

Meeting Halfway

Is Driverless-cars the Solution to Saudi Women Driving Ban?

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Abstract—Driverless-car is a technology from the future that seems to be a reality sooner than expected. All countries around the world are assessing their readiness to adopt the change. For many, it is a technology that promises safer roads and better environment, and a huge economical shift. For Saudi women, this technology might be the solution to a social dilemma that prevents women from driving themselves. This paper explores Saudi Arabia's readiness for Driverless-cars by highlighting the unique women driving ban situation. More research needs to be conducted to arrive to conclusions regarding how Saudi's will receive Driverless-cars.

Keywords—Driverless-cars; social computing; technology readiness; autonomous cars

I. INTRODUCTION

There are many terms that are used interchangeably to refer to Driverless-cars including self-driving, autonomous, or robotics. It has been a science fiction fantasy that was portrayed in the media. Recently, major car manufacturers announced their plans to make Driverless-cars available on the road. The announcement has stirred world-wide debate exploring the various areas that are expected to be affected. The scale of the introduction of the new technology is expected to revolutionize many areas including: transportation, legal, economical and in some places, social.

The choice of the "Driverless" term from the list above was intentional in this paper since it directly serves the problem at hand. Saudi women are the only women in the world who are not allowed to drive. The main problem is **who should be behind the steering wheel?** The answer cannot be concluded up to this minute because of the fierce debate that is still going on between those who want to allow the women to take the wheel and others who want only men to do so. This research is trying to demonstrate how Driverless-cars maybe the correct answer.

The research starts by giving a brief background about the Saudi women driving ban, it moves to introducing Driverless-cars and the main concerns associated with them. The second part of the research presents Saudi Arabia readiness for Driverless-cars from vehicle and human related matters and concludes by showing how Driverless-cars can be a solution to Saudi women driving ban.

II. BACKGROUND

A. Saudi-Women Driving Ban

The issue of Saudi Women being banned from driving has been a media frenzy for the last couple of years. A story that came back into the attention of the international community after various forms of protests were reported [1]. While there are no laws that actually ban women from driving, activist regard it to social pressure. It is commonly known that women are not allowed to issue a Saudi driver's license despite the fact that there are no laws to prohibit this [2].

The debate between those who are with and against is focused on the social norms and religious values. For those who are against allowing women to drive, commuting in a vehicle for women is not acceptable and is demeaning for the women reputation. The ability to operate motorized vehicles is even considered masculine and not in favor for women nature. This view is not imposed by men alone, many women are actually afraid to lose the comfort of being driven around [3]. These women have the choice of hiring a private driver or being driven around by male relatives.

For the counterpart, the driving ban is not only limiting their ability to move from one place to another, it is also presenting a heavy financial burden that is eating up a big percentage of their monthly income [4].

Between the two parties, the Saudi officials remain silent. One of the straight-forward answers to the matter was presented by the late King Abdullah in 2005 during an interview with American TV presenter, Barbra Walters. The King stated back then that he is a strong believer in women's rights and the driving issue needs time and patience [5].

During the last decade women visibility has increased widely in Saudi Arabia. It became socially acceptable for women to play more public roles including taking part in Shura Council [1]. This change pushed to more debate about the driving ban deeming it as necessity not luxury. Many arguments were presented from both sides, one of the main focuses of those who are pushing to allow women to drive is the fact that women are currently driven by a foreigner driver (non-relative males) which is against the Islamic laws which forbids women from being alone with men whom she can marry. They think that being allowed to drive alone is more religious than being driven around by the hired male driver. This argument was counter-attacked by the fact that women are not encouraged to leave their homes without a male

relative. These views proved to be unrealistic given that many families are increasingly depending on women. With legislations such as the “feminization” of Saudi employment in retail shops, women are becoming more employable than men in some professions [1].

B. Driverless-cars

According to Brookings Institution, there is no definition for Driverless-car. The term is self-explanatory and it refers to the fact that these cars have some level of automation [6]. There are many levels of automation in vehicles in general, ranging from level-1 to level-5. Where level-1 cars provide automation in specific sets of functionality and gives the driver full responsibility while level-5 cars promise a full self-driving automation without any responsibility on the driver's side [7].

The focus of this paper is on level-5 which is defined as “Full Self-Driving Automation: Vehicles can System performs all driving functions on all normal road types, speed ranges and environmental conditions” [8]. These cars are by definition, computer-controlled which promises increasing safety, better environment, and less number of vehicles on the road in general.

Driverless-cars are considered as an example of an Internet of Things application [9]. They require a huge amount of data to be collected through various types of sensors. This data undergoes analysis that is communicated through the Clouds of traffic and navigation systems. There is a list of technologies that works together to achieve the desired full-automation of Driverless-cars. Such as [10]:

- **Self-Steering:** Driverless-cars are equipped by number of cameras that watch the road and collect data in order to allow the car to make steering decisions. Cameras interact with road marks and laser sensors.
- **LIDAR:** This technology relies on Optical sensing to measure distances.
- **GPS:** Using Satellite data, this system allows for navigation to destinations.
- **DGPS:** An enhancement to GPS that improves accuracy to up to 10 m.
- **Digital Maps:** A process where data collected is used to create images.

C. Concerns with Driverless-cars

Driverless-cars are expected to impose wide changes. Many researchers have explored the various concerns that might be affected with the introduction of the new technology. In a report by ARRB Group in Australia, the following areas have been identified as structure to assess readiness [11]:

- **Road environment:** This area includes the road network that the cars are supposed to operate on, traffic management and infrastructure design.
- **Vehicle issues:** These issues are connected to the car itself and how it will look, operate and be secured amongst various other issues.

- **Human issues:** These include matters that relate to licensing, training of operators of the vehicle and legislations.

Other research have explored readiness for Driverless-cars from the perspective of people opinions such as in [12]. Others provided an analysis based on benefits and concerns such as in [8].

II. READINESS FOR DRIVERLESS-CARS IN SAUDI ARABIA

All countries around the world are assessing their readiness for the new technology that is changing how we commute. The Saudi case is not different in terms of changes that may need to be reflected to support Driverless-cars. In investigating readiness of Saudi Arabia to Driverless-cars, the same method followed by [11] will be used for guidance. Fig. 1 shows the areas covered by readiness assessment. In terms of road environment and infrastructure, there is an immediate need for evaluation. Roads need to be supported with the technologies that provide full automation. Internet services and GPS data which facilitate how Driverless-cars operate must be accurate and up to date. However, the Vehicle and the Human issues are going to be the main focus here due to their relevance to the women driving ban.

A. Vehicles Issues

In the ARRB report, various issues in connection to the vehicle have been explored. The following are selected in order to serve the research problem; others were removed due to either irrelevance to the subject at hand or to Saudi Arabia:

- **Terminology:** Many terms exist to refer to Driverless-cars, this one was chosen because it signifies and highlights how they are considered a solution to the current problem of women driving ban.
- **What will Driverless-cars look like?** The current view of things shows that little will change regarding how Driverless-cars are designed. In the Saudi context, more coverage of what is inside the car is required if the car is used by women. Given the autonomous property of these cars, that should not be an issue. In fact, women will be able to wear their veils while in the car which is one of the hurdles that stands in the way of allowing them to drive. Veil or Niqab is regarded as a social and religious necessity. Conversely, it may be limiting to the range of vision when driving normal cars.
- **Who will own Driverless-cars?** It is expected that private ownership of vehicles to drop around the world. However, in the case of Saudi Arabia, one of the richest countries in the World, where the GDP per capita is one of the highest.¹ It is normal for families in Saudi Arabia to own multiple private cars of expensive brands [13]. As for the lower classes, predications provided that Driverless-cars can be owned by commercial organizations/private sector entities that provide the service to the public. The existing services such as Uber and the regional competitor, Careem can

¹ <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

be considered as candidate owners to Driverless-cars in Saudi Arabia.

- **In-vehicle safety systems:** With a country where car accidents are considered an alarming problem, car safety is crucial. In 2013, WHO reported that almost half a million car accident took place with 24.6% of the resulting in death [13]. 57% of these accidents involve female teachers who travel from their residences to schools in rural areas.² Driverless-cars come with a promise of low accident rate. It is crucial that manufacturers need to focus on this aspect and install high confidence in the public eye.



Fig. 1. Readiness for Driverless-cars [11].

- **Security of vehicle controls and data privacy:** There are cultural differences in data collection. Data privacy acts are different from one country to another. Since Driverless-cars collect huge amount of data, it is required that these regulations are reviewed to ensure data protection. One of the concerns with data is that it can be hacked and used maliciously. Sensitive personal data needs to be handled with care to prevent any harm that may result from data.

B. Human Issues

The human related matter maybe the most important with relevance to the problem at hand. These include:

- **Legal liability:** According to level-5 Driverless-cars, there will be some level of human input needed in case of emergency. This will act as backup in the incident where action is required to overcome an accident. Hence, placing some level of legal liability on the person in the car instead of passing it completely to the car.
- **Driver training:** It is not clear yet if there will be training required before allowing human operation of the car. This might have some connection to the

previous point as it might be required to have some training in order to allow intervention in case of emergency.

- **Driver licensing:** This issue is still unclear as well since licensing proves driver's ability and legal liability. However, by definition, the amount of skill needed to operate the car is expected to be minimal compared to regular cars.

It is quite clear that there is a social aspect that is linked to the Saudi women driving ban. Exploring readiness that was provided in this paper does not reveal the level of social acceptance for this new technology. A more appropriate method would be using a survey that questions public opinion. The only study that investigated public opinion with regards to Driverless-cars was conducted in 2016 and published in a newspaper article [14]. It targeted main safety concerns that were common in all other similar surveys. The study did not cover the women driving ban or possible changes in regulations. The study also found that the second biggest concern was cyber-security and fear of hacking.

Another account in the matter was presented in [15]. A pessimistic review of the problem that believes that to lift the ban, social reform needs to take place. The writer doubted that Driverless-cars would bring change to Saudi women. However, she does not deny that the technology will resolve a huge portion of the problem once arriving. That can be read along with Uber announcement that 80% of their Saudi clients are females.

III. CONCLUSION AND FUTURE WORK

Driverless-cars have the potential to increase the mobility in situations where people are not able to manage their own transportation. Either because of laws that are preventing them from doing so, such as senior citizens or women in the case of Saudi Arabia or because of disability that is not allowing them to operate a regular vehicle. In both ways, Driverless-cars present an easy solution because of the inherited automation promised by this technology.

For Saudi women, Driverless-cars are considered a solution to both who are for and against lifting women driving ban. For those who oppose allowing women to drive, women will simply be not driving. They are being driven around by no one. On the other side, Driverless-cars are still providing the mobility they need without having to be driven around by any one.

Women would require minimal training in order to be able to act in case of emergency. Private data, such as name and picture needs to be handled with care. For increased assurance, family members will be able to monitor the female since the vehicle keeps sending data.

The main concern for families in this case would be cyber-security and the possibility of having the car hacked with malicious intent. Otherwise, it seems that Driverless-cars as a middle-ground solution that would put the women driving problem to rest. **It simply says, "no one needs to hold the steering wheel!"**

² <http://www.arabnews.com/news/527906>

Future work will include exploring public opinion in Saudi Arabia about Driverless-cars with emphasis on women driving ban.

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