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EXPLORING PUBLIC PERCEPTION AND ACCEPTABILITY OF INTELLIGENT SPEED ADAPTATION (ISA) IN MALAYSIA

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ABSTRACT

Intelligent Speed Adaptation (ISA) is a promising technology for improving speed management and road safety. Despite its potential benefits, there is limited research on public perception and acceptance of ISA in Malaysia. This study employed a descriptive, cross-sectional framework and a tool constructed based on the available literature. Using an online survey of 776 respondents, this study explored how Malaysian drivers perceive and accept the ISA system as well as their level of knowledge about it. Descriptive statistics were performed using SPSS software to explore the data distribution and profile. The findings revealed that most respondents lacked knowledge and awareness about ISA, including their purpose to counter speeding (79.9%). Only 8.1% had a vehicle equipped with an ISA system, and 54.4% used navigation systems on their mobile phones. Most respondents were unsure about the impact of ISA on reducing vehicle emissions and enhancing fuel efficiency. Among the four types of ISA intervention levels, respondents were more optimistic about having a warning system in their cars than a more restrictive one. Overall, 84.4% of respondents supported imposing ISA on all cars in their community. The majority of the respondents had a positive attitude towards the ISA. The findings of this research can inform policy makers in designing targeted public awareness campaigns, stakeholder engagement initiatives, and pilot programmes to enhance the acceptability and impact of ISA technology in Malaysia.

Keywords: *Intelligent Speed Adaptation, Speed Management, In-Vehicle Speed Advisory Technologies, Speeding, Public Perception*

INTRODUCTION

One of the most crucial factors contributing to motor vehicle crashes, injuries, and deaths is driving at excessive and unsafe speeds. Speed contributes to approximately one-third of road traffic fatalities in high-income countries and up to half of those in low- and middle-income countries (World Health Organization, 2017). In Malaysia, out-of-control vehicles are the leading cause of fatal road crashes, leading to 1,929 fatalities in 2023 alone (Royal Malaysian Police, 2023). However, the severity of this problem has remained relatively constant over the

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last decade. Previous in-depth crash investigation reports in Malaysia identified risky driving, speeding, and crash compatibility as the primary factors contributing to crashes and injuries (Afiqah et al., 2020; Siti Atiqah et al., 2017).

Speed management is one of the four elements of The Safe System approach, which is a comprehensive strategy widely adopted to prevent serious injuries and fatalities from road traffic crashes. Speed management must employ various measures, including enforcement, engineering, and education. The more widespread the measures, particularly enforcement, and the greater the range, severity, and implementation of sanctions against speeding, the greater the compliance (Global Road Safety Partnership, 2008).

The Intelligent Speed Adaptation (ISA) technology is another option for speed management. In-vehicle speed advisory technologies, such as Intelligent Speed Adaptation or Assistance and speed alerts, whether integrated by manufacturers or added later through mobile applications, provide drivers with valuable information regarding the appropriate driving speeds based on road conditions and geographical location and have become commonplace in vehicles on our roads. Because of its potential to save lives and provide significant safety benefits, the ISA is likely the most effective new vehicle safety technology currently available. These in-vehicle systems support driver compliance with speed limits and warn drivers or prevent them from exceeding current speed limits. GPS technology linked to a speed-zone database allows a vehicle to "know" its location and speed limits while on the road. Depending on the posted speed limit, the ISA can directly intervene to reduce vehicle speed by increasing the accelerator resistance or capping the maximum speed. Conversely, mobile phone applications programme drivers to alert them when they surpass the speed limit, providing them with free access to precise speed zone information (Starkey, Charlton, Malhotra & Lehtonen, 2020; Starkey & Charlton, 2020; Carsten, 2012; Ghadiri, Prasetijo, Sadullah & Hoseinpour, 2011; Várhelyi, 2002). Eco-driving systems operate similarly and provide drivers with information regarding their speed and acceleration rate to reduce fuel use (Barkenbus, 2010; Kircher & Ahlstrom, 2014).

Intelligent Transport Systems (ITS) perceive ISA as a valuable measure of road safety because they allow for smooth and steady traffic flow through adjustable driving speeds. Three modes categorise ISAs: 1. The advisory mode provides the driver with drive-speed information when the system detects that the vehicle exceeds an imposed speed limit. 2. The voluntary mode substitutes for the required method and enables direct driver control over the vehicle's acceleration, and 3) the mandatory mode, where the ISA regulates the driving speed to prevent exceeding the mandated speed (Ando & Mimura, 2015).

Horberry, Regan and Stevens (2014) categorise in-vehicle feedback systems into three types: 1) information systems provide relevant information that the driver might miss; 2) warning systems alert the driver to take action if they do not respond correctly; and 3) in critical situations, intervening systems take control of the vehicle. Auditory, visual, and tactile alerts can provide feedback, particularly when a vehicle exceeds its speed limits.

Morsink, et al. (2006) identified four ISA types: 1) displaying the speed limit and notifying the driver of changes; 2) warning the driver when exceeding the speed limit, allowing the driver to heed or ignore it; 3) providing force feedback through the gas pedal when the driver attempts to exceed the limit, with an option to override; and 4) automatically limiting the vehicle's speed without allowing the driver to override. Similar to Malaysia, ISA is a car safety

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technology that is available for several new car models. Furthermore, since 2017, most express buses and lorries already have mandatory top-speed limiters when speed-monitoring gadgets are installed in vehicles. The European Union has proposed legislation mandating the installation of ISA in all new passenger vehicles by 2022. This is mandatory for all new cars sold, beginning in July 2024.

ISA has garnered increasing interest globally as an effective measure to enhance road safety by reducing speed. Various surveys and trials conducted in countries such as Germany, Australia, Belgium, the Netherlands, the United States, and the United Kingdom have demonstrated the potential of ISA systems to effectively mitigate speed (Peiris et al., 2022; Starkey & Charlton, 2020; Ramle et al., 2020; Sadeghi-Bazargani & Saadati, 2016; Guo, Blythe, Edwards, Pavkova, & Brennan, 2015; Ghadiri, Prasetijo, Sadullah, & Hoseinpour, 2011; Vlassenroot, Broekx, Mol, Panis, Brijs, & Wets, 2007). Extensive trials in real-world driving have demonstrated that ISA can significantly reduce speeding and promote positive attitudes among users, and at least some sections of the public are willing to purchase ISA systems (Carsten, 2012).

Warner and Åberg's (2008) longitudinal study on ISA's effectiveness revealed that the most significant speed-reducing effects occurred initially. At the start of the trial, the time spent speeding dropped by 75%, but towards the end, it increased to 50% of the baseline, indicating partial habituation or non-compliance by drivers. However, even after three years, the speeds remained lower than the pre-activation levels, demonstrating ISA's effectiveness of the ISA in reducing speeding. An ISA field trial study in the UK between 2004 and 2006, carried out by Lai and Carsten (2012), examined the benefits of ISA delivery and its effect on vehicle speed. Researchers have found that the ISA system significantly transforms the speed distribution from a conventional bell shape to an asymmetric distribution biased towards the high-speed end. The ISA reduced the excessive speed and speed variation, resulting in a positive outcome for accident reduction.

Ghadiri, Prasetijo, Sadullah, and Hoseinpour (2011) conducted a local study examining the impact of an ISA system on driving speed, driver acceptance, and trial procedures for a pilot study in Penang, Malaysia. The researchers analysed the speed behaviour using speed data from an 11-test driver-vehicle experiment. The system activated vocal and visual warnings when the drivers exceeded speed limits. The results showed that the speed-warning system reduced the mean and maximum driving speeds. Driver attitudes towards the system improved post-trial, positively influencing driving behaviour when the system was active.

Sadeghi-Bazargani and Saadati (2016) systematically reviewed speed management strategies. The review included 22 of 803 articles. Most studies (63%) indicated positive effects on driver behaviour and road safety, particularly in Europe. drivers adhere to speed limits and drive more comfortably. Speed cameras, engineering schemes, ISA, speed limits and zones, vehicle-activated signs, and integrated strategies were the most common strategies reported in the literature. Various strategies have different effects on the mean speed of vehicles, ranging from 1.6 to 10 km/h. In addition, 8 - 65% and 11 - 71% reductions were reported in person-injured and fatal crashes, respectively, resulting from various strategies. Various strategies mainly depend on road characteristics, drivers' attitudes toward the country's strategy, and economic and technological capabilities. The researchers highly recommend conducting national

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and regional studies on speed management in low and middle-income countries, considering the factors potentially affecting speed management strategies.

More recently, Starkey and Charlton (2020) conducted a study on using in-vehicle information systems and the perceptions of their driving effects using an online survey of 1,017 drivers in New Zealand. This study indicates that the use of speed-related systems is low. Without incentives or education, it is likely to remain low despite drivers' beliefs that they have safety benefits. However, there is evidence that drivers have access to and are willing to engage with driver-safety-related apps. Nearly half of the sample had access to an ISA, with around half (approximately one-quarter of the total sample) admitting that they had received speed-related warnings. The relatively high proportion of drivers with access to ISA is encouraging, even though the most significant challenge is to encourage drivers to use them. The number of respondents who reported using a speed advisory system was the same as those who reported texting, email, or social media while driving. The respondents rated the information and advisory systems as most likely to improve their safety. They were willing to install these systems in their car. Although the respondents believed that supportive and intervening systems would improve safety, they were unlikely to install them in their vehicles. A set of two-variable correlations showed that perceived safety benefits were strongly linked to all four systems (Information System: $r = 0.58$, Advisory System: $r = 0.70$, Supportive System: $r = 0.68$, intervening system: $r = 0.70$; all $p < 0.001$, N = 1016).

Vlassenroot, Mol, Marchau, Brookhuis, and Witlox (2010) completed a study in Belgium and the Netherlands with 5,599 responses to the web survey. This study describes and conceptualizes the most common and relevant socio-psychological factors that can influence the acceptance of ISA. The results showed that 95% of the respondents favored ISA. Seven out of ten respondents wanted to have an informative or warning system. Three out of ten wanted to go even further and chose to have a supportive or even restricting ISA type. Drivers choose more restrictive systems only if their penetration level is sufficiently high.

Undoubtedly, knowledge regarding the level of acceptance of new technologies and systems is an essential area of concern for the government, automotive manufacturers, and equipment suppliers, particularly for those with a significant potential to enhance safety (Regan et al., 2017; Vlassenroot et al., 2010). The critical success factor in implementing new in-vehicle technologies is understanding how users experience and respond to these devices. Although we acknowledge the importance of acceptance and support, we lack consistency in the acceptability and measurement methods (Vlassenroot et al., 2010). In most ISA studies, acceptance refers to users' opinions, attitudes, and values relative to their experiences when driving with a system (Vlassenroot, et al., 2007; Comte, Wardman, & Whelan, 2000). Despite a series of road safety enforcement programmes in Malaysia to tackle the speeding problem, many drivers still engage in speeding behaviour (Muhamad Kamil, Ng, Faridah Hanim, & Mohammed Aliass, 2013). Noradrenalina, Nor Fadilah, Sanizah, Nuura Addina, and Nuur Sakinah (2015) found that 77% and 71% of Malaysian drivers were admitted to driving more than 10 km/h and 20 km/h over the speed limit in the past month. More than half the respondents believed that the chances of law enforcement summoning them were low, with the probability of an enforcer summoning them being less than 70% (M = 6.21; SD = 2.907).

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As proven by previous studies, Malaysia could also benefit from the effectiveness of ISA in reducing overspeeding, thus enhancing road safety. However, despite the potential benefits of ISA, there is limited research on the public perception and acceptability of this technology in Malaysia. Understanding ISA's public perception and acceptability is crucial for successfully implementing this technology in Malaysia. The present study surveyed to understand better the public perception and acceptance of ISA in Malaysia. The main factors explored were the knowledge, attitude, and general acceptance of Malaysian drivers of the ISA system.

METHODOLOGY

This study adopted a descriptive, cross-sectional design using an instrument developed based on existing literature. It focused on how the public perceives the ISA system, emphasizing Malaysian drivers' knowledge, attitudes, and acceptance. Purposive sampling targeting Malaysian drivers was used to select a sample size of 776 drivers. Responses were excluded from the analysis if the individual had never driven a vehicle in the previous year. Of the 793 completed surveys, 17 were removed, leaving 776 responses for analysis. The research analysed eight demographic factors: age, gender, level of education, monthly income, preferred mode of transportation, and vehicles frequently used during the past year. Respondents' crash history and experience of being summonsed were also gathered for the survey. The questions included the number of summonses related to speed offences received from enforcers in the past year and the history of traffic crashes in the last five years.

Research Instrument

An online survey was conducted using Google Forms between November 2022 and February 2023. Data were collected through a questionnaire containing both closed- and open-ended questions. The questionnaire comprised the following components: perceptions and knowledge of ISA functions, drivers' usage of in-vehicle speed advisory technology, and the system's effectiveness in improving speeding behaviour and acceptance of ISA in vehicles.

Data Analysis

Data were auto-generated in Microsoft Excel using Google Forms. Data with straight-lining responses, missing values, or incomplete responses were excluded from the analysis. Descriptive analyses were performed to determine the distribution and profile of data.

Participant's Demographic Characteristics

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Table 1 presents a summary of the drivers' demographic characteristics. The sample consisted of 49.6% males and 50.4% females. Most respondents were between 19 and 60 years old, with a mean age of approximately 39.97. Concerning education, 45.3% of the sample held a bachelor/master/PhD, whereas 28.5% held an STPM/diploma/cert qualification. Conversely, only 2.3% of the participants completed the UPSR/PMR. The most common mode of transportation reported by the respondents in this study was cars, accounting for 63.4% of all responses. Motorcycles were the second most common mode of transportation, representing 18.3% of the sample. MPV/SUV was the third most popular mode of transportation, with 17.9% of the respondents choosing it. Only 0.4% of the population reported using other transportation modes. Most of the responses (91.5%) were driven daily. The remaining frequency was several times per week (6.6%) or monthly (1.9%). Data reveals that most respondents (43.8%) reported earning RM 4,850 or less monthly, followed by those earning RM 4,851 and RM 10,970 (41.4%). Approximately 13.3% of the respondents indicated their monthly income was RM 10,971 or above.

This study also collected data on the experience of receiving speed summonses and involvement in traffic crashes in the last five years. Most respondents (95.4%) reported not having been involved in speeding-related crashes over the past five years. However, only a small proportion (4.6%) indicated that they experienced such crashes during this period. Approximately 21.3% of participants indicated that they had been issuing speeding summons in the past year, whereas the remaining 78.7% reported that they had not received such summons.

Table 1
Demographic Characteristics of Drivers, Experience of Received Speed Summonses, and Crash History

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		N	%
Age Category (N=775)	Below 25 years old	26	3.4
Range 19-60; Mean=39.97	26– 45 year old	590	76.1
	Above 45 years old	159	20.5
Gender	Male	385	49.6
	Female	392	50.4
Highest Education Level	UPSR/PMR or equivalent	18	2.3
	SPM or equivalent	119	15.3
	STPM/Diploma/Certificate or equivalent	285	36.7
	Bachelor/Master/PhD	350	45.1
	Other	4	5.0
Monthly Income	No Income	12	1.5
	RM 4,850 and below	340	43.8
	RM 4,851 to RM 10,970	321	41.4
	RM 10,971 and above	103	13.3
Preferred mode of transportation	Car	492	63.4
	Motorcycles	142	18.3
	MPV/SUV	120	17.9
	Other	3	0.4
Driving frequency during the past year	Daily	710	91.5
	Several times a week	51	6.6
	Several times a month	15	1.9
Experienced of speed summonsed in the past year	Yes	171	22.0
	No	605	78.0
Range 1-15; Mean=2.12			
Involvement in traffic crashes in the last five years	Yes	43	5.5
	No	733	94.5
Range 1-12; Mean=1.95			

RESULTS AND DISCUSSIONS

This section outlines the findings of this study. It comprises multiple subsections that focus on various aspects, including drivers' perceptions and knowledge of ISA functions, in-vehicle speed advisory technology usage, ISA systems, and acceptance of the system's effectiveness in improving speeding behaviour in Malaysia.

Driver's Perceptions and Knowledge About ISA Functions

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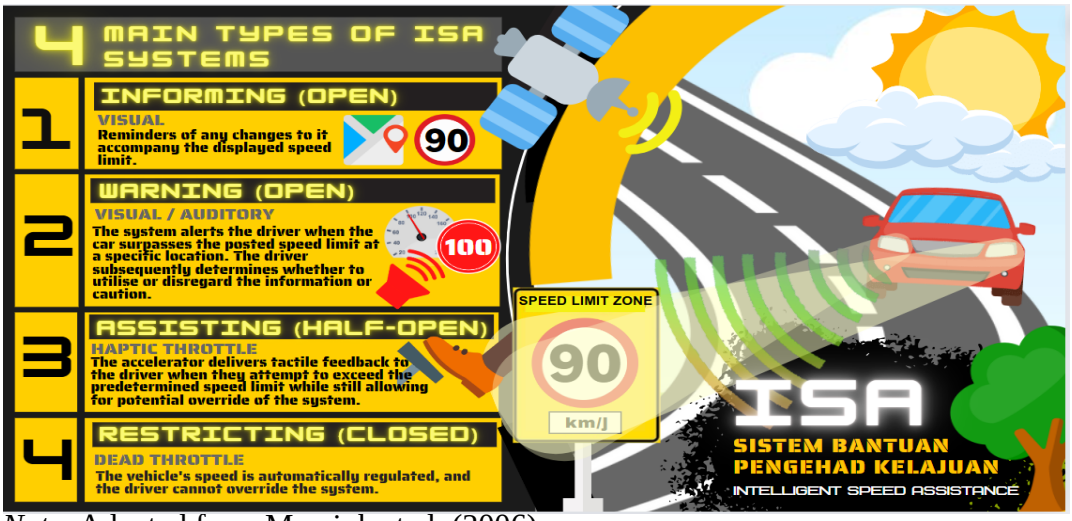
Manufacturers have installed in-vehicle information systems that aim to provide drivers with a wide range of assistance, including speed-warning notifications. Mobile phones and navigation system applications are becoming more accessible in older vehicles to assist with similar speed notifications (Starkey et al., 2020). Respondents were asked to evaluate their perceptions of the effectiveness of the four main types of ISA systems in addressing speed issues. The ISA systems are generally classified into four types. According to Morsink et al. (2006), detailed explanations of all the four main types of ISA systems are illustrated in Figure 1.

Figure 1
Four Main Types of ISA Systems



Note. Adapted from Morsink et al. (2006)

A Likert scale was used to determine the effectiveness of the questions, with one being the most effective, two being slightly effective, three being the most effective, four being very effective, and five being the most effective. Respondents were then asked to choose their preferred system type to ascertain their opinions on the four ISA system types.

As seen in Figure 2, most respondents (76.2%) believed that the open warning type effectively addressed speed issues. With 74.8% of the respondents believing in its effectiveness, the Informing (open) type was placed second. Only 55.3% of ISA system users thought that the assisting (half-open) type was effective, whereas the restricting (closed) type was considered the last option.

Figure 2
Drivers' Perception of the Effectiveness of Four Types of ISA Systems in Dealing with Speed Issues

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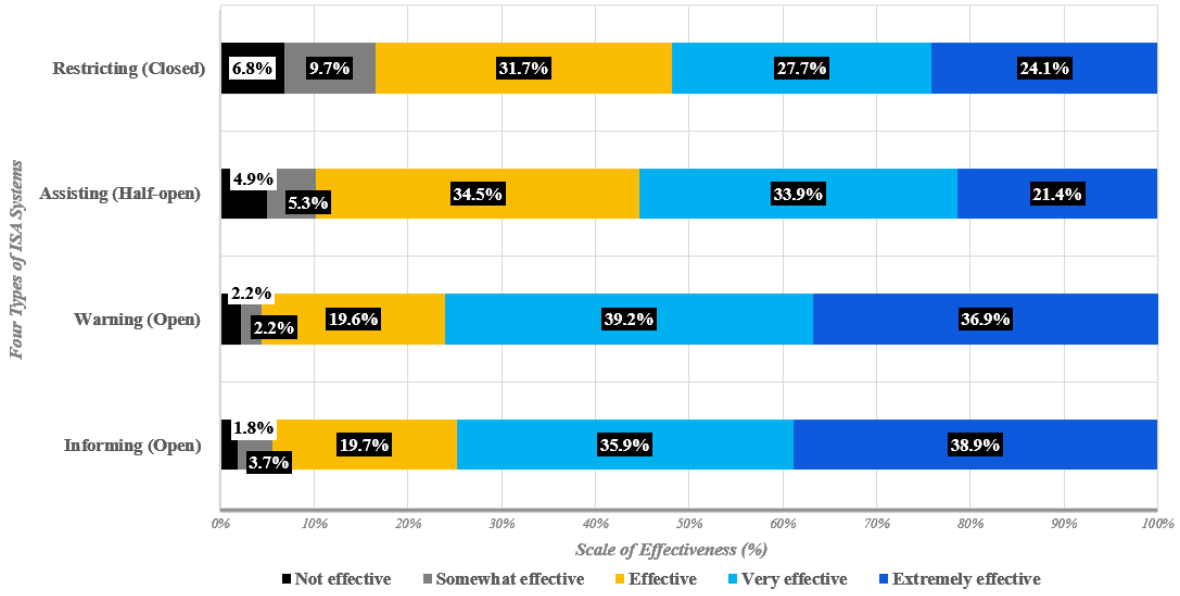

Regarding the four types of ISA systems, as shown in Figure 3, 297 respondents (38.3%) preferred an open warning system that could be visual or audio, such as a beep or vocal warning. The second type of information chosen by 27.6% of respondents was open information. The third respondent's preferred choice was either the assisting (half-open) type (24.5%) or the advisory intervention (voluntary/driver-select system). The last option is the restricted (closed) type, which is a mandatory system (9.7%), which is the mandatory system. Having a warning system, such as a vocal or beep system in their cars, was seen as a more favorable option by most participants than a more restrictive one (Figure 3).

The results were consistent with a study by Kolosz, Grant-Muller, and Djemame (2014) on preferences for in-vehicle information systems in the United Kingdom. The open warning system received the highest preference from 38.3% of respondents for the four types of ISA systems. This was followed by the informing (open) type, which 27.6% of the participants preferred. The assisting (half-open) type was chosen by 24.5% of the respondents, whereas the restricted (closed) type was the least preferred (9.7 %).

Vlassenroot et al. (2010) conducted a study in Belgium and the Netherlands, which showed that 95% of the respondents favoured ISA. Seven out of ten respondents desired an informative or warning system. Three out of ten individuals interested in exploring the topic further opted for a supportive or restrictive ISA type.

Blum and Eskandarian (2006) reviewed research on ISA and discussed possible strategies to maximize effectiveness and acceptance while reducing the negative effects on roadway safety. The study also highlighted that having a warning system, such as a vocal or beep system in cars, was more favourable to most participants than having a more restrictive system. As previously researched, this preference for warning systems aligns with the potential benefits of ISA systems in enhancing roadway safety by reducing speed. These systems have been evaluated previously,

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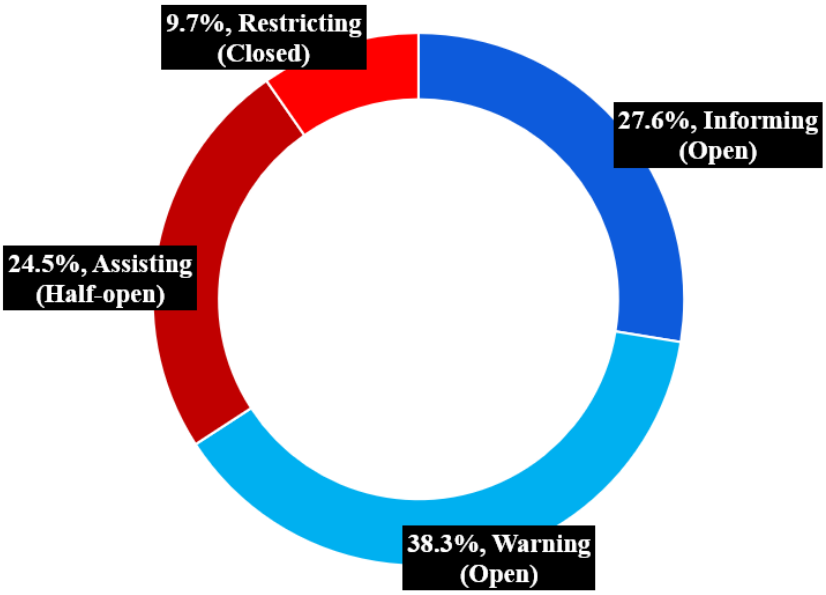
and a significant paradox has been revealed. Although mandatory systems that strictly enforce speed limits can be effective, they encounter significant challenges in gaining consumer acceptance.

Financial incentives such as purchase subsidies can encourage the use of voluntary ISA systems, as suggested in the literature (Molin & Bos, 2014). This approach has the potential to positively impact driver behaviour towards accepting and using ISA systems, which can contribute to overall road safety. In conclusion, the preference for open warning systems, as indicated by a study conducted in the Netherlands, underscores the importance of user acceptance and usability in designing and implementing ISA systems. By considering user preferences and offering incentives for adoption, ISA technologies can be integrated into vehicles, leading to safer road environments and fewer speeding incidents.

Figure 3
Preferred Type of ISA Systems



Drivers' Usage of In-Vehicle Speed Advisory Technology, ISA Systems

The respondents were asked about using in-vehicle speed advisory technology, known as the ISA system. They were asked, "Have you heard about systems that can give a warning or

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information about the posted speed limits?" and "Are you aware that speed limit advice can be found in navigation systems?"; "Are you familiar with the term in-vehicle speed advisory technology?"; "Have you heard about ISA?"; and "Do you understand the use of ISA to counter speed?"

Results illustrated in Table 2 show that more than 61.7% of the respondents reported that they were aware that navigation systems included speed limit advice and speedometers. The navigation system on mobile phones was used by only 54.4% of those participants. Regarding the types of navigation systems, the Google Map app (42.5%) and WAZE app (41.0%) were the most popular navigation system apps reported by 422 respondents. Only a small percentage of respondents used the Drive Mark app and Global Positioning System (GPS), 4.5% and 1.8%, respectively.

Only 5.7% of the respondents reported using this application was stressful or distracting. This application was comfortable for most of them, with 95.5% feeling at ease and 58.4% believing they drove within the set speed limit. Furthermore, individuals were asked about their knowledge of the systems that could provide warnings or information about posted speed limits. Respondents were also asked whether they had access to the system or an ISA in their car. Only 37.4 number of participants had heard of it. The number of people who know about ISA and understand their ability to decrease speed is limited to 20% of the population.

Of the 776 respondents, 63 (8.1%) had vehicles equipped with an ISA system. The application caused 14.3% of 63 respondents to experience stress or distraction. The majority of respondents (76.2%) found this application comfortable, and 85.7% confirmed that they adhered to the established speed limit.

Table 2
Drivers' Usage of In-Vehicle Speed Advisory Technology, ISA Systems (N=776)

	Response	N	%
	Yes	479	61.7

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Are you aware that speed limit advice can be found in navigation systems?	No	297	38.3
Do you use your mobile phone's navigation data app (GPS) while driving?	Yes	422	54.4
	No	354	45.6
Types of Navigation Systems			
DriveMark		14	1.8
Google Map		330	42.5
Global Positioning System (GPS)		35	4.5
WAZE		318	41.0
Others		3	0.4
Do you feel stressed or distracted while using this application? (N=422)	Yes	24	5.7
	No	398	94.3
Do you feel comfortable with this application? (N=422)	Yes	401	95.0
	No	21	5.0
Will you drive according to the speed limit set while using this application? (N=422)	Yes	331	78.4
	No	91	21.6
Have you heard about systems that give warnings or information about posted speed limits?	Yes	288	37.1
	No	488	62.9
Have you heard about ISA and understand its use to counter speed?	Yes	156	20.1
	No	620	79.9
Is your vehicle equipped with the ISA System?	Yes	63	8.1
	No	713	91.9
Do you experience any stress or distractions while working with the ISA system? (N=63)	Yes	9	14.3
	No	54	85.7
Do you feel comfortable with this ISA system? (N=63)	Yes	48	76.2
	No	15	23.8
Will you drive according to the speed limit set while using this ISA system? (N=63)	Yes	54	85.7
	No	9	14.3

Drivers' Acceptance of the Effectiveness of the ISA System in Improving Speeding Behaviour

Respondents were asked about the effectiveness of the ISA system in enhancing their speeding behaviour. Ten statements were solicited for public opinion about effectiveness and thoroughly discussed, as listed in Table 3. They were then asked to rate the system's effectiveness in improving safety, particularly speeding behavior, using a 5-point scale, where one (1) totally disagreed and five (5) totally agreed with the respective statement.

74.5% of respondents confirmed that the ISA system had a positive effect on traffic safety in the community area. Seventy-four percent of respondents agreed that the ISA system could reduce speeding offenses. 71.5% of participants supported the ISA in maintaining the posted speed limit. Of the respondents, 71.2% agreed with the ISA speed management strategy, which aims to

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prevent drivers from exceeding the speed limit. Most respondents (69.4%) believed that if all drivers utilised this technology, it would effectively minimise severe injuries and fatalities within their community. Sixty-six percent affirmed that the ISA's efficiency contributed to a smooth and safe driving experience on unfamiliar roads.

Surprisingly, the respondents were unsure about the advantages of this ISA, which is a solution to global warming, air pollution (C02 emissions), and decreases in fuel usage. As evidenced by this, there is a lack of knowledge and limited understanding of the ISA system. Day, Norman, Poulter, Ozkan, and Rowe (2023) recently studied private motorists' adoption and application of ISA from user and non-user perspectives. The interview data provided valuable evidence for incorporating ISA to enhance their safety potential. The results demonstrate a lack of knowledge regarding ISA. Neither group knew much of it before the study or when purchasing a car fitted with an ISA.

Table 3

Drivers' Acceptance of the Effectiveness of ISA System in Improving Speeding Behaviour

	Totally Disagree	**Disagree**	**Neutral**	**Agree**	**Totally Agree**
I think that the ISA System.....	**f (%)**	**f (%)**	**f (%)**	**f (%)**	**f (%)**
This would be an effective system to change and improve drivers' speeding behaviour.	19 (2.4)	30 (3.9)	212 (27.3)	281 (36.2)	234 (30.2)
The ISA is an appropriate and effective system for reducing driving stress.	29 (3.7)	64 (8.2)	262 (33.8)	260 (33.5)	161 (20.7)
ISA is to make sure the driver does not exceed the speed limit.	18 (2.3)	25 (3.2)	180 (23.3)	293 (37.9)	258 (33.3)
Helping to have a smooth and safe driving on an unfamiliar road.	22 (2.8)	37 (4.8)	202 (26.0)	290 (37.4)	225 (29.0)
To reduce fuel consumption.	26 (3.4)	35 (4.5)	259 (33.4)	253 (32.6)	203 (26.2)
One of the solutions to global warming and air pollution (C02 emissions).	44 (5.7)	65 (8.4)	269 (34.7)	208 (26.8)	190 (24.5)
Help to maintain the posted speed limit.	13 (1.7)	25 (3.2)	183 (23.6)	313 (40.3)	242 (31.2)
ISA could help to reduce speed offences.	12 (1.5)	21 (2.7)	166 (21.4)	297 (38.3)	280 (36.1)
If all drivers use this technology, it will be effective and help to reduce severe injuries and fatalities in the community.	12 (1.5)	27 (3.5)	198 (25.5)	282 (36.3)	257 (33.1)

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https://ejournal.upsi.edu.my/index.php/ESSS/index
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Increase traffic safety in this area.	10 (1.3)	21 (2.7)	167 (21.5)	298 (38.4)	280 (36.1)

Drivers' Acceptance of ISA System to Counter Speed

To counter speed, the respondents were asked for their opinions regarding their acceptance of the new technology, specifically the ISA system. Table 4 indicates that most participants supported imposing ISA in the community. Most respondents (87.8%) agreed that they would drive according to the speed limits. Only 12.2% of the participants disagreed. About 84.4% supported imposing ISA on all cars in their community. Approximately 15.6% did not support this speed management strategy, which is precisely the ISA's effectiveness at countering speed.

Table 4
Drivers' Acceptance of ISA System to Counter Speed

Opinion	Response	N	%
I will drive according to the speed limit set while using this ISA system.	Yes	681	87.8
	No	95	12.2
I fully support implementing the policy of imposing ISA on all cars in Malaysia.	Yes	655	84.4
	No	121	15.6

CONCLUSION

The primary objective of this research was to investigate the attitudes and perceptions of the Malaysian public towards ISA through an extensive online survey of 776 participants. The findings reveal diverse attitudes towards the implementation of the ISA in Malaysia. While some individuals support speed management initiatives, others have reservations and apprehensions. In contrast, others view it as a potential solution for traffic congestion and safety issues.

The study indicated that a significant number of respondents lacked knowledge about ISA and their purpose in addressing speeding-related issues. Only a small percentage of the vehicles were equipped with ISA, and about half of the respondents used navigation systems on their mobile phones. Respondents were more optimistic about vehicles equipped with a warning system than a more restrictive system. Overall, the majority support imposing ISA on all cars and has a positive attitude towards the technology. This study also compares the public perception and acceptability of ISA in Malaysia with those of other countries that have implemented ISA.

This study explored the potential future of the ISA system in Malaysia and its implications for road safety. Its significance lies in understanding ISA's public perception and acceptability, which can guide future policies and interventions. These findings impact the implementation of the ISA in Malaysia and other similar contexts. Understanding public perception is crucial for successful ISA implementation. This study highlighted the importance of educational campaigns and awareness initiatives to improve driver comprehension and

acceptance. Bridging the knowledge gap and emphasizing the benefits of ISA technology can enhance its adoption and contribute to safer roads.

Future research should investigate integrating ISA with emerging technologies such as autonomous vehicles and smart city infrastructure to enhance transportation efficiency and sustainability in Malaysia. Additionally, it is essential to examine the long-term effects of ISA on traffic safety and driving experience and analyse factors influencing ISA acceptance in Malaysia.

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