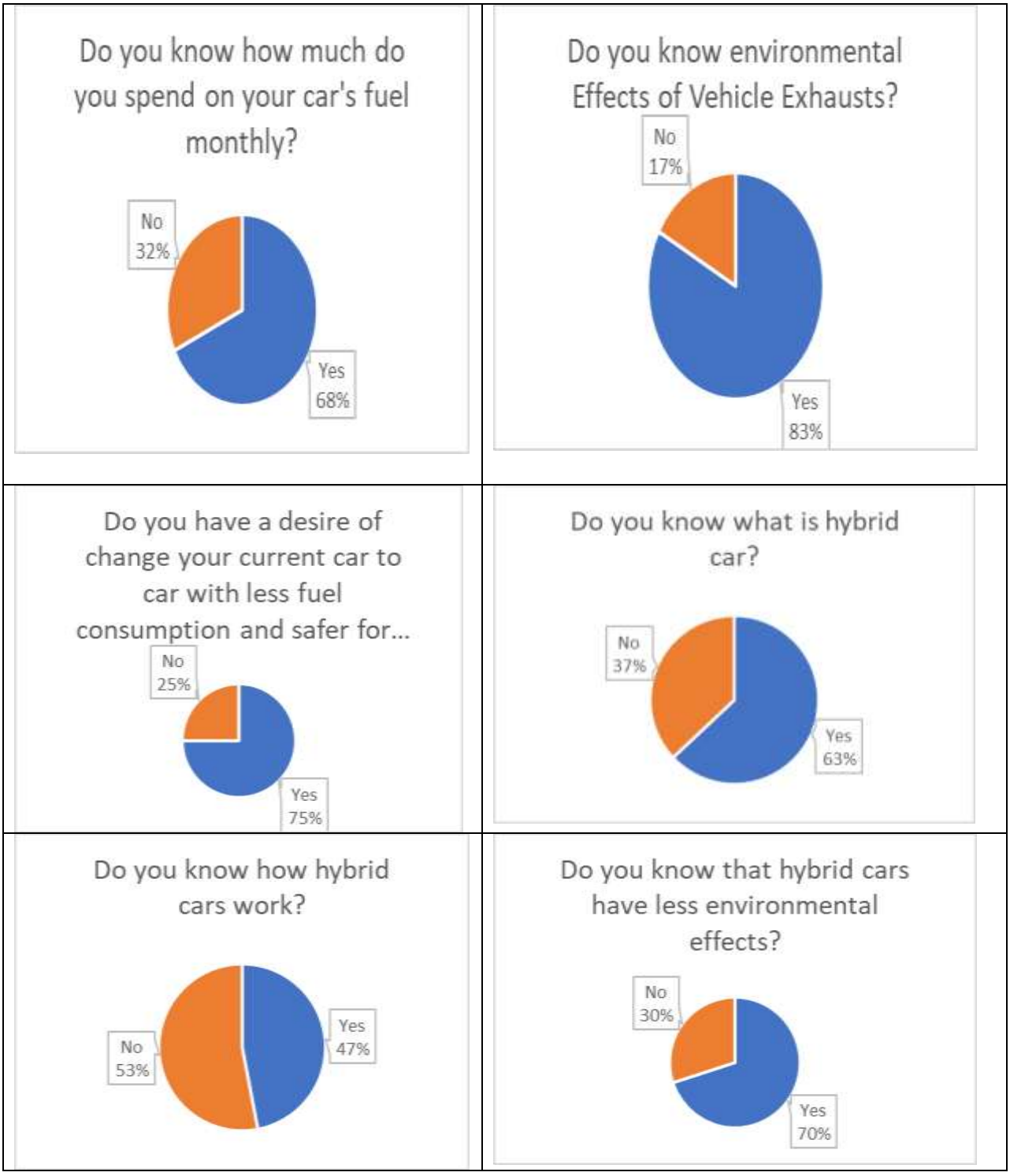
III. RESULTS

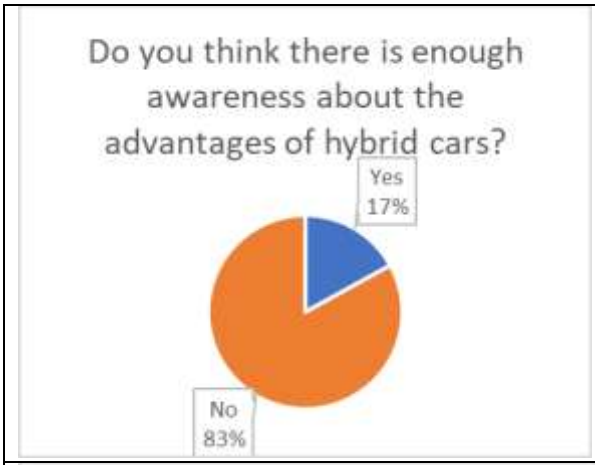
There was a 314 response to the questionnaire (100% males, 50% are university students 40% employees 10% others).

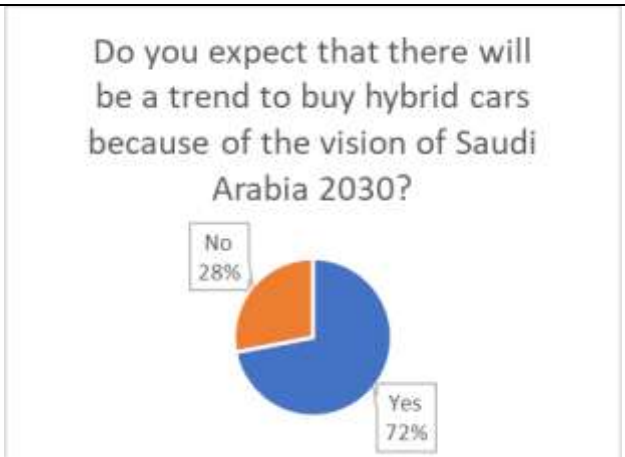
Figure1: The questionnaire statements and the responses for each statement

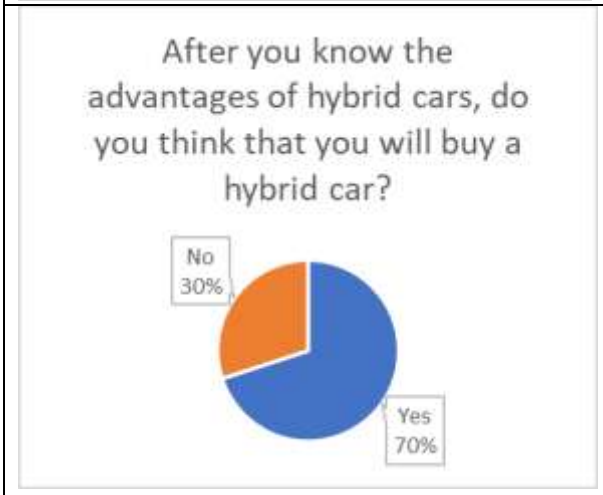


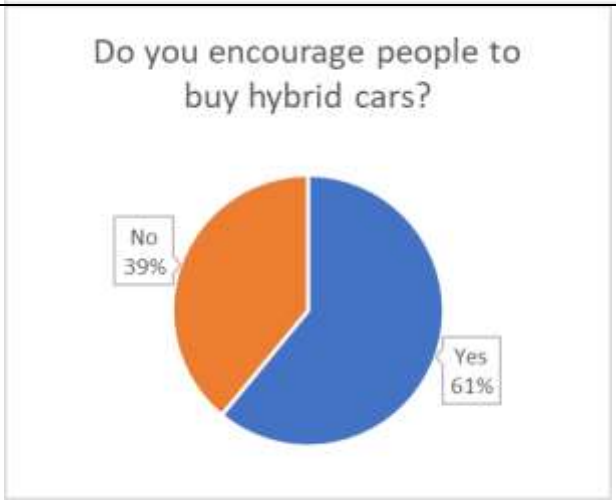


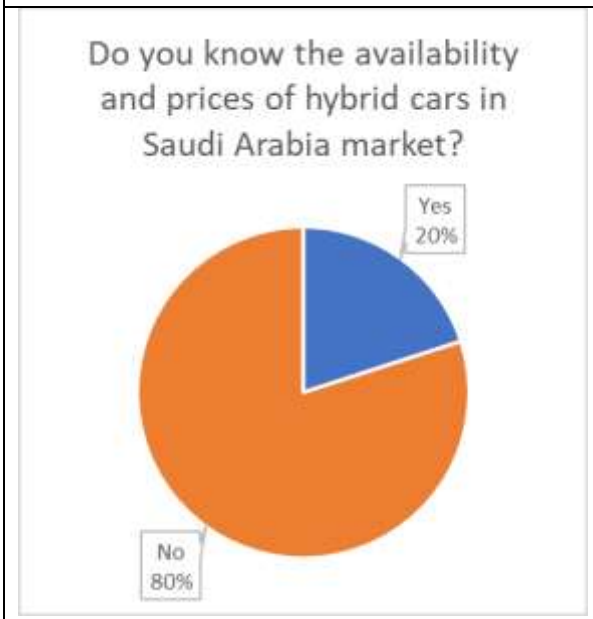

Do you know how much do you spend on your car's fuel monthly?
No 32%
Yes 68%
Do you know environmental Effects of Vehicle Exhausts?
No 17%
Yes 83%
Do you have a desire of change your current car to car with less fuel consumption and safer for...
No 25%
Yes 75%
Do you know what is hybrid car?
No 37%
Yes 63%
Do you know how hybrid cars work?
No 53%
Yes 47%
Do you know that hybrid cars have less environmental effects?
No 30%
Yes 70%

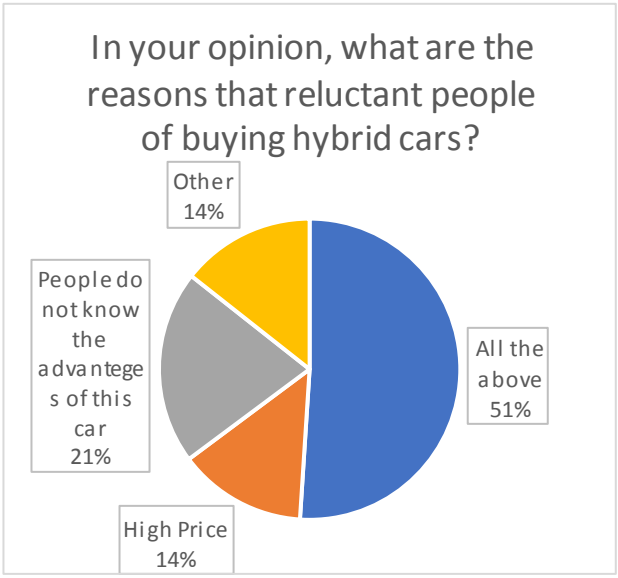

Do you think there is enough awareness about the advantages of hybrid cars?
Yes 17%
No 83%

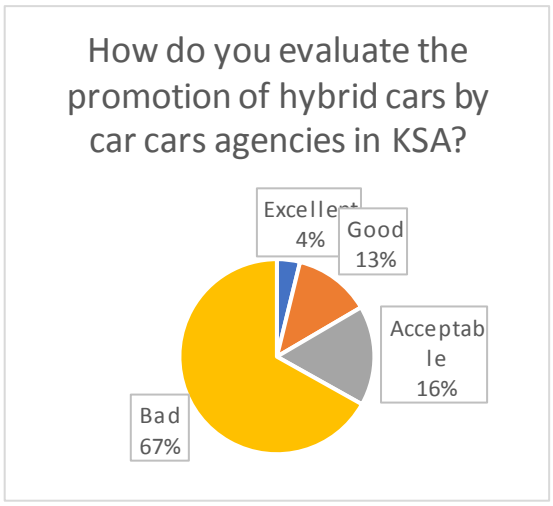

Do you expect that there will be a trend to buy hybrid cars because of the vision of Saudi Arabia 2030?
No 28%
Yes 72%

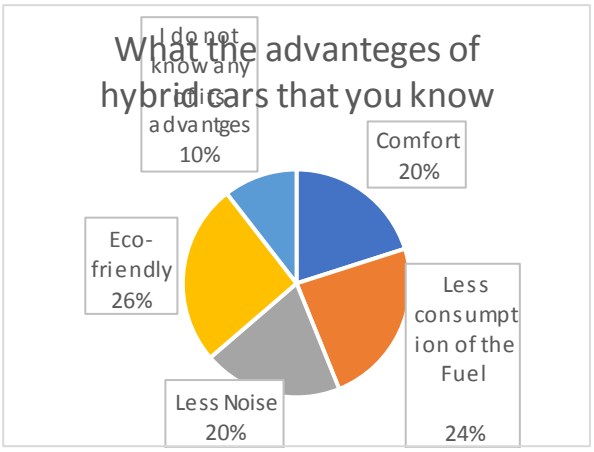

After you know the advantages of hybrid cars, do you think that you will buy a hybrid car?
No 30%
Yes 70%


Do you encourage people to buy hybrid cars?
No 39%
Yes 61%


Do you know the availability and prices of hybrid cars in Saudi Arabia market?
Yes 20%
No 80%


In your opinion, what are the reasons that reluctant people of buying hybrid cars?
Other 14%
People do not know the advantages of this car 21%
All the above 51%
High Price 14%





It can be seen that the young people whose ages between 18 to 30 years are the most effective and interested with this issue as well as the low income group. Most of the people have a wariness about a bout the impacts of hybrid cars on the environment but they did not know the working principles of these cars.

An interview was conducted with Mr. Osama Kotbi, Director of Abdul Latif Jameel Branch in Al-Madinah Al-Munawwarah (official agent of Toyota and Lexus cars in Saudi Arabia). He was asked some questions relative to finding solution to the problem of the hybrid cars' rarity in Saudi Arabia. He acknowledged that after

rising the cost of gasoline, people will have interested with hybrid cars and will buy it, but the important point is that it will be available in various types. In 2018, hybrid cars will be issued some new car types such as Camry. Moreover, you can test the car and see how to spend for gasoline and how much it will cost.

Despite the rapid marketing of the hybrid vehicles in the world, their usage and contributions to environmental protection in Saudi Arabia have not been evaluated by the owners or the distributors. Therefore, a lot of work must be done to explain to the owners the advantages of these cars and how it works and what's the difference between these cars and the conventional cars worked on the internal combustion engines principles.

IV. CONCLUSION AND RECOMMENDATIONS

In conclusion, we see that most people know about hybrid cars generally but they do not know "How it works", "what the differences between hybrid cars and others", "what is the advantages and disadvantages" and more. In my opinion, I think the cars companies did not give a good or enough information about hybrid cars like "How it works", "Is it convenient" and that give us a bad effect from the companies. Addition, the companies may lose a huge earnings from producing these cars. However, from our interview we have seen that the cars companies are working on the problem and they will have a good appearance in 2018. According to result and the interview with Mr. Osama Kotbi, the feasible solution to the problem of the hybrid cars' rarity in Saudi Arabia is to define or educate more people on hybrid cars, reduce the price of the hybrid cars and have more types of hybrid cars.

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