

## ORIGINAL ARTICLE

# MALAYSIAN DRIVERS' PERCEPTION TOWARDS ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS)

Muhammad Syafiq SYED MOHAMED<sup>1</sup>

<sup>1</sup>*Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka (UTeM) , 76100 Durian Tunggal, Melaka, Malaysia.*

## ABSTRACT

In the past few years many advanced driver assistance systems (ADAS) has made their way into common passenger cars. ADAS such as autonomous emergency braking (AEB), blind spot information system (BLIS), and many more has slowly made their way into passenger cars in Malaysia. Examples of cars in Malaysia equipped with some ADAS technology include the 2016 Mazda 3, Hyundai Ioniq Hybrid, and the recently introduced Honda CR-V. Even though ADAS has been around in passenger cars as early as late 1990's, ADAS has only been widely introduced into passenger cars in the last few years. In this study, a content analysis of Malaysian automotive online portal was conducted to determine the overall perception of Malaysian drivers towards ADAS. As many as 277 comments related to ADAS were obtained from the Malaysian automotive online portal. Only 63 comments were related to the perception of ADAS. The comments were divided further into 27 positive comments and 36 negative comments. Due to the attitude of Malaysian drivers, as well as their driving style, ADAS technology was perceived to be more of a nuisance rather than of assistance. Two famous Malaysian driving habits, e.g. the cutting of lanes and tailgating were discussed together with the related ADAS (Lane Departure Warning, Adaptive Cruise Control and Autonomous Emergency Braking). Future implications of ADAS in Malaysia were also discussed.

**Keywords:** *Advanced Driver Assistance Systems, ADAS, Malaysian drivers, perception*

## INTRODUCTION

Malaysia has witnessed a rapid growth in passenger car sales from the last ten years (Malaysia Automotive Association, 2017). Ever since the introduction of the Malaysian Institute of Road Safety Research (MIROS) in 2007, vehicle safety is taken very seriously by car manufacturers in Malaysia. High end safety features that used to be only available in luxury cars in Malaysia such as antilock brakes, airbags, electronic brake distribution and traction control are some of the standard safety features offered in normal B segment cars in Malaysia, such as the Proton Persona, Toyota Vios and Honda City. Safety conscious Malaysian drivers have indirectly forced the Malaysian automotive industry to offer those safety features in cars. On top of the safety features offered by car manufacturers, Malaysian drivers may also be looking forward for technologies that can make driving easier and less stressful, which are called Advanced Driver Assistance Systems (ADAS). Examples of ADAS are; radar cruise control, automated emergency braking, blind spot monitoring system, lane assist, and many more. Despite the fact that ADAS is intended to assist drivers, not all drivers will readily welcome the addition of new technologies such as ADAS in their cars. Such addition of new technologies can increase the anxiety levels of drivers. This was noted by Osswald et al. (2012), as drivers have high levels of anxiety towards ADAS. High levels of anxiety may become a hindrance

towards a smooth adoption of ADAS among drivers. ADAS is expected to experience high levels of growth (Duan and Chen, 2011; Karlquist 2017) in line with the desire of relevant authoritative bodies to increase the levels of road safety.

## BACKGROUND

Advanced Driver Assistance Systems (ADAS) has been around since 1990s. ADAS aims to assist drivers while driving by warning the drivers of impending collisions, informing drivers about blind spots, initiating emergency braking and many other functions designed to make driving safer and increase levels of road safety. The main impetus for the development of ADAS came from increasing accident statistics involving vehicles worldwide. Automotive manufacturers and relevant road authorities are increasingly concerned with the rising levels of accident statistics worldwide, and are continually working towards finding solutions to the problem. One of the many possible ways is the introduction of ADAS in vehicles for drivers.

ADAS system intends to help drivers in preventing errors while driving, and warn drivers of any impending mistakes while driving as well as provide partial assistance during driving (Smith et al., 2008). Despite the fact that ADAS has been around for some time, only a very few vehicles in Malaysia are actually equipped with some ADAS. Those vehicles are usually luxury brands such as Volvo, Mercedes and BMW. As stated by Planing and Britzelmaier (2012), the latest innovations in automotive

tends to take a long time to cascade down from luxury vehicles to the mass market vehicles. In fact, in Malaysia one ADAS technology such as the blind spot information system (BLIS) for example only appeared in the Malaysian market Volvo V50 in year 2010, even though BLIS was offered in the overseas market Volvo V50 since?. In 2010 no other car makers in Malaysia offered ADAS except for Volvo. Another example can be found for the Mercedes Benz W220 (year 1999 until 2005), the S-class. The Mercedes Benz W220 is equipped with an adaptive cruise control system which is called Distronic in overseas market, but the feature is absent from the Malaysian market Mercedes Benz W220. The slow introduction of ADAS in the Malaysian market vehicles seems to indicate that ADAS technology is not known to most Malaysian drivers, hence the lack of demand for ADAS. Similarly, the diffusion of ADAS technologies among drivers in European market for example has been very slow as well (Planing and Britzelmaier, 2012).

The introduction of ADAS in vehicles is not without any issues. ADAS is perceived by many drivers to be the latest technology for cars. Acceptance levels of ADAS among drivers remain to be mixed, some drivers prefer the usage of ADAS and some are highly against the usage of ADAS. According to research (Davis, 1989; Simon, 2005; Venkatesh et al., 2003) there are several factors that influences technology acceptance for new technology utility, ease of use and systems usage as well as learnability. Drivers who have yet to experience the usage of any ADAS are typically sceptical on ADAS trying to interfere with their driving (Stave and Strand, 2015). Therefore the subject of technology acceptance among drivers for ADAS is a highly relevant issue particularly among Malaysian drivers, especially now that ADAS is slowly making their way to common market brands in Malaysia such as the Hyundai Ioniq, Peugeot 308 and Mazda 6 for example.

It was acknowledged in the previous literature by Osswald et al. (2012), Venkatesh et al. (2003) and Davis (1989) that the adoption and usage of a new technology depends on the perceived usefulness and perceived ease of use. Users will be more than likely to adopt and use a particular technology if it was believed that by using the technology will help in their task performance. In the context of Malaysian drivers, it is unclear as to whether ADAS brings about the perceived ease of use and perceived usefulness when ADAS is being used. Safety is a major concern while driving as shown by Cades et al. (2017) and Mohamed et al. (2015, 2016). This may be the reason why some drivers may be apprehensive towards new technology such ADAS in cars. Since ADAS is relatively unknown in Malaysia, studies concerning the effects of

ADAS on Malaysian driving behaviour are non-existent. Therefore the main aim of this study is to explore the Malaysian drivers' perspectives on the subject of ADAS technology in cars.

## METHODS

A qualitative approach was utilized in this study since ADAS is relatively new among Malaysian drivers. The issue of ADAS acceptance is largely unexplored, therefore the qualitative approach works best for this study. According to Krueger and Casey (2009), qualitative approach is very suitable for research issues that are unexplored, and the main aim is to uncover a wide variety of feelings and experiences as well as motives. A major benefit using qualitative approach is that the ability to understand or explore novel perspectives of the issue being studied, without the constraints from questionnaires or surveys. The researcher has to delve very deep into the participant's thinking to achieve a sound understanding of the issue being studied.

Online user reviews and comments from online forums can provide a great deal of information concerning the attitude of Malaysian drivers towards ADAS. Users in online forums are typically very frank and honest about their feedback, since they are not constrained by the face to face interaction limitations. With the growth of online media in the past ten years, many users have resorted to giving their comments and feedback online for newly launched consumer products. Online media is also the main source of information for prospective users of new products in the market. Prospective users depend on the feedback given by others when making decisions to purchase a product or a service. Comments and feedback from online media becomes the tentative indicator for purchasing decisions. Prospective users would want to know about the experiences from actual users of those new products before buying them, in order to avoid potential disappointments. Ever since the rapid growth of Internet in Malaysia in the late 1990's, online communities have mushroomed to significant proportions. Online portals such as Paultan.org and Lowyat.net have hundreds of users frequenting the portals on a daily basis. Most of the online users of these portals are in the age range of approximately between 15 to 50 years old, and most of them are technologically savvy. Any new products that are introduced in the Malaysian market will be discussed upon extensively, and this is the reason why the authors of this study have chosen to perform content analysis of the online reviews and comments coming from the two biggest online portals in Malaysia, i.e. Lowyat.net and Paultan.org.

Content analysis of online user comments provides an excellent resource for capturing the Malaysian drivers' perception of ADAS. Content analysis, according to Stone, Dunphy, Smith & Ogilvie (1966) is a research technique that involves systematic and objective analysis of certain patterns within text. Content analysis is widely used for analysing the current trends of user behaviour. According to Macnamara (2005) the technique of content analysis has been applied to study textual literature that can be found in a variety of settings such as movies, editorial and advertising content and TV programs as well as interview transcripts. Other research techniques such as interviews and focus group discussions can be influenced by the bias coming from the interviewers themselves (Chenail, 2011). Focus group discussions also may be influenced by ideas coming from dominant participants in the group, resulting in a forced agreement from other participants in the group. This can be particularly true among collectivist cultures, especially Malaysian culture where collectivism spirit is generally high (Schermerhorn & Harris, 1997). Therefore, the content analysis technique was used in this study, where online users are free to voice out any opinion on any issue without having to succumb to the majority opinion coming from a group discussion setting.

Currently in Malaysia only a few car models are equipped with some ADAS technologies. Examples are Ford Mondeo, Hyundai Ioniq, Volvo S60, Honda Accord 2.4 (Lane Watch Feature), Mazda 6 and Peugeot 308. Since many Malaysians are not very familiar with the ADAS technology, all the related articles and postings which contained user comments related to ADAS were collected from Paultan.org. Paultan.org is one of the most popular automotive enthusiast portals in Malaysia, therefore it was selected for this study. The online portal provided the researcher with a sizable number of comments to be analysed. Each one of the comments analysed was classified into positive or negatively oriented comments. Each positive and negative comment was further analysed, and summarized into relevant discussion topics as described below.

## RESULTS

A total of 277 user comments were obtained from the automotive online portals concerning ADAS. From the 277 comments, only 63 comments reflected on the attitude of Malaysian drivers concerning ADAS. Those 63 comments were divided further into 36 negative comments and 27 positive comments concerning ADAS. The results of the analysis of the comments revealed several issues

concerning the usage of ADAS in Malaysia. Certain ADAS features were found to be more of an annoyance for Malaysian drivers instead of helping them in their daily driving. This is due to the fact that Malaysian driving habits are incongruent with the functions offered by ADAS, which is to ensure safety while driving. The Malaysian driving habits and their issues with certain ADAS features are discussed below.

### Malaysian Driving Habits: Cutting across lanes and Lane Departure Warning (LDW)

Lane Departure Warning (LDW) is an ADAS feature that helps drivers to maintain a lateral control of the vehicle while driving. According to Headley (2005), failure to maintain lateral control resulted in about 55 percent of vehicular crashes in USA. LDW helps drivers to maintain lateral control of the vehicle via a visual and audible alarm, if the driver unintentionally fails to maintain control. However the LDW feature may irritate drivers who intentionally switch lanes indiscriminately. Malaysian drivers are especially prone to this habit of cutting into other lanes while driving, in order to avoid having to queue behind a long line of cars in traffic congestion. This behaviour is reportedly to be annoying to other drivers having to wait and queue in a traffic jam. Cutting across lanes is very common during congestion, as stated by Shinar and Compton (2004). This is due to the fact that most drivers are under the time pressure to get to their destination, especially during rush hours. Coupled with a lot of cars on the road having the same motivation, the problem of lane cutting during congestion and rush hour traffic is compounded. Maintaining lane while driving is a crucial task for drivers, but apparently the motivation to keep a straight lane while driving changes according to the situation as shown by the behavior of Malaysian drivers. Frequent cutting of lanes will result in the frequent alarms given off by the Lane Departure Warning system to the drivers, and drivers may be annoyed by the alarms given off by the LDW. Car manufacturers such as Volvo have developed technologies to assist drivers in maintaining lane while driving, but according to one car review by a Malaysian motoring journalist, the Lane Departure Warning feature on a 2012 Volvo S80 was perceived to be more of annoyances since Malaysians have a tendency to cut across lanes indiscriminately (Kamaludin, 2012). The comment by the Malaysian motoring journalist, plus several comments from other online automotive portals proves the fact that there is a mismatch of expectations between what was intended by the car manufacturers and the Malaysian drivers' behaviour.

### Malaysian Driving Habits - Tailgating and Adaptive Cruise Control (ACC)

Another common behaviour exhibited by Malaysian drivers is tailgating at high speeds on the highway. Tailgating is one of the leading causes of irritation among drivers (Mazureck and Hattem, 2006) and according to Mizell et al (1997), tailgating accounted for 62% of the

aggressive behaviors among motorists in the USA. Tailgating is quite common among Malaysian drivers, and it is seen as a behavioural norm for Malaysians on the road. An ADAS feature called adaptive cruise control helps drivers to maintain a longitudinal control of their vehicle by maintaining a range of speed on their vehicle as well as a set distance from the vehicle in front. This feature could potentially prove to be annoying for certain Malaysian drivers with the tailgating habit. The following negative comments on adaptive cruise control were extracted from the list of comments obtained from the Malaysian online automotive forums:

"If you need the car to tell you the distance from the car in front, you don't belong on the road. Keep your Volvo at home. TAKE.THE.BUS"  
 "In Europe it will work because the car cutting in will signal first. In Malaysia no one uses a signal indicator before changing lanes. The system would have a longer time to predict a lane change by looking at the signal first."

"Won't work..in my town its stop for a traffic light every 1 minute. My car has cruise control but never used it."

"I'd imagine the ACC will put off a lot of Malaysian drivers. What's the point in spending RM300k+ if you can't tailgate or drive suicidally? :P"

Some amount of scepticism concerning the adaptive cruise control was present among certain Malaysian drivers which are reflected from the comments above. Common themes found are local driving conditions and driver mentality.

Apart from negative comments concerning adaptive cruise control, there are some Malaysians who are quite receptive towards the usage of adaptive cruise control, where they found it to be useful in traffic congestion:

"[...] Adaptive Cruise Control (ACC) with Queue Assist - is a standard feature using radar-based adaptive cruise control system which automatically maintains a set gap to the vehicle in front. This comfort-enhancing system operates at speeds of 0 to 200km/h, which basically means the car drives itself while in queues with repeated speeding up or slowing down, including speeds below 30 kilometre per hour (perfect for traffic jams !!)"

"uuuhhhhhh yess.. this is one of the most irritating thing that happen with my volvo's adaptive cruise.. I truly hope that adaptive cruise will be sort of standard in Malaysia because it will definitely help reduce crashed by maintaining the right distance with the car in front.. and u don't have to do the guessing game of how fast the car in front of you is going or how hard is the car braking, the radar will keep track of that in an instant...."

"I'm surprised only one person here caught on the dynamic cruise control, and it didn't find explanation in the article. Any idea how the Peugeot system works? Is it fully automatic, i.e. in a traffic jam it will start and stop automatically? If yes that is EXTREMELY convenient in Malaysia, makes driving in a traffic jam so much easier."

"I have seen that, but it still doesn't clarify things. You see, most systems like these will keep a distance to the car up front, until it stops (not sure if the Peugeot does even this, as it is mentioned in the video that it stays within 30 km/h... what happens if the car slows down

beyond that?). When the car in front drives away, you'll be stationary. Some however start moving again, which in a traffic jam is perfect. So the big question is: Will it start moving again after a full stop? That would be great for Malaysia."

#### Malaysian Driving Habits - Autonomous Emergency Braking (AEB)

Another ADAS technology being mentioned in the online Malaysian automotive forums is the autonomous emergency braking (AEB) where the system automatically performs braking if driver fails to apply the brakes in time to avoid collisions with an object in front of the vehicle. Certain cars in Malaysia are equipped with the AEB technology, for example the 2016 Mazda 3. However, consistent with other ADAS technologies such as LDW and ACC, the AEB was also negatively perceived by Malaysian drivers. Examples of comments are listed below:

"really? I thought accidents can be reduced if you just stopped using your smart phone to communicate while youre driving , isnt that an easier way to make humans more accountable ? what if in an emergency , the AEB fails ? end of the day , youre only human and can be the only accountable person for your driving"

"yea, imagine those stupid "road warrior" or "need for speed" type of drivers, who always suddenly appears behind you and trail you so close like there's a magnet between the cars, will not be able to do this anymore...coz their cars will suddenly brake....hhahaa.."

"Absolutely, becuz the attitude and mentality of our fellow Malaysian is that : "haha, now that I have this auto brake thing, can drive faster and no need to die."

"What if, the autonomous braking is the reason why you are jammed there for 2-3hours because you couldn't do a force cut to the less jam lane? :D"

The common theme present in all the comments given by Malaysian drivers in the online automotive portals is "driver mentality". Malaysians believe that before the usage of ADAS can take place, the driving attitudes of Malaysian drivers must change first. Driving attitude is not described in any of the previous models or theories such as TAM, UTAUT or even in CTAM. Malaysian drivers believe that even though the technology may be useful in increasing levels of safety, bad driving attitude will always override the benefits offered by ADAS.

Attitude also may play a major role in influencing the levels of perceived usefulness and perceived ease of use. Osswald et al. (2012) has proposed the concept of "attitude towards using technology" in the Car Technology Acceptance Model (CTAM) that leads to behavioural intention to use the technology. In the case of Malaysian drivers, the construct of attitude needs to be addressed further in future research concerning the acceptance of ADAS among Malaysian drivers.

#### CONCLUSION AND FUTURE IMPLICATIONS FOR MALAYSIAN DRIVERS

One important factor that needs to be taken into account when designing technology

to be used for users is that how the technology is actually perceived and used by the users, and this could not be more relevant for ADAS. This is particularly crucial for ADAS since it is supposed to increase safety levels while driving. Driving styles of drivers from different countries and culture needs to be taken into consideration. Driving style is described as unique characteristic of driving for each driver. Levels of attention and car following distance are examples of driving characteristics which are unique for each driver (Lindgren and Chen, 2006). Malaysian drivers certainly have their own unique driving characteristics such as the propensity for tailgating and changing lanes abruptly. Driving styles are one of the many outcomes coming from the Malaysian driver's attitude towards ADAS. Therefore, as a result of Malaysian's unique driving styles, the aspect of perceived usefulness of ADAS was very low. Both the driving attitude and the driving styles needs to be addressed in the future research concerning ADAS usage in Malaysia.

## COMPETING INTERESTS

There is no conflict of interest.

## REFERENCES

- Cades, D. M., Crump, C., Lester, B. D., & Young, D. (2017). Driver Distraction and Advanced Vehicle Assistive Systems (ADAS): Investigating Effects on Driver Behavior. In *Advances in Human Aspects of Transportation* (pp. 1015-1022). Springer International Publishing.
- Chenail, R. J. (2011). Interviewing the investigator: Strategies for addressing instrumentation and researcher bias concerns in qualitative research. *The Qualitative Report*, 16(1), 255.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, pp. 319-340.
- Duan, L., & Chen, F. (2011, July). The future of advanced driving assistance system development in China. In *Vehicular Electronics and Safety (ICVES), 2011 IEEE International Conference on* (pp. 238-243). IEEE.
- Headley, P. (2005). ESC as a baseline for active safety. *Proceedings of 19th ESV, NHTSA Washington*.  
In *Proceedings of the 4th International Conference on Automotive User Interfaces and Interactive Vehicular Applications* (pp. 51-58). ACM.
- Kamaludin, J. (2012). Review: 2011 Volvo S80 T5 Exclusive Powershift - Wemotor.com. Retrieved July 3rd, 2017, from <http://www.wemotor.com/>
- Karlquist, V. (2017). Design and implementation of an automotive experimental platform for ADAS.
- Krueger, R., & Casey, M. (2009). Focus groups: A practical guide to applied science.
- Lindgren, A., & Chen, F. (2006). State of the art analysis: An overview of advanced driver assistance systems (ADAS) and possible human factors issues. Proceedings of the Swedish Human Factors Network (HFN) Conference, Linköping, Sweden, 38-50.
- Macnamara, J. R. (2005). Media content analysis: Its uses, benefits and best practice methodology. *Asia-Pacific Public Relations Journal*, 6(1), 1.
- Malaysia Automotive Association. (2017). Summary Of New Passenger & Commercial Vehicles Registered In Malaysia For The Year 1980 To March 2017. Retrieved May 4, 2017, from [http://www.maa.org.my/info\\_summary.htm](http://www.maa.org.my/info_summary.htm)
- Mazureck, U., & Hattem, J. (2006). Rewards for safe driving behavior: Influence on following distance and speed. *Transportation Research Record: Journal of the Transportation Research Board*, (1980), 31-38.
- Mohamed, M. S. S., Shamsul, B. M. T., Rahman, R., Aini, M. S., & Jalil, N. A. A. (2016). Integrating Usability in Automotive Navigation User Interface Design via Kansei Engineering. *Modern Applied Science*, 10(7), 208.
- Mohamed, M. S. S., Shamsul, B. M. T., Rahman, R., Jalil, N. A. A., & Said, A. M. (2015). Determination of Salient Variables Related to Automotive Navigation User Interface Research Survey for Malaysian Consumers. *Advanced Science Letters*, 21(6), 2089-2091.
- Osswald, S., Wurhofer, D., Trösterer, S., Beck, E., & Tscheligi, M. (2012, October). Predicting information technology usage in the car: towards a car technology acceptance model.
- Planing, P., & Britzelmaier, B. (2012). Understanding Consumer Acceptance Of Advanced Driver-Assistance Systems-A Qualitative Study On The German

Market. *International Journal of Sales, Retailing and Marketing*, 1(3), 32-40.

Schermerhorn, J. R., & Harris Bond, M. (1997). Cross-cultural leadership dynamics in collectivism and high power distance settings. *Leadership & Organization Development Journal*, 18(4), 187-193.

Shinar, D., & Compton, R. (2004). Aggressive driving: an observational study of driver, vehicle, and situational variables. *Accident Analysis & Prevention*, 36(3), 429-437.

Simon, J. H. (2005). *Learning to drive with Advanced Driver Assistance Systems. Empirical studies of an online tutor and a personalised warning display on the effects of learnability and the acquisition of skill*. Doctoral dissertation, Technischen Universität Chemnitz, Germany.

Stave, C., & Strand, N. (2015). Drivers' knowledge and learning of advanced driver assistance systems. In *22nd ITS World Congress, Bordeaux, France, 5-9 October 2015*.

Stone, P., Dunphy, D., Smith, M., & Ogilvie, D. (with credit given to Dr Ole Holsti. (1966). *The general inquirer: a computer approach to content analysis*. Cambridge: MIT Press.

Venkatesh, V., Morris, M. G. Davis, G. B., Davis, F. D. (2003). User acceptance of information technology: toward a unified view, *MIS Quarterly* 27(3), pp. 425-478.