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School for School of Transportation Sciences

Master of Transportation Sciences

Master's thesis

Investigating determinants of speeding behavior and acceptability of Intelligent Speed Adaptation (ISA) technology. The case of minibus taxi drivers in Addis Ababa, Ethiopia

Wondwesen Girma Mamo

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences, specialization Traffic Safety

SUPERVISOR :
prof. dr. Kris BRIJS

CO-SUPERVISOR :
dr. Veerle ROSS

MENTOR :
Dr. Abebawu MINAYE

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Preface

This thesis is submitted for the Master of Sciences at Hasselt University. The components in this thesis described herein were conducted under the supervision of promoter Prof. Dr. Kris Brijs and co-promoter Dr. Veerle Ross in the Institute of Transportation Sciences, Hasselt University. The thesis consists of two papers that represent the results of exploring determinants in speeding behavior among minibus taxi drivers' using the 'major theorists' model; and investigating the behavioural intention to accept Intelligent Speed Adaptation (ISA) technology using UTAUT model among minibus taxi drivers in Addis Ababa, Ethiopia.

Minibus taxis driver take the first very few ranks in terms of contribution to the road safety problem in Addis Ababa City, Ethiopia. Speeding is the most common road safety problem that results many traffic accidents in the City. Most minibus taxi drivers in the City drive fast and violet the speed limit. A theory-driven interventions are important in order to manage such risky driving behaviour. By considering this interest, this thesis attempted to understand the reason behind minibus taxi drivers' speeding behaviour, and future acceptability of Intelligent Speed Adaptation device.

Acknowledgements have been given to all individuals who contributed a lot for the success of this thesis.

Wondwesen Girma Mamo

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Preface i
Acknowledgements ii
List of table v
List of figurs v
1. General backgrounds 1
1.1. Introduction 1
1.2. Briefly situating the theoretical background 4
1.3. Statement of the problem 4
1.4. General References 6
2. Paper One 9
2.1. Exploring determinants in speeding behaviour using the 'major theorists' model among minibus taxi drivers in Addis Ababa, Ethiopia 9
2.2. Abstract 9
2.3. Introduction 10
2.4. Theoretical framework: The 'major theorists' model 11
2.5. Situating 'major theorists' model for speeding behaviour and Hypotheses 11
2.5.1. Behavioural intention, environmental contexts, perceived driving skills and driving fast …… 11
2.5.2. Attitude, social pressure and self-efficacy 13
2.6. Methods 14
2.6.1. Respondents 14
2.6.2. Questionnaire 15
2.6.3. Analyses 16
2.6.4. Validating the instrument 16
2.6.5. Attitude, behavioural intention, speeding behaviour, perceived driving skill 18
2.6.6. Self-efficacy, Social pressure and environmental context 19
2.7. Results 20
2.7.1. Correlation 20
2.7.2. Path model: Fit indexes 22
2.7.3. Path models 23
2.8. Discussion 27
2.9. Theoretical and practical implications 29
2.9.1. Theoretical implications 29
2.9.2. Practical implications 30
2.10. Limitations 32
2.11. Conclusion 32

2.12. References **33**

3. Paper Two **36**

3.1. Investigating the acceptability of Intelligent Speed Adaptation among Minibus Taxi Drivers in Addis Ababa, Ethiopia **36**

3.2. Abstract **36**

3.3. Introduction **36**

3.4. Towards introducing in-vehicle ITS speed management technology **37**

3.5. Theoretical background about acceptability **38**

3.6. Methods **40**

3.6.1. Respondents **40**

3.6.2. Questionnaire **40**

3.6.3. Data collection procedure **40**

3.6.4. Validating instrument **41**

3.7. Results **42**

3.7.1. Correlation **42**

3.8. Discussion **45**

3.9. Limitation **46**

3.10. Practical implications **46**

3.11. Conclusion **47**

3.12. References **48**

4. General Conclusion **50**

Appendices **51**

Appendix A **51**

A1. Questionnaire **51**

Appendix B **60**

B1. Interview guidelines for taxi drivers **60**

B2. Focus Group Discussion: FGD guideline for taxi drivers **60**

Appendix C **61**

C1. List of articles used for item bank preparation **61**

List of table

Papre 1

Table 1. Factors loading of items measuring determinants in speeding behavior……..16

Table 2. Means, Standard Deviations, Reliability Coefficients, and Inter-correlations between variables…… ……21

Table 3. Fit statistics for four models…….....22

Table 4. Path Analysis Standardized Estimates in Model 1……...24

Table 5. Path Analysis Standardized Estimates in Model 2……...25

Table 6. Path Analysis Standardized Estimates in Model 4……...27

Paper 2

Table 1. Factors loading of items measuring acceptability of ISA technology…….….41

Table 2. Means, Standard Deviations, Reliability Coefficients, and Inter-correlations between variables…….42

Table 3. Path model: Fit index statistics for model 1…….....43

Table 4. Path Analysis Standardized Estimates……..44

List of figurs

Paper 1

Fig. 1. Behaviaral intention to drive fast, perceived driving skill (PDS) to drive fast, enforcement environment in driving fast, age and speeding behaviour……23

Fig. 2. Attitude to drive fast, social pressure to drive fast raise from persons on road (SPRPR), self-efficacy to drive fast, behavioral intention to drive fast and speeding behavior…….24

Fig. 3. Attitude to drive fast, Social pressure to drive fast raise from persons on road (SPRPR), Self-efficacy to drive fast, behavioral intention to drive fast, perceived driving skill (PDS) to drive fast, Social pressure to drive fast raise from relatives (SPRR), enforcement environment in driving fast, age and speeding behavior……..26

Paper 2

Fig. 1. Attitude, effort expectancy, behavioural intention, social influence and driving experience……..44

1. General backgrounds

1.1. Introduction

Speeding is one of major risk factors that heighten the probability of road traffic crashes (De Pauw, Daniels, Thierie, & Brijs, 2014). It increases not only the chance to engage in crash, it also affects the severity level of road crash in terms of human lives loss, injuries and property damages (Carcary, Power, & Murray, 2001; Elvik, 2009; Garvill, Marell, & Westin, 2003). It is evident that speeding decreases the time drivers remain to give safe response to unexpected road traffic emergencies (Farmer, Retting, & Lund, 1999) that require greater distance for stopping and adequate reaction time (Tian, 2013). Such situation clearly refers the exponential relationship between speeding and the threat to engage in crash (Kloeden, McLean, & Glonek, 2002). In practice, reducing speed would consequently decreases the crash rate and its severity level (Kimber, 1990; Nilsson, 2000). For instance, an empirical investigation carried out on the relationship between speeding and crash showed that decreasing in speed limit (e.g., 90km/h to 70km/h) would reduce the degree of serious injuries and fatalities (De Pauw et al., 2014). In another way, the degree of risk goes with the speed level i.e., as Rosen and Sander (2009) the pedestrian fatality risk at 50 km/h is five times higher than the risk at 30 km/h

Causative factors associated with speeding are accompanied by multi-dimensional manifestations. Such features can be generally grouped as predispose, enable and reinforce factors, which are identified in the PRECEDE-PROCEED health promotion planning model (Green & Kreuter, 1991). *Predisposing factors* encompasses knowledge, beliefs, values, attitudes, self-efficacy, intention, and perception; *enabling factors* include availability, accessibility, laws, and driving skills; and *reinforcing factors* are resulted from other people-family, peers, teachers, employers, community leaders, and decision makers (Gielen, McDonald, Gary, & Bone, 2008). In terms of speeding, such factors can be situated as predisposing factors (e.g., instrumental attitude towards speeding) that motivate drivers to set justifications for their speeding behaviour; enabling factors (e.g., highway and speed-accommodating vehicle) permit drivers to speed up; and reinforcing factors (e.g., poor speed surveillance) incentivize drivers to drive fast (Gabany, Plummer, & Grigg, 1997).

In order to manage the cost of speeding and its contributing factors highlighted above, interventionists may use the 3Es approaches, namely Enforcement, Education and Engineering (Groeger, 2011). For example, Garvill et al. (2003) suggested that when many drivers often exceed the speed limits, road authorities engage in different strategies that put drivers in

complying with the speed rule. Such strategies could involve informational campaign, enforcement and physical measure (e.g., road humps, radar, elevate pedestrian crossing).

As an enforcement strategy, transport authorities reduce the cost of speeding by passing a legislative action, for example, implementation of speed limit (Berry, Johnson, & Porter, 2011). From this perspective, legislating the speed limit is a major direct mechanism that authorities employ to manage drivers' speeding behaviour, and their speed choice on different sections of a road (Berry et al., 2011). Such speed limit legislation comes to the ground through delegating police officers, patrol and speed control camera. Thus, exceeding speed limit results probability of fines (Paris & Van den Broucke, 2008), for instance, licence suspension, warning letters and financial penalties (Masten & Peck, 2004). This intervention strategy may become effective on roads where there are speed surveillances systems that can record drivers' actual overt speeding. Those drivers who only comply with speed rules in the immediate locality of the surveillance site, may increase their speed as soon as the traffic police surveillance site has been passed (Mäkinen et al., 2003). Instead of an exclusive focus on speed limit enforcement through observing external speeding behaviour, it would be important to mix it with traffic education (e.g., anti-speeding campaign) in order to strengthen drivers' compliance with the speed limit.

In contrast to the enforcement strategy which may dominantly focus on the drivers' overt speeding behaviour, in educational intervention, a wide room is given to the motivational and cognitive determinates (e.g., attitudes, social norm and self-efficacy, intention) behind the speeding behaviour. Sustainable anti-speeding interventions would not be effective without considering such drivers' motivational determinants of speeding behaviour (Hatakka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002; Victoir, Eertmans, Van den Bergh, & Van den Broucke, 2005). In order to persuade drivers not to violate the speed limit, it is essential to identify particular factors that determine their speeding behaviour (Elliott, Armitage, & Baughan, 2005). Unlike enforcement intervention strategy, its effectiveness would be depending on the surveillance efforts; educational intervention would be more efficient to bring behavioural change among drivers to comply with the speed limit regardless of any traffic area, either it is accompanied by surveillance system or not. Like (maybe more than) enforcement and educational approaches, another important approach is an engineering strategy that plays the most important roles to curb the cost of speeding.

Anti-speeding engineering interventions mostly rely on the Intelligent Transportation System (ITS) and physical improvement on road where accidents often happen and many drivers exceed the speed limit. In-vehicle ITS technologies, for instance, Intelligent Speed Adaptation (ISA) would directly control drivers' speeding behaviour based on the local speed limit (Young, Regan, Triggs, Jontof-Hutter, & Newstead, 2010). Installing speed cameras is also an important ITS engineering intervention by which derivers are made to comply with the speed limit (Blincoe, Jones, Sauerzapf, & Haynes, 2006). In terms of physical improvement, according to Elvik, Vaa, Hoye, and Sorensen (2009), it may involve narrowing road width, rumble strips, speed humps, raised pedestrian crossings, plateau junctions and speed zones. Simulator studies show that a gate construction around the urban entrance area (Ariën et al., 2014) marking transverse rumble strips and backward pointing herringbone pattern nearby curve (Ariën et al., 2017) would reduce drivers' speeding behaviour.

Anti-speeding interventions would be sustainable and effective when they combine strategies derived from enforcement, education and engineering approaches. However, a difficult task for interventionists and researchers is to develop theory-driven interventions that aim to influence drivers' behaviour (Elliott & Armitage, 2009). Such task becomes more difficult in the contexts of developing countries where there are no adequate scientific studies. In order to address this gap an attention is given to adopt strategies that are effective in the traffic contexts of developed countries. Imported strategies may not be effective due to failure to consider difference between developed and developing countries in terms of road traffic contexts.

Ethiopia like many developing countries, it has different road traffic contexts (as compared to developed countries) that demand local understanding and empirical evidences to develop effective interventions that comprises different approaches. In recent year, even though it is very limited, there has been a growing effort in conducting traffic safety researches (e.g., Abegaz, Berhane, Worku, Assrat, & Assefa, 2014; Mamo & Haney, 2014; Mamo, Newnam, & Tulu, 2014; Newnam, Mamo, & Tulu, 2014). Considering such effort, the current studies would add contribution to the growing empirical studies regarding road traffic safety in Ethiopia by investigating the determinants of speeding behaviour and acceptability of Intelligent Speed Adaptation technology among minibus taxi drivers in Addis Ababa, Ethiopia.

1.2. Briefly situating the theoretical background

In order to achieve the aim of the current studies, the 'major theorists' model (Fishbein, Triandis, Kanfer, Becker, & Middlestadt, 2000) and the unified theory of acceptance and use of technology (UTAUT) model (Adell, Varhelyi, & Nilsson, 2014; Venkatesh, Morris, Davis, & Davis, 2003) were used as theoretical frameworks for discovering determinants in speeding behaviour, and acceptability of ISA technology respectively.

To be a little bit specific, in the first study, the motives behind drivers' speeding behaviour was examined using the 'major theorists' model (a combination of five motivational theories: namely, HBM , SCT, TRA, theory of subjective culture and interpersonal relation; and theory of self-regulation and self-control) proposed by Fishbein et al. (2000)). In this model, existing or current determinants of speeding behaviour among minibus drivers was explored. Whereas, in the second paper, the future acceptability of Intelligent Speed Adaptation (ISA) technology, which is designed to monitor speeding behaviour, among minibus taxi drivers was examined. As framework, this part of the study employed UTAUT that integrates eight models (namely, TRA; TAM; TPB; the model of PC Utilisation; Motivational model; a combined model of TAM and TPB; SCT, and innovation diffusion theory (Venkatesh et al., 2003)) that could often be employed to investigate acceptability of new technology.

1.3. Statement of the problem

Traffic crash is one of major causes of death worldwide that resulted 1.35 million death each year (World Health Organization, 2018). In terms of economic development, the rate of road traffic crash is high in low-income countries (Bliss & Breen, 2012). For instance, the death rate resulted from traffic crash is three times high in low-income countries than in high-income countries (World Health Organization, 2018). Like many developing countries, Ethiopia faces high rate of road crash (The Addis Ababa Police City Administration, 2018). The rate of road traffic accidents in Addis Ababa, Ethiopia reaches at a critical level when compared to rates in the capital cities of developed countries (Mamo & Haney, 2014).

Driving in inappropriate speed, which is belong to human factors, is considered as one of the most contributing factors for many severe traffic crashes around the world (Åberg, Larsen, Glad, & Beilinsson, 1997; Carcary et al., 2001; Garvill et al., 2003). Speed is not only influences the potential of getting involved in a traffic crash, it also moderates the severity and number of crashes (Van der Pas, Kessels, Veroude, & van Wee, 2014). The Addis Ababa

Police Commission (2016) report indicated that from 2014 to 2015, 17 904 accidents were recorded in the city. Out of this number, more than half of accidents caused by inappropriate speeding behaviours, such as driving beyond the speed limit, driving quickly without ceding priority to pedestrians on crossroad, and improperly overtook other vehicles. Such report also indicated that vehicles, such as Automobile, Station Wagon, Taxi (mini-bus with 12 passengers) and Pickup took the lion's share for traffic accidents that happened in the city for several consecutive years. A local study (e.g., Abegaz et al., 2014) indicated that drivers who operate taxi for 12 passengers would often engage in driving beyond the speed limit. A more recent annual road safety report indicated that 72% minibus taxi drivers in Addis Ababa violet the speed limit (The Addis Ababa Police City Administration, 2017). Such statistical and empirical evidences may demand to conduct a research that considers minibus taxi drivers as a study's participants.

Considering the information presented above, in order to reduce the costs of speeding among minibus taxi drivers in Addis Ababa, interventions that involve education, enforcement and engineering may bring significant impact. For example, a local study suggested that road safety activities accompanied by awareness creation, physical speed limit measure and strict police enforcement would bring down the negative impact of speeding among such drivers (Abegaz et al., 2014). These interventions would be more effective when they are based of well-established theoretical frameworks.

In order to develop theory-driven effective interventions, therefore, as a contribution to the starting up of the growing traffic safety researches in Ethiopia, the current studies investigated determinants in speeding behaviour, and acceptability of ISA technology among minibus taxi drivers in Addis Ababa. To be more specific, paper one contributed some directions for behavioural intervention by looking at determinants in driving fast including social pressure (i.e., social pressure to drive fast raise from people on the road and relatives), personal orientation in relation to speeding (e.g., self-efficacy and behavioral intention to drive fast) and environmental context (e.g., enforcement environment to drive fast). Like paper one, although the aim is different, paper two also contributed knowledge about the future acceptability of ISA technology in Addis Ababa. The Ethiopian Road Authority is working towards launching in-vehicle speed control device which first demands knowledge about the acceptability of such technology among users. To enhance the effectiveness of this ITS intervention, the results about ISA acceptability in paper two would provide transport

authority with (at least) some directions about the future acceptability of ITS oriented speed management device, for instance ISA in this study's context.

1.4. General References

Abegaz, T., Berhane, Y., Worku, A., Assrat, A., & Assefa, A. (2014). Effects of excessive speeding and falling asleep while driving on crash injury severity in Ethiopia: a generalized ordered logit model analysis. *Accident Analysis & Prevention, 71*, 15-21. doi: https://doi.org/10.1016/j.aap.2014.05.003

Åberg, L., Larsen, L., Glad, A., & Beilinsson, L. (1997). Observed vehicle speed and drivers' perceived speed of others. *Applied Psychology, 46*(3), 287-302. doi: https://doi.org/10.1111/j.1464-0597.1997.tb01231.x

Adell, E., Varhelyi, A., & Nilsson, L. (2014). The definition of acceptance and acceptability. In T. H. Michael A. Regan, Alan Stevens (Ed.), Driver acceptance of new technology. Theory, measurement and optimisation (pp. 11-21). UK.

Ariën, C., Brijs, K., Brijs, T., Ceulemans, W., Vanroelen, G., Jongen, E. M., . . . Wets, G. (2014). Does the effect of traffic calming measures endure over time?–A simulator study on the influence of gates. *Transportation Research Part F: Traffic Psychology and Behaviour, 22*, 63-75. doi: https://doi.org/10.1016/j.trf.2013.10.010

Ariën, C., Brijs, K., Vanroelen, G., Ceulemans, W., Jongen, E. M., Daniels, S., . . . Wets, G. (2017). The effect of pavement markings on driving behaviour in curves: a simulator study. *Ergonomics, 60*(5), 701-713. doi: https://doi.org/10.1080/00140139.2016.1200749

Berry, T. D., Johnson, K. L., & Porter, B. E. (2011). Speed(ing): A Quality Control Approach. In B. E. Porter (Ed.), *Handbook of Traffic Psychology* (pp. 249). USA: Elsevier Inc.

Blincoe, K. M., Jones, A. P., Sauerzapf, V., & Haynes, R. (2006). Speeding drivers' attitudes and perceptions of speed cameras in rural England. *Accident Analysis & Prevention, 38*(2), 371-378. doi: https://doi.org/10.1016/j.aap.2005.10.008

Bliss, T., & Breen, J. (2012). Meeting the management challenges of the Decade of Action for Road Safety. *IATSS research, 35*(2), 48-55.

Carcary, W., Power, K., & Murray, F. (2001). *The New Driver Project: Changing driving beliefs, attitudes and self-reported driving behaviour amongst young drivers through classroom-based pre and post driving test interventions*: Scottish Executive.

De Pauw, E., Daniels, S., Thierie, M., & Brijs, T. (2014). Safety effects of reducing the speed limit from 90 km/h to 70 km/h. *Accident Analysis & Prevention, 62*, 426-431. doi: https://doi.org/10.1016/j.aap.2013.05.003

Elliott, M. A., & Armitage, C. J. (2009). Promoting drivers' compliance with speed limits: Testing an intervention based on the theory of planned behaviour. *British journal of psychology, 100*(1), 111-132. doi: https://doi.org/10.1348/000712608X318626

Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2005). Exploring the beliefs underpinning drivers' intentions to comply with speed limits. *Transportation Research Part F: Traffic Psychology and Behaviour, 8*(6), 459-479. doi: https://doi.org/10.1016/j.trf.2005.08.002

Elvik, R. (2009). *The Power Model of the relationship between speed and road safety: update and new analyses*.

Elvik, R., Vaa, T., Hoye, A., & Sorensen, M. (2009). *The handbook of road safety measures*: Emerald Group Publishing.

Farmer, C. M., Retting, R. A., & Lund, A. K. (1999). Changes in motor vehicle occupant fatalities after repeal of the national maximum speed limit. *Accident Analysis & Prevention, 31*(5), 537-543. doi: https://doi.org/10.1016/S0001-4575(99)00010-X

Fishbein, M., Triandis, H. C., Kanfer, F. H., Becker, M., & Middlestadt, S. E. (2000). Factors influencing behavior and behavior change.

Gabany, S. G., Plummer, P., & Grigg, P. (1997). Why drivers speed: The speeding perception inventory. *Journal of Safety Research, 28*(1), 29-35. doi: https://doi.org/10.1016/S0022-4375(96)00031-X

Garvill, J., Marell, A., & Westin, K. (2003). Factors influencing drivers' decision to install an electronic speed checker in the car. *Transportation Research Part F: Traffic Psychology and Behaviour, 6*(1), 37-43. doi: https://doi.org/10.1016/S1369-8478(02)00045-1

Gielen, A. C., McDonald, E. M., Gary, T. L., & Bone, L. R. (2008). Using the precede-proceed model to apply health behavior theories. *Health behavior and health education: Theory, research, and practice, 4*, 407-429.

Green, L. W., & Kreuter, M. W. (1991). Health promotion planning: an educational and environmental approach *Health promotion planning: an educational and environmental approach*: Mayfield.

Groeger, J. A. (2011). How many e's in road safety? In B. E. Porter (Ed.), *Handbook of traffic psychology* (pp. 3-12): Elsevier.

Hatakka, M., Keskinen, E., Gregersen, N.-P., Glad, A., & Hernetkoski, K. (2002). From control of the vehicle to personal self-control; broadening the perspectives to driver education. *Transportation Research Part F: Traffic Psychology and Behaviour, 5*(3), 201-215.

Kimber, R. (1990). *The relationship between speed, accidents and injury: Appropriate speeds for different roads and conditions.* Paper presented at the Proceedings PACTS Conference on Speed, Accidents and Injury: Reducing the Risks.

Kloeden, C. N., McLean, J., & Glonek, G. F. V. (2002). *Reanalysis of travelling speed and the risk of crash involvement in Adelaide South Australia*: Australian Transport Safety Bureau.

Mäkinen, T., Zaidel, D. M., Andersson, G., Biecheler-Fretel, M.-B., Christ, R., Cauzard, J.-P., . . . Heidstra, J. (2003). Traffic enforcement in Europe: effects, measures, needs and future. *Final report of the ESCAPE (Enhanced Safety Coming from Appropriate Police Enforcement) consortium. Available at virtual. vtt. fi/escape (retrieved 22 February 2010)*.

Mamo, W. G., & Haney, D. M. (2014). Attitudes and behaviors regarding traffic regulations in Addis Ababa, Ethiopia. *International Perspectives in Psychology: Research, Practice, Consultation, 3*(1), 37.

Mamo, W. G., Newnam, S., & Tulu, G. S. (2014). Investigating the individual and organisational predictors of work-related driving crash involvement in Ethiopia. *Transportation Research Part F: Traffic Psychology and Behaviour, 23*, 156-164. doi: https://doi.org/10.1016/j.trf.2014.01.001

Masten, S. V., & Peck, R. C. (2004). Problem driver remediation: a meta-analysis of the driver improvement literature. *Journal of safety Research, 35*(4), 403-425. doi: 10.1016/j.jsr.2004.06.002

Newnam, S., Mamo, W. G., & Tulu, G. S. (2014). Exploring differences in driving behaviour across age and years of education of taxi drivers in Addis Ababa, Ethiopia. *Safety Science, 68*, 1-5. doi: 10.1016/j.ssci.2014.02.012

Nilsson, G. (2000). Effects of speed limits on traffic accidents in Sweden. VTI Report 68, LinkoÈping, Sweden.

Paris, H., & Van den Broucke, S. (2008). Measuring cognitive determinants of speeding: An application of the theory of planned behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour, 11*(3), 168-180.

Petridou, E., & Moustaki, M. (2000). Human factors in the causation of road traffic crashes. *European journal of epidemiology, 16*(9), 819-826. doi: https://doi.org/10.1023/A:1007649804201

Rosen, E., & Sander, U. (2009). Pedestrian fatality risk as a function of car impact speed. *Accident Analysis & Prevention, 41*(3), 536-542. doi: https://doi.org/10.1016/j.aap.2009.02.002

The Addis Ababa Police City Administration. (2017). Annual Road Safety Report 2016 -2017. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety. In 3 (Ed.).

The Addis Ababa Police City Administration. (2018). Annual Road Safety Report 2017 -2018. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety. In 3 (Ed.).

The Addis Ababa Police Commission. (2016). Report on trends of road traffic accident in Addis Ababa (1998–2007 E. C) and contributing factors to traffic accident on junction areas in Addis Ababa. Addis Ababa, Ethiopia: Author.

Tian, Z. (2013). Speed-accident relationship at urban signalized intersections. *Procedia-Social and Behavioral Sciences, 96*, 1383-1388. doi: 10.1016/j.sbspro.2013.08.157

Van der Pas, J., Kessels, J., Veroude, B., & van Wee, B. (2014). Intelligent speed assistance for serious speeders: The results of the Dutch Speedlock trial. *Accident Analysis & Prevention, 72*, 78-94.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Victoir, A., Eertmans, A., Van den Bergh, O., & Van den Broucke, S. (2005). Learning to drive safely: Social-cognitive responses are predictive of performance rated by novice drivers and their instructors. *Transportation Research Part F: Traffic Psychology and Behaviour, 8*(1), 59-74.

World Health Organization. (2018). *Global status report on road safety 2018*: World Health Organization.

Young, K. L., Regan, M. A., Triggs, T. J., Jontof-Hutter, K., & Newstead, S. (2010). Intelligent speed adaptation—Effects and acceptance by young inexperienced drivers. *Accident Analysis & Prevention, 42*(3), 935-943.

2. Paper One

2.1. Exploring determinants in speeding behaviour using the 'major theorists' model among minibus taxi drivers in Addis Ababa, Ethiopia

2.2. Abstract

Speeding is the most common road safety problem that results many traffic accidents in Addis Ababa, Ethiopia. Minibus taxis take the first very few ranks in terms of contribution to the road safety problem in the City. Our aim was to investigate determinants in minibus taxi drivers' speeding behaviour using the 'major theorists' model, which is an integrated framework drawn from the dominant motivational models. Participants were 218 male minibus taxi drivers in Addis Ababa. The study followed sequential procedures that involved first develop self-report instrument, then validate the tool and finally test assumptions in the 'major theorists' model. To perform validation and testing assumptions, we employed factors loading analyses, correlational analyses and path analyses. The results in this study supported the assumptions drawn from the 'major theorists' model. In the first assumption, the path modelling explained 28% of the variance in speeding behaviour through all three positive statistically significant direct paths included behavioural intention to drive fast, perceived driving skill to drive fast, and enforcement environment in driving fast. In the second assumption, we found that the path modelling explained 28% of the variance in speeding behaviour through two positive statistically significant direct paths included one from behavioural intention to drive fast (mediator variable), and another from self-efficacy to drive fast. In the final assumption, the path modelling explained 36% of the variance in speeding behaviour through five positive statistically significant direct paths included behavioural intention to drive fast, self-efficacy to drive fast, enforcement environment in driving fast, social pressure to drive fast raise from people on the road, and social pressure to drive fast raise from relatives. Thus, we concluded that self-efficacy to drive fast, weak enforcement environment not to drive fast, social pressure to drive fast raise from people on the road and relatives, behavioural intention to drive fast, and perceived driving skill to drive fast are likely to represent target areas for road traffic safety interventions aimed at minibus taxi drivers in Addis Ababa. These results, therefore, may provide the potential to reduce minibus taxi drivers' engagement in driving fast as well as the burden of road traffic injury and death in Addis Ababa. This study also provides theoretical implications for future road traffic safety researches that would employ the 'major theorists' model.

Keywords: *Speeding, 'major theorists' model, minibus taxi drivers, determinants of speeding, Ethiopia*

2.3. Introduction

Traffic crash is one of major causes of death worldwide that resulted 1.35 million death each year (World Health Organization, 2018). The rate of road traffic crash is high in low-income countries (Bliss & Breen, 2012). For instance, the death rate resulted from traffic crash is three times high in low-income countries than in high-income countries (World Health Organization, 2018). Like many developing countries, Ethiopia faces high rate of road traffic crash (The Addis Ababa Police City Administration, 2018). The rate of road traffic accidents in Addis Ababa, Ethiopia reaches at a critical level when compared to rates in the capital cities of developed countries (Mamo & Haney, 2014). The Addis Ababa Police Commission (2016) report indicated that from 2014 to 2015, 17 904 accidents were recorded in the city. Out of this number, more than half of accidents caused by inappropriate speeding behaviours, such as driving beyond the speed limit, driving quickly without ceding priority to pedestrians on crossroad, and improperly overtook other vehicles. Such report also indicated that vehicles, for example, Automobile, Station Wagon, Taxi (mini-bus with 12 passengers) and Pickup took the lion's share for traffic accidents that happened in the city for several consecutive years. A more recent annual road safety report that consisted of findings of observational studies indicated that 72% minibus taxi drivers in Addis Ababa violet the speed limit (The Addis Ababa Police City Administration, 2017). A local study, conducted a few years ago, (e.g., Abegaz, Berhane, Worku, Assrat, & Assefa, 2014) also confirmed that drivers who operate minibus taxi for 12 passengers would often engage in driving beyond the speed limit.

To curb the costs of speeding among minibus taxi drivers in Addis Ababa, local empirical studies may be required to design effective interventions. In order to design such evidence-based countermeasures, the underlying factors that contribute to speeding behaviour among drivers need to be uncovered. Motivational models that aim to understand determinants in a behaviour can be successfully used as a frame of reference to explain and predict (Ajzen, 1991) drivers' preference of speeding behaviour that may consequently affect their exposure to accidents.

To be more specific, an integrated model i.e., 'major theorists' perspective drawn from several of the motivational models (see the theoretical framework), can be used as an

important framework for a comprehensive understanding of behaviours (Fishbein, 1997 in Armitage & Conner, 2000). In this study context, using such integrated model to predict drivers' speeding behaviour would be better instead of using a single motivational model presented below. Therefore, it aimed to take this 'major theorists' model as framework to investigate determinants in speeding behaviour among minibus taxi drivers in Addis Ababa.

2.4. Theoretical framework: The 'major theorists' model

The drive behind a scientific interest to employ a 'major theorists' model is linked with the workshop carried out by leading proponents of five major behavioural theorists that included Bandura (social cognitive theory), Becker (health belief model), Fishbein (reasoned action), Kanfer (theory of self-regulation and self-control), and Triandis (Subjective Culture and Interpersonal Relations) (Fishbein, Triandis, Kanfer, Becker, & Middlestadt, 2000). The workshop aimed at discussing some main points of consensus (among such models) that included identification of key variables (namely, positive intention, skills, attitude, social pressure, self-efficacy, environmental constraints, self-image and emotional reaction) (see part 2.5) that appear to serve as determinants of any given behaviour (Fishbein et al., 2000).
Considering the constructs identified above, we attempted to contextualize them into the current study. Prior situating such variables, we identified constructs compatible with Ethiopian context through consulting local experts, minibus taxi drivers and literature about Integrated Behavioural Model (e.g., Montaño & Kasprzyk, 2008). Therefore, self-image construct has been removed from this study, and speed oriented emotional reaction construct has been merged with attitude construct.

2.5. Situating 'major theorists' model for speeding behaviour and Hypotheses

Depending on assumptions in the 'major theorists' model in relation to joint ability to predict behaviours, we described the grouping of these concepts together with their already established influence on behaviours and the proposed hypotheses for the current study.

2.5.1. Behavioural intention, environmental contexts, perceived driving skills and driving fast

Perceived Driving Skills to drive fast: In this study, due to methodological (i.e., measurement technique) purpose, drivers' perceived driving skill to drive fast is taken into consideration instead of driving skills (which was originally identified in major theorists model as skill, and

cannot be collected through self-report survey). In most conditions, drivers' perceived driving skill is understood through a self- report way in which they make appraisal about their own driving skills in relation to driving fast. In this study, it can be conceived as a minibus taxi driver self- appraisal of his driving skill in performing driving fast across different road traffic contexts. *Behavioural Intention to drive fast*: Intentions can be contextualized as the cognitive representation of individuals' willingness to (Ajzen, 1991) perform a speeding behaviour. Intention may involve conceptual extension that encompasses implementation intention (Sheeran, Webb, & Gollwitzer, 2005), and behavioural intention, which can in this study be defined as 'the extent to which a person has formulated conscious plans (Warshaw & Davis, 1985, p. 214 in Konerding, 1999) to drive fast in different road traffic contexts. *Environmental context:* The driving environment that encompasses both physical as well as legal aspects may play an important role for driver to drives fast or not. For instance, Gargoum, El-Basyouny, and Kim (2016) indicated that road geometry and weather conditions impact a driver's perception to comply with speed limit or not. Drivers' travel practice is depending on the interaction with environmental context that may involve enforcement resources, speed limits, and road conditions (Lave & Elias, 1996). Environmental context, thus, refers the traffic context accompanied by physical and enforcement conditions that influence drivers' practice of driving fast. Speeding behavior is an important factor to which the prediction weight of each variable (presented above) is explored. Like other factors situated above, speeding behavior can be situated as an action of driving fast that is beyond the legal speed limit of a given road context. It has to be taken into consideration that in this report 'driving fast' and 'speeding behavior' can be used interchangeable.

Considering the variables mentioned above, Fishbein et al. (2000) theorized that environmental constraints, skill and behavioral intention are sufficient to produce a behavior (e.g., speeding behaviour in the case of this study). Independently, strong intention to perform a behaviour is not only enough to produce the actual behaviour, but they also need to possess skill to perform that particular behaviour (Montano & Kasprzyk, 2008), and traffic environmental context that makes possible or impossible a behaviour (Triandis, 1989). An integrated theoretical model, which is a modified version of 'major theorists' model, sets requirements in which any behaviour is most likely happens (Fishbein & Yzer, 2003). They indicated that such requirements show that a person most likely performs an action when he possesses a strong behavioural intention to manage the action, if he has the sufficient skill or

abilities demanded to engage in the action; and if the environment is conducive to perform the action. Similarly, Montaño and Kasprzyk (2008) showed that a certain behaviour might most likely happen when individuals have skill, strong intention, and no serious environmental constraint to perform a particular behaviour. By taking the information presented above into account, we hypothesized that:

H1. Perceived driving skill to drive fast, behavioural intention for speeding, low environmental constraints to drive fast will predict the driving fast behaviour.

2.5.2. Attitude, social pressure and self-efficacy

Paris and Van den Broucke (2008) situated constructs stated herewith in the context of speeding behaviour: an *attitude towards driving fast* is likely or unlikely evaluation of the expected outcomes of the speeding behaviour, both in terms of instrumental outcomes and affective (experiential) outcomes. The *social pressure about driving fast* is a perceived social influence to engage in driving fast of interest, and is derived from others' behaviour and direct feedback. Finally, the *self-efficacy to drive fast* is the degree to which an individual believes that his speeding behaviour is under his control in relation to his driving skill.

Intention to drive fast is an important predictor of exceeding speed limits (Holland & Conner, 1996). It is determined by attitude towards the behaviour, subjective norm and perceived control (Elliott, Armitage, & Baughan, 2005). According to Fishbein et al. (2000) in the 'major theorists' model, variables other than mentioned in H1 that included social pressure, self-efficacy, and attitude influence the strength and direction of relationship between intention and behaviour. A modified version of 'major theorists' model i.e., an integrated behavioural model suggested by Montaño and Kasprzyk (2008) indicated that a behavioural intention is predicted from attitude, social pressure, and self-efficacy. Therefore, we can give the following hypothesis:-

H2. Positive attitude towards driving fast, higher social pressure in relation to driving fast and better self-efficacy to drive fast will predict driving fast behaviour through behavioural intention.

In this context, attitude towards driving fast, social pressure to drive fast and self-efficacy to drive fast are distal predictors of speeding behaviour (Fishbein and Yzer, 2003)

According to Fishbein et.al. (2000) any behaviour can better be predicted by 'major theorists' model that incorporate constructs, including positive behavioural intention, skills, attitude,

social pressure, self-efficacy, environmental constraints, self-image and emotional reaction. To be more specific, in the Integrated Behaviour Model, any given behaviour is most likely predicted when an individual possess strong behavioural intention to engage in behaviour; necessary skills to perform the behaviour; and no environmental constrictions that prevent individuals from doing the behaviour (Fishbein, 2008). Individuals' attitude, social pressure and self-efficacy influence the strength of behavioural prediction from positive intention (Montaño & Kasprzyk, 2008). Depending on the information highlighted above, the researchers hypothesized that:

H3. Behavioural intention for speeding (with its antecedents: - attitude towards driving fast, social pressure to drive fast and self-efficacy in driving fast); perceived driving skill to drive fast; and low environmental constraints to drive fast will better predict the speeding behaviour.

During the workshop participants identified all key behavioural determinants (that were already mentioned above in section 2) through looking at common perspectives of different motivational models (Fishbein et al., 2000). Based on this idea, we hypothesised:-

H4: Proximal variables including attitude to drive fast, social pressure to drive fast, self-efficacy in driving fast, behavioural intention to drive fast, perceived driving skill to drive fast, low environmental constraints to drive fast will predict the speeding behaviour.

2.6. Methods

2.6.1. Respondents

As mentioned in the introduction part, the observational studies indicated that more than 70% of minibus taxi drivers in Addis Ababa violated the speed limit (The Addis Ababa City Administration, 2017), and consequently they are more likely to contribute for many severe crashes in the city (Abegaz et al., 2014). As part of their job, these drivers are supposed to spend a considerable amount of time on road, may stay at higher speed, travel frequent trips, and frequent stop and run. They engage in ever day trips in which they experience road traffic conditions that might not be experienced by other non-work related drivers in Addis Ababa. Legally, to be a minibus driver in Addis Ababa City, he or she must finish driving training test accompanied by theory and practice in relation to traffic regulations (e.g., speed limit in Addis Ababa) (Mamo & Haney, 2014). Minibus taxi drivers in Addis Ababa operate under the flexible schedules in which each driver waits a queue until passengers have filled their

minibus taxi. As far as they secured enough passengers, they would engage in frequent trip starting early in the morning until evening.

Considering such features, this study involved 218 male minibus taxi drivers. The range of these respondents' age was between 38 and 68 with an average of 32.38 And SD = 7.64. The driving experiences of participants ranged from 0.03 to 20 with an average year of 5.82 and SD = 5.02.

2.6.2. Questionnaire

An empirical study should be done in order to obtain convergent and discriminant validity for constructs identified in 'major theories' model (Armitage & Conner, 2000) in the Ethiopian context.

In order to develop the data collection instrument for the selected constructs in the 'major theorist' model, items collection, which involving more than 505 items, was created. Such items were prepared through assessing different sources of information that included interview, Focus Group Discussion (FGD), articles review, transport reports, recorded local video and personal experiences. The researchers conducted interviews and FGD with taxi drivers in Addis Ababa. Questions in FGD and interview were prepared in a way that addressed predispose, reinforce and enable factors of speeding behaviour among minibus taxi drivers in Addis Ababa.

From the items collection, the researchers screened important items that could fit with measuring each construct in the 'major theorists' model. In order to reach to the final items, experts engaged in a ranking technique in which they ordered valid items in respective construct by considering the local traffic context and minibus taxi drivers in Addis Ababa. After these all steps, the first best items were thoroughly examined for their appropriateness. Initially, nine items for measuring environmental context (e.g., *Speed breaker limits my speedy driving*), eleven items in measuring attitude to drive fast (e.g., *Driving fast aids me to reach at my destination more quickly*) and ten items for measuring social pressure to drive fast (e.g., *Driving fast is culturally considered as a sign of hero*) were identified. For the remaining constructs, four items for measuring perceived driving skills to drive fast (e.g., *I am skilful to drive fast on all types of roads*); seven items in ,measuring speeding behavior (e.g., *How often do you drive fast on a freeway?*); five items for self-efficacy in driving fast (e.g., *I believe my driving skills can meet the challenges of speeding*) were employed. And five items for measuring

behavioral intention to drive fast (e.g., *Imagine you are driving on the road where there is free traffic volume, do you intend to drive fast*) were selected.

2.6.3. Analyses

Prior computing the path analyses, we carried out factor loading and correlation analyses for identifying the final items that would measure the proposed constructs, and understanding the relationship among such constructs respectively. To gain an overall sense of fit of the data for path analyses to the hypothesized models, different goodness of fit statistics including the root mean square error of approximation (*RMSEA*) (McDonald & Ho, 2002; Steiger, 1990), chi square statistic, comparative fit index (*CFI*) (Hu & Bentler, 1999), and the goodness-of-fit index (*GFI*) (McDonald & Ho, 2002) were used. Forty-six observed variables were used as indicators of the latent constructs. The seven factors with different models were estimated in Amos using maximum likelihood estimation. Furthermore, item that measured demographic information of drivers was treated as moderator variable in the analyses.

2.6.4. Validating the instrument

To examine whether items used to measure attitudes, social pressure, self-efficacy, environmental constraint, perceived driving skill, and behavioural intention and speeding behaviour were assessing separate constructs, we employed the Exploratory Factor Analysis (*EFA*). Prior to evaluating the results of *EFA*, the Kaiser-Meyer-Olkin and Barlett's test of Sphericity were used by treating all items together. The value of *KMO* measurement was 0.822, and Barlett's test of Sphericity x^2 (1035, N = 218) = 3900.93, $p < .001$, indicating that the sample size was adequate.

Table 1
Factors loading of items measuring determinants in speeding behaviour

	1	2	3	4
Attitude				
Driving fast enables me to reach at destination more quickly	.630	_	_	_
Driving fast helps me to make frequent trips	.790	_	_	_
Driving fast assists me to transport many passengers per day	.721	_	_	_
Driving fast is a solution to win time shortage	.698	_	_	_
Driving fast helps me to overtake other drivers for securing the first few waiting queue at destination in order to get passengers for the next trip	.652	_	_	_

Speeding behaviour

How often do you drive fast to generate more daily income?	_	.771	_	_
How often do you drive fast to run away from traffic light?	_	.728	_	_
How often do you drive fast on a freeway?	_	.673	_	_
How often do you drive fast to arrive at destination for securing better queue?	_	.643	_	_
How often do you drive fast on road where there is no police officer?	_	.668	_	_
How often do you drive fast in evening?	_	.681	_	_

Perceived driving skill

I am skilled to drive fast in order to overtake other drivers	_	_	.681	_
I am skilful to drive fast on all types of roads	_	_	.687	_
I am skilled to drive fast than the average divers do	_	_	.629	_
During driving fast, I am skilled to manipulate the vehicle without exert much technical efforts	_	_	.533	_

Behavioural intention

Imagine you are driving in traffic situation where there are other drivers, so do you intend to drive fast in order to escape from being overtaken by those drivers	_	_	_	.828
Imagine you are driving towards your destination, hence do you intend to drive fast in order to get better queue for having passengers soon	_	_	_	.796
Imagine you are driving for work purpose, do you intend to drive fast in order to generate more daily Income	_	_	_	.770
Imagine you are driving on the road where there is free traffic volume, do you intend to drive fast	_	_	_	.682
Imagine you are driving at evening, do you intend to drive fast to transport large number of passengers	_	_	_	.639

Environmental context	1*	2*
Night driving allows me to driving fast	.726	_
Poor traffic management system in Addis Ababa makes me not comply with the speed limit (r)	.699	_
If I am once punished, my driving fast continuous until (within 72 hours) I am supposed to pay that fine	.616	_
Low traffic volume increases the chance of my driving fast	_	.712
My driving would not be beyond the speed limit, If a hand held speed camera is available around the road (r)	_	.591
Speed breaker limits my driving fast (r)	_	.549
Lack of self-explaining road (e.g., better speed limit signs) influences me to drive fast	_	.488

Social pressure to drive fast	**1****	**2****
Most passenger in waiting queues influence me to drive fast for a return trip	.755	_
My driving fast goes with the speeders around me in the traffic flow	.697	_
Most road users crossing behavior makes me to follow inappropriate speeding		

Patters	.619	_
Most police officers push me to respect the speed limit (r)	.622	_
Most people that are important to me find that I should not drive fast (r)	_	.808
Most Ethiopians find it advisable that drivers should not drive fast (r)	_	.697
Employer and/or family members want me to generate better daily income at any cost, even by driving fast	_	.584
Self-efficacy	**1*** **	2***
I am confident to drive fast under all traffic conditions	.796	_
I choose to drive fast because I trust my driving skill	.686	_
I believe I can drive fast on unfamiliar areas	.651	_
I believe I can definitely drive fast in high speed areas	_	.951

Note: *1 = Attitude towards driving fast; 2 = Speeding Behaviour (SB); 3 = Perceived driving skill (PDS); 4 = Behavioural intention to drive fast (BI). 1* = Enforcement Environment to drive fast (EE) 2* = Physical Environment to drive fast (PE). 1** = Social pressure to drive fast raise from persons on road (SPRPR); 2** = Social pressure to drive fast raise from relatives (SPRR); 1*** and 2*** = self-efficacy to drive fast (SE).*

Principal Component Analysis (*PCA*) was used to examine the possible structure of the scales. In the first analysis, all 46 items were included in a single *PCA*, using the eigenvalue >1 to determine the number of components to be extracted, and rotations, e.g., Varimax rotation to yield maximum discrimination between the scales. However, after Varimax rotation this solution did not produce a more interesting and an interpretable result that could strictly match with the 'major theories' model.

Considering such analyses contexts, we decided to compute factor loading in different ways in order to find out interpretable and valid items of dimensions, and sub-dimensions. After a number of analyses, we found interpretable result for 20 items in measuring variables i.e., attitude towards driving fast, behavioural intention to driving fast, speeding behaviour, perceived driving skill to drive fast. For the rest variables in the 'major theorists' model, we computed a separate *PCA* with varimix rotation on the items of dimensions (i.e., environmental context in driving fast, self-efficacy to drive fast, social pressure to drive fast).

2.6.5. Attitude, behavioural intention, speeding behaviour, perceived driving skill

We initial used 27 items measuring variables i.e. 11 items for attitude, 5 items for behavioural intention, 7 items for speeding behaviour and 4 items for perceived driving skill. However, after we looked different possibilities in the factor loading analyses, we identified and discarded items that were not loaded in the interpretable manner. Thus, 20 items were identified as final items to measure attitude towards driving fast, behavioural intention to

drive fast, speeding behaviour, perceived driving skill to drive fast. Thus, a Principal Component Analysis *(PCA)* with Varmix rotation using the eigenvalue >1 to determine the number of components to be extracted of 20 items reproduced a four-components solution accounted for 55.85% of the variance. Through this way, 5 items for attitude, 4 items for perceived driving skill, 5 items in behavioural intention, and 6 items for speeding behaviour were obtained. Such factors loading indicated that 6 items from attitudes, 1 item from speeding behaviour were discarded to find the factor loading stated in table 1. The content of items in attitude dimension reflected minibus taxi drives' trip-oriented tendency towards driving fast. Whereas, items under respective construct in table 1 reflected behavioural intention to drive fast, perceived driving skill to drive fast and speeding behaviour. The Cronbach alpha for measuring attitude, behavioural intention, speeding behaviour and perceived driving skill ranged from α = 0.6 to α = 0.8 (see table 2).

2.6.6. Self-efficacy, Social pressure and environmental context

For the rest variables other than mentioned in 2.6.5, we computed a separate *PCA* with varimix rotation using the eigenvalue >1 for each of environmental context to drive fast, self-efficacy related to driving fast, social pressure to drive fast.

2.6.6.1. Social pressure to drive fast

A *PCA* of 9 items measuring social pressure to drive fast produced a 3-factors solution explaining 54.84% of the variance. From the analysis, two items formed non-interpretable factor that would not be defined in a more meaningful way. After discarded these two items, a *PCA analysis* produced 2 components solution accounted for 50.87% of the variance. The first component contains 4 items, whereas the second component consists of 3 items. The content of items in the first component seems to reflect a social pressure to drive fast raise from persons on road (*SPRPR*) (e.g., *my driving fast goes with the speeders around me in the traffic flow*). The second component reflects a social pressure to drive fast raise from relatives (*SPRR*) (e.g., *Most people that are important to me find that I should not drive fast*). Cronbach alphas for measuring *SPRPR* and SPRR were α= .61 and α= .53 respectively.

2.6.6.2. Environmental context to drive fast

A *PCA* of seven items measuring environmental context to drive fast produced a 2-factors solution explaining 43.10% of the variance. The first component contains 3 items, whereas the second component consists of 4 items. The items in the first component indicated

enforcement environment to drive fast (e.g., *If I am once punished, my driving fast continuous until (within 72 hours) I am supposed to pay that fine*). The second component reflects a physical environment to drive fast (e.g., *Speed breaker limits my driving fast*). Cronbach's alphas for measuring enforcement environment and physical environment to drive fast were α = .5 and α = .4 respectively. The physical environment to drive fast was not considered in the path models for the reason that it scored Cronbach's alpha below .5.

2.6.6.3. Self-efficacy to drive fast

A principal component analysis of four items measuring self-efficacy to drive fast produced a 2-factors solution explaining 64.69% of the variance. The first component contains 3 items, whereas the second component consists of only one item. An item in the second component reflected drivers' believe that they could drive fast in high-speed areas. The content of items in the first component can be generally considered as self-efficacy to drive fast. The Cronbach's alpha for measuring a self-efficacy to drive fast was α = .54. A factor with one item was not considered for further analysis due to the reason that it consisted of an item.

2.7. Results

2.7.1. Correlation

To test the hypotheses given in this study, we first computed correlational analyses among speeding behaviour, behavioural intention to drive fast, attitude towards driving fast, perceived driving skill to drive fast, social pressure to drive fast raise from persons on road, and relative, enforcement environment, and physical environment to drive fast and self-efficacy to drive fast, age and driving experience. Inter-correlations between variables of this study as well as their means, standard deviations and reliability are stated in Table 2.

Table **2**

Means, Standard Deviations, Reliability Coefficients, and Inter-correlations between variables

Variables	1	2	3	4	5	6	7	8	9	10	11
Age (1)											
Experiences (2)	.628**										
SB (3)	-.154*	-.119	α = .83								
BI (4)	-.196**	-.226**	.419**	α = .83							
Attitudes (5)	-.039	-.100	.262**	.218**	α = .79						
PDS (6)	-.052	-.042	.332**	.312**	.458**	α = .61					
SPRPR (7)	-.076	-.121	.411**	.238**	.582**	.494**	α = .61				
SPRR (8)	-.053	.066	.227**	.052	-.236**	.103	.015	α = .53			
EE (9)	-.060	-.037	.387**	.239**	.491**	.405**	.620**	.009	α = .49		
PE (10)	-.083	-.139*	.247**	.174*	.306**	.292**	.328**	.103	.104	α = .41	
SE (11)	-.121	-.112	.419**	.272**	.490**	.538**	.544**	.122	.440**	.217**	α =.54
M	32.38	5.82	2.47	2.26	2.7	2.77	2.55	3.40	2.39	3.45	2.53
SD	7.64	5.02	0.83	0.81	0.89	0.78	0.8	0.85	0.82	0.65	0.81

*Note: 1 = Age; 2 = driving experiences; 3 = Speeding Behaviour (SB); 4 = Behavioural Intention (BI); 5 = Attitude towards driving fast; 6 = perceived driving skill (PDS). 7 = Social pressure to drive fast raise from persons on road (SPRPR); 8 = Social pressure to drive fast raise from relatives (SPRR). 9 = Enforcement Environment to drive fast (EE); 10 = Physical environment to drive fast (PE); 11 = Self-efficacy to drive fast (SE). M = mean; SD = standard deviation * P ≤ .05 **P ≤ .01*

Before we test hypotheses stated in 2.3, we computed correlations among variables identified under each hypothesis. In hypothesis 1, we included variables that were behavioural intention to drive fast, perceived driving skill to drive fast, environmental context in driving fast and speeding behaviour. Moreover, age was later considered as moderator variable in the analysis process. Thus, the result of correlation among variables in H1 indicated that statistically significant positive relationship between speeding behaviour with behavioural intention to drive fast (r = .42, p < .01), perceived driving skill to drive fast (r = .33, p < .01), enforcement environment in driving fast (r = .39, p < .01). For the moderator variable, a statistically significant negative relationship between speeding behaviour and age (r = -.15, p < .05). These findings showed that minibus taxi drivers with positive behavioural intention to drive fast; drivers who perceived that they were skilful to drive fast and those who drove in less managed environment were more likely to report as they drove fast.

In H2, we incorporated variables that were attitude to drive fast, social pressure to drive fast, self-efficacy to drive fast, behavioral intention to drive fast and speeding behavior. The correlation among such variables indicated that statistically significant positive relationship

between behavioural intention to drive fast with attitude towards driving fast (r = .22, p < .01), social pressure to drive fast raise from people on road (r = .24, p < .01), self-efficacy to drive fast (r = .27, p < .01). Statistically significant positive relationships were identified between speeding behaviour and behaviour intention (r = .42, p < .01), self-efficacy to drive fast and speeding behaviour (r = .42, p < .01). These findings referred that those drivers with attitude toward driving fast, confident to driving fast, influenced by pressure to drive fast raised from road users would engage in driving fast.

All variables included in H1 and H2 were incorporated both in hypotheses 3 and 4. The result of correlations among such variables identified in the first two hypotheses should also be similarly considered for H3 and H4.

2.7.2. Path model: Fit indexes

As we mentioned in the method part, to gain an overall sense of fit of the data to the hypothesized models, different goodness of fit statistics including *RMSEA*, X^2, *CFI*, *NFI*, and *GFI* were used. By considering all hypotheses given above, four models of fit were evaluated with a combination of criteria. Fit statistics for the four models are displayed in Table 3.

Table 3.
Fit statistics for four models

Hypotheses:- Models Criteria	**H1- Model 1**	**H2 – Model 2**	**H3- Model 3***	**H4 – Model 4**
X^2 with (p-value and degree of freedom)	.101 (p = 95, df = 2)	11.124 (p = .004, df = 2.)	239.935 (p = .000, df = 12)	2.178 (p = .903, df = 6)
RMSEA	.000	.145	.296	.000
CFI	1	.966	.534	1
GFI	1	.980	.775	.998
NFI	.999	.961	.530	.996

**The model did not involve at least one fit index*

Table 3 indicated that except model 2 and 3, the rest two models scored non-significant chi-square, which was acceptable fit index. With the exception of model 3, fit indexes including CFI, GFI and NFI fell under acceptable range i.e., 0.95 to 1 values. In terms of RMSEA, except in model 2 and 3, the value of this index in model 1 and 4 fell under acceptable range ≤ 0.08.

2.7.3. Path models

We used three path models to examine the degree to which participants' self-reported speeding behaviour was predicted from behavioural intention, attitude, perceived driving skill, social pressure to drive fast raise from persons on road, social pressure to drive fast raise from relatives, enforcement environment, and self-efficacy (see Fig. 1, 2 and 3). Moreover, participants' age was considered as moderator variable in model 1 and 4. The path modelling allowed us to examine the independent and cumulative effects of the predictor variables, and test whether the data supported the hypothesized distinction between the antecedents and determinant of behavioural intention to drive fast and speeding behaviour.

Fig. 1.
Behavioural intention to drive fast, perceived driving skill (PDS) to drive fast, enforcement environment in driving fast, age and speeding behaviour

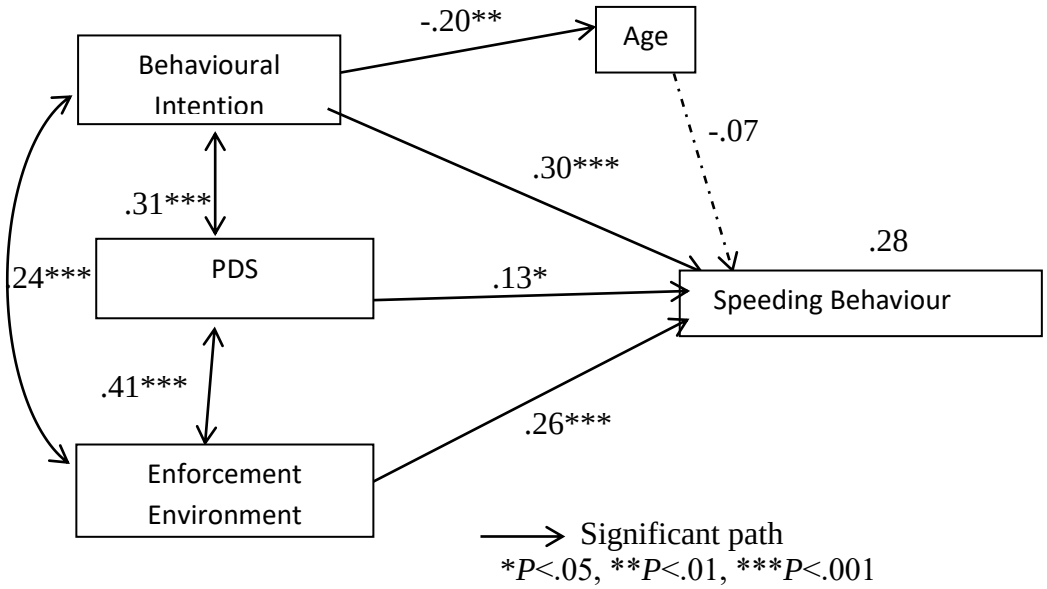

Fig. 1. Path estimates from the structural equation model

Note: PDS – Perceived driving skill

Hypothesis 1: The Path modelling explained 28% of the variance in speeding behaviour via all three positive statistically significant direct paths included behavioural intention to drive fast (β = 30, $p < .001$), Perceived driving skill to drive fast (β = .13, $p < .05$), and enforcement environment in driving fast (β = .26, $p < .001$). These findings suggested that behavioural intention to drive fast, perceived driving skill to drive fast and enforcement environment in driving fast directly influenced the self-reported drivers' speeding behaviours. In this model, we incorporated age as moderator variable between behavioural intention to drive fast and speeding behaviours.

Table 4.
Path Analysis Standardized Estimates

Predictors	*B*	*SE*	*P*	R^2
Model 1 – Speeding behaviour				28
Speeding behaviour ⟵ PDS	.13	.070	.046	
Speeding behaviour ⟵ Implementation intention	.30	.064	.000	
Speeding behaviour ⟵ Enforcement environment	.26	.065	.000	
Speeding behaviour <- - - Age	-.07	.006	.216	
Age ⟵ Implementation intention	-.20	.625	.003	

Thus, hypothesis 1 was supported i.e., perceived driving skill to drive fast, behavioural intention for speeding, low environmental constraints to drive fast would predict the speeding behaviour. Such predictor variables co-variated in the path modelling (see Fig. 1). It has to be taken into account that age was later included in the model as moderator variable, but not in the hypothesis 1.

Fig. 2.
Attitude to drive fast, social pressure to drive fast raise from persons on road (SPRPR), self-efficacy to drive fast, behavioral intention to drive fast and speeding behavior

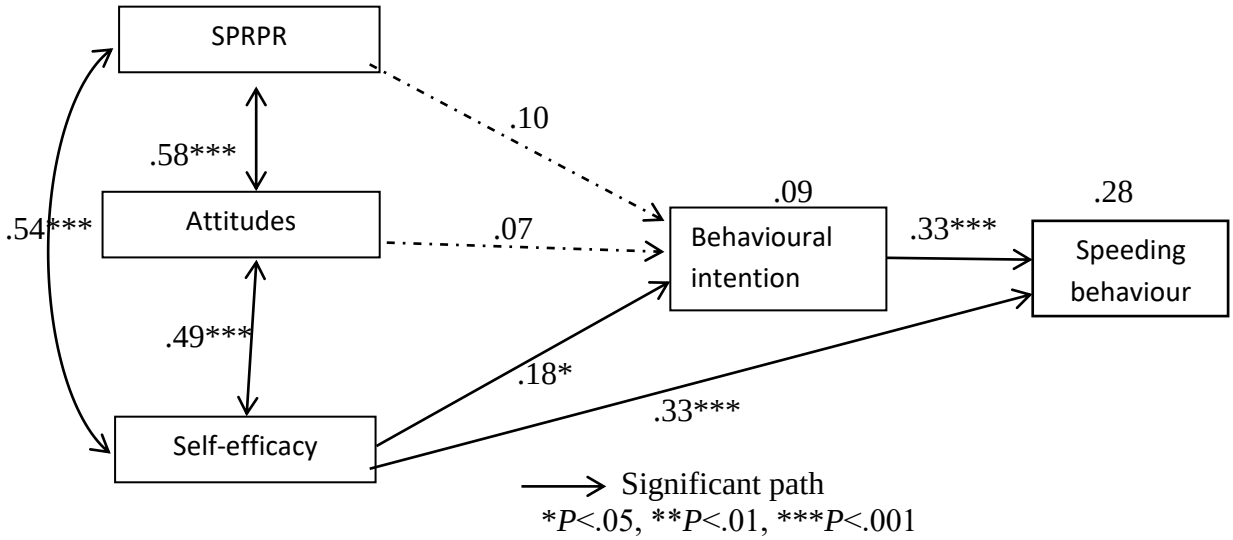

Fig. 2. Path estimates from the structural equation model

Hypothesis 2: The path modelling explained 28% of the variance in speeding behaviour through two positive statistically significant direct paths included one from behavioural intention to drive fast (mediator variable) ($_\beta$ = .33, p < .001), and another from self-efficacy to drive fast ($_\beta$ = .33, p < .001).

Table 5. Path Analysis Standardized Estimates

Predictors	*B*	*SE*	*P*	R^2
Model 1 – Speeding behavior				28
Implementation intention				09
speeding behaviour ⟵ Behavioural intention	.33	.062	***	
Speeding behaviour⟵ Self-efficacy	.33	.062	***	
Behavioural intention ⇠ Attitude	.07	.075	.381	
Behavioural intention ⇠ SPRPR	.10	.086	.263	
Behavioural intention ⟵ Self-efficacy	.18	.080	.021	

Note: SPRPR- social pressure to drive fast raise from people on road

Such results indicated that there was a direct influence on speeding behaviours from self-efficacy and behavioural intention to drive fast. A statistically significant direct path accounted for 9% of the variance in behavioural intention to drive fast resulted from only one statistically significant direct path i.e., self-efficacy to drive fast ($_\beta$ = .18, p <.05). This referred us that self-efficacy impacted the behavioural intention to drive fast. However, the result indicated no statistically significant paths to behavioural intention to drive fast from attitude and social pressure to drive fast raise from people on road. These findings may suggest that drivers' behavioural intention to drive fast was not significantly influenced by their attitude towards driving fast and social pressure to drive fast raise from people on road. This model partially supported hypothesis two in which the statistically non-significant paths should be taken into account.

Hypothesis 3: we did not run a path model for hypothesis 3 due to failure in getting fit-index in all criteria including REMSEA, Chi-square, CFI, GFI, and NFI (see table 3). Therefore, hypothesis 3 was not statistically supported.

Fig. 3.
Attitude to drive fast, Social pressure to drive fast raise from persons on road (SPRPR), Self-efficacy to drive fast, behavioral intention to drive fast, perceived driving skill (PDS) to drive fast, Social pressure to drive fast raise from relatives (SPRR), enforcement environment in driving fast, age and speeding behavior

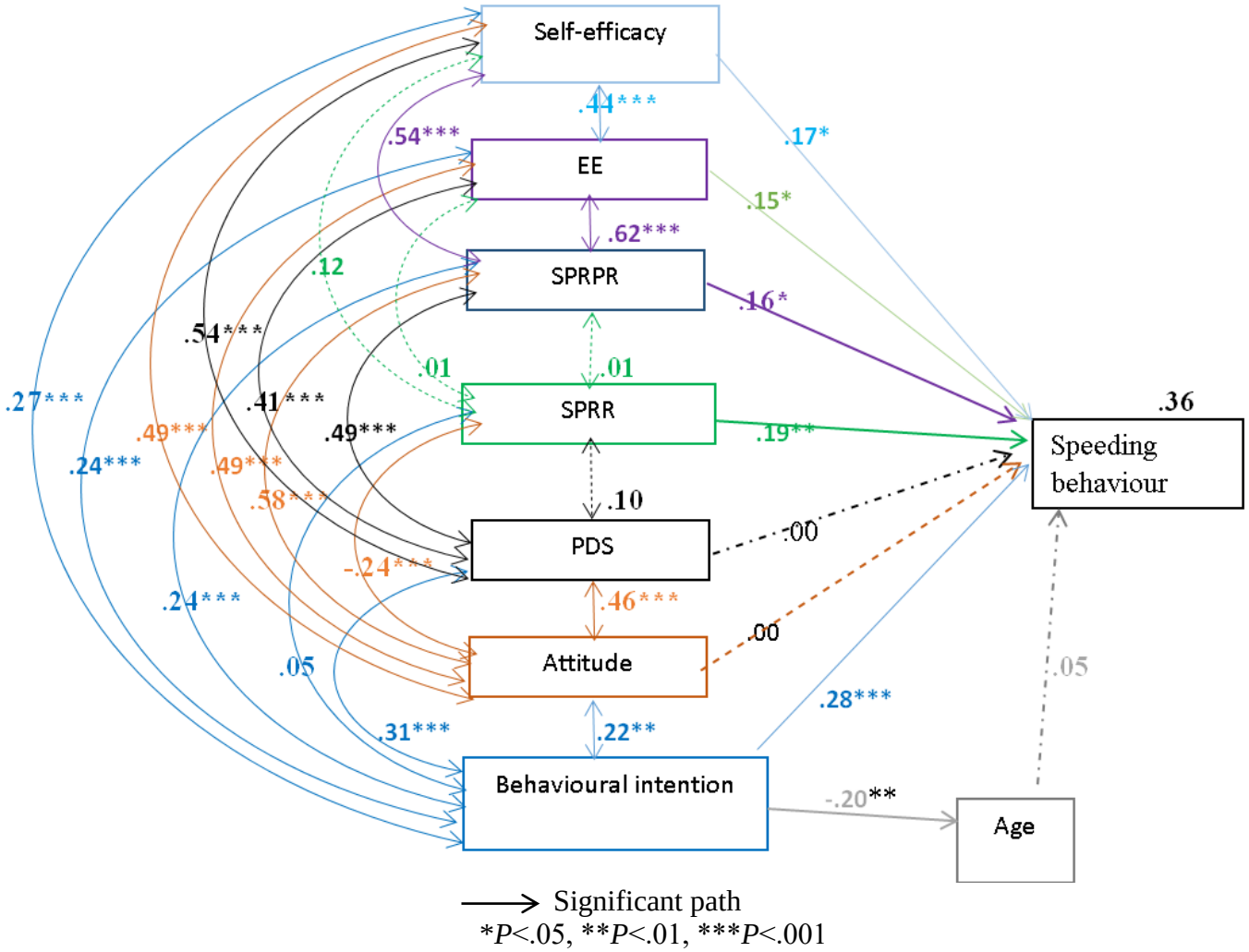

Fig. 3. Path estimates from the structural equation model

Hypothesis 4. The Path modelling explained 36% of the variance in speeding behavior through five positive statistically significant direct paths included behavioural intention (β = .28, p < .001), self-efficacy (β = .17, p < .05), enforcement environment (β = .15, p < .05), Social pressure to drive fast raise from persons on road (SPRPR) (β = .16, p < .05), Social pressure to drive fast raise from relatives (SPRR) (β = .19, p < .01). Age was a moderator variable between behavioural intention to drive fast and speeding behaviour. The findings in this model indicated that behavioural intention to drive fast, self-efficacy to drive fast, enforcement environment in driving fast, social pressure to drive fast raise from persons on road, and relatives directly influenced speeding behaviour. However, in this model, the result indicated no statistically significant paths to speeding behaviour from attitude and perceived driving skill. These findings may suggest that attitude to drive fast and perceived driving skill to drive fast did not influence speeding behaviour in a statistically significant manner.

Results in the current model supported hypothesis four, however the findings of no statistically significant paths should be taken into account. Except PDS with SPRR, SPRR with SPRPR, and Self-efficacy with enforcement environment, the combination of all predictor variables co-variated in the path modelling.

Table 6.
Path Analysis Standardized Estimates

Predictors	*B*	*SE*	*P*	R^2
Model 1 – Speeding behavior				36
Age ⟵ Implementation intention	-.20	.625	.003	
Speeding Behaviour ⟵ SPRR	.19	.058	.002	
Speeding Behaviour ⟵ SPRPR	.16	.083	.047	
Speeding Behaviour ⟵ PDS	.00	.075	.959	
Speeding Behaviour ⟵ EE	.15	.073	.042	
Speeding Behaviour ⟵ Self-Efficacy	.17	.074	.023	
Speeding Behaviour ⟵ Attitudes	.00	.071	.985	
Speeding Behaviour ⟵ Implementation intention	.28	.061	***	
Speeding Behaviour ⟵ Age	-.05	.006	.386	

***EE**- enforcement environment, **PDS** – perceived driving skill, **SPRR** – Social pressure to drive fast raise from relatives, **SPRPR** – Social pressure to drive fast raise from people on road*

2.8. Discussion

The aim of this study was to investigate determinants of minibus taxi drivers' speeding behaviour using the 'major theorists' model, which is an integrated model to identify factors behind behaviour.

The results of analyses fully and partially supported all hypotheses, except one. In hypothesis one, we identified that perceived driving skill to drive fast, behavioural intention to drive fast, low enforcement environment to drive fast were direct predictors of speeding behaviour, and age was a moderator variable. Minibus taxi drivers who were in low enforcement environment, reported as holding behavioural intention to drive fast, and perceived that they have driving skill to drive fast, reported as they engaged in driving fast. Such finding related with the idea of Fishbein et al. (2000); Fishbein & Yzer (2003) that indicated positive intention, environmental context and driving skills are sufficiently important to engage in behaviour, and they are most proximal determinants of any behaviour. Montano & Kasprzyk (2008) also confirmed that strong intention to perform a behavior is not only enough to produce the actual behavior, but also they need to possess skill (which was measured as perceived driving skill in this study) to perform a behaviour, and as (Triandis, 1989) environmental context that makes possible or impossible that particular behaviour.

Results in hypothesis two indicated that drivers' speeding behaviour was influenced by behavioural intention and self-efficacy to drive fast. Behavioural intention to drive fast was impacted by self-efficacy to drive fast, but not by attitude to drive fast and social pressure to drive fast raise from people on road. Those drivers who held behavioural intention to drive fast and self-efficacy to drive fast engaged in driving fast behaviour. It was surprising that drivers who possessed positive attitude towards driving fast and experienced social pressure to drive fast raised from people on road did not show significant intention to engage in speeding behaviour. The finding specifically distal factors (i.e., attitude, social pressure and self-efficacy) are poorly consistent with previous studies (see below), but the prediction of speeding behaviours from behavioural intention to drive fast and self-efficacy to drive fast are more consistent.

The intention, which is the most proximal determinant of the actual speeding behavior, is in itself a function of attitudes, social norms, and perceived behavioral control (Paris & Van den Broucke, 2008). Drivers' attitudes towards not conforming to the speed limits, their subjective norm in relation to speeding and perceived behavioral control regarding speeding have been shown to make significant contributions to their intention to comply with/exceed the speed limits (Elliott, Armitage, & Baughan, 2003). Research conducted by Cristea, Paran, and Delhomme (2013) indicated that intention to drive beyond speed limits best explained the self-reported speed behaviour. This research also indicated that high perceived behavioral control regarding driving beyond speed limits explained the self-reported speed behaviour. Such consistency is not only for self-driving speeding behaviours, it is also for observed speeding behaviours (Elliott, Armitage, and Baughan, 2007).

In hypothesis 4, the combination of self-efficacy to drive fast, enforcement environment to drive fast, and social pressure to drive fast raise from people on the road, and relative, and behavioural intention to drive fast influenced drivers' speeding behaviour, but perceived driving skill to drive fast and attitude towards driving fast did not influence the speeding behaviour. Minibus taxi drivers who possessed self-efficacy to drive fast, drive in weak enforcement environment, experienced social pressure to drive fast raise from relatives and people on road, possessed behavioural intention to drive fast engaged in driving fast. Such results are supported by previous literatures (e.g., Armitage & Conner, 2000, Fishbein, et al., 2000). They also relatively adhered with the general assumption given in 'major theorists' model. For example, constructs in 'major theories' model including attitude, norms, self-efficacy, intention, skill and abilities, environmental constraints, self-image, and emotional

reactions are key factors in predicting behavior (Armitage & Conner, 2000) and changing behavior (Glanz, Rimer, & Viswanath, 2015). Those constructs mentioned above must be true for a person to perform a behavior, and they account for most of the variance in any given deliberate behavior (Fishbein, et al., 2000).

It would be interesting to link hypotheses 1 and 4 by considering the suggestions presented in Fishbein, et al. (2000) i.e., constructs in 'major theorists' model other than behavioural intention, environmental context and skill; help to strength the prediction of behaviours from those variables mentioned in the above paragraph. Similarly, in this study, integrating attitude towards driving fast, social pressure to drive fast and self-efficacy to drive fast into the analysis increased the prediction weight (see model 1 & 4: prediction weight increased from 28% to 36%), which was predicted by behavioural intention, environmental context and perceived driving skill (which were assumed as sufficient to produce a behaviours).

2.9. Theoretical and practical implications

With the exception of hypothesis 3, the results of this study are relatively consistent with the proposed and existing theoretical perspectives that can be used as frameworks for intervention development and inputs for future research directions. Considering such consistency, this study would involve both practical and research implications.

2.9.1. Theoretical implications

In terms of research implication, this study attempted to test the 'major theorists' model in the context of speeding in developing country. As far as we knew, this model has never been tested yet, especially in the area of speeding behaviour in Ethiopia. Therefore, it would be interesting to look at the research implications by considering the theoretical issues in relation to the results of the current study. Considering this, we would like to propose four directions that shall be taken into account by future researches. The findings in this study (hypothesis 1 and 4) indicated that moderator variable (e.g., age in this study situation) should be taken into consideration depend on the context where these models are applied. Like the moderator variables in model 1 and 4, the future research shall consider different moderator variables when they employ the proximal variables (identified in major theorists model) to predict behaviour.

For hypothesis 3, we employed the recommendation given by Montaño and Kasprzyk (2008). However, this study did support such recommendation. Thus, it would be good to indicate that the future studies shall revalidate and retest this model in the area of speeding. Such

retesting indications shall also be applied into those other fitted models (identified in hypotheses 1, 2 and 4) for the purposes of better and consistent results.

The final direction, which can be considered as precondition for the first and the second directions, instrument that can measure variables under major theorists model need to be test and retest to develop widely valid and reliable tool that can consider issues in the area of driving behaviours. It would be important that the future research need to consider the actual driving behaviours when they attempt to address the research directions given in this study.

2.9.2. Practical implications

Transport policy makers consider that speeding is addressed using enforcement, engineering and education (Elvik, Vaa, Hoye, & Sorensen, 2009). Similarly, in terms of practical implication, this study involved features related education (psycho-social factors to drive fast) and environment enforcement in driving fast (e.g., weak enforcement to drive fast) that can be taken into account to manage speeding behaviour in Addis Ababa. Results in this study imply that self-efficacy to drive fast, weak enforcement environment not to drive fast, social pressure to drive fast raise from people on the road and relatives, behavioural intention to drive fast, and perceived driving skill to drive fast are likely to represent important targets areas for road traffic safety interventions aimed at minibus taxi drivers.

Considering the result of this study highlighted above, the following intervention actions can be drawn. Road safety education in Ethiopia need to be framed to educate minibus taxi drivers to hold accurate perception about their driving skill. Drivers could be optimist that they may think their accident exposure due to speeding is lower than the average drivers (Sundström, 2008). For example, young drivers may overestimate their own driving ability and underestimate traffic hazards (Rumar, 1985). From interventional perspective, such optimism may reduce the effectiveness of safety campaign measures (Delhomme, Verlhiac, & Martha, 2009). By considering such issues, there should be a room to give education and training to drivers with wrong perception about their driving skill in relation to speeding. Moreover, teach drivers about driving fast would lead accident although their self-appraisal indicates them, as they are good in their driving skill. Such trend can be applied for the case of self-efficacy to drive fast, i.e., educate drivers that although they are confident in their ability to drive fast across various traffic contexts, there would be high probability to engage in crash if they drive fast.

Such education and training has to be framed in a way in which drivers can look deep into themselves in relation to speeding. According to Keskinen and Hernetkoski (2011), it would be good to deliver education and training of self-evaluative and metacognitive skills to drivers in order to make capable them in acknowledge the risks involved in relation to their skills, and evaluate their own personal issues of these skills and risks. Such efforts would also be important for driver to get feedbacks on his personal behavior from within the self. These authors also indicated, self-evaluative skill help driver in addressing of his motives and goals, social pressure, skills and abilities related to different aspects of driving (e.g., speeding in current study's context) (Keskinen & Hernetkoski, 2011).

Educational interventions (e.g., training and media campaigns) are important to influence norms that impact drivers' driving skills (Niu, Liu, Wang, & Li, 2019). In order to intervene the impact of social pressure (raise both from drivers' relatives and from people on the road) on minibus taxi drivers to drive fast, safety education presented in the form of training and media campaign have to be backed by technology and enforcement. The more intervention strategies are combined, the better effects happen. Thus, combining educational information (Niu et al., 2019) with speeding in-vehicle warning information (Liu & Jhuang, 2012) would bring effective improvement in drivers' driving behaviour. As Newnam, Lewis, and Watson (2012) incorporating feedback and goal setting exercises using an objective measurement tool in weekly or daily based speed related safety management among occupational drivers are effective to reinforce for reducing over-speed that consequently improve the road safety

Improving the enforcement systems that include night driving prohibition, poor traffic management and automated traffic fine handling system would be important to minimize minibus taxi drivers' action from engaging in driving fast. Teaching drivers about the risk of night driving fast would be important. This can be achieved by DVD Discussion Resource (Fylan & Stradling, 2014) that include drivers watch a video in which people discuss about their speedy driving at night time, and the bad consequences of their decisions and actions pertaining to such risky driving. Then a trainer may make a discussion (after they watched the video) with drivers by covering issues related to blaming for such action, consequences and prevention.

In order to improve the poor traffic management system, in-vehicle ITS technologies would directly control drivers' speeding behaviour by limiting their speed based on the local road speed limit (Young, Regan, Triggs, Jontof-Hutter, & Newstead, 2010). Regarding fine

handling system, as Eccles (2012) using automated enforcement for speeding would effectively reduce the delay time of paying fine in which drivers would violet speed limit for the reason that additional fine may not be applied until the fine time (72 hours) has been expired.

2.10. Limitations

This study may involve some limitations that should be solved. The first limitation was associated with cross-sectional measurements in which minibus taxi drivers were measured once. Such limitation may create a challenge to 'carry out a causal implication that would explain the relationship between the variables as it was not possible to test the casual relationships that were proposed in this research' (Mamo et al., 2014). Thus, longitudinal research would be needed to provide further validation for the casual relationships that were proposed in this study (Mamo et al., 2014). The second possible limitation would be associated with participants response bias i.e., social desirability, the tendency of drivers to answer items in a social acceptable manner. However, to minimize such limitation, authors structured the instrument in a manner that could minimize response and items sequence biases, for example, add reverse statement in the instrument and mix-up together items that measure different constructs.

The third limitation would be attributed with the initial Varimax rotation that did not produce a more interpretable result that could strictly match with the 'major theories' model. Such outputs may be associated with the 'major theorists' model which is a hypothetical model and has never been tested in various contexts that would give insight for its measurement improvement. Initially, the model was proposed to find out determinants behaviour for HIV/AIDS exposure, thus apply such model in the context of road traffic safety may demand unique consideration. Moreover, these items were not previously tested and retested (i.e., developed as well as validated instrument) before we used it for the current study.

2.11. Conclusion

This study aimed at exploring different determinants of minibus taxi drivers' speeding behaviour using an integrated or 'major theorists' model. With the exception of hypothesis 3, the results fully and relatively supported the rest hypotheses. The findings of this study suggested that factors associated with social pressure (i.e., social pressure to drive fast raise from people on the road and relatives), personal orientation in relation to speeding (e.g., self-efficacy and behavioural intention to drive fast) and environmental context (e.g., enforcement environment to drive fast) made minibus taxi drivers to engage in driving fast. The results in

this study gave both theoretical implication in relation to the development of testing the 'major theorists' model, and practical recommendations for improving road safety problems behind minibus taxi drivers' speeding behaviour in Addis Ababa, Ethiopia.

2.12. References

Abegaz, T., Berhane, Y., Worku, A., Assrat, A., & Assefa, A. (2014). Effects of excessive speeding and falling asleep while driving on crash injury severity in Ethiopia: a generalized ordered logit model analysis. *Accident Analysis & Prevention, 71*, 15-21. doi: https://doi.org/10.1016/j.aap.2014.05.003

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211. doi: https://doi.org/10.1016/0749-5978(91)90020-T

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A structured review. *Psychology and health, 15*(2), 173-189. doi: 10.1080/08870440008400299

Bliss, T., & Breen, J. (2012). Meeting the management challenges of the Decade of Action for Road Safety. *IATSS research, 35*(2), 48-55.

Cristea, M., Paran, F., & Delhomme, P. (2013). Extending the theory of planned behavior: The role of behavioral options and additional factors in predicting speed behavior. *Transportation Research Part F: Traffic Psychology and Behaviour, 21*, 122-132.

Delhomme, P., Verlhiac, J.-F., & Martha, C. (2009). Are drivers' comparative risk judgments about speeding realistic? *Journal of Safety Research, 40*(5), 333-339. doi: https://doi.org/10.1016/j.jsr.2009.09.003

Eccles, K. A. (2012). *Automated enforcement for speeding and red light running* (Vol. 729): Transportation Research Board.

Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003). Drivers' compliance with speed limits: an application of the theory of planned behavior. *Journal of Applied Psychology, 88*(5), 964. doi: http://dx.doi.org/10.1037/0021-9010.88.5.964

Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2005). Exploring the beliefs underpinning drivers' intentions to comply with speed limits. *Transportation Research Part F: Traffic Psychology and Behaviour, 8*(6), 459-479. doi: https://doi.org/10.1016/j.trf.2005.08.002

Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2007). Using the theory of planned behaviour to predict observed driving behaviour. *British Journal of Social Psychology, 46*(1), 69-90. doi: 10.1348/014466605X90801

Elvik, R., Vaa, T., Hoye, A., & Sorensen, M. (2009). *The handbook of road safety measures*: Emerald Group Publishing.

Fishbein, M. (2008). A reasoned action approach to health promotion. *Medical Decision Making, 28*(6), 834-844. doi: https://doi.org/10.1177/0272989X08326092

Fishbein, M., Triandis, H. C., Kanfer, F. H., Becker, M., & Middlestadt, S. E. (2000). Factors influencing behavior and behavior change.

Fishbein, M., & Yzer, M. C. (2003). Using theory to design effective health behavior interventions. *Communication theory, 13*(2), 164-183. doi: https://doi.org/10.1111/j.1468-2885.2003.tb00287.x

Fylan, F., & Stradling, S. (2014). Behavioural Change Techniques used in road safety interventions for young people. *Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology, 64*(3), 123-129.

Gargoum, S. A., El-Basyouny, K., & Kim, A. (2016). Towards setting credible speed limits: identifying factors that affect driver compliance on urban roads. *Accident Analysis & Prevention, 95*, 138-148. doi: https://doi.org/10.1016/j.aap.2016.07.001

Glanz, K., Rimer, B. K., & Viswanath, K. (2015). *Health behavior: Theory, research, and practice*: John Wiley & Sons.

Holland, C. A., & Conner, M. T. (1996). Exceeding the speed limit: an evaluation of the effectiveness of a police intervention. *Accident Analysis & Prevention, 28*(5), 587-597. doi: https://doi.org/10.1016/0001-4575(96)00031-0

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55. doi: https://doi.org/10.1080/10705519909540118

Keskinen, E., & Hernetkoski, K. (2011). Driver education and training *Handbook of traffic psychology* (pp. 403-422): Elsevier.

Konerding, U. (1999). Formal models for predicting behavioral intentions in dichotomous choice situations. *Methods of Psychological Research, 4*(2), 1-32.

Lave, C., & Elias, P. (1996). Did the 65 mph Speed Limit Save Lives? *Journal of safety Research, 1*(27), 55.

Liu, Y.-C., & Jhuang, J.-W. (2012). Effects of in-vehicle warning information displays with or without spatial compatibility on driving behaviors and response performance. *Applied ergonomics, 43*(4), 679-686.

Mamo, W. G., & Haney, D. M. (2014). Attitudes and behaviors regarding traffic regulations in Addis Ababa, Ethiopia. *International Perspectives in Psychology: Research, Practice, Consultation, 3*(1), 37.

McDonald, R. P., & Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological methods, 7*(1), 64. doi: 10.1037/1082-989X.7.1.64

Montaño, D. E., & Kasprzyk, D. (2008). Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. In B. K. R. Karen Glanz, and K. Viswanath (Ed.), *Health behavior and health education : theory, research, and practice* (pp. 67 - 92): John Wiley & Sons, Inc.

Newnam, S., Lewis, I., & Watson, B. (2012). Occupational driver safety: Conceptualising a leadership-based intervention to improve safe driving performance. *Accident Analysis & Prevention, 45*, 29-38. doi: 10.1016/j.aap.2011.11.003

Niu, S. F., Liu, Y. J., Wang, L., & Li, H. Q. (2019). Effects of Different Intervention Methods on Novice Drivers' Speeding. *Sustainability, 11*(4), 1168.

Paris, H., & Van den Broucke, S. (2008). Measuring cognitive determinants of speeding: An application of the theory of planned behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour, 11*(3), 168-180.

Rumar, K. (1985). The role of perceptual and cognitive filters in observed behavior *Human behavior and traffic safety* (pp. 151-170): Springer.

Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin, 31*(1), 87-98. doi: https://doi.org/10.1177/0146167204271308

Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate behavioral research, 25*(2), 173-180. doi: 10.1207/s15327906mbr2502_4

Sundström, A. (2008). Self-assessment of driving skill–A review from a measurement perspective. *Transportation Research Part F: Traffic Psychology and Behaviour, 11*(1), 1-9. doi: https://doi.org/10.1016/j.trf.2007.05.002

The Addis Ababa City Administration. (2017). Annual Road Safety Report 2016 -2017. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety.

The Addis Ababa City Administration. (2018). Annual Road Safety Report 2017 -2018. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety.

The Addis Ababa Police Commission. (2016). Report on trends of road traffic accident in Addis Ababa (1998–2007 E. C) and contributing factors to traffic accident on junction areas in Addis Ababa. Addis Ababa, Ethiopia: Author.

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological review, 96*(3), 506.

World Health Organization. (2018). *Global status report on road safety 2018*: World Health Organization.

3. Paper Two

3.1. Investigating the acceptability of Intelligent Speed Adaptation among minibus taxi drivers in Addis Ababa, Ethiopia

3.2. Abstract

To have an insight about the acceptability of Intelligent Speed adaptation (ISA) is an important requirement for the development of supported implementation of such technology. The aim of this study was to investigate the behavioural intention to accept ISA technology among minibus taxi drivers in Addis Ababa, Ethiopia. Participants were 218 male minibus taxi drivers in Addis Ababa. In order to analysis the data, the study employed factors loading analyses, correlational analyses and path analyses. The results supported the hypothesis given in this study. The path modelling explained 40% of the variance in behavioral intention to accept ISA technology through two positive statistically significant direct paths included effort expectancy to use ISA and attitude towards this technology, but not statistically significantly from social influence to use ISA technology. We identified that positive evaluation towards using ISA technology; and the degree of convenience associated with the use of this technology among minibus taxi drivers are likely to represent target issues for intervention in order to increase the extent to which minibus taxi drivers intend to use such technology. These acceptability results, therefore, may have practical implications for Ethiopian Transport authority which takes the initiative to start the speed management ITS technology in Addis Ababa, Ethiopia.

Keywords: *ISA technology, Acceptability, UTAUT, Speeding, minibus taxi drivers, Ethiopia*

3.3. Introduction

Speeding is one of major risk factors that heighten the probability of road traffic crashes (De Pauw, Daniels, Thierie, & Brijs, 2014). It increases not only the chance to engage in crash, it also affects the severity level of road crash in terms of human lives loss, injuries and property damages (Carcary, Power, & Murray, 2001; Elvik, 2009; Garvill, Marell, & Westin, 2003). A major aggravating factor associated with the cost of speeding is that many drivers may not comply with the speed limits (Stanojević, Jovanović, & Lajunen, 2013). Not complying with the speed limit is a common problem in Addis Ababa, for example, the 2016 -2017 annual road safety report of the Addis Ababa City Administration indicated that 90% of buses, 73% of trucks and 72% of minibuses violated the speed limit of the City (The Addis Ababa Police City Administration, 2017).

In order to improve the road safety problem associated with speeding, it is essential to decrease drivers' engagement in driving fast (Stanojević et al., 2013). To realize this, interventionists may use different strategies that include enforcement, education and engineering (Groeger, 2011). Out of such strategies, anti-speeding engineering interventions, specifically, the Intelligent Transportation System (ITS) may play significant role in terms of handling drivers' involvement in driving beyond the speed limit (van der Pas, Marchau, Walker, Van Wee, & Vlassenroot, 2012). In-vehicle ITS technologies, for instance, Intelligent Speed Adaptation (ISA) would directly control drivers' speeding behaviour by limiting their speed based on the local speed limit (Young, Regan, Triggs, Jontof-Hutter, & Newstead, 2010). ISA could have a strong impact on road traffic safety; for example, large-scale use of ISA systems could achieve a 48% of reduction in the number of fatal accidents (Siebenga, 2000 in Blum & Eskandarian, 2006) and reduce the economic loss due to accidents and congestion (Brookhuis & de Waard, 1999).

3.4. Towards introducing in-vehicle ITS speed management technology

In Addis Ababa, 28, 289 total crashes, 3133 injury victims, 24, 928 property damage, and 478 fatalities were recorded in 2017/18 (The Addis Ababa Police City Administration, 2018). Speeding is a major problem that contributes for this large number of deaths, injuries and property lost. Observational studies incorporated in the 2017/18 annual road safety report indicated that 40% of drivers in Addis Ababa violated the speed limit (The Addis Ababa Police City Administration, 2018). As indicated above, majority of buses, trucks and minibuses often engaged in speed limit violation (The Addis Ababa Police City Administration, 2017). A local study conducted by Abegaz, Berhane, Worku, Assrat, and Assefa (2014) also confirmed that minibus tax drivers would often engage in driving beyond the speed limit.

By considering the cost of speed limit violation in Ethiopia, the Ethiopia Transport Authority planned to introduce a speed limiter technology for vehicles. Taking this plane into account, companies have been invited by the Authority to launch the ITS that obligates drivers must respect the speed limit of the given road context. As preconditions to launch the services, the Authority has initiated the importing process of the device in collaboration with potential companies; and build infrastructure that facilitates the service of such technology. Apart from the physical infrastructure requirement, users' supports towards such technology would be the next step to secure success in this effort.

In order to bring the forecasted benefits of this new automotive technology, there should be precondition in understanding about drivers' acceptance and intention to use it (Najm, Stearns, Howarth, Koopmann, & Hitz, 2006). Understanding how users will experience and respond to a new in-vehicle technology is a key factor of success in the future implementation of this device (Vlassenroot, Brookhuis, Marchau, & Witlox, 2010). The acceptability of ITS technology among drivers is, therefore, a vital issue in the development and deployment of such in-vehicle technology, unless it would not bring the desired effect across drivers' speeding behaviors (Mitsopoulos, Regan, & Haworth, 2002).

van der Pas et al. (2012) indicated that the uncertainties associated with the implementation of ITS are major barriers for policymakers to effectively implement it. For instance, how users respond to the ISA implementation is one of hindrance among a number of uncertainties for the practical acceptance of the ISA technology (Agusdinata, van Der Pas, Walker, & Marchau, 2009). Due to such challenges, there has been an increasing acknowledgement among ITS researchers and producers that in-vehicle ITS technologies would effectively reduce the rate of road traffic crashes, when they are sufficiently accepted by users (Mitsopoulos, Regan, & Haworth, 2002). Transport policy makers are also becoming interested to know drivers' acceptance of new technology that has impact on road safety, and how desirable outcomes can be supported by promoting acceptance of new technology (Regan, Stevens, & Horberry, 2014).

Considering the information presented above, implementation of ISA would bring the forecasted benefit level, if it is based an understanding of prior conditions through using the local evidences about drivers' behavioural intention to accept it. This study, therefore, investigates the acceptability of ISA technology among minibus taxi drivers who often violate the speed limit in Addis Ababa (The Addis Ababa Police City Administration, 2018).

3.5. Theoretical background about acceptability

Acceptance is an important foundation for the successful introduction and adoption of a new technology in transport contexts (Adell, Varhelyi, & Nilsson, 2014). As a methodological construct, acceptance is a contested term which is subjected to several, but relatively similar definitions (Regan, Stevens, & Horberry, 2014). The word acceptance may often be replaced by the term acceptability (Vlassenroot, Brookhuis, Marchau, & Witlox, 2010). However, scholars argued that there has been a conceptual distinction between acceptability and acceptance (e.g., Adell et al., 2014). The former refers an attitudinal construct that involves

prospective judgement of measurement for a new technology to which people have no experience, but it will be introduced to them in the future (Schade & Schlag, 2003). Whereas, the later construct indicates both the behavioural and attitudinal reactions regarding a new technology to which they have a practical exposure (Schade & Schlag, 2003).

In this study, methodologically, acceptability is preferred for the reason that ISA technology has not been embedded in minibus taxis which are currently operating in Addis Ababa, Ethiopia. However, in the near future, the Ethiopian Transport Authority would widely launch speed management ITS that enforces and obligates drivers to respect the local speed limits accordingly. The implementation of such speed control technology may demand to conduct a prospective research that uncovers its acceptability among drivers. In order to address this issue, it would be important to use a model that combines several theories, and necessary for proactively assessing the success of a new technology acceptance (Adell et al., 2014). Therefore, this study used constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) that integrates different models: namely, TRA; TAM; TPB; the model of PC Utilisation; Motivational model; a combined model of TAM and TPB; SCT, and innovation diffusion theory (Venkatesh, Morris, Davis, & Davis, 2003).

The UTAUT model consists of variables, such as performance expectancy, attitude, effort expectancy, social influence, and behavioural intention. Adell et al., (2014) indicated that variables mentioned above could be conceived as: Attitude toward ISA is driver's evaluation towards using this technology; effort expectancy is the degree of convenience associated with the use of the ISA; behavioural intention to accept ISA as the extent to which a taxi driver intends to use such technology. Performance expectancy is the degree to which a taxi driver believes that using the ISA technology would help him to attain gains in driving performance; social influence is the degree to which a taxi driver perceives that important others believe he should use the ISA when he drives. Finally, behavioural intention to drive fast is the extent to which a taxi driver has formulated conscious intention to drive fast in different road traffic contexts.

Adell et al., (2014) indicated that performance expectancy, effort expectancy, attitude and social influence could be proximal predictors of behavioural intention to accept ISA among drivers in the future. In their research, these authors also found that performance expectancy and social influence associated with the drivers' intention to use the ISA technology.

Moreover, age, experience, voluntariness and gender would moderator the prediction of behavioural intention from effort expectancy, performance expectancy, and social influence (Venkatesh et al., 2003). Due to methodological reason as prospective research, this study involves behavioral intention to use ISA, performance expectancy, effort expectancy, attitude and social influence. Moreover, driving experience would be considered as moderator variable (Venkatesh et al., 2003). Considering the empirical discussion presented above, therefore, we can hypothesize that:-

> Attitude, effort expectancy, performance expectancy and social influence will predict the behavioural intention to accept ISA technology in which driving experience is a moderate variable.

3.6. Methods

3.6.1. Respondents

This study involved 218 male participants who were minibus taxi drivers in Addis Ababa. The range of participants' age was between 38 and 68 with an average of 32.38 And SD = 7.64. The driving experiences of participants ranged from 0.03 to 20 with an average year of 5.82 and SD= 5.02 year.

3.6.2. Questionnaire

As far as this research emphasises on the future acceptability of IAS technology among drivers, it only included performance expectancy, effort expectancy, social influence, behavioural intention and attitude towards the ISA technology (Adell et al., 2014; Venkatesh et al., 2003). In this model, therefore, except attitude towards ISA, all constructs mentioned above were measured by a modified version of UTAUT instrument (Adell et al., 2014) and attitude was measured by the original items of UTAUT model (Venkatesh et al., 2003). Four items measured each of effort expectancy, performance expectancy, effort expectancy and attitude, for instance**,** *I would find the ISA useful in my driving; Authorities would be helpful in the use of the ISA; I would find the ISA easy to use; and using the ISA is a good idea*, were respectively used. Behavioural intention to use ISA technology was measured by three items (e.g., *I would plan to use the ISA technology in the next two weeks*).

3.6.3. Data collection procedure

After obtaining approval from the Addis Ababa City Transport program management office, the researchers engaged in data collection processes to gather data from minibus taxi drivers.

Due to the nature of their driving task, participants were selected through convenience sampling techniques based on their availability on the taxi station where they were accessible. To secure participants' consent, they were individually approached when they were not driving. After obtaining oral consent from each driver, a self-report questionnaire was distributed. Participants did receive orientation about the data filling process. Before they filled the questionnaire, each participant watched a brief video that did demonstrate how ISA functions (watch at https://www.youtube.com/watch?v=4MUxJYGAMjo). Moreover, the content of video was orally presented to each participant. Specifically, the video was modified only to indicate the advisory and supportive (mandatory) parts of ISA. As Young, Regan, Triggs, Jontof-Hutter, and Newstead (2010) the advisory part of ISA provides warning to a driver when he exceeds the speed limit, a static visual icon (accompanied by an auditory tone (beep) in the form of a small speed limit sign appeared on a visual display located on the dashboard. If exceeding the speed limit continues, the supportive or mandatory component of ISA system, instead of issuing an auditory tone, the driver receives upward pressure on the accelerator pedal (Young et al., 2010). The amount of fuel that goes to the engine declines, and then the vehicle's speed decline too in a way that adhere with the local road speed limit.

3.6.4. Validating instrument

To test whether items used to measure behavioural intention to use ISA technology (BI), Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), attitude toward using technology were assessing separate constructs; we employed the Confirmatory Factor Analysis (C*FA*). All 19 items measuring variables indicated above were computed in a single PCA with Varimax rotation and 5 loading factors, but it did not show confirmation in items measuring of distinct factors, instead the results did show mix-up among items in non-interpretable way i.e., the result showed uncommon items loading per construct.

Table 1
Factors loading of items measuring acceptability of ISA technology

	1	2	3	4
I like working with the ISA technology.	.829	_	_	_
Using the ISA technology is a good idea.	.753	_	_	_
Working with the ISA technology is fun.	.800	_	_	_
The ISA technology makes work more interesting.	.636	_	_	_
Authorities would be helpful in the use of the ISA technology.	_	.890	_	_
In general, authorities would support the use of the ISA technology.	_	.631	_	_
People who are important to me would think that I should use the ISA technology.	_	.546	_	_

My interaction with the ISA technology would be clear and understandable.	_	.749	_	
Learning to operate the ISA technology is easy for me	_	_	.672	_
I would find the ISA technology easy to use.	_	_	.654	_
It would be easy for me to become skilful at using the ISA technology.	_	_	.696	_
I would plan to use the ISA technology in the next two weeks.	_	_	_	.814
I would predict I would use the ISA technology in the next two weeks.	_	_	_	.626

Note: 1 = Attitude, 2 =social influence, 3 = Effort expectancy, 4 = Behavioural intention to accept ISA,

Thus, we avoided all items measuring performance expectancy and one item from each of measuring behavioural intention to use ISA technology (i.e., *I would intend to use the ISA technology in the next two weeks*), and social influence to use ISA technology (i.e., *People who influence my behavior would think that I should use the ISA technology*).

After such decision, a principal component analysis with Varimax rotation and 4 factors of 13 items measuring behavioral intention, effort expectancy, social influence, attitude produced a 4-factors solution explaining 73.35% of the variance. Each of the first and the third components contain four items measuring each of attitude towards using ISA and effort expectancy; three items measuring social influence to use ISA loaded in component 2, and the fourth component consisted of two items for measuring behavioural intention to use ISA technology. Cronbach alphas for measuring these variables ranged from α = 0.70 and α = 0.91.

3.7. Results

The aim of this study was to explore the behavioural intention to accept ISA technology among minibus taxi drivers in Addis Ababa. In order to achieve this aim, analyses of correlation, fit indexes, path model are incorporated under this part.

3.7.1. Correlation

Table 2

Means, Standard Deviations, Reliability Coefficients, and Inter-correlations between variables

Variables	1	2	3	4	5
Driving Experiences (1)					
Attitudes towards ISA (2)	.004	α = 0.91			
Effort Expectancy (3)	.030	.706**	α = .80		
Social Influences (4)	-.008	.614**	.551**	α =.73	
Behavioural Intention (5)	.095	.595**	.558**	.406 **	α = .70
M	5.82	3.56	3.57	3.73	3.42
SD	5.03	0.96	.76	0.80	0.85

***. Correlation is significant at the 0.01 level (2-tailed), M = Means SD = Standard Deviations*

In our hypothesis, we included variables that were behavioral intention, effort expectancy, social influence, attitude, and driving experience. The result of correlation among variables in the hypothesis indicated that statistically significant positive relationship between behavioural intention to accept ISA technology with attitude (r = .60, p < .01), effort expectancy (r = .56 p < .01), and social influence (r = .41, p < .01). These findings showed that taxi drivers with positive attitude towards ISA technology, have effort expectance in relation to ISA, and socially influenced to use ISA were more likely report as they behavioural intended to accept ISA technology. Such findings may further indicated us when minibus taxi drivers' effort expectancy, social influence, attitude toward using ISA technology increased, the behavioural intention to accept ISA technology increased too.

3.7.2. Path model: Fit indexes

Table 3

Path model: Fit index statistics for model 1

Hypotheses:- Models	**H1- Model 1**
Criteria	
X^2	.227 (p = .89, df = 2)
RMSEA	.000
CFI	1
GFI	1
NFI	.999

Table 1 indicated that all fit indexes in model 1 including chi-square, comparative fit index (CFI), Goodness-of-fit index (GFI) and Normed fit index (NFI), the Root Mean Square Error of Approximation (RMSEA) fell under acceptable range. To be more specific, fit index statistics in model 1 are [$\boldsymbol{X^2}$ = .227, p = .89, df = 2, RMSEA = .000, CFI = 1, NFI = .999, GFI = 1].

Fig. 1
Attitude, effort expectancy, behavioural intention, social influence and driving experience

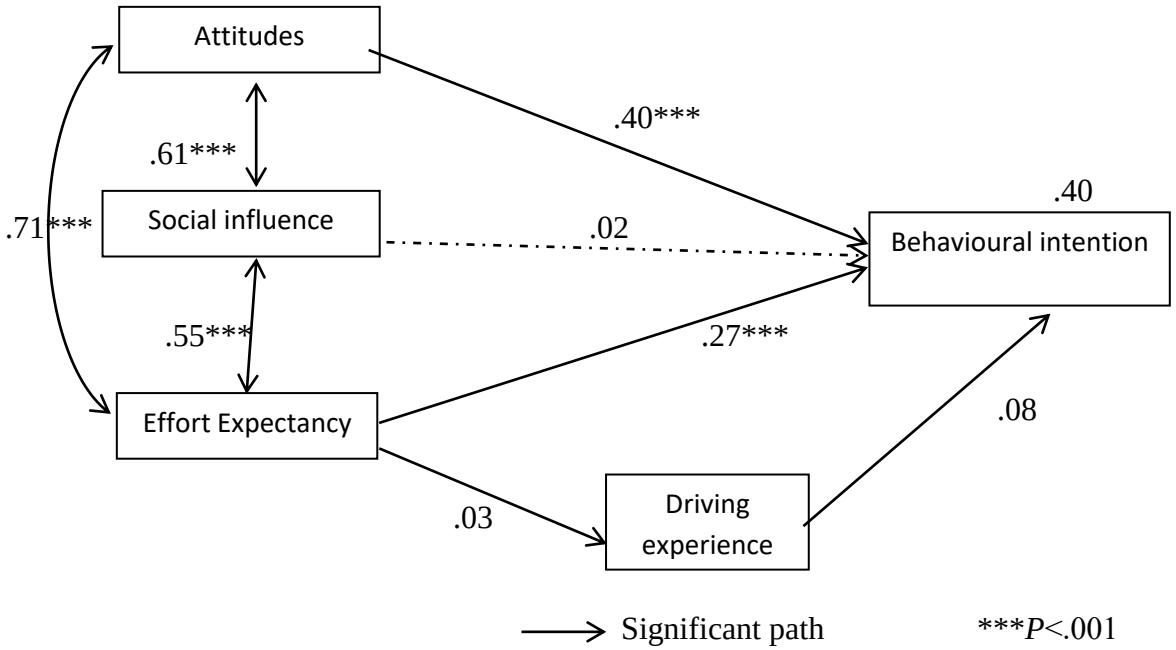

Fig. 1. Path estimates from the structural equation model

Table 4.
Path Analysis Standardized Estimates

Predictors			***B***	***SE***	***P***	R^2
Model 1 – Behavioral intention						40
Behavioural intention	⟵	Attitude	.40	.071	***	
Behavioural intention	⟵	Effort Expectancy	.27	.085	***	
Behavioural intention	⇠	Social influences	.02	.073	.820	
Behavioural intention	⇠	driving experience	.08	.009	.107	
Driving experience	⇠	Effort Expectancy	.03	.449	.654	

The Path modelling explained 40% of the variance in behavioural intention to accept ISA through two positive statistically significant direct paths included effort expectancy (β = .27, p < .001), and attitude (β = .40, p < .001). The findings in this model indicated that attitude and effort expectancy directly influenced behavioural intention to accept ISA. However, in this model the result indicated no statistically significant path to behavioural intention from social influence. This finding may suggested that behavioural intention was not statistically significantly impacted by social influence to use ISA technology. Although the result did not show statistically significant paths to behavioural intention from social influence to use ISA technology, the model relatively supported the hypothesis given in this study. More

importantly, performance expectance was not included in the model analysis for the reason that it was not appropriately loaded in the factor loading analysis (see validating instrument). Thus, such information should be taken into account when we consider that the results relatively supported the hypothesis. In this model, driving experiences was employed as moderator variable between effort expectancy and behavioural intention. All predictor variables statistically significantly co-variated each other.

3.8. Discussion

To have an insight about the acceptability of Intelligent Speed adaptation (ISA) is a key factor for the success of supported implementation of ISA technology (Vlassenroot et al., 2011). This refers that understanding how users will react and experience ISA, and consideration of their need in relation to this device shall be important in the development and implementation of such ITS technology (Vlassenroot, Brookhuis, Marchau, & Witlox, 2008). Considering such information, the aim of this study was to explore acceptability of Intelligent Speed Adaptation among minibus taxi drivers in Addis Ababa, Ethiopia.

In the given hypothesis, we identified that positive evaluation towards using ISA technology (i.e., attitude); and the degree of convenience associated with the use of the ISA (effort expectancy) among minibus taxi drivers directly predicted the extent to which they behaviourally intend to use this technology. However, unexpectedly the degree to which a taxi driver perceives that important others believe he should use the ISA when he drives (i.e., social influence) did not significantly predict the behavioural intention to use ISA technology. This probably happened for the reason that the society has never been exposed to ISA yet, thus participants may not have any indication about what the society thinks about ISA in relation to drivers are supposed to use it.

The finding, specifically, consistent with Venkatesh et al. (2003) and Regan, Mitsopoulos, Haworth, and Young (2002), but in contrast to Adell et al. (2014), in the current study effort expectancy showed significant direct relation to behavioral intention to use the driver support systems. Reversely, inconsistent with Venkatesh et al. (2003); Adell et al. (2014) and Regan et al. (2002), social influence towards using the driver support systems did not show significant direct prediction for behavioural intention to use such technology.

The result regarding the impact of drivers' tendency on their behavioural intention to accept ISA technology is consistent with the work of scholars (e.g., Adell et al., 2014; Vlassenroot & Brookhuis, 2014) who showed that attitude towards technology can be included as direct

determinants in the behavioural intention to accept technology. A study conducted by Marell and Westin (1999) indicated that drivers' attitudes towards ITS for speed checking showed a high level of acceptance. However, such finding may be inconsistent with the result of Várhelyi, Hjälmdahl, Hydén, and Draskóczy (2004), over time drivers may be become less positive towards speed control systems. In this context, participants in the current study may later develop negative attitude towards ISA when they have actual interaction with it.

In this study we could notice that minibus taxi drivers' driving experience was a moderator variable between the extent of convenience to use ISA and behavioural intention to use ISA. Such finding is consistent with the work of Venkatesh et al., (2003) who indicated that experience would moderator the prediction of behavioural intention from effort expectancy.

3.9. Limitation

Even though this study has strengths, the following limitations of the research should be addressed. The first limitation is associated with the data collection processes in which they were gathered at one point in time that probably may not rule out the casual relationships identified in this study. The second limitation is the analysis of minibus taxi drivers may not provide sufficient samples for generalizing the findings to all drivers, for example, bus driver, automobile and trucks. Thus, future studies that will address non-minibus drivers need to be done. Thirdly, the self-report survey was first prepared in English (Adell et al. 2014) and translated into Amharic. This might produce bias the results. However, the forward-backward-forward translation performed by language experts would reduce the biases. The tendency of minibus taxi drivers to answer items in a social acceptable manner would be a problem, however the study attempted to minimize it by using reversely framed statement in the instrument as well as mixing together items that measure different constructs in a way that reduce sequences biases.

3.10. Practical implications

In order to manage the road safety problem resulted from driving beyond speed limit, ISA can be introduced as a transport policy instrument that would enforce drivers to respect the local road speed limit (Molin & Brookhuis, 2007). Although such large-scale use of the ISA system would bring major benefit to the road safety, acceptability of such technology is still a challenging issue (Blum & Eskandarian, 2006; Van Nes, Houtenbos, & Van Schagen, 2008). In order to develop appropriate ISA implementation strategy as Vlassenroot et al. (2008), it

would be necessary to provide decision-makers with evidences that are based on well-accepted socio-psychological models.

Considering such information, the results in this study may offer practical implications for Ethiopian Transport Authority in relation to acceptability of speed control ITS technology, which has been under process to be launched in Ethiopia.

In this context, we can concentrate on two major constructs (i.e., effort expectancy to use ISA and attitude towards ISA) that directly predicted drivers' behavioral intention to accept ISA technology. Prior the actual implementation of ITS in Ethiopia for managing the costs of speed limit violation, media campaign would be important to develop positive attitude among users of such technology. Awareness and belief creation about ISA's contribution in attaining various personal and societal goals would be made by mass communication campaign, and large scale demonstration of such technology (Molin & Brookhuis, 2007). Mere exposure to this technology would enhance drivers' tendency towards it (Zajonc, 1968 in Marell & Westin, 1999). Such exposure may empower drivers to positively evaluate the electronic speed checker prior they had tested it (Marell & Westin, 1999).

Regarding the effort-expectancy related to ISA, integrating demonstration oriented training about the degree of convenience associated with the use of the ISA in driving license school education (e.g., give practical test to graduate drivers in order to evaluate the extent to which they react to the response produced from voluntary component in ISA technology) would be important to increase drives' behavioral intention to accept ISA technology. Demonstration of ISA introduction (Molin & Brookhuis, 2007) in terms of accident reduction and saving life would be good to increase its acceptability among users.

Intention to accept ISA may not be enough for implementation of this technology. Pilot studies that includes the actual use of speed control ITS technology should be conducted. Thus, future studies shall consider such direction for better understanding of users' acceptance of such technology.

3.11. Conclusion

The aim of this study was to explore the behavioural intention to accept ISA technology among minibus taxi drivers in Addis Ababa. The results of this study relatively supported the given hypothesis. Attitude towards ISA, and effort expectancy in relation to ISA made minibus taxi drivers to behaviourally intended to accept such technology. The results of this

study attempted to give practical implications regarding the acceptability of speed control technology, which is under consideration to be implemented in Ethiopia.

3.12. References

Abegaz, T., Berhane, Y., Worku, A., Assrat, A., & Assefa, A. (2014). Effects of excessive speeding and falling asleep while driving on crash injury severity in Ethiopia: a generalized ordered logit model analysis. *Accident Analysis & Prevention, 71*, 15-21. doi: https://doi.org/10.1016/j.aap.2014.05.003

Agusdinata, D., van Der Pas, J., Walker, W. E., & Marchau, V. (2009). Multi-criteria analysis for evaluating the impacts of intelligent speed adaptation. *Journal of advanced transportation, 43*(4), 413-454.

Adell, E., Varhelyi, A., & Nilsson, L. (2014). The definition of acceptance and acceptability. In T. H. Michael A. Regan, Alan Stevens (Ed.), Driver acceptance of new technology. Theory, measurement and optimisation (pp. 11-21). UK.

Blum, J., & Eskandarian, A. (2006). *Managing effectiveness and acceptability in intelligent speed adaptation systems.* Paper presented at the 2006 IEEE Intelligent Transportation Systems Conference.

Brookhuis, K., & de Waard, D. (1999). Limiting speed, towards an intelligent speed adapter (ISA). *Transportation Research Part F: Traffic Psychology and Behaviour, 2*(2), 81-90.

Carcary, W., Power, K., & Murray, F. (2001). *The New Driver Project: Changing driving beliefs, attitudes and self-reported driving behaviour amongst young drivers through classroom-based pre and post driving test interventions*: Scottish Executive.

De Pauw, E., Daniels, S., Thierie, M., & Brijs, T. (2014). Safety effects of reducing the speed limit from 90 km/h to 70 km/h. *Accident Analysis & Prevention, 62*, 426-431. doi: https://doi.org/10.1016/j.aap.2013.05.003

Elvik, R. (2009). *The Power Model of the relationship between speed and road safety: update and new analyses*.

Garvill, J., Marell, A., & Westin, K. (2003). Factors influencing drivers' decision to install an electronic speed checker in the car. *Transportation Research Part F: Traffic Psychology and Behaviour, 6*(1), 37-43. doi: 10.1016/S1369-8478(02)00045-1

Groeger, J. A. (2011). How many e's in road safety? In B. E. Porter (Ed.), *Handbook of traffic psychology* (pp. 3-12): Elsevier.

Marell, A., & Westin, K. (1999). Intelligent transportation system and traffic safety–drivers perception and acceptance of electronic speed checkers. *Transportation Research Part C: Emerging Technologies, 7*(2-3), 131-147.

Mitsopoulos, E., Regan, M. A., & Haworth, N. (2002). Acceptability of in-vehicle intelligent transport systems to Victorian car drivers. *Royal Automobile Club of Victoria (RACV), Report*(02/02).

Molin, E. J., & Brookhuis, K. A. (2007). Modelling acceptability of the intelligent speed adapter. *Transportation Research Part F: Traffic Psychology and Behaviour, 10*(2), 99-108.

Najm, W., Stearns, M., Howarth, H., Koopmann, J., & Hitz, J. S. (2006). Evaluation of an automotive rear-end collision avoidance system: United States. Department of Transportation. National Highway Traffic Safety ….

Regan, M. A., Mitsopoulos, E., Haworth, N., & Young, K. (2002). Acceptability of in-vehicle intelligent transport systems to Victorian car drivers. *Monash University Accident Research Centre*.

Regan, M. A., Stevens, A., & Horberry, T. (2014). Driver acceptance of new technology: Overview. In T. H. Michael A. Regan, Alan Stevens (Ed.), *Driver Acceptance of New Technology: Theory, Measurement, and Optimisation* (pp. 1-21). UK.

Schade, J., & Schlag, B. (2003). Acceptability of urban transport pricing strategies. *Transportation Research Part F: Traffic Psychology and Behaviour, 6*(1), 45-61.

Stanojević, P., Jovanović, D., & Lajunen, T. (2013). Influence of traffic enforcement on the attitudes and behavior of drivers. *Accident Analysis & Prevention, 52*, 29-38. doi: https://doi.org/10.1016/j.aap.2012.12.019

Tapp, A., Nancarrow, C., & Davis, A. (2015). Support and compliance with 20 mph speed limits in Great Britain. *Transportation Research Part F: Traffic Psychology and Behaviour, 31*, 36-53. doi: https://doi.org/10.1016/j.trf.2015.03.002

The Addis Ababa Police City Administration. (2017). Annual Road Safety Report 2016 -2017. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety. In 3 (Ed.).

The Addis Ababa Police City Administration. (2018). Annual Road Safety Report 2017 -2018. Addis Ababa. Prepared in collaboration with Bloomberg Philanthropies Initiative for Global Road Safety. In 4 (Ed.).

van der Pas, J.-W. G., Marchau, V. A., Walker, W. E., Van Wee, G., & Vlassenroot, S. (2012). ISA implementation and uncertainty: A literature review and expert elicitation study. *Accident Analysis & Prevention, 48*, 83-96.

Van Nes, N., Houtenbos, M., & Van Schagen, I. (2008). Improving speed behaviour: the potential of in-car speed assistance and speed limit credibility. *IET Intelligent Transport Systems, 2*(4), 323-330.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Vlassenroot, S., & Brookhuis, K. (2014). Socio-Psychological Factors That Influence Acceptability of Intelligent Transport Systems: A Model. In T. H. Michael A. Regan, Alan Stevens (Ed.), *Driver Acceptance of New Technology* (pp. 35-50). UK: CRC Press.

Vlassenroot, S., Brookhuis, K., Marchau, V., & Witlox, F. (2010). Towards defining a unified concept for the acceptability of Intelligent Transport Systems (ITS): A conceptual analysis based on the case of Intelligent Speed Adaptation (ISA). *Transportation Research Part F: Traffic Psychology and Behaviour, 13*(3), 164-178.

Vlassenroot, S., Brookhuis, K., Marchau, V., & Witlox, F. (2008). *Measuring acceptance and acceptability of ITS. Theoretical background in the development of a unified concept.* Paper presented at the 10th TRAIL Congress and Knowledge Market. TRAIL in Perspective.

Vlassenroot, S., Molin, E., Kavadias, D., Marchau, V., Brookhuis, K., & Witlox, F. (2011). What drives the acceptability of intelligent speed assistance (ISA)? *European journal of transport and infrastructure research.-Delft, 11*(2), 256-273.

Várhelyi, A., Hjälmdahl, M., Hydén, C., & Draskóczy, M. (2004). Effects of an active accelerator pedal on driver behaviour and traffic safety after long-term use in urban areas. *Accident Analysis & Prevention, 36*(5), 729-737.

Young, K. L., Regan, M. A., Triggs, T. J., Jontof-Hutter, K., & Newstead, S. (2010). Intelligent speed adaptation—Effects and acceptance by young inexperienced drivers. *Accident Analysis & Prevention, 42*(3), 935-943.

Young, K. L., Regan, M. A., Triggs, T. J., Jontof-Hutter, K., & Newstead, S. (2010). Intelligent speed adaptation—Effects and acceptance by young inexperienced drivers. *Accident Analysis & Prevention, 42*(3), 935-943.

4. General Conclusion

This section consisted of the general conclusion of paper one and two. In the first paper, we aimed at exploring personal, social and environmental determinates of speeding behavior among minibus taxi drivers in Addis Ababa, Ethiopia. The findings of this first study suggested that factors associated with social pressure (i.e., social pressure to drive fast raise from people on the road and relatives), personal orientation in relation to speeding (e.g., self-efficacy and behavioral intention to drive fast) and environmental context (e.g., enforcement environment to drive fast) contributed to minibus taxi drivers to engage in speeding behavior.

In paper two, we aimed to examine the behavioural intention to accept ISA technology among those participants in paper one. We identified that positive evaluation towards using ISA technology; and the degree of convenience associated with the use of the ISA among minibus drivers directly predicted the extent to which minibus taxi drivers behaviourally intended to use such technology. However, unexpectedly the degree to which a taxi driver perceives that important others believe he should use the ISA when he drives, did not significantly predict the behavioural intention to use ISA technology.

Results in the first study gave theoretical implication in relation to the development of testing the 'major theorists' model, and practical recommendations for improving safety factors behind minibus taxi drivers' speeding behaviour; and results in the second study gave practical implications regarding acceptability of speed management ITS technology among minibus taxi drivers in Addis Ababa, Ethiopia.

Appendices

Appendix A

A1. Questionnaire

This questionnaire has been prepared to collect data for the study which aims to develop integrated models regarding motivational determinants of speeding behavior and acceptability of Intelligent Speed Adaptation (ISA) technology among taxi (minibus) drivers in Addis Ababa, Ethiopia. It has been structured in three parts. In the first part, questions that ask for drivers' traffic experiences and personal information are presented. The second part involves items that help to understand contributing factors for driving fast among taxi drivers. Finally, in the third part, items that aid to collect data about drivers' acceptability of ISA technology are included. The questionnaire is to be filled in by drivers who operate taxi on the selected routes in Addis Ababa.

Dear participants: please read items included under each part of this questionnaire and fill them accordingly. Since the success of this study is based the genuine information you give, you are kindly requested to provide your true responses to each item. You do not need to write your name or plate number on this questionnaire. All collected data through this tool would only be used for research purpose. If you are not interested to participate in this study, you can withdraw yourself from filling this questionnaire.

Thank you in advance for your cooperation and responses!

Part I: Traffic experience and background information

Direction: - Please respond to the following inquiries by putting "X" or providing the required information in the space provided.

1. Your age _____
2. Your educational level _____
3. Your driving experience as taxi drive (in year or month) _____
4. Your car proprietorship status

A. Your own ☐ B. Your family ☐ C. Your employer ☐

Part II: Items assessing determinants of drivers' speeding behavior

Direction: This part aims to understand the phenomenon behind driving fast instead of who drive slow or fast. Thus, read each of the following items freely, and then put "X" mark on your choice that best describes your **genuine response** (e.g., level of agreement) to each item accordingly.

Specific instruction: when you fill all items stated under this part, they must be filled based on the operational definition of driving fast given below.

Driving fast is a speeding action that is beyond the legal speed limit of a given road context.

No	**Constructs: Attitude towards driving fast, Perceived driving skill, Environmental context, Social (normative) pressure in driving fast, and Self-efficacy**	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Driving fast is necessary to generate better daily income	5	4	3	2	1
2	Police officers presence around the road network reduces my driving fast (r)	1	2	3	4	5
3	Most passengers push me to drive fast	5	4	3	2	1
4	I believe my driving skill can meet the challenges of driving fast	5	4	3	2	1
5	Most Ethiopians find it advisable that drivers should not drive fast (r)	1	2	3	4	5
6	I am skilful to drive fast on all types of roads	5	4	3	2	1
7	Driving fast enables me to reach at destination more quickly	5	4	3	2	1
8	Speed breaker limits my driving fast (r)	1	2	3	4	5
9	Low traffic volume increases the chance of my driving fast	5	4	3	2	1
10	Employer and/or family members want me to generate better daily income at any cost, even by driving fast	5	4	3	2	1
		SA	**A**	**N**	**D**	**SD**
1	I choose to drive fast because I trust my driving skill	5	4	3	2	1
2	Driving fast is an adventure action	5	4	3	2	1
3	My driving would not be beyond the speed limit, If a hand held speed camera is available around the road (r)	1	2	3	4	5
4	I am skilled to drive fast than the average divers do	5	4	3	2	1
5	Driving fast is a solution to win time shortage					
6	Most people that are important to me find that I should not drive fast (r)	1	2	3	4	5
7	Lack of self-explaining road (e.g., better speed limit signs) influences me to drive fast	5	4	3	2	1
8	Most slow drivers make me to drive fast in which I overtake them	5	4	3	2	1
9	Driving fast reduces the possibility of my exposure to crash (r)	1	2	3	4	5
		SA	**A**	**N**	**D**	**SD**
1	I am confident to drive fast under all traffic conditions	5	4	3	2	1
2	Driving fast assists me to transport many passengers per day	5	4	3	2	1
3	If I am once punished, my driving fast continuous until (within 72 hours) I am supposed to pay that fine	5	4	3	2	1
4	Most passenger in waiting queues influence me to drive fast for a	5	4	3	2	1

	return trip					
5	Wrong social perception about taxi drivers disappointed me to comply with the speed limit (r)	1	2	3	4	5
6	Driving fast helps me to make frequent trips	5	4	3	2	1
7	Night driving allows me to driving fast	5	4	3	2	1
8	Most road users crossing behaviour makes me to follow inappropriate speeding patters	5	4	3	2	1
9	I believe I can definitely drive fast in high speed areas	5	4	3	2	1
10	I feel bad if I am forced to stop driving fast					
		SA	**A**	**N**	**D**	**SD**
1	Poor traffic management system in Addis Ababa makes me not comply with the speed limit (r)	1	2	3	4	5
2	I am skilled to drive fast in order to overtake other drivers	5	4	3	2	1
3	Factors that limit my driving fast should be avoided	5	4	3	2	1
4	Respecting the speed limit is monotonous (r)	1	2	3	4	5
5	During driving fast, I am skilled to manipulate the vehicle without exert much technical efforts	5	4	3	2	1
6	Poor road infrastructure makes me not to respect limit	5	4	3	2	1
7	Most police officers push me to respect the speed limit (r)	1	2	3	4	5
8	I believe I can drive fast on unfamiliar areas	5	4	3	2	1
9	My driving fast goes with the speeders around me in the traffic flow	5	4	3	2	1
10	Driving fast helps me to overtake other drivers for securing the first few waiting queue at destination in order to get passengers for the next trip	5	4	3	2	1
II	**Speeding behaviour:** How often do you engage in the following speeding behaviour	***Very Often***	***Fairly Often***	***Some-times***	**Almost**	**Never**
1	How often do you drive fast to generate more daily income?	5	4	3	2	1
2	How often do you drive fast to run away from traffic light?	5	4	3	2	1
3	How often do you drive fast on a freeway?	5	4	3	2	1
4	How often do you drive fast on road where there is no police officer?	5	4	3	2	1
5	How often do you drive fast to overtake other drivers?	5	4	3	2	1
6	How often do you drive fast to arrive at destination for securing better queue?	5	4	3	2	1
7	How often do you drive fast in evening?	5	4	3	2	1
III	**Behavioral intention**	**Strongly**	**likely**	**Neutral**	**Unlikely**	**Strongly unlikely**
1	Imagine you are driving on the road where there is free traffic volume, do you intend to drive fast	5	4	3	2	1
2	Imagine you are driving in traffic situation where there are other	5	4	3	2	1

	drivers, so do you intend to drive fast in order to escape from being overtaken by those drivers					
3	Imagine you are driving towards your destination, hence do you intend to drive fast in order to get better queue for having passengers soon	5	4	3	2	1
4	Imagine you are driving for work purpose, do you intend to drive fast in order to generate more daily income	5	4	3	2	1
5	Imagine you are driving at evening, do you intend to drive fast to transport large number of passengers	5	4	3	2	1

Part III: Items assessing acceptability of ISA technology

General instruction: This part of the questionnaire involves items measuring taxi drivers' acceptability of ISA technology in Addis Ababa. Before you fill these items, please watch the following brief video about ISA. https://www.youtube.com/watch?v=4MUxJYGAMjo As you watched from the brief video, the aim of ISA technology is to manage the speed level of a vehicle according to the local speed limit.

Imagine an automotive industry in Addis Ababa is going to introduce this technology into your vehicle in the coming two weeks. However, this technology will be introduced in your vehicle, when you only accept it, and allow this industry to insert ISA in your vehicle.

Depending on this scenario, therefore, please carefully read each of the following items, and then put "X" mark on your choice that best describes your **genuine response** (e.g., level of agreement) to each item accordingly.

No	**Constructs:** Behavioral intention to use ISA technology (BI), Performance expectancy (PE), Effort expectancy (EE), Social influence (SI), Attitude toward using technology.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	Imagine that an automotive industry in Addis Ababa could insert ISA technology into your car for free. Thus, to what extent do you agree with the following items					
1	I would intend to use the ISA technology in the next two weeks.	5	4	3	2	1
2	I would find the ISA technology useful in my driving.	5	4	3	2	1
3	It would be easy for me to become skillful at using the ISA technology.	5	4	3	2	1
4	Using the ISA technology increases my driving performance.	5	4	3	2	1
5	If I use the ISA technology, I will decrease my risk of being involved in an accident	5	4	3	2	1
6	I would predict I would use the ISA technology in the next two weeks.	5	4	3	2	1
		SA	A	N	D	SD
1	My interaction with the ISA technology would be clear and understandable	5	4	3	2	1
2	People who are important to me would think that I should use the ISA technology.	5	4	3	2	1
3	Authorities would be helpful in the use of the ISA technology.	5	4	3	2	1
4	Learning to operate the ISA technology is easy for me	5	4	3	2	1
5	I would plan to use the ISA technology in the next two weeks.	5	4	3	2	1
6	People who influence my behaviour would think that I should use the ISA	5	4	3	2	1

	technology.					
7	The ISA technology makes work more interesting.	5	4	3	2	1
		SA	A	N	D	SD
1	I would find the ISA technology easy to use.	5	4	3	2	1
2	In general, authorities would support the use of the ISA technology.	5	4	3	2	1
3	Using the ISA technology enables me to react to the situation more quickly.	5	4	3	2	1
4	Using the ISA technology is a good idea.	5	4	3	2	1
5	Working with the ISA technology is fun.	5	4	3	2	1
6	I like working with the ISA technology.	5	4	3	2	1

IV. Instrument: Amharic version

ጥናታዊ መጠየቅ

የዚህ ማኪይቅ ዋና አላማ ታክሲ አሽከርካሪዎች በፍጥነት እንዲያሽከረክሩ የሚያስገድዷቸዉን አነሳሽ ምክንያቶች እና የፍጥነት ማስተካካያ ማሪያ (Intelligent Speed Adaptation Technology) በታክሲ አሽከርካሪዎች ዘንድ ያለዉን ተቀባይነት በሜዳሰስ የተቀናጁ ሞዴሎች ለማዳበር ታስቦ የተዘጋጀ ነው። ይህ ማኪይቅ ሶስት ክፍሎች አሉት። የመጀሚያዉ ክፍል ስለ አሽከርካሪዎች የማገድ ትራፊክ ተሞክሮ እና የግል ሚጃ የሚኪይቁ ጥያቄዎች ይዟል። ሁለተኛዉክፍል ለታክሲ አሽከርካሪዎች በፍጥነት ማሽከርከር አስተዋፅኦ የሚያደርጉ ምክንያቶች ለሚዳት የሚያግዙ ዐረፍተ-ነገሮች አካቷል። በሜጩረሻም በሦስተኛዉ ክፍል የፍጥነት ማስተካካያ ማሪያ ቴክኖሎጂ በታክሲ ሾፌሮች ዘንድ ያለዉን ተቀባይነት ለሜዳሰስ የሚያስችሉ ዐረፍተ-ነገሮች ይዟል።

የ ተከበሩ የ ዚህ ማኪይቅ ተሳታፊ ሆይ፡ - እባክዎን በዚህ ማኪይቅ ውስጥ ያሉትን እያንዳንዱን ጥያቄ እና ዐረፍተ-ነገር ያንብቡ እና እንደ ሁኔታዉ ማልስ ይስጡ። የዚህ ጥናት ስኬታማነት የተመሠረተውእርስዎ በሚሰጡት ትክክለኛ ማልስ ማሳረት ስለሆነ በእርስዎ ዘንድ እዉነተኛ እና ትክክለኛ ነዉ የሚሉትን ማልስ እንዲሰጡበታላቅ ትህትና እጠይቃለሁ። በዚህ ማኪይቅ ላይ ስምዎን ወይም የሚና ማእያ ቁጥርዎን ሜፍ አያስፈልግም፡ በዚህ ማኪይቅ በኩል የተሰበሰበ ሚጃ ለምርምር ዓላማ ብቻ ይውላል። በዚህ ጥናት ውስጥ እርስዎ ለማሳተፍ ካልፈለጉ ይህን ማኪይቅ መመላት አይጠበቅበዎትም፡

ለትብብርዎ እና ምላሽዎ አስቀድሜአማሳግናለሁ!

ክፍል 1. የ ማሽከርከር ተሞክሮና የ ግል ሚጃ፡ - ከዚህ በታች በተዘረዘሩት ክፍት ቦታዎች ላይ አስፈላጊዉን ምላሽ በማገባት ይሜሉ

1. እድሜዎ ስንት ነዉ_____ 2. የ ትምህርት ደረጃዎ ይግለፁ _____

3. ታክሲ ለስንት አሞት አሽከረከሩ _____

4. የ ሚያሽከረክሩት ታክሲ የማን ነዉ? ሀ. የ እራስዎ ☐ ለ. የ ቤተሰብዎ☐ ሐ. የ ቀጣሪዎ ☐

ክፍል 2. ታክሲ አሽከርካሪዎችን በፍጥነት እንዲነዱ የሚያደርጓቸዉን አነሳሽ ነገሮችን የሜስሱ ዐረፍተ-ነገሮች

የዚህ ክፍል አላማማነ በፍጥነት ወይም በዝግታ ያሽከረክራል የሚለዉን ለማወቅ ሳይሆን በፍጥነት የማሽከርከር ክስተትንና ገፋፊ ምክንያቶችን ለሜዳሰስ ታስቦ የተዘጋጀ ነዉ። ስለዚህ ከዚህ በታች የተዘረዘሩትን ዐረፍተ ነገሮችን ካነበቡ በኋላ የእርስዎን ትክክለኛ ማልስ ይገልፅልኛል የሚሉትን አሜራጭበማከበብ ወይምየ "√" ምልክት በሚድርግ ለእያንዳንዱ ዐረፍተ-ነገር ትክክለኛ ምላሽዎን ይስጡ።

መመሪያ፡ በዚህ ክፍል ዉስጥ ላሉት ዐረፍተ-ነገሮች የሚስማሙዎትን አማራጭ ሲስጡ የሚከተለዉን የፍጥነት ማሽከርከር ትርጉምማሻ ማረጋገጫስጡ።

<u>በፍጥነት ማሽከርከር</u> ማለት አንድ ሹፌር ለሚያሽከረክርበት መንገድ ከተወሰነለት የፍጥነት ገደብበላይ ሲያሽከረክር ማለትነዉ።

ተ.ቁ	**የሚሰሱት ጉዳዮች:** በፍጥነት ለመንዳት ያለ ዝንባሌ፣ ስለ ግል ማሽከርከር ብቃት ያለ ግምገማ፣ ትራፊክ ነክ አካባቢያዊ አግባብ፣ በፍጥነት ለማሽከርከር ያለ የማህበራዊ ግፊት፣ በማሽከርከር ብቃት ላይ ያለ ግላዊ መተማመን	በጣምእስማማለሁ/በእስ/	እስማማለሁ/እስ/	መልስም/ም/	አልስማማም/አ/	በጣምአልስማማም/በአ/
1U	የተሻለየቀንገቢለማስገባት በፍጥነት ማሽከርከር አስፈላጊነዉ	5	4	3	2	1
2Ur	በማሽከረክርበት መንገድአካባቢየትራፊክ ፖሊስ ሞኖር በፍጥነት መንዳቴን ይቀንሰዋል	1	2	3	4	5
3U	አብዛኞቹተሳፋሪዎች በፍጥነት እንዳሽከረክር ይገፋፉኛል	5	4	3	2	1
4U	የመንዳት ብቃቴ በፍጥነት በማሽከርከር ጊዜየሚፈጠሩትን ተግዳሮቶች መወጣት እንደሚያስችለኝ አምናለሁ	5	4	3	2	1
5Ur	አብዛኛቹኢትዮጵያዉያን፣ አሽከርካሪዎች ከፍጥነት ወሰን በላይ እንዳይነዱይማራሉ	1	2	3	4	5
6U	በሁሉምዓይነት መንገዶች ላይ በፍጥነት ለማሽከርከር ብቁነኝ	5	4	3	2	1
7U	በፍጥነት ማሽከርከር ወደ ሞድረሻ ቦታዬ ባስቸኳይ እንድደርስ ያስችለኛል	5	4	3	2	1
8Ur	ፍጥነት ለመቀነስ በመንገድላይ የተሰሩ ትናንሽ ጉብታዎች ፍጥነቴን ይወስኑታል	1	2	3	4	5
9U	ነፃ ወይምያልተጨነቀ የትራፊክ ፍሰት በፍጥነት የመንዳት ሁኔታዬን ከፍ ያደርገዋል	5	4	3	2	1
10U	አሠሪዬ እና/ወይምየቤተሰብአባላቶቼ ማንኛዉንምማክዋትነት ከፍዬ፤ በፍጥነት ትምእንኳን ቢሆን ነድቼ የተሻለ የዕለት ተዕለት ገቢ እንዳስገባ ይፈልጋሉ	5	4	3	2	1
		በእስ	እስ	መአ	አል	በአል
1ለ	በማሽከርከር ብቃቴ ስለምተማመን በፍጥነት መንዳትን እማርጣለሁ	5	4	3	2	1
2ለ	በፍጥነት ማሽከርከር የጀብደኝነት ድርጊትነዉ	5	4	3	2	1
3ለr	በእጅየሚያዝ ፍጥነት መቆጣጠሪያ ካሜራ በማሽከረክርበት መንገድ አካባቢ ካለ ከፍጥነት ወሰን በላይ አላሽከረክርም	1	2	3	4	5
4ለ	ከብዙሃኑ አሽከርካሪዎች በላቀ ሁኔታ በፍጥነት የመንዳት ብቃት አለኝ	5	4	3	2	1
5ለ	በፍጥነት ማሽከርከር የጊዜእጥረትን ለማሸነፍ አይነተኛ መፍትሄነዉ					
6ለr	ለእኔ በጣምአስፈላጊ/ቅርብከሆኑት አብዛኞቹ ሰዎች በፍጥነት ማዝእንደሌለብኝ ይፈልጋሉ	1	2	3	4	5
7ለ	እራሳቸዉን ገላጭየሆኑ መንገዶች እጥረት (ለምሳሌበቂ ምልክቶች የሌላቸዉ) በፍጥነት እንድነዳ ተጽዕኖ ያደርጉብኛል	5	4	3	2	1
8ለ	አብዛኞቹ ዝግ/ቀስ አድርገዉየሚዱሹፌሮች በፍጥነት እንድነዳ ተፅእኖ ያደርጉብኛል	5	4	3	2	1
9ለr	በፍጥነት ማሽከርከር ለትራፊክ አደጋ ተጋላጭቴን ይቀንሰዋል	1	2	3	4	5

		በእስ	እስ	መአ	አል	በአል
1ሐ	በሁሉምየ ትራፊክ ሁኔ ታዎች ዉስጥ በፍጥነ ት ለ ማ ዝ ል በ ማ ሉ ነ ኝ	5	4	3	2	1
2ሐ	በፍጥነ ት ማሽከርከር ብዙ ተሳፋሪዎችን በቀን ውስጥእንዳጓጉዝ ይረዳኛል	5	4	3	2	1
3ሐ	አ ንድጊዜ ከተቀጣሁ የ ቅጣቱ የ ማ ፈ ያ ገ ደብእ ስኪያልቅ ድረስ (ማ ለ ትምእ ስከ 72 ሰ ዓ ታት) በ ፍጥነ ት ማ ዳ ቴን እ ቀጥላ ለሁ	5	4	3	2	1
4ሐ	ተሰልፈዉታክሲ በ ማ ኩበቅ ላ ይ ያ ሉ አ ብዛ ኞቹ ተሳ ፋ ሪ ዎችን ተ ማ ልሶ ለ ማ ድረ ስ ሲ ባ ል በ ፍጥነ ት ማ ዳ ቴ ላ ይ ተጽዕ ኖ ያ ድራ ል	5	4	3	2	1
5ሐr	ስ ለ ታክሲ ነ ጅዎች ያ ለ የ ተሳ ሳ ተ የ ማ ህ በ ረ ሰ ብ ግ ን ዛ ቤ የ ፍጥነ ት ገ ደብን እ ን ዳ ከ ብር አ ያ ነ ሳ ሳ ኝ ም	1	2	3	4	5
6ሐ	በ ፍጥነ ት ማሽከርከር ብዙ ደርሶ ማ ል ስ ጉ ዞ ዎችን ለ ማ ድረ ግ ይረ ዳ ኛ ል	5	4	3	2	1
7ሐ	የ ምሽ ት ጉ ዞ በ ፍጥነ ት ማ ዳ ት እ ን ድች ል ይ ፈ ቅ ድ ል ኛ ል	5	4	3	2	1
8ሐ	የ አ ብዛ ኛ ዎቹ እ ግ ረ ኞች የ ማ ኅ ድ አ ጤ ቃ ቀ ም ሁ ኔ ታ (ለ ምሳ ሌ ማ ኅ ድ የ ሜ ቋ ረ ጥ ባ ህ ሪ ን) ተ ገ ቢ ያ ል ሆነ ፍ ጥ ነ ት እ ን ድ ከ ተ ል ያ ደ ር ገ ኛ ል	5	4	3	2	1
9ሐ	ከ ፍ ተ ኛ ፍ ጥ ነ ት በ ተ ፈ ቀ ደ በ ት ማ ኅ ድ ላ ይ በ እ ር ግ ጠ ኝ ነ ት በ ፍ ጥ ነ ት እ ን ደ ማ ዝ አ ም ና ለ ሁ	5	4	3	2	1
10ሐ	በ ፍጥነ ት ስ ነ ዳ እ ን ዳ ቆ ም ከ ተ ገ ደ ድ ኩ ማ ጥ ፎ ስ ሜ ጭ ይ ሰ ጣ ኛ ል					
		በእስ	አስ	መአ	አል	በአል
1ማ	በ ስ ራ ላ ይ ያ ለ ዉ የ ከ ተ ሞ የ ት ራ ፊ ክ አ ስ ተ ዳ ደ ር ስ ር ዐ ት የ ፍ ጥ ነ ት ወ ሰ ን ን እ ን ዳ ላ ከ ብ ር ያ ደ ር ገ ኛ ል	1	2	3	4	5
2መ	ሌ ሎ ች አ ሽ ከ ር ካ ሪ ዎ ች ን ለ ማ ቅ ደ ም በ ፍ ጥ ነ ት ለ ማ ዳ ት ብ ቁ ነ ኝ	5	4	3	2	1
3መ	በ ፍ ጥ ነ ት ማ ሽ ከ ር ከ ሬ ን የ ሚ ድ ቡ ሁ ኔ ታ ዎ ች መ ወ ገ ድ አ ለ ባ ቸ ው	5	4	3	2	1
4ማ	የ ፍ ጥ ነ ት ወ ሰ ን ን ማ ክ በ ር አ ሰ ል ቺ ነ ዉ	1	2	3	4	5
5መ	በ ፍ ጥ ነ ት በ ም ዳ በ ት ወ ቅ ት ሚ ና ዉ ን ብ ዙ ም ሳ ል ቸ ገ ር ለ ሜ ቆ ጣ ጠ ር ብ ቁ ነ ኝ	5	4	3	2	1
6መ	ደ ካ ማ የ መ ኅ ድ መ ሠ ረ ተ ል ማ ት የ ፍ ጥ ነ ት ገ ደ ብ ን እ ን ዳ ላ ከ ብ ር ያ ደ ር ገ ኛ ል	5	4	3	2	1
7ማ	አ ብዛ ኛ ዎ ቹ የ ት ራ ፊ ክ ፖ ሊ ስ ሞ ን ኖ ች የ ፍ ጥ ነ ት ወ ሰ ን ን እ ን ዳ ከ ብ ር ይ ገ ፋ ፉ ኛ ል	1	2	3	4	5
8መ	ከ ዚ ህ በ ፊ ት ባ ላ ሽ ከ ረ ከ ር ኩ ባ ቸ ዉ መ ኅ ዶ ች ላ ይ በ ፍ ጥ ነ ት መ ዳ ት እ ን ደ ም ች ል አ ም ና ለ ሁ	5	4	3	2	1
9መ	የ እ ኔ በ ፍ ጥ ነ ት መ ዳ ት በ ት ራ ፊ ክ ፍ ሰ ቱ ዉ ስ ጥ ባ ሉ ሌ ሎ ች በ ፍ ጥ ነ ት በ ሚ ያ ሽ ከ ር ክ ሩ ሹ ፌ ሮ ች የ ሚ ሮ ጩ ነ ዉ	5	4	3	2	1
10መ	በ ፍ ጥ ነ ት መ ዳ ት ሌ ሎ ች አ ሽ ከ ር ካ ሪ ዎ ች ን በ ሞ ቅ ደ ም በ ሜ ዳ ረ ሻ ቦ ታ ላ ይ የ ተ ሻ ለ ወ ረ ፋ ይ ዞ ተ ሳ ፋ ሪ ዎ ች ን ለ ሜ ቋ ጥ ለ ዉ ጉ ዞ ቶ ሎ ለ ማ ገ ኘ ት ይ ጠ ቅ ሜ ል	5	4	3	2	1
II	**በ ፍ ጥ ነ ት የ ማ ሽ ከ ር ከ ር ድ ር ጊ ት፡ - በ ም ን ያ ህ ል ጊ ዜ ያ ት በ ሚ ከ ተ ሉ ት ን ድ ር ጊ ቶ ች ዉ ስ ጥ ይ ሳ ተ ፋ ሉ**	በ ጭ ም በ ተ ደ ጋ ጋ ሚ	በ ተ ደ ጋ ጋ ሚ	አ ል ፎ አ ል ፎ	በ ጭ ም ጭ ቁ ት	ፈ ፅ ሞ
1ሠ	የ ተ ሻ ለ የ ቀ ን ገ ቢ ለ ማ ከ ገ ባ ት ሲ ባ ል ም ን ያ ህ ል ጊ ዜ በ ፍ ጥ ነ ት ያ ሽ ከ ረ ከ ራ ሉ?	5	4	3	2	1
2ሠ	ከ ት ራ ፊ ክ ሞ ብ ራ ት ለ ማ ም ለ ጥ ሲ ባ ል ም ን ያ ህ ል ጊ ዜ በ ፍ ጥ ነ ት ያ ሽ ከ ረ ከ ራ ሉ?	5	4	3	2	1

3ሠ	ለፍጥነ ት በተሰራ ማነ ገ ድ ላ ይ ምን ያህል ጊዜ በፍጥነ ት ያሽከረክራሉ?	5	4	3	2	1
4ሠ	የ ትራፊክ ፖሊስ በ ሚይኖር ባቸውማነ ገ ዶች ላ ይ ምን ያህል ጊዜ በፍጥነ ት ያሽከረክራሉ?	5	4	3	2	1
5ሠ	ሌሎች አሽከርካሪ ዎችን ለ ማለፍ ምን ያህል ጊዜ በፍጥነ ት ያሽከረክራሉ?	5	4	3	2	1
6ሠ	በ ማረሻዎ ቦታ ደርሶ የ ተሻለ ወረፋ ወይምተራ ለ ማያ ዝ ምን ያህል ጊዜ በፍጥነ ት ያሽከረክራሉ?	5	4	3	2	1
7ሠ	በ ምሽት ላ ይ ምን ያህል ጊዜ በፍጥነ ት ያሽከረክራሉ?	5	4	3	2	1
III	**ድርጊ ታዊ እቅድ፡** በ ምን ያህል ደረጃ በ ሚከ ተሉት ዐ ረፍተ-ነ ገ ሮች እ ን ደ ሚስ ማሙ ይግለ ፁ	በ ጣም እ ስ ማ ሚ ላ ሁ	እ ስ ማ ማ ላ ሁ	መ ወሰ ን አ ል ችል ም	አ ል ስ ማ ማ ም	በ ጣም አ ል ስ ማ ማ ም
1ረ	ነ ፃ የ ትራፊክ ፍሰት ያ ለ በት ማነ ገ ድ ላ ይ እ ያ ሽከረከሩ እ ን ደሆኑ ይገ ምቱ፤ ስ ለዚህ በ ፍጥነ ት እ ን ደ ሚ ዱ ያ ቅዳሉን?	5	4	3	2	1
2ረ	ሌሎች አ ሽከርካሪ ዎች ባ ሉ በት የ ትራፊክ ሁኔ ታ ውስ ጥ ሚ ና እ የ ነ ዱ እ ን ደሆነ አ ድርገ ዉይገ ምቱ፤ ስ ለዚህ በ እ ነ ዚያ ሾ ፌ ሮች ከ ሚቀ ደም ለ ማ ሟ ጥ በ ፍጥነ ት ለ ማ ሽከርከር ያ ቅዳሉነ ?	5	4	3	2	1
3ረ	ወደ ማረሻዎ እ ያ ሽከረከሩ እ ን ደሆነ ይገ ምቱ፤ ስ ለዚህ የ ተሻለ ተራ ይዞ ቶ ሎ ተሳፋሪ ዎችን ለ ማ ገ ኘት በ ፍጥነ ት ያ ሽከረክራሉን?	5	4	3	2	1
4ረ	ለ ስራ ጉዳይ እ የ ነ ዱ እ ን ደሆነ ይገ ምቱ፤ ስ ለዚህ ተ ጨ ማሪ የ ቀ ን ገ ቢ ለ ማ ማ ጨ ት ሲ ሉ በ ፍጥነ ት ያ ሽከረክራሉን?	5	4	3	2	1
5ረ	በ ምሽት እ የ ነ ዱ እ ን ደሆነ አ ድርገ ውይገ ምቱ፤ ስ ለዚህ ብዙ ተሳፋሪ ዎችን ለ ማ ጓ ጓ ዝ በ ፍጥነ ት ያ ሽከረክራሉን?	5	4	3	2	1

ክፍል III. የ ISA ቴክኖሎጂ ተቀባይነ ት የ ሚ ያስ ተ ዐ ረፍት-ነ ገ ሮች

ይህ ማ ከይቅ የ ISA ቴክኖሎጅ በ ታክሲ አ ሽከርካሪ ዎች ዘ ን ድ ያ ለ ዉን ተቀባይነ ት ለ ማ ጎ ለ ብ የ ሚ ች ሉ ዐ ረፍት-ነ ገ ሮች ይዟ ል። ይህ ን ማ ከይቅ ከ መ ሞ ላ ተ ዎ በ ፊት ይህ ን ማ ከይቅ የ ሚ ያ ቀ ር ብ ሎ ዎ ሰ ዉ ስ ለ ISA ቴክኖሎጂ ን አ ጭ ር ቪ ዲ ዬ እ ና ት ን ታ ኔ ይ ሰ ጠ ዎ ታ ል። ከ ቪ ዲ ዬ እ ን ደ ተ ማ ላ ከ ቱ ት የ ISA ቴክኖሎጂ አ ላ ማ የ ሚ ና ዉን ፍጥነ ት እ ን ደ የ አ ካ ባ ቢ ዉ የ ፍጥነ ት ወ ሰ ን እ ን ዲ ሆ ን ለ ማ ድረ ግ የ ማ ያ ስ ች ል ነ ዉ። አ ን ድ በ አ ዲ ስ አ በ ባ ዉ ስ ጥ የ ማ ኝ የ ሚ ና ኢ ን ዱ ስ ት ሪ ይህ ን የ ISA ቴክኖሎጂ በ ሜ ቃ ጥ ሉ ት ሁ ለ ት ሳ ምን ታ ት ዉ ስ ጥ በ ሚ ና ዎ ዉ ስ ጥ ለ ማ ጠ ም ይ ፈ ል ጋ ል። ይ ሁ ን እ ን ጂ ይህ ቴክኖሎጂ በ ሚ ና ዎ ዉ ስ ጥ የ ማ ጠ ሙ ዉ በ እ ር ስ ዎ ዘ ን ድ ተ ቀ ባ ይ ነ ት ሲ ያ ገ ኝ እ ና ለ ኢ ን ዱ ስ ት ሪ ዉ ሲ ፈ ቅ ዱ ለ ት ነ ዉ።

ከ ላ ይ ባ ለ ዉ ሁ ኔ ታ ላ ይ በ መ ሞ ር ኮ ዝ, እ ባ ክ ዎ ን የ ሚ ከ ተ ሉ ት ን ዐ ረ ፍ ት-ነ ገ ሮ ች በ ጥ ን ቃ ቄ ካ ነ በ ቡ በ ኋ ላ የ እ ር ስ ዎ ን ት ክ ክ ለ ኛ አ ሚ ራ ጭ ይ ገ ል ፅ ል ኛ ል የ ሚ ሉ ት ን አ ሚ ራ ጩ ን በ ማ ክ በ ብ ወ ይ ም የ “√" ም ል ክ ት በ ሚ ድ ር ግ ለ እ ያ ን ዳ ን ዱ ዐ ረ ፍ ተ-ነ ገ ር ት ክ ክ ለ ኛ ም ላ ሽ ዎ ን ይ ስ ጡ።

No	በአዲስ አበባ ውስጥ የሚኝ አንድ የተሽከርካሪ ሞተር ኢንዱስትሪ የ ISA ቴክኖሎጂን በሚከተሉት ሁለት ሳምንታት ዉስጥ በነፃ በእርስዎ ታክሲ ሊገጠምእንድሆነ ያስቡና በምን ያህል ማከን በሚከተሉት ዐረፍተ-ነገሮች እንደሚስማሙእያንዳነ ዱ ጥያቄ ከተሰጡት አማራጮች ላይ አነዱን ይምረጡ	ሃላፊነትአልወስድም	ሃላፊነትእወስዳለሁ	መወሰን አልችልም	አልስማማም	በጭራሽአልስማማም
1U	በሚቀጥሉት ሁለት ሳምንታት የ ISA ቴክኖሎጂን ለማከቀም የማቅድ ይሆናል	5	4	3	2	1
2U	የ ISA ቴክኖሎጂን በሚናዬ ውስጥ ሞኖሩ ለሜከኮር ከር ስራዬ ጠቃሚእንደሚያን ነዉ	5	4	3	2	1
3U	የ ISA ቴክኖሎጂን ለማሳመድ ለእኔ ቀላል ሆኖ እንደማገኘዉ ነዉ	5	4	3	2	1
4U	የ ISA ቴክኖሎጂን ማከቀምየ ሜከኮር ከሬን አፈፃፀም ይጨምረዋል	5	4	3	2	1
5U	ISA ቴክኖሎጂን ከተጠቀምኩለትራፊክ አደጋ ተጋላጩ ቴን እቀንሳለሁ	5	4	3	2	1
6U	በሚቀጥሉት ሁለት ሳምንታት ውስጥ የ ISA ቴክኖሎጂ ልጠቀም እንደምቾ እገምታለሁ.	5	4	3	2	1
		በእስ	እስ	ማአ	አል	በአል
1ለ	ከ ISA ቴክኖሎጂ ጋር የሚረኝ ማከተጋብር ግልጽ እና የሚዳዉአይነት ይሆናል	5	4	3	2	1
2ለ	ለእኔ አስፈላጊ የሆኑ ሰዎች የ ISA ቴክኖሎጂን ማከቀም እንዳለብኝ ያስቡ ይሆናል	5	4	3	2	1
3ለ	ባለስልጣኖች በ ISA ቴክኖሎጂ አጠቃቀምረገድ ድጋፍ ያደርጉ ይሆናል	5	4	3	2	1
4ለ	የ ISA ቴክኖሎጂን ትግበራ ለመሚር ለእኔ ቀላል ነዉ	5	4	3	2	1
5ለ	በሚቀጥሉት ሁለት ሳምንታት የ ISA ቴክኖሎጂን ለማከቀም እቅድ አለኝ	5	4	3	2	1
6ለ	ጠባዬ ላይ ተጽዕኖ የሚያደርጉ ሰዎች የ ISA ቴክኖሎጂን ማከቀምእንዳለብኝ ያስቡ ይሆናል	5	4	3	2	1
7ለ	የ ISA ቴክኖሎጂ ማከቀምስራን የበለጠአስደሳች ያደርገዋል.	5	4	3	2	1
		በእስ	እስ	ማአ	አል	በአል
1ሐ	የ ISA ቴክኖሎጂ ማከቀምቀላል ሆኖ አገኝዋለሁ	5	4	3	2	1
2ሐ	በደምሳሴየ ISA ቴክኖሎጂን ማከቀምበትራንስፖርት ባለስልጣኖች ዘንድ ይደገፍ ይሆናል	5	4	3	2	1
3ሐ	የ ISA ቴክኖሎጂን ማከቀምለትራፊክ ሁኔታዎች በፍጥነት ምላሽ እንድሰጥ ያስችለኛል	5	4	3	2	1
4ሐ	የ ISA ቴክኖሎጂን ማከቀምጥሩ ሀሳብነዉ	5	4	3	2	1
5ሐ	የ ISA ቴክኖሎጂ በሚናዬ ዉስጥ ተገ ጥሞማዳት አስደሳች ነዉ	5	4	3	2	1
6ሐ	የ ISA ቴክኖሎጂ በሚናዬ ዉስጥ ተገ ጥሞማዳት እወዳለሁ	5	4	3	2	1

Appendix B

B1. Interview guidelines for taxi drivers

In order to identify predisposing, reinforcing and enabling factors related to speeding behaviour of taxi drivers, the following interview questions were raised.

- Do you engage in driving fast? if yes, how?
- How driving with and without passengers influences your speeding behaviour?
- How do you drive quickly when you think that passengers are waiting for your taxi service?
- How speeding is different across hours i.e., rush hour, night-time, daytime?
- Does driving in familiar place affect your speeding behaviour? If yes, how?
- What effect may have on speeding when drivers think about their destination?
- How road infrastructure and road types affect your speeding behaviour?
- How society and police officers' perception towards taxi driver affect your speeding behaviour?
- How driving experience and skill affect your speeding behaviour?
- Does driving in high and less traffic volume affects your speed? How?
- How is speeding affected when you move from high to less traffic volume?
- Do economic factors affect drivers speeding behaviour? If yes, how?
- Does low tariff contribute for driving quickly in order to fulfil the daily income? How?
- How having your own family affects your speeding behaviour in relation to crash?
- Does your past accident history affects your current speeding behaviour? How?
- Do you manage your speeding behaviour for the sake of competition with other drivers?
- Do you drive quickly for satisfaction? Why?
- How do your friends affect your driving behaviour?
- How speeding is associated with the road nature (length, width, uphill and downhill, zebra line, median, shoulder, within villages, main road, traffic light, no self-driving road)?
- Do vehicle qualities and fuel amount affect speeding behaviour?
- How is you speeding behaviour in city and peripheral parts?
- Do maintenance and fuel cost affect speeding? If yes, how?
- Does government transport policy and its implementation affect speeding? If yes, how?
- How weather condition affect speeding?
- How enforcement affects your speed?

Note: Depend on participants' response to each question additional follow-up questions were raised

B2. Focus Group Discussion: FGD guideline for taxi drivers

Themes of focus group discussions:

Predisposing factors for speeding

Reinforcing factors to drive fast

Enabling factors of speeding behaviour

In order to address the above themes, the following concerns were raised in the form of speed oriented questions. Moreover, follow up questions were raised based on ideas entertained during the focus group discussion.

Speed oriented drivers' knowledge, commitment, self-image, attitude, driving skills, perception, and self-efficacy, traffic environment, number of waiting passengers, economic outcome, satisfaction, short time to finish travel, peer pressure, ITS, crash, zoning system, vehicle quality, taxi proprietorship status, emotional reaction, road nature, traffic police, traffic environmental context, and berries and so forth

Appendix C

C1. List of articles used for item bank preparation

No	Articles
1	Hassan, H. M., Shawky, M., Kishta, M., Garib, A. M., & Al-Harthei, H. A. (2017). Investigation of drivers' behavior towards speeds using crash data and self-reported questionnaire. *Accident Analysis & Prevention*, *98*, 348-358.
2	Cordazzo, S. T., Scialfa, C. T., Bubric, K., & Ross, R. J. (2014). The driver behaviour questionnaire: A north American analysis. *Journal of safety research*, *50*, 99-107.
3	Stanojević, P., Lajunen, T., Jovanović, D., Sârbescu, P., & Kostadinov, S. (2018). The driver behaviour questionnaire in South-East Europe countries: Bulgaria, Romania and Serbia. *Transportation research part F: traffic psychology and behaviour*, *53*, 24-33.
4	af Wåhlberg, A., Dorn, L., & Kline, T. (2011). The Manchester Driver Behaviour Questionnaire as a predictor of road traffic accidents. *Theoretical Issues in Ergonomics Science*, *12*(1), 66-86.
5	Broughton, P. S., Fuller, R., Stradling, S., Gormley, M., Kinnear, N., O'dolan, C., & Hannigan, B. (2009). Conditions for speeding behaviour: a comparison of car drivers and powered two wheeled riders. *Transportation Research Part F: Traffic Psychology and Behaviour*, *12*(5), 417-427.
6	Paris, H., & Van den Broucke, S. (2008). Measuring cognitive determinants of speeding: An application of the theory of planned behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, *11*(3), 168-180.
7	Gabany, S. G., Plummer, P., & Grigg, P. (1997). Why drivers speed: The speeding perception inventory. *Journal of Safety Research*, *28*(1), 29-35.
8	De Pelsmacker, P., & Janssens, W. (2007). The effect of norms, attitudes and habits on speeding behavior: Scale development and model building and estimation. *Accident Analysis & Prevention*, *39*(1), 6-15.
9	Steg, L., & van Brussel, A. (2009). Accidents, aberrant behaviours, and speeding of young moped riders. *Transportation research part F: traffic psychology and behaviour*, *12*(6),

	503-511.
10	George, S., Clark, M., & Crotty, M. (2007). Development of the Adelaide driving self-efficacy scale. *Clinical Rehabilitation*, *21*(1), 56-61.
11	Cauzard, J. P. (2004). European drivers and road risk. *Part 1: Report on principal results. SARTRE 3 report*, *1*.
12	Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary educational psychology*, *36*(1), 36-48.
13	Chen, C. F., & Chen, C. W. (2011). Speeding for fun? Exploring the speeding behavior of riders of heavy motorcycles using the theory of planned behavior and psychological flow theory. *Accident Analysis & Prevention*, *43*(3), 983-990.
14	Newnam, S., Greenslade, J., Newton, C., & Watson, B. (2011). Safety in occupational driving: Development of a driver behavior scale for the workplace context. *Applied Psychology*, *60*(4), 576-599.