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Development of Safety Star Grading Program: A Star Rating System for Express Bus Operator in Malaysia

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Abstract – *In 2007, the Malaysian Institute of Road Safety Research (MIROS) with engagement from numerous stakeholders has come out with a Safety, Health and Environment Code of Practice (SHE COP). The main reason for the existence of this SHE COP is because of a drastic increase in the number of crashes within the five years involving commercial vehicles especially express buses. Subsequently, in 2010, SHE COP has been gazetted as Industrial Code of Practice for Transportation Sector (ICOP 2010) under the Occupational Safety and Health Act 1994 (OSHA 1994). This ICOP 2010 can be used as guidelines to improve safety management for fleet operators. However, it has limitations to disseminate information to the public on the level of safe operation by the operators for them to make a good decision. Through some focus group discussions, a review of ICOP 2010, and a pilot test, MIROS has developed a star rating system named as Safety Star Grading Program (SSG) to provide information to the public on the level of safety management and service performance of the express bus operators. This SSG rating criteria consist of 4 elements which are safety, health, service performance, and comfort. Under the safety element, there are six sub-elements which are policy, organization, planning and implementation, evaluation, and action. Overall, this SSG was developed by referring to the basic concept of a safety management system to provide public transportation users with information to make a better decision on choosing the safest operator.*

Keywords: Safety Star Grading (SSG) Program, star rating, bus operator, safety management system, fleet operators

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1.0 INTRODUCTION

Crashes involving commercial buses in Malaysia have shown an increasing trend from 2002 to 2007. According to road accidents data obtained from Royal Malaysia Police road accidents statistics and analyzed using MIROS Road Accidents Database System (MROADS), the number of fatalities recorded was 341 compared to 242 in 2002 (RMP, 2007). The figure shows

a disturbing trend of fatality to casualty ratio of 17.2% in 2002 increasing to 34.7% in 2007. This is a serious matter and something should be done to address the commercial bus operators to make sure they comply with a good safety management system as proposed in the Safety, Health and Environment Code of Practice for Transportation Sector (MIROS, 2007). Furthermore, this Code of Practice has been gazetted in 2010 as the Industrial Code of Practice for Transportation (ICOP 2010) under Occupational Safety and Health Act 1994 (OSHA 1994).

The gap in the implementation of the ICOP has been further discussed in focus group discussions and several recommendations have been brought up including having one mechanism on how to disseminate info on the level of safety practices complied by the operators to the user. This has been triggered by the development of the Safety Star Grading (SSG) Program. Thus, the Malaysian Institute of Road Safety Research has been the leading agency in developing this safety star rating program. An instrument to evaluate the level of compliance to ICOP 2010 can be used to identify weak points and provide opportunities for the bus operator to further improve, and the consumer-driven factor has also been highlighted as the concept of the program to ultimately aim in reducing the number of crashes, injuries, and fatalities involving express buses' driver and passenger. Furthermore, based on several studies, operational safety management can help reduce crashes and incidents, asset damage, and operational cost which in return will increase company profitability (Bottani, 2008; Fernández-Muñiz, 2008; Murray et al., 2012).

The Safety Health and Environment (SHE) Code of Practice (COP) has been developed by MIROS with the contribution from several government agencies, NGOs, and industries such as the Department of Occupational Safety and Health (DOSH), Department of Road Safety (JKJR), Royal Malaysia Police (RMP), Road Transport Department (RTD), Peninsular Malaysia Express Bus Operators Association (PMBOA), Pan Malaysia Bus Operators Association (KPBESM), Pan Malaysia Malay Bus Operators Association (PEMBAWA) and other and Multinational Fleet Transporters (MIROS, 2007). The gist of the COP is related to the POPEA concept namely, Policy, Organization, Planning and Implementation, Evaluation and Action (ILO, 2001; MIROS, 2007; DOSH, 2010). This concept is derived from the quality of the Plan, Do, Check, and Act (PDCA) cycle concept.

From 2010 to 2013, several assessments and audits on ICOP SHE compliance have been conducted by MIROS. Based on the assessments and audits, it was found that there is a need to develop a structured safety audit checklist to ease the process of auditing. In addition, findings from the audits of operators on SHE COP compliance have been used to assist the synthesis of the assessment tool suggested for this research. This tool used standard management methodology for quantitative assessment of management compliance. Occupational Safety and Health (OSH) management system consist the following elements which can be used for evaluation purposes: risk analysis, hazard control, setting of performance goals, defining roles and responsibilities, training, communication, established procedures, emergency response plan, auditing, and closing the loop (ILO, 2001; MIROS, 2007; DOSH, 2010). These elements can be translated into measurable indicators for assembling the assessment tool.

The rating system has been used all around the world to help customers make a choice that suits their needs and budget. The common rating system being used is for hotels for differentiating their service provided to customers. In addition, many ratings are being carried out in Malaysia such as public restrooms, restaurants, government agencies in public services, and driving institutes. Even though the express bus operators need to comply with OSH

regulation, there is no simple indicator for the public to know the level of compliance of the company in accordance with the law. Thus, the safety star grading for bus operators is formulated to provide an indicator of the safety performance of bus operators for the general public to make their best choice with confidence when they want to travel and to complement the implementation of the existing regulation.

2.0 METHODOLOGY

The development of SSG comprises four stages specifically literature review, assessment tool development, engagement with stakeholders, and assessment tool testing and refinement.

2.1 Identification of 'Safety Management Audit Tools'

At this stage, relevant pieces of literature were reviewed to obtain the best practice in fleet management. In addition, the keyword for 'safety management system in transport', 'occupational safety and health in transport', 'safety management audit tools' and 'safety audit checklist' were being used to filter the pieces of literature during the search. This stage includes reviewing guidelines for OSH management globally.

2.2 Development of Assessment Tool

The main document that is referred to in developing the assessment tool was Safety Health and Environment (SHE) Code of Practice (COP) (MIROS, 2007), Occupational Safety and Health Industry Code of Practice for Road Transport Activities by the Department of Occupational Safety and Health (DOSH) Malaysia (ICOP 2010) (DOSH, 2010) and Occupational Safety and Health Act 1994 (OSHA 1994). Most of the elements from this code of practice have been adapted into the assessment tool as the assessment criteria. Other than that, reviews on best practices by other countries or organizations also have been done and additional vital elements which interrelated with the safe operation were also incorporated while setting the criteria. All elements included in the assessment tools were then been divided into the compulsory item and additional items to be complied by the operators.

2.3 Engagement with Stakeholders

After the first draft of the assessment tool being developed, feedback is needed from various agencies especially from the stakeholders to improve the tool. At this stage, several meetings and workshops with stakeholders and enforcement agencies were conducted to get their feedback on the star rating system mainly on the assessment criteria. Besides meetings and workshops, focus group discussions have been conducted into two separate groups. The first group consisted of government authority related to commercial vehicles operation and licensing while the second group was represented by the bus operators. The respondents from bus operators were then being divided into small groups to obtain feedback on the assessment tool. Both engagements were conducted to obtain feedback and consensus from both parties as they are the stakeholders. Furthermore, all beneficial input derived from the session has been recorded to further analyze for proposed elements and marking scores in the assessment tools.

2.4 Assessment Tool Refinement and Testing

Based on inputs and feedback gathered from the engagement session with various stakeholders, the tool has been revised accordingly into the final draft. In order to ensure reliability, the tool can be easily comprehended by the assessors, a pilot test was conducted to test the final draft of the tool. The test was conducted among selected express bus operators.

3.0 RESULT AND DISCUSSION

3.1 Identification of 'Safety Management Audit Tools'

Based on the reviews, the star rating system is identified as the best approach to indicate the level of safety practiced by the bus operator. Adoption of the conceptual framework of Occupational Safety and Health Code of Practice as safety components in the assessment was further divided into safety and health policy (P), organization (O), planning and implementation (P), evaluation (E), and action (A). The conceptual framework is shown in Figure 1.

Figure 1: Main elements of the OSH management system (ILO, 2001; MIROS, 2007)

In addition to safety requirements as stated in the Occupational Safety and Health Code of Practice, the health component is also required to be monitored. Besides safety and health components, service performance and comfort during the journey were also included. The inclusion is supported by studies done by Karlsson & Larsson (2010), Rohani et al. (2013), and Batarce et al. (2015). Thus, based on all of the requirements mentioned above, the assessment tools have been divided into four components, five elements, and three sub-elements. Figure 2 shows the framework of Safety Star Grading assessment tools.

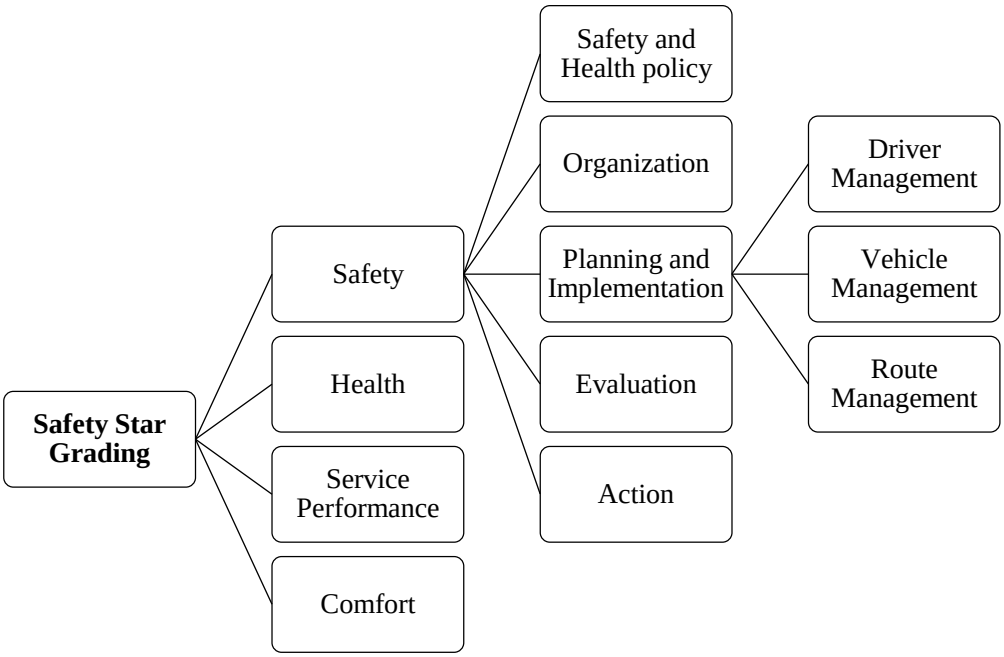

Figure 2: Safety Star Grading Program framework

3.2 Development of Assessment Tool

Based on the development process, the first draft of the assessment tool was developed according to the criteria that have been used in the previous safety management audit. Besides, additional criteria for checking the implementation status and safe operating practice are also included in this assessment tool. The list of initial assessment criteria is shown in Table 1.

Table 1: Initial list of assessment criteria

Criteria	Source of Adoption
Policy	
Policy is available in hard copy	OSHA 1994
Policy prominently displayed	OSHA 1994
Policy is signed by top management	OSHA 1994
Policy is dated	OSHA 1994
Policy communicated	OSHA 1994
Safety is part of employee and management job specification	OSHA 1994
Organization	
There is a documented Safety and Health Committee organization chart and directly reporting to top management	SH Com Reg 1996
Term of reference for committee members defined	SH Com Reg 1996
Chairman is top management (or his appointed representative)	SH Com Reg 1996
Chairman, secretary and all committee members are formally appointed.	SH Com Reg 1996
Number of employee representatives (Min. 2 for less than 100 employees. Min 4 for 100 employees and above)	SH Com Reg 1996
Committee meeting min 1 per 3 months	SH Com Reg 1996
Chairman is present for every meeting	SH Com Reg 1996
Secretary is present for every meeting	SH Com Reg 1996
For every meeting, total number of representatives' employer and employee who attend equals or exceeds 50%	SH Com Reg 1996
Minutes of every meeting is circulated within 2 weeks.	SH Com Reg 1996
Members of SH Committee had OSH training	SH Com Reg 1996

Members of SH Committee had training on roles and responsibilities of Safety and Health Committee as described under the Act.	SH Com Reg 1996
SHC conducts workplace inspection at least once in 3 months.	SH Com Reg 1996
SHC members are trained in accident investigation	SH Com Reg 1996
Person in charge (PIC) and deadline determined for the action indicated in the minutes	SH Com Reg 1996
Does the SH Committee discuss in its meetings? (a) "Near misses" reported (such as sudden braking). (b) Accidents reported (e.g., worker injuries, property damage) (c) Dangerous occurrence (e.g., vehicle breakdown, overturn) (d) Driver traffic violations (e) Inappropriate driving behavior (IDB) e.g. Use of handphone, smoking while driving. (f) Employees' welfare	OSHA 1994, SH Com Reg 1996
Full-time SHO is employed (registered with DOSH)	OSH (Safety and Health Officer) Order 1997
HIRARC (Hazard Identification Risk Assessment Risk Control) is conducted for the following activities: (a) Workshop (b) Office (c) Depot (d) Journey	OSH ICOP RTA 2010
Procedure for emergency response is available	OSH ICOP RTA 2010
Written Driver Management Standard Operating Procedure	
Driver recruitment procedure.	OSH ICOP RTA 2010
Driver categorization	OSH ICOP RTA 2010
Training and awareness program	OSH ICOP RTA 2010
Driving procedure	OSH ICOP RTA 2010
Driving hours and working hours	OSH ICOP RTA 2010
Driving roster	OSH ICOP RTA 2010
Driver incentives and demerit	OSH ICOP RTA 2010
Self-evaluation (Self-assessment on driver).	OHSAS 18001 & MS 1722
Written Vehicle Management Standard Operating Procedure	
Checklist on vehicle safety devices	OSH ICOP RTA 2010
Procedure for vehicle replacement.	MIROS COP 2007
Vehicle maintenance	OSH ICOP RTA 2010
Vehicle assignments	MIROS COP 2007
Proper vehicle usage – guide for vehicle usage	OSH ICOP RTA 2010
Vehicle license –license, permit, inspection by authority	OSH ICOP RTA 2010
Self-evaluation (Self-assessment on vehicles).	OSH ICOP RTA 2010
Route Risk Management Standard Operating Procedure	
Hazard identification and risk assessment along routes.	OSH ICOP RTA 2010
Risk management along routes.	OSH ICOP RTA 2010
Personal insurance against accidents.	OSH ICOP RTA 2010
Passenger and baggage management.	OSH ICOP RTA 2010
Emergency response.	OSH ICOP RTA 2010
Passenger insurance.	MIROS COP 2007
Incident/accident reporting system.	OSH ICOP RTA 2010
Drivers and vehicle monitoring system	OSH ICOP RTA 2010
Annual incident/accident reporting to DOSH (JKKP 8 Form).	OSH ICOP RTA 2010

Evaluation and Action	
Internal audit/monitoring	SH Com Reg 1996, OSH ICOP RTA 2010
External audit/third party evaluation	SH Com Reg 1996, OSH ICOP RTA 2010
Workplace inspection report	OSH ICOP RTA 2010
Customer satisfaction evaluation report	OSH ICOP RTA 2010
Review of evaluation result and action for improvement	OSH ICOP RTA 2010
Performance Index (Annual Basis)	
Number of traffic summonses per 10k Vehicle Kilometer Travel	Risk exposure measurement
Number of accidents per 10k Vehicle Kilometer Travel	
Number of fatalities per 100k Passenger Travel	
Number of injuries per 100k Passenger Travel	
Number of customer complaints per 100k Passenger Travel	
On-road Observation (Based on Sampling)	
Speed profile on GPS (speeding)	OSH ICOP RTA 2010
Availability of safety information (e.g., emergency number, proper labeling of the emergency door, specific direction, no smoking (for drivers)	OSH ICOP RTA 2010
Safety practice while driving (e.g., use seat belt, no smoking, no handphone usage, follow speed limit, use proper lane, no harsh braking, no tailgating)	OSH ICOP RTA 2010
Safety practice at terminal/R&R (e.g., make announcement, count passengers, etc.)	OSH ICOP RTA 2010
Bus condition (e.g., clean, not shaking, black smoke, etc.)	OSH ICOP RTA 2010
Leadership Commitment	
Top management involvement in safety planning	Michael et al. (2005); Dejoy et al. (2010)
Top management involvement in setting safety performance targets	
Top management involvement in safety performance review	

3.3 Engagement with Stakeholders

Focus group discussions have been separated into two specific groups. The first group consisted of government authorities which were DOSH, RTD, Land Public Transport Commission (LPTC), and Department of Licensing, Ministry of Tourism. The second group consisted of representatives from the bus operator namely KPBESM, PEMBAWA, PMBOA, *Persatuan Agen-Agen Perlancongan dan Pengembaraan* (MATTA), Plusliner Ekspress and Konsortium Transnasional Berhad. In total, 40 respondents from the second group were divided into four groups for discussion on the assessment tools.

During the engagement session with stakeholders from the industry, the presented criteria that have been listed earlier during the assessment development tool were accepted as criteria for the rating system. The only criteria that were being further discussed are the performance index. The suggestion from the industry is that the performance index must be differentiated according to the bus operators' number of buses where the bigger number should reflect with the higher number of indexes.

From the perspective of the authorities, all the criteria presented for star rating were accepted in agreement. Furthermore, the criteria are based on law requirements and shall be complied with.

3.4 Assessment Tool Refinement and Testing

After engagement with stakeholder, further discussion among the researchers and technical team members were done to finalize the assessment tool checklist. Due to the constraint in obtaining performance index data from the express bus operators, alternatively, demerit points based on the incidence of a fatal crash accident, inappropriate driving behavior, and driving under influence were introduced in the rating system to cater for the constraint.

Following that, the star rating criteria have been grouped into each level of star rating ranging from 1- to 5-star according to the compliance, importance, and weightage. Apart from compulsory criteria which were stated in the regulation, there were also some additional criteria under 5-star criteria which have been introduced to reward any extra effort and initiative made by the operators.

A pilot test of the final draft of the assessment tool was conducted among twelve express bus operators. Based on the pilot test results, final adjustment and refinement of the criteria were done to finalize the star rating system.

4.0 CONCLUSION

The Safety Star Grading (SSG) Program was introduced with the aim of providing information to the public on the level of safety management operation complied by the express bus operators. This assessment tool can help the star rating program to be structurally conducted. Besides, the level of safety practices of an organization can be measured objectively and systematically. Further applied research and evaluation of the assessment tool are encouraged to be conducted for future improvement of the star rating program.

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Appendix I. Scoring Based on Level for Each Criteria

CRITERIA	1★	2★	3★	4★	5★
POLICY					
Policy is dated, reviewed and signed by top management	**0/3**	-	-	-	-
Policy prominently displayed	-	**0/1**	-	-	-
Policy communicated and understood	-	**0/1**	-	-	-
ORGANISATION					
Safety issues discuss in management meeting /Safety and Health Committee (SHC) meeting	**0/3**	-	-	-	-
There is a documented Safety and Health Committee organization chart and directly reporting to Top Management	**0/3**	-	-	-	-
Chairman is top management (or his appointed representative)	**0/3**	-	-	-	-
Chairman, secretary and all committee members are formally appointed.	-	**0/1**	-	-	-
Number of Employee representatives (Minimum 2 for less than 100 employees. Minimum 4 for 100 employees and above)	-	**0/1**	-	-	-
Members of SHC had Occupational Safety and Health (OSH) awareness training.	-	-	**0/1**	-	-
For every meeting, total number of representatives for employer and employee who attend equals or exceeds 50%	-	-	**0/1**	-	-
All staff were informed about SHC/Safety Personnel and it was documented	-	-	-	**0/1**	-
Minimum one committee meeting in three months.	-	-	-	**0/1**	-
Chairman is present for every meeting.	-	-	-	**0/1**	-
Secretary is present for every meeting.	-	-	-	**0/1**	-
SHC conducts workplace inspection at least once in 3 months	-	-	-	**0/1**	-
Members of SHC had training on roles and responsibilities of Safety and Health Committee as described under the Section 29 OSHA	-	-	-	**0/1**	-
All aware of the SHC	-	-	-	-	**0/1**
SHC members are trained in accident investigation	-	-	-	-	**0/1**
Minutes of every meeting is circulated within 2 weeks	-	-	-	-	**0/1***
DRIVER MANAGEMENT					
Driver recruitment procedure	**0/3**	-	-	-	-
Basic vehicle familiarization/ safety awareness training	**0/3**	-	-	-	-
Pre-duty assessment by supervisor	**0/3**	-	-	-	-
Driving hours and working hours compliance	**0/3**	-	-	-	-
Driving roster implemented	**0/3**	-	-	-	-
Drivers monitoring system using logbook	**0/3**	-	-	-	-
Self-evaluation (Self-assessment by driver)	**0/3**	-	-	-	-
Drivers monitoring system using Global Positioning System (GPS)	-	-	**0/1**	-	-
Driver categorization	-	-	-	**0/1**	-
Defensive driving	-	-	-	**0/1**	-
Driver incentives and demerit	-	-	-	**0/1**	-
VEHICLE MANAGEMENT					
Checklist on vehicle safety devices	**0/3**	-	-	-	-
Vehicle preventive maintenance/service	**0/3**	-	-	-	-
Vehicle license	**0/3**	-	-	-	-
Vehicle defect/breakdown recording and reporting	**0/3**	-	-	-	-
Procedure for vehicle acquisition, replacement and disposal.	-	**0/1**	-	-	-
Vehicle assignments	-	-	-	**0/1**	-
ROUTE RISK MANAGEMENT					
Hazard identification and risk assessment along routes	**0/3**	-	-	-	-
Risk management along routes	**0/3**	-	-	-	-
Emergency response	**0/3**	-	-	-	-
Accident reporting system on actual accident	**0/3**	-	-	-	-
Incident reporting system	-	-	**0/1**	-	-

Annual incident/accident reporting to DOSH	-	-	**0/1**	-	-
Personal insurance against accidents	-	-	-	-	**0/1**
Passenger and baggage management	-	-	-	-	**0/1**
Accident reporting system on near misses	-	-	-	-	**0/1**
All of the above elements are monitored in regular formal meetings and documented	-	-	-	-	**0/1**
EVALUATION & ACTION					
Internal audit/monitoring	**0/3**	-	-	-	-
External audit/third party evaluation	-	-	-	-	**0/1**
SERVICE PERFORMANCE					
Speed compliance	-	-	-	-	**0/1***
Use of seatbelt for driver	-	-	-	-	**0/1***
No smoking while driving	-	-	-	-	**0/1***
Safety practice at terminal/Rest & Service Areas	-	-	-	-	**0/1***
Punctuality for departure	-	-	-	-	**0/1***
Seatbelt install for all seats	-	-	-	-	**0/1***
Customer complaints mechanism	-	-	-	-	**0/1***
COMFORT					
Cleanliness of internal and external bus	-	-	-	-	**0/1***
Seat condition	-	-	-	-	**0/1***
Excessive smoke emission	-	-	-	-	**0/1***
Ambiance	-	-	-	-	**0/1***
HEALTH					
Indoor air quality	-	-	-	-	**0/3***
Random check on drug and alcohol by company	-	-	-	-	**0/3***
Medical profile of driver maintains by the company	-	-	-	-	**0/3***
Fatigue Risk Management System	-	-	-	-	**0/3***
Minimum score for each star level	**51**	**65**	**70**	**80**	**100**

*__Note:__ Optional item

Scoring Method

All criteria have to be accessed in order to evaluate compliance. The score for each criteria ranging from 0 to 3, which the full score is either-one or three according to the criteria table. The operators need to go through two conditions before the star rating can be determined. The first condition is to fulfill the requirement for each star level before can be upgraded to a higher star. The second condition will be based on the final score after deducting demerits points. The star determination will be awarded according to the first and second conditions whichever is lower.

Appendix II. Demerit Points

NO	INCIDENCES	DEMERIT
1.	Tailgating, handphone use while driving, dangerous overtaking, red-light running	Deduct 5 points
2.	Driver caught positive drug/alcohol (operation base)	Deduct 5 points
3.	Fatal crash (due to operators' negligence)	Deduct 10 points

Appendix III. Summary of Star Award Determination

Level of Safety Star Grading	Condition to Comply		
	First Condition	Second Condition (Scores)	Star Award
1 Star	Must comply with the minimum requirement of respective star	51–64	Based on the lower star from the first and second condition
2 Stars		65–69	
3 Stars		70–79	
4 Stars		80–99	
5 Stars		100–111	