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"Designated Driver Service" for drinking drivers: application in Motorcycle Dependent Cities

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Abstract: In recent years, abusing alcohol drinking is becoming a hot topic, attracting the high attention in the society. Alcohol drinking is seriously dangerous to drivers in the traffic flow. Impaired driving not only puts the driver at risk, but also passengers' lives and others who share the road. Under WHO's report (2012), accidents related to alcohol is in an emergency case in developing countries with the high rate of alcohol drinking. Statistics data in Vietnam shows that about 40% traffic accidents (among which there are 11% accidents having fatalities) are involved with alcohol.
The paper introduces the approach of analyzing the behavior of alcohol drinking drivers. The interview conducted in Hanoi in 2016 has been applied to illustrate the theoretical model. The model focuses on the solution of providing the service of "Safe designated driver home after drinking". From that, comprehensive and consistent solutions for such situation can be proposed.

Keywords: Traffic Safety; Drinking Driver; Motorcycle Dominated traffic flow;Theory of Behavior; Designated Driver Service; Risk Analysis

1. INTRODUCTION

The harmful use of alcohol is a leading risk factor for premature death and disability in the world. According to WHO (World Health Organization), worldwide alcohol causes 1.8 million deaths (3.2% of total) and 58.3 million (4% of total) of Disability-Adjusted Life Years (DALYs). Unintentional injuries alone account for about one third of the 1.8 million deaths, while neuro-psychiatric conditions account for close to 40% of the 58.3 million DALYs.
It is clear that drink–driving increases the probability of a road trafc crash, as well as the likelihood that death or serious injury will result (Elvik et al. 2009). The risk of impairment starts at very low levels of alcohol consumption and rises exponentially with alcohol intake. Drivers with a BAC (Blood Alcohol Concentration) of between 0.02 g/dl and 0.05 g/dl have at least a three times greater risk of dying in a vehicle crash. This risk increases to at least six times with a BAC between 0.05 g/dl and 0.08 g/dl, and rises exponentially above 0.08 g/dl (Killoran A et al. 2015). Drinking and driving is also associated with other high-risk road use behaviours such as speeding or not using seat-belts (Shults RA et al. 2001).
According to the Global Statistics Report (WHO, 2010), in countries with high income, there are about 20% drivers died by accidents having BAC higher than legal limitation; in countries with low and middle income, there are about 33% - 69% drunk drivers died by accidents, 8% - 29% fatalities drivers has drunk alcohol before the accidents. Moreover, in case of professional drivers, damage level caused by alcohol in the driving process may be bigger,

because it can effect not only the driver, but also directly influence other fatality and property.
In Vietnam, the statistics hospital report (Huyen, 2015) showed that the traffic accident victims with illegal BAC consist of 64%. Among 500 fatalities by traffic accidents, there are 34% victims with illegal BAC. Experts estimated that abusing alcohol cover more than 40% the traffic accidents' cause, including direct and indirect reason.
Impairment by alcohol is an important factor influencing both the risk of a road crash as well as the severity of the injuries that result from crashes. The effect of alcohol after using shall depend on the human being's nature, health, weight, gender (eg. a man has the trend to solve the alcohol quicker than a woman), the body, nearest eating, age (youngers can quicker process the alcohol).
Any drug that affects the central nervous system has the potential for driver impairment. However, the use of both medicinal and recreational drugs and their effect on driving performance and crash involvement is much less well understood than alcohol. Drivers who have been drinking have a much higher risk of involvement in crashes than those with no alcohol in their blood, and this risk increases rapidly with increasing BAC.
The immediate effects of alcohol on the brain are either depressing or stimulating in nature, depending on the quantity consumed. Either way, alcohol results in impairment which increases the likelihood of a crash since it produces poor judgement, increased reaction time, lower vigilance and decreased visual acuity. Physiologically, alcohol also lowers blood pressure and depresses consciousness and respiration. Alcohol also has analgesic and general anaesthetic properties. Alcohol can impair judgement and increase crash risk even at relatively low BAC levels. However, the effects become progressively worse as the BAC increases. Not only do judgement and reaction time suffer, but vision also deteriorates. Apart from its direct impact on crash outcomes, alcohol is believed to affect other aspects of driver safety such as seat-belt wearing, helmet use, and speed choice. Although detailed consideration of drugs other than alcohol has been deliberately omitted from this manual, the consumption of alcohol, partly due to its tendency to reduce inhibition, is often associated with the use of other drugs which can impact upon driving performance. Alcohol impairment has a signifcant effect on the crash risk of drivers, riders and pedestrians; it is routinely reported as one of the most serious contributing factors to road crashes in motorized countries. Drivers who have been drinking have a much higher risk of involvement in crashes than those with no alcohol in their blood, and this risk grows rapidly with increasing blood alcohol concentration. For motorcyclists, having a BAC over 0.05g/dl has been estimated to increase crash risk by up to 40 times compared to having a zero BAC. (Haworth N. et al, 2002)
The initial and most obvious impact of alcohol on human being is the central nervous system, over-courage the psychology, and/or lead to tired and sleepy feeling. Whereas, driving is the task in need of focusing, good reaction and processing with the situation. When the driver perform the driving task in the condition of (temporary) reducing his capacity, coping with dangerous/risky situation may lead to the higher probability of traffic accidents.
The following figure discribe the relationship between „drinking" traffic behaviour and traffic

accident.

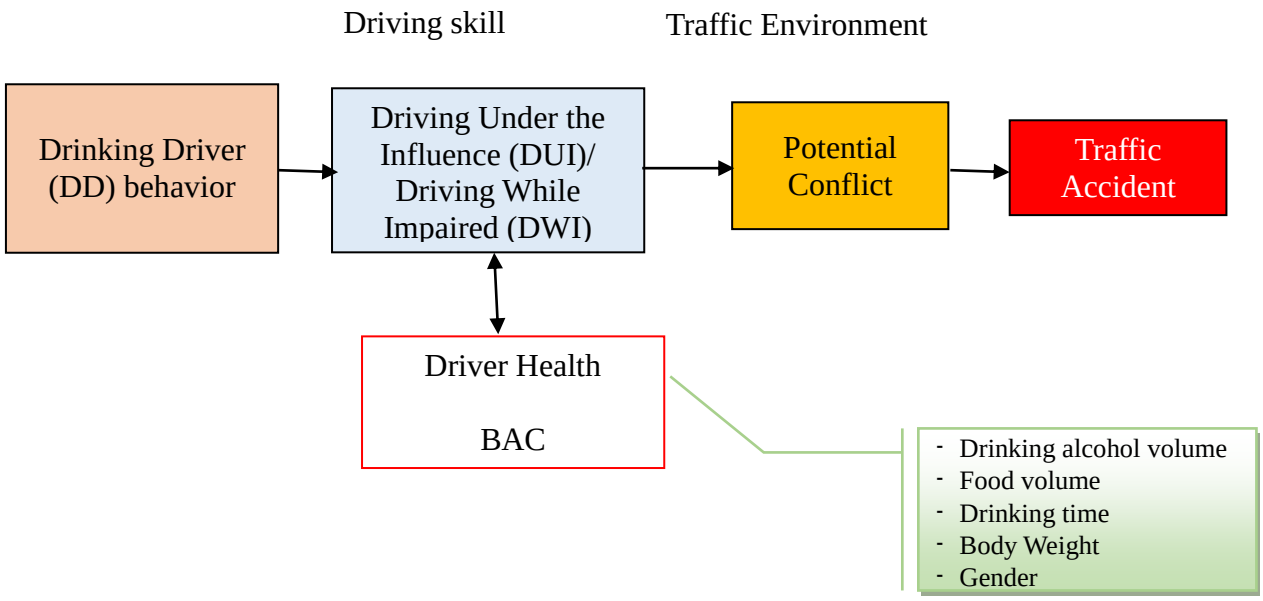

Figure 1. The relationship between „drinking" traffic behaviour and traffic accident

(Source: Lê Thu Huyền (2015))

2. ATTITUDE, PERCEPTION AND BEHAVIOUR OF VEHICLE CHOICE

Theory of planned behaviours (TPB) is explained in the above chapter. This theory has been successfully applied in car traffic flow (e.g. in Europe).

The Theory of Planned Behaviour from intentions to actions has been applied to studies of the relations among beliefs, attitudes, behavioural intentions and actual behaviour in various fields including traffic safety particularly driving behaviour.

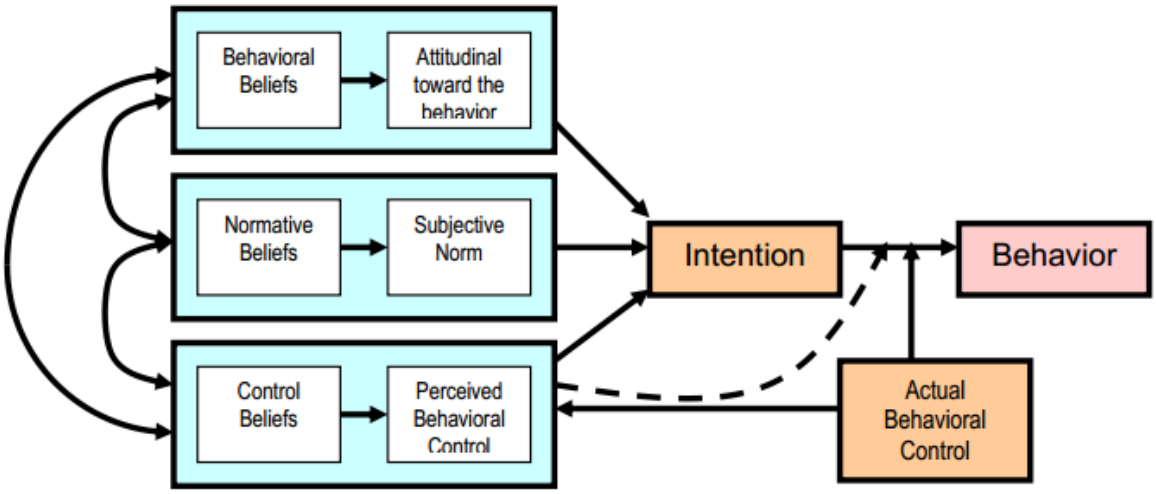

Figure 2. Theory of Planned Behaviour (Icek Ajzen, 1985, ver. 2006)

Theory of planned behaviour suggests that behavioural belief and attitude toward behaviour are related, normative beliefs has influenced over subject norm, perceived behavioural control is determined by the total set of accessible control beliefs and behaviour is a compatible

intentions of perception of behavioural control and actual behavioural control.
In fact, the final target of the driver is approaching his destination in the most appropriate time (in most of the trips). Therefore, it can be said that every risk that he can meet in the way, such as the risk of traffic conflicts or accidents, etc., may have the risk (probability) of influencing to the whole trip. In the approach of risk analysis, to one individual driver, there is the negotiation between the risk of being punished by traffic rules and the risk of getting stuck (failure of reaching his destination in time).
When the driver feels the higher risk of getting stuck (failure of reaching the travel destination in time), saving the time becomes a priority when journey delays may have arisen. Thus driving in such a way that may save time become potentially rewarding options, motivating potentially risky behaviour.
Examples of such tactics are driving faster, accepting shorter gaps in stream entry or stream crossing, overtaking recklessly and running red lights. The situation seems to be more serious to motorcyclists as they drive such a flexible and manoeuvrable vehicle that they can take full use of any space they have in their visual pattern.
Briefly speaking, a driver decides (with intention or not) to violate traffic regulations when s/he supposes that s/he can gain more than losing with such behaviours.
The consequences of behaviour also provide a mechanism for learning. The "rewarding" of a particular behaviour (with a pleasant consequence) makes it more likely to occur again under similar circumstances. The "punishing" of a particular behaviour (with an unpleasant consequence) makes it less likely. This analysis provides a framework for incorporating the processes of motivation and learning in understanding the causes of risk-taking. A person may engage in a risky behavior because it has rewarding consequences.
So the question will be: what consequences can motivate risky behaviour (in this case, the behavior of violating road traffic regulations)? Although accidents are usually triggered by one final act or failure to act, they nevertheless have multiple causes. When all of those causes occur together in the right pattern – an accident is inevitable. The fact that a pattern of events is typically necessary for an accident to happen means that the driver can sometimes (or often) get away with mistakes. Such a forgiving system can enable the driver to get away with unsafe practices for a long time. In this way, the driver can unwittingly learn unsafe behaviour. In similar ways, if the driver can drive when violating traffic signals or lane markings without being punished with the "feeling" that s/he can drive much faster, then the violation behaviours become more common.
Doctoral thesis (Huyen 2009) also provides the research with the results of behavior of violating traffic regulations. From the theoretical model with the empirical data (from Vietnam situation), the model of analyzing cause-and-effect chain of behavior has been established. Briefly speaking, general attitudes towards legislations as well as specific perception in a special situ (involving experience about the site/intersection and his/her own compromise of risks) lead to traffic behaviors. Among them, "general attitude" is more sustainable, influenced by such elements as education, cultural environment, social attitude… Whereas "scenario perception" is influenced by such elements in the specific traffic

environment, including trip motivation, ability of perception and processing the situation.
The following figure describes the relationship from attitude, perception to the behavior of vehicle choice.

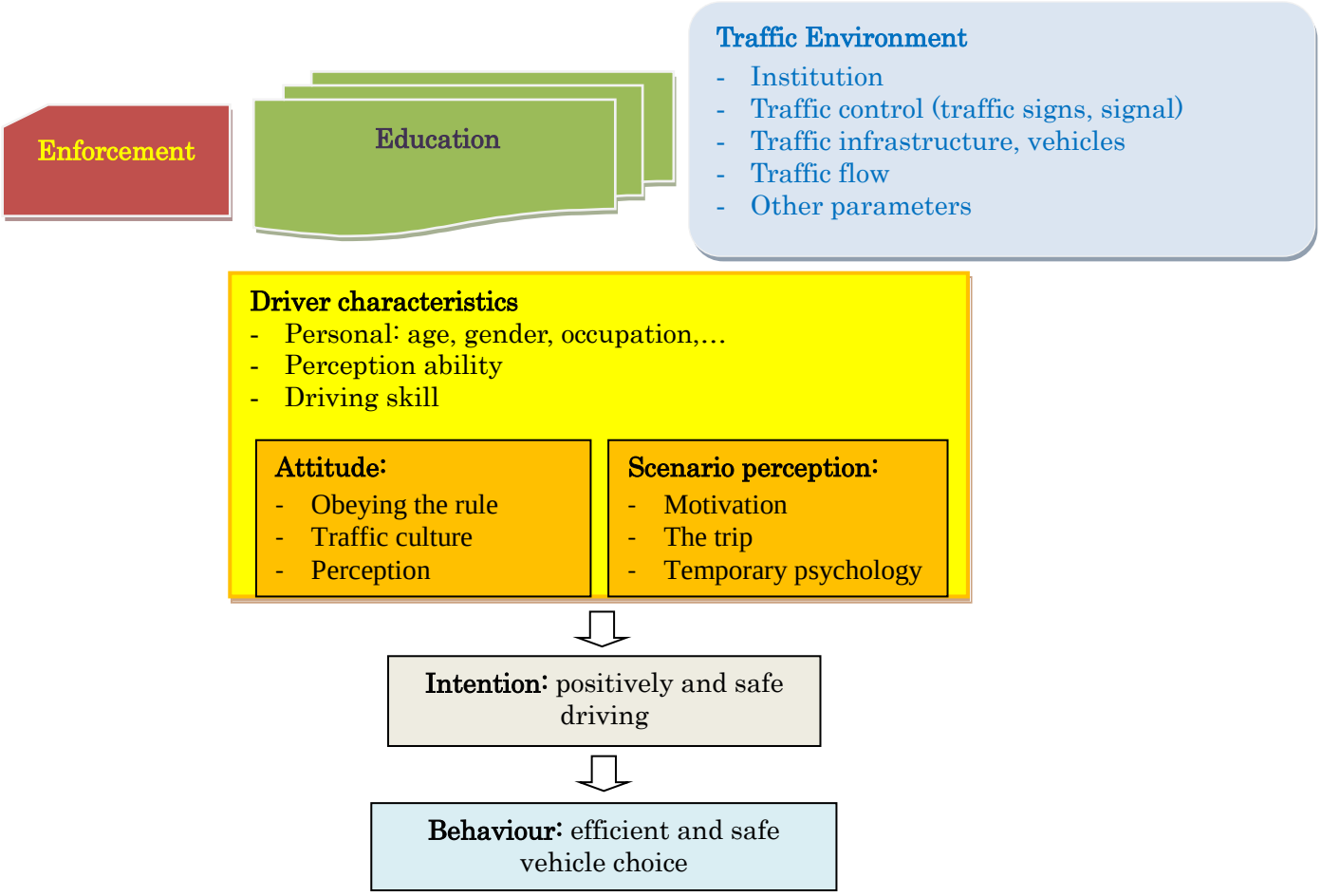

Figure 3. Driver behavior chain of vehicle choice

(Source: Lê Thu Huyền (2009))

3. DESIGNATED DRIVER SERVICE

3.1 Terms and definition

According to Lange et al. (2006), the designated driver concept was developed in Scandinavia over several decades beginning in the 1920's leading to a formalized driver program in the 1980's.
The program was introduced in Canada in 1986 by Hiram Walker and Sons as "The Canadian Club Designated Drivers Program". The program was accepted readily and supported by the police, mothers against drunk driving, the hospitality industry and the public. There were few if any detractors. The program was heavily promoted by Hiram Walker's President Doug Young and the company's PR agency Marshall Fenn Limited led by David Butler. The concept swept Canada, the USA, and many other countries during 1986. The use of a sober

driver to operate a motor vehicle had than at that time been promoted as one abstaining from alcohol to drive others safely within their party when out on the town or at social events.
This driver would than volunteer to operate a motor vehicle safely so that others would not have to drive while drunk, impaired, and within a state that when they were unable to operate a motor vehicle legally and safely on public streets and roadways this person was the designated driver and would volunteer to drive safely. This person operated a vehicle to transport friends and no fee was charged for doing so, so all would be safe after a night out with friends. This person is not offering a service as a transportation service.
Since then, numerous businesses and designated drivers service operations have sprouted up across Canada to help address the problem of drinking and driving. They transport the impaired drivers home as passengers in their own vehicles. These operations use a two person team: one person to drive the impaired individual in their own vehicle, and the other as the follow driver within another vehicle to recover the other driver from the vehicle of the impaired individual upon arrival at the customer's destination, the driver parks the vehicle, and collects a fee for the service. Understand this is a type of safe ride program service or drivers alternative transportation service that do so for a service fee.
These are not necessarily true "designated driver" programs, but instead [Safe Ride] programs, as the sober driver is not designated from within the [natural drinking group].
Many countries in the world (eg. USA, Canada, Japan, EU, Singapore…) have already developed this service. According to a 2008 survey conducted on behalf of Anheuser-Busch by TNS Custom Research Inc., a majority of American adults use the life-saving practice of designating a driver. The survey revealed that nearly two out of three adults (more than 137 million Americans) have been a designated driver or been driven home by one. Importantly, the benefits of designated drivers aren't limited to keeping our roads safe; they also play a role in protecting the environment. More than 6.5 billion driving miles were saved by designated drivers, based on responses when asked how many miles were saved on a typical trip.

3.2 Evaluating the feasibility of Designated Driver Service (DD Service) in Hanoi

In Vietnam, some companies have the idea to cooperate with restaurants and hotels in providing this service to customers (drinkers). Such service is expected to reduce the traffic accidents related to drinking drivers.
In order to evaluate the DD service ability of success, a short interview has been promoted in Hanoi in July 2016 with the sample of 300 questionnaire. The survey has been designed under the light of Theory of Behaviour, with the aim of understanding the cause of behavior (vehicle choice behavior). From that, it is expected to propose the effective way to develop the service in order to reduce the risk of drinking drivers. The interview has been placed near “restaurants”, “hotels”, beverage shops,… aiming at motorcyclists or car drivers after drinking in the recent 01 month.
The survey focus on male drinkers (82%) more than female ones (18%). Among interviewes, there are 49% people at the age of 25-44, 36% ones under 25, 13% ones of 45-60, 2% people of more than 60. The education is scattering from school, undergraduate, master degree to

doctoral degree. The occupations of interviewees are also taken into consideration.

Most of interviewees often go for drinking outside. However, they do not have the practical experience of traffic accident after drinking (only 14,3% has such experience in recent 05 years) or being caught by policemen due to drunk driving (only 15,3% in recent 05 years).

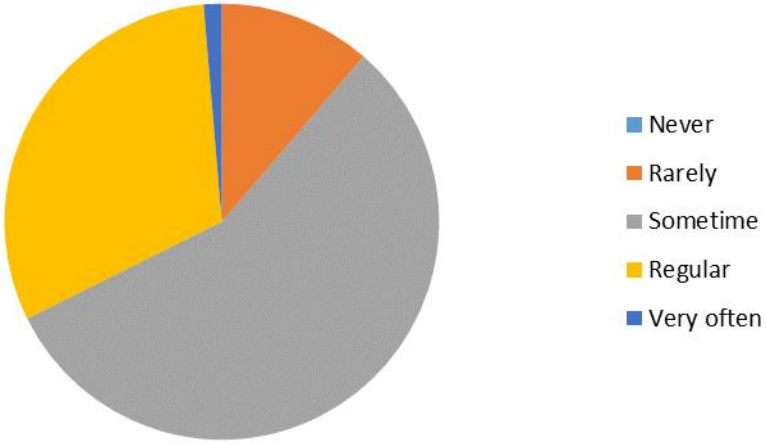

Figure 4. Frequency of interviewees' drinking outside

The survey result shows that motorcyclists has higher trend of self-driving after drinking (93%) in comparision with car drivers (85%). Meanwhile, the percentage of peope rarely drinking outside covers only 11%. There are only 02 person (0,67%) who never drive after drinking.

The frequency of drunk driving of both motorcyclists and car drivers can be seen in the following figure.

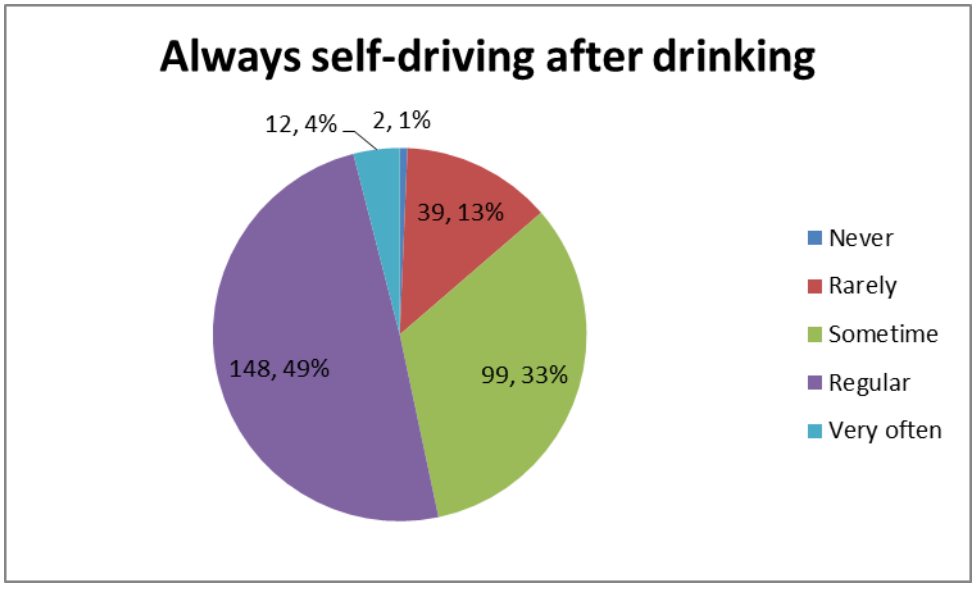

Figure 5. Frequency of drunk driving (in recent 01 month)

The research continue with analyzing influencing parameters of perception, intention as described below.

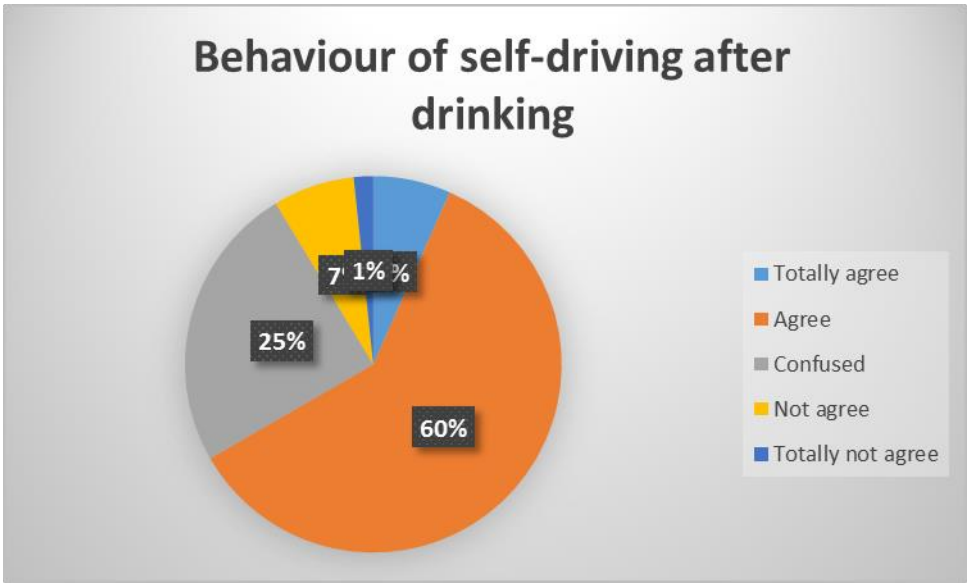

Figure 6. Intention (potential) of driving after drinking (in coming 3 months)

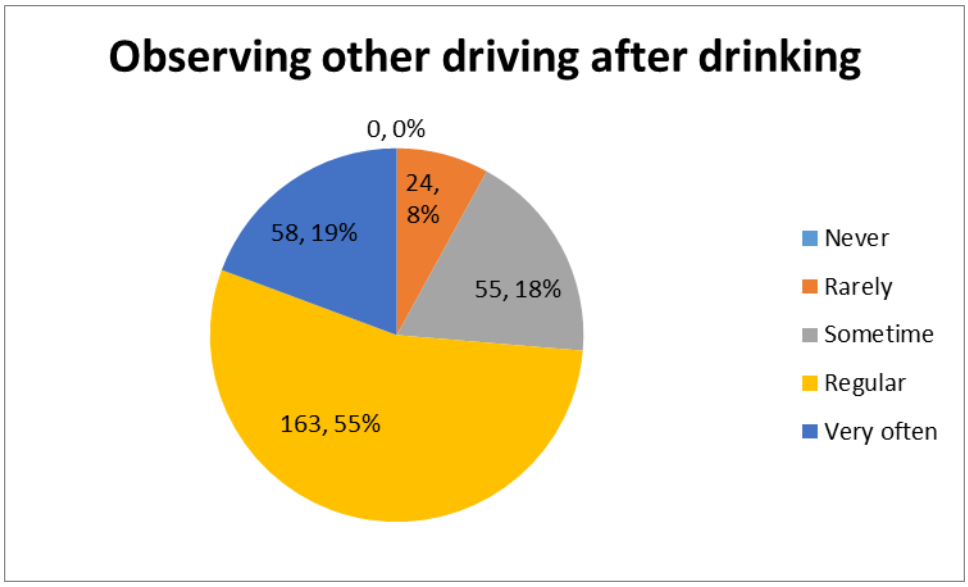

Figure 7. Perception of other behaviours

Interviewees has the trend of over-estimating the ability of riding vehicles after drinking. Suprisingly, among interviewes, only few people (<30%) can correctly calculate BAC equivalent to the drinking alcohol volume (eg. measured by glass).

Below are description of causes of DD behaviour.

- Behaviourial beliefs:
    - Self-driving after drinking can help me to reach the destination quicker
    - Self-driving after drinking helps me to feel more freedom and self confident
    - Self-driving after drinking brings happiness
    - Self-driving after drinking can cause stress

- Self-driving after drinking increases the risk of serious accidents
- Self-driving after drinking can be accepted in some cases

- Social control beliefs influencing DD behaviour: "Most of my friends and relatives driving after drinking"
- Perceived Behavioral Control:
  - Self-driving after drinking is simple and easy
  - Self-driving after drinking depends on circumstances, not only on my-self
  - I often try to avoid self-driving after drinking, but I cannot

➔ Such perception and attitude show that DD service can support travelers after drinking to participate in social/family activities.

Finally, the research use some SP (State Preference) question for the ability of using DD Service in Hanoi in the near future. The result reveals that, the choice of DD Service may depend on such elements of:

- Probability to be caught by the police
- When being caught, it can be purnished, such as:
  - *Penalty (by money)*
  - *Losing the driving license*
  - *Informing the employment (losing the job)*
- Waiting time
- Service cost
- Service Reliablity (particular the ability of ensuring vehicle safety, trips, customers)

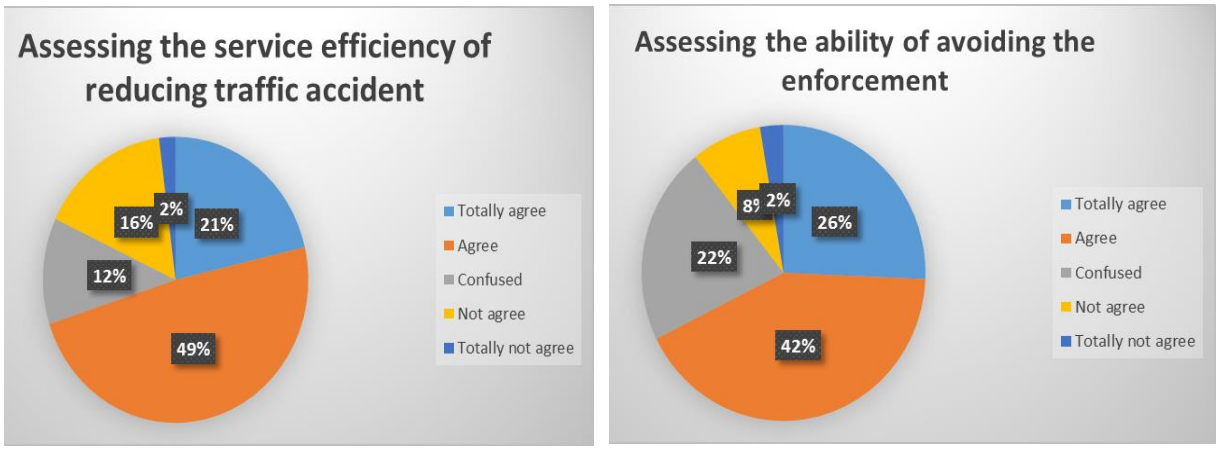

Figure 8. Interviewees' assessment on service and enforcement

Among such elements, those related to balance between service cost and risk of penalty when being caught in drunk drving has the highest influence. People at the age of 25-40 have the highest trend to use the service (53% probability). Occupation also influence the probability to select the service. The group of officers shall have the highest probability (55%) to use the service.

3.3 Solution for DD Service

From the field survey, as well as best practices, the DD service can can be considered as an efficient solution to reduce the risky behavior of drunk driving. Some policy to encourage such service can be recommended as follows:

- Strengthening regulations, increasing penalty level (taking into consideration solutions of penalty points, temporary/permanent collecting the license), and other enforcement measurements with Drunk Driving behaviour.
- Constructing legal institution to manage the DD Service, ensuring the ability to provice the service reliably, sustainably and friendly
- Conducting research on solutions to support enterprises to provide DD service, such as developing IT platform, constructing customer-friendly apps in the city, subsidize and other financial supporting measurements to reduce the cost of service supply
- The potential customer of DD service will be the group at the age of 25-40, office staffs.
- Promotion campaign and solutions are needed for the service.

4. CONCLUSION AND RECOMMENDATION

So far, traffic accidents are of high importance to the public health spectrum around the world. In developing countries such as Vietnam, the mortality rate from road traffic accidents is rather high in comparison with other countries in this region. Discussion about the importance of the human factor in transport policy is growing. Aware of the serious effects traffic accidents have on the whole society, scientific researchers, traffic engineers and policy makers in Vietnam have developed many projects and conducted research in the field of traffic safety over the past few years. The human factor is considered the central element in the whole system. The final goal is to organize a traffic environment that is convenient and safe for road users.

Conducting the research on Theory of Behaviour and the field survey on drunk driving behavior in Hanoi can figure out such following conclusions:

- The methodology is practical and applicable in analysing drunk driving and DUI behaviour
- The methodology is efficient in motorcycle-dominated traffic flow and traffic behaviour
- The methodology advantage is its ability to work well even in case of data shortage. At the same time, the methodology also reveals its ability to be improved and expanded whenever the knowledge and data are enlarged.
- It has been determined the direct relationship between behaviours of drunk driving and DUI/DWI, relationship between drivers' attitude and perception with risky behaviour
- The case study can be applied to evaluate traffic measurements, strategy, policy, etc. before and after implementation

- The Designated Driver Service providing to drivers aims at two targets: satisfying the need for social/cultural communications (with alcohol drinks) of Vietnamese people, and ensuring traffic safety for travellers as well.

Conducting research on unsafe/dangerous behaviours related to alcohol drinks can be further developed, aiming at such specific objectives:

- Quantifying parameters in the model, with their probability distributions.
- Determining risky/unsafe of different vehicles (motorcycle, cars, bus, trucks, non-motorized vehicles) in the traffic flow.
- Evaluating and verifying relationships among parameters.
- Determining causes of dangerous behaviours (DUI/DWI) related to alcohol drinks
- Proposing and evaluating the efficiency of solutions for edjusting risky behaviour in mixed traffic flow

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