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APPLICATION OF A NEW TECHNICAL MECHANISM IN THE INVESTIGATION OF ROAD ACCIDENTS IN THAILAND

The rising trend of motorization and improving socio-economic status of Thai people directly influences the aggravating road safety situation with fatalities and permanently disabled injuries of about 130,000 and 500,000 respectively over the past decades. An estimated annual cost from road crashes amounts to about US$2,500 million, 3.4 percent of Gross National Product (GNP), undoubtedly inflicts Thailand with a burning public health concern in the South East Asian region.

The collection and use of accurate and comprehensive data related to road accidents is very important to road safety management. The road accident data are necessary not only for statistical analysis in setting priority targets but also for in-depth study in identifying the contributory factors to have a better understanding of the chain-of-events. Having the inconsistencies in the aims of the police and the road safety engineers, the data analysis and its interpretation usually does not result in proper countermeasures. Sometimes a lack of proper knowledge of crash and proper training of the police officers in charge on systematic data collection procedures from a crash scene adds to the diverging nature of the role of the police and the road safety professionals.

The accident investigation involves the inspection of crash scenes and the documentation of all necessary and available information of each component (i.e. human, vehicle, and road-environment). Accident reconstruction is defined by Baker and Fricke as "… the efforts to determine from whatever information is available, how the accident occurred". Accident reconstruction approach works backward from the evidence of the crash investigation and the remains of the crash to look into the scenario of before (pre crash), during (crash) and after the crash (post crash). The sequential

analysis of end results to the initial condition of the events can establish “how” and “why” a particular type of crash occurs. Mathematics and Newtonian physics are applied in this analysis. It can be stated that crash reconstruction goes back to investigate the contributory factors and/or causes behind the crash event based on major and minor physical clues left behind at the crash scene.

The techniques of crash reconstruction, trajectory and damage based analysis by using physics simplifies the determination of many important parameters of crash events. Moreover, to obtain a reliable conclusion, detailed information encompassing the system components needs to be thoroughly investigated. The information necessary for reconstruction starts with the crash scene. The answers to the questions of ‘why’, ‘what’, ‘when’ and ‘how’ should lead the reconstruction process to build up the real scenario of the pre-crash, crash, and post crash.

Photographing of important clues and videotaping of the crash scene plays a vital role for the reconstruction. Injury information from occupant medical reports can be verified with the trajectory of the occupants found inside the involved vehicles at the scene. Therefore, an “open mind” investigative attitude is very crucial to search for all the detailed information from the scene.

Good examples of more complex and systematic accident investigation techniques are AcciMap, model STAMP model, MTO-analyses and FRAM method. Each of these advanced techniques requires specialized training before being mastered in practice, and therefore they will only be briefly overviewed in this article.

The AcciMap accident analysis technique is based on Rasmussen’s risk management framework . Initially, different accident scenarios are selected and the causal chains of events are analysed using a cause-consequence chart. A cause-consequence chart represents a generalisation that aggregates a set of accidental courses of events.

STAMP (Systems Theoretic Accident Modeling and Processes) focuses on the role of constraints in safety management. Instead of defining safety in terms of preventing component failure events, safety is defined as a continuous control task to impose the constraints necessary to limit system behaviour to ensure only safe changes and adaptations. Accidents are seen as resulting from inadequate control or enforcement of constraints on safety-related behaviour at each level of the system development and system operations control structures.

Therefore, accidents can be understood in terms of why the controls that were in place did not prevent or detect maladaptive changes (e.g. identifying the safety constraints that were violated at each level of the control structure, as well as why the constraints were inadequate or, if they were potentially adequate, why the system was unable to exert appropriate control over their enforcement).

The process leading to an accident (loss event) can be described as an adaptive feedback function that fails to maintain safety as performance changes over time to meet

a complex set of goals and values. This adaptive feedback mechanism allows the model to incorporate adaptation as a fundamental property.

Accidents and also near misses almost never result from one single cause, most accidents involve multiple, interrelated causal factors.

All actors or decision-makers influencing the normal work process might also influence accident scenarios, either directly or indirectly. This complexity should also be reflected in the accident investigation process. The aim of accident investigations should be to identify the event sequences and all (causal) factors influencing the accident scenario in order to be able to propose risk reducing measures which may prevent future accidents.[14]

Often, accident investigations involve using a set of accident investigation methods. Each method might have different purposes and may make their own contribution to the total investigation process. It is important to remember that every piece of a puzzle is as significant as the others.

Graphical illustrations of the event sequence are useful during the investigation process because they provide an effective visual aid that summarises key information and provides a structured method for collecting, organising and integrating collected evidence to facilitate communication between the investigators. Graphical illustrations also help to identify information gaps.[15]

During the investigation process, different methods should be used in order to analyse emerging problem areas. There should be at least one member of the multi-disciplinary investigation team who has good knowledge about the different accident investigation methods, and is able to choose the optimal methods for analysing the different problems. [16]

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