Responsibility of the bus operator in terms of safety and health: A Malaysian case study

S S K Singh1*, S Abdullah1, A H Azman1, N N M Nasir1, M R M Yazid1, H Hishamuddin1, W A W Ghopa1, A K Ariffin1, D A Wahab1, A H Shahrir1, A Azhar2 and M S Solah2

1Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, MALAYSIA
2Malaysian Institute of Road Safety Research (MIROS), 43000 Kajang, Selangor, Malaysia.

*E-mail: salvinder@ukm.edu.my

Abstract. This paper presents the bus agencies perspective towards the express bus safety based on the bus maintenance and safety factors to reduce the road accidents in Malaysia. Express buses were scored the highest percentage in bus accident cases primarily owning to the driver negligence. This survey was conducted among 34 respondents working with the bus agencies. The respondents composed of the employees in administration and management positions of the companies. The questionnaires were developed based on the five-point Likert Scale to assess the safety perception of express buses. The questionnaires have a high reliability of Alpha Cronbach’s score at 0.9362 in safety aspects. In the aspect of management commitment, the Alpha Cronbach’s score is 0.6479 and 0.6061 was recorded in the aspect of suggestion improvement. In term of improvement suggestion, 94.12% of respondents were satisfied with the decision of bus agencies to improve the safety and health aspects of the company drivers and employees. Furthermore, 91.18% agreed with the bus agencies to use the Information and Communication Technology (ICT) systems in order to monitor and manage the safety of buses during service period. Hence, effective safety protocols such as drivers monitoring system must be implemented by responsible agencies to mitigate the careless behaviours of drivers and improve the safety of buses.

1. Introduction
Malaysia is one of the developing countries where the express bus accidents had caused intensive losses of life and economic. The buses accident number had consistently soaring at an alarming rate in every year and brought a major concern about the safety of the express buses among the society. From year 2012 until 2015, the Malaysia Institute of Road Safety Research (MIROS) had reported a total of 1855 bus accidents. Solah et al. [1] remarked that increasing number of express bus accidents and high casualties number had severely affected the impression of public on the express bus services in the nation. Consequently, this will inevitably reduce the public’s confidence in the safety of public transportations [2].

There are many factors that cause the express bus accidents such as over speed, faulty protective systems, components failure, bad road condition, irresponsible management, lack of maintenance or etc. [3]. Fatigue of drivers is one of the primary factors of accidents in which the drivers feel tired and
loss concentration after a prolonged period of driving. Drivers’ fatigue is often attributable to the lack of rest and safety awareness and can significantly reduce the driving efficiency [4]. Moreover, Oluwole et al. [3] stated that mechanical component failures and human errors are also the main safety concerns of the express buses. Some critical safety components such as the brakes and tyres must be regularly serviced because these components are responsible in controlling of the buses. According to study, about 56% of accidents are caused by mechanical component failures. Break failure is main cause of the mechanical failures [5]. Serious fatal buses accidents because of the driver’s misbehaviour like over speeding with a fully loaded bus [2] Serious fatal buses accidents because of the driver’s misbehaviour like over speeding with a fully loaded bus [6].

This study investigates the responsibility of the transportation companies in the aspect of driving safety and health of the drivers. The survey focused on the safety awareness and company’s commitment to ensure the driving safety and drivers’ health condition as well as the improvement of bus safety measurements. It is intended to understand perceptions of transportation companies on the bus safety management and drivers’ health conditions. The study is essential to recover public confidence on the safety of public transportation.

2. Methodology
This study was conducted by Universiti Kebangsaan Malaysia for local transportation companies in Malaysia. This study focused on the transportation companies that are responsible in the bus safety management. The study adopted questionnaire surveys to investigate the perceptions of transportation companies’ employees concerning the bus safety and drivers’ health conditions.

The targeted group of this study are employees of transportation companies that were currently working at the administrative and management positions in the companies. A total of number of 34 respondents was involved in this survey. The respondents were selected from various main local transportation companies in the Peninsular Malaysia. The targeted respondents are individuals that were responsible to the bus safety management. This work takes a descriptive approach. The questionnaires composed of four sections and all question types are in closed ended.

i. Section A: Demographic information of respondents.
ii. Section B: Safety aspects of buses.
iii. Section C: Management commitment.
iv. Section D: Suggestions for improving the bus express safety.

Section A investigated the demographic information of the respondents that consists of some multiple-choice questions. In this section, the respondents were required provide the following information:

i. The respondent’s working position and the location of his/her company
ii. Personal information such as gender, race, educational level, etc
iii. Salary
iv. Destination
v. Total bus and type of bus selection

Section B, C, and D comprised a Likert scale question category based on a five part-point Likert Scale to evaluate the perception on safety of express buses, i.e., strongly disagree (1), disagree (2), satisfactory (3), agree (4) and strongly agree (5). The questionnaires were developed based the contributing factors of respondent’s perception towards the express bus services. Section B comprised of seven categories:

i. Management and monitoring of safety and health programs
ii. Driver management
iii. Vehicle management
iv. Travel management
v. Record management
vi. Information technology system
vii. Safety education and learning

Albeit the answers in the questionnaires were ranked accordingly to the A five part-point of Likert scale, respondents might be uncertain to some of their answers. Under such circumstance, some neutral words such as “partially agreed”, “probably” or “do not know” should be provided as a choice of answer. In addition, the statement might be vague and imprecise, that may create confusion, leading to respond for the scale of three (3), not sure. The category for agree (scale 4, 5) and disagree (scale 1, 2) is combined in order to determine for a mean score, and it can be used for avoiding focusing on the individual items.

Analysis of reliability and validity for questionnaire were conducted based on the Rasch analysis using the designated WINSTEPS software package. Based on Rasch measurement model, the reliability acceptable range of Alpha Cronbach’s (α) is between 0.71 to 0.99, indicating a good reliability level. Table 1 illustrates the verbal interpretation reliability level based on Alpha Cronbach’s score [7]. α value of less than 0.5 indicates unacceptable reliability. The α value between 0.5-0.6 represents the questionable reliability while 0.7-0.8 indicates acceptable reliability. Subsequently, good and excellent reliability should have α values ranging between 0.8-0.9 and 0.9-1.00, respectively [8]. The frequency analysis of this study is used based on the frequency of selection and percentage of the agreed statement [9].

| Score of Alpha Cronbach | Reliability   |
|-------------------------|--------------|
| 0.9 ≤ α < 1.0           | Excellent    |
| 0.8 ≤ α < 0.9           | Good         |
| 0.7 ≤ α < 0.8           | Acceptable   |
| 0.6 ≤ α < 0.7           | Questionable |
| 0.5 ≤ α < 0.6           | Poor         |
| α < 0.5                 | Unacceptable |

### 3. Results and discussion

The demographic information of respondents was illustrated in Table 2. The respondents comprised 55.88% of male and 44.18% of female. The age of the respondents was divided into five age groups. Most of the respondents (44.12%) were above 40 years old, and the smallest age group was 21-24 years old with only one respondent (2.94%). Furthermore, majority of the respondent are Malay race (97.06%) and only 2.94% was Chinese race. The highest education level of the respondents was Diploma/Degree (52.94%), followed by secondary level (44.12%) and the lowest at primary level (2.94%). The job positions of the respondents had been divided in four categories: Executive (41.18%), Administration (38.24%), Technical Support (17.64%) and others (2.94%). Table 3 shows the frequency of the destinations and the status of bus ownership in which either the bus was owned by the companies or rented from third party. Based on this survey, the transportation companies had arranged the schedule route destination. 67.65% was arrange to all destination around Peninsular Malaysia, 20.59% and 11.76% arrangement for Eastern and North Malaysia, respectively.

The Alpha Cronbach’s (α) score for reliability of section B, C and D are shown in Table 4. For section B, the Alpha Cronbach’s (α) score for reliability is 0.9362 which shows that the level of reliability was good. Meanwhile, the Alpha Cronbach’s (α) score of section C and D were 0.6479 and 0.6061, respectively, indicating questionable reliability. This indicator was based on Bond and Fox’s interpretation that was shown in Table 1.

The Safety and Health section was divided into several criteria to investigate the extent of the companies’ involvement and contribution to the safety and health of drivers and passengers. Figure
Ge 1(a) shows that the respondents were totally agree that the transportation companies held the responsibility to manage the policy for passenger safety and health. All the transportation companies had standard safety and health policies and the permanent officers were appointed to manage and monitor the implementation of the policies. However, 82.35% declared that their companies did not appoint any committee of safety and health while another 14.71% stated that the companies had appointed a committee of safety and health. In the observation, 85.29% of respondents stated that their transportation companies prepared some contingency plans for emergency situations and 14.71% claimed that their companies did not have one.

| Table 2. Demographic information of 34 respondents involved in the survey |
|-----------------|-----------------|-----------------|
| Characteristics | Frequency (n)   | Percent (%)     |
| Gender          | Male            | 19              | 55.88           |
|                 | Female          | 15              | 44.18           |
| Ages            | 21-24           | 1               | 2.94            |
|                 | 25-29           | 10              | 29.41           |
|                 | 30-34           | 5               | 14.71           |
|                 | 35-40           | 3               | 8.82            |
|                 | >40             | 15              | 44.12           |
| Race            | Malay           | 33              | 97.06           |
|                 | Chinese         | 1               | 2.94            |
|                 | India           | 0               | 0               |
|                 | Others          | 0               | 0               |
| Educational level | Primary     | 1               | 2.94            |
|                 | Secondary       | 15              | 44.12           |
|                 | Diploma/Degree  | 18              | 52.94           |
| Job Position    | Executive       | 14              | 41.18           |
|                 | Administration  | 13              | 38.24           |
|                 | Technical       | 6               | 17.64           |
|                 | Others          | 1               | 2.94            |

| Table 3. Destination and bus ownerships |
|-----------------|-----------------|-----------------|
| Characteristics | Frequency (n)   | Percent (%)     |
| Destination     | North           | 4              | 11.76           |
|                 | Southern        | 0              | 0               |
|                 | Eastern         | 7              | 20.59           |
|                 | Outside         | 0              | 0               |
| Malaysia        | All destination | 23             | 67.65           |
| Bus             | Own             | 34             | 100             |
|                 | Rent            | 0              | 0               |

| Table 4. Reliability Statistics for Section B, C and D |
|-----------------|-----------------|-----------------|
| Section         | Cronbach’s Alpha|
| B               | 0.9362          |
| C               | 0.6479          |
| D               | 0.6061          |

In the aspect of driver management as shows in Figure 1(b), large majority of respondents agreed that the companies handled the driver's issues very well. Their companies had imposed strict requirements on the employment of bus drivers, for example, a qualified driver must possess a valid
driving license, properly and regularly trained. The companies also assessed the driving skills of the drivers and monitored their working hours. Furthermore, the companies implemented a shifting system of drivers to prevent exhausted drivers and ensure the safety of the journey. The transportation companies offered various benefits to the bus drivers such as staff loan to those who need financial support.

The third part of Section B was the vehicle management as illustrated in Figure 1(c). Respondent were asked about the vehicle management related to the bus maintenance and safety equipment. Respondents agreed that the mentioned items had been put under well monitor by the bus drivers. They claimed that the buses were well maintained and regularly inspected by PUSPAKOM, a government agency responsible to the safety inspection of public transportation. The respondents were also asked if their companies complied with the technical standards or international security standards such as United Nation Economic. Results shows that 82.35% of them were certain while 17.65% were unsure.

The bar chart in Figure 1(d) shows the respondents’ opinion on the travel management. The transportation companies had good knowledge about the legal provisions of road safety. 85.29% and 91.18% employee in the company knows the bus route and how the licences been given to bus agencies. The respondents claimed that speed of the buses was constantly recorded using Global Positioning System (GPS) and customers’ complaints had been taken seriously to ensure the safety of the bus journey. It is the responsibility of the companies to record all matters pertaining to bus management Figure 1(e) shows that most of the companies had managed the records systematically. The records included the bus management, accidents cases, summons, driver or employee training records, audits and employee health and safety committee.

Nowadays, the information technology systems had been extensively applied in public transportsations. The respondents were tested on their knowledge about the latest technology. Figure 1(f) shows the level respondents knowledge on different types of information technology system. 94.12%of respondents agreed that the buses were installed with the GPS technology and sensors to detect the bus location. The GPS instalment in the express buses was mandatory since 2008 as proposed by Land Public Transport Commission (SPAD) [10]. The system is capable to record and monitor the speed of the buses on real-time basis. However, the instalment of GPS tracking system in the express buses did not effectively prevent the accidents. Therefore, many other technology devices had also been used to improve the safety of the buses. Questionnaires survey revealed that 88.24% of transportation companies adopted the Smart Transportation system such as online ticketing system.

Moreover, 64.71% of the companies used the eCall Initiative Technology to seek for immediate assistance under emergency situation. Other than that, some companies were using technologies like Vehicle Identification (55.88%), On-Board Vehicle System (44.12%), Video Image Processing (58.82%) and Logistic Database (55.82%). 11.76% of the companies obtained the drivers’ health information through IoT online system while 88.24% of the companies did not utilise the system. The last criterion in section B as shown in Figure 1(g) concerning about the safety education and learning of the respondents. The respondents were asked if their companies provided safety and driving training, safety awareness and instilling good values in the drivers, as well the provision of written safety and health policy modules. Most of the respondents agreed that their companies had fulfilled the criteria and only two respondents were disagreed.
Figure 1. Health and Safety criteria; (a) Management and Monitoring of Safety Health Programs (b) Driver Management (c) Vehicle Management (d) Travel Management (e) Record Management (f) Information Technology System and (g) Safety Education and Learning

In the aspect of management commitment, several criteria were not satisfied by the transportation companies. These criteria were illustrated in Figure 2. 73.53% respondents disagree that the safety of
drivers and passengers were their responsibility. 94.12% was disagree with the statement that the management never discussed with the drivers or employee about passengers’ comfort and safety. 97.06% disagreed that the bus agencies do not have the schedule and limitation of bus velocity. The respondents do not agree about the break (94.12%), tires (79.41%), engine (76.47%), steering wheel (64.71%) were inspected and repaired only if the items were found damaged or not functioning. The companies always inspect and monitor the bus maintenance. 91.18% agreed that the bus agencies had provided the safety equipment such as first aid kits and fire extinguishers in the buses. 94.12% of respondents found that a good company always concerns about drivers’ and employees’ health condition and welfare. The companies 100% emphasis driver or employee discipline and 94.12% said that their salary and allowances were reasonable. However, a small portion of respondents (2.94%) claimed that the basic training for maintenance was not provided due to the lack of budget.

Note:

C1.1 The safety of drivers and passengers is their responsibility and should not be placed on the shoulders of bus companies.
C1.2 Management never discussed with drivers about safety and comfort aspects of passengers.
C1.3 The company does not have a specific schedule system and driving limits.
C1.4 Brakes are only inspected and repaired if damaged.
C1.5 Tires are only inspected and replaced if bald.
C1.6 The engine will only be inspected and repaired if damaged.
C1.7 The steering wheel inspected the situation and if necessary.
C1.8 Buses are always equipped with safety equipment such as first aid kits and fire extinguishers.
C1.9 Companies that care about health and welfare/ workers.
C1.10 The company places emphasis on the driver/employee displacement.
C1.11 Salary and allowance given to the drive/employee is reasonable.
C1.12 Drivers are not given basic training for operators due to the lack of budget.

Figure 2. The percentage of Management Commitment criteria

Figure 3 shows the respondents’ opinions on improvement suggestion for safety aspect. 94.12% of respondents were satisfied with their companies’ efforts in safety improvement and another 5.88% were uncertain. Furthermore, 91.18% of respondents agreed that the Information and Communications Technology [11] systems were very beneficial to the safety management and greatly improved the express bus safety.
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Figure 3. The percentage of Improvement Suggestion criteria

4. Conclusion
The road accidents that involve the express buses are increasing and had become an alarming issue in Malaysia. This study investigated the responsibility and commitment of the transportation companies in managing and monitoring the drivers, vehicles, travels, and records. In addition, the involvement of companies in the safety and health of drivers or employees was also investigated. The companies were found to have imposed many safety measurements and protocols concerning the vehicle maintenance, drivers’ health condition monitoring and safety equipment to ensure the drivers’ and passengers’ safety. It was also found that the companies were up-to-date with the latest information technologies that can facilitate the management process.

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