IMPROVEMENT OF ROAD ACCIDENT DATABASE FOR THAILAND

Amornchai LEELAKAJONJIT
Inspector of Technology
Traffic Police Division
Ladyaw, Jatujak, Bangkok
10900 Thailand
Fax: +66-2-515-3022
E-mail: amornchai.le@police.go.th

Kunnawee KANITPONG
School of Engineering and Technology,
Asian Institute of Technology (AIT),
Klong Luang, Pathumthani
12120 Thailand
E-mail: kanitpon@ait.ac.th

Ulrich BRANNOLTE
Professor
Department of Transport Planning and
Traffic Engineering,
Bauhaus-University Weimar, 99423
Weimar, Germany
E-mail: ulrich.brannolte@uni-weimar.de

Pawinee IAMTRAKUL
Faculty of Architecture and Planning,
Thammasat University,
Rangsit Campus, Pathumthani
12121 Thailand
E-mail: iamtrakul@gmail.com

ABSTRACT:
Thailand is one of the serious road accident counties in the world. Although there are many road safety agents including government and non-government organizations try to solve and find better solutions for Thai society but it seems the current road safety management system are not effective because the accident situation is not improved. The key to support road safety management in all countries is an accident data. This study found some accident data problems in Thailand such as accident underreport, missing required data, non-map based location data. These data problems cause road safety management problems. This study aims to improve accident database for support road safety management in Thailand. The methodology of this study consists of review European and international experience, development of accident data set, improvement of accident database. This study used VISUM Safety from PTV Company to analyze some blackspot identifications. The main outcomes of this study are improved police accident report and improved accident database for Thailand.

KEYWORDS: accident database, blackspot, enforcement, Thailand

1. INTRODUCTION

Accident data is the most important of road safety fundamentals because it need for persuading politic leaders that road traffic injuries are a priority issue. These data can also be used in the media to make the general public more aware of legislation and changes in behavior that will improve their safety. Road accident data are keys to identifying risks, developing strategies and interventions to address those risks, and evaluating the impact of interventions (WHO, 2010). Thailand has some problem situations about road safety management especially road accident data quality. There are various road accident databases in Thailand which they have different accident report forms, data elements and data quality. It causes difficulty of data analysis and cooperation...
for road safety management. For data sharing, there is no regular sharing between the accident database owner because of some reasons such as some worry about data privacy, some have no policy to share data, and some have technical limitation. However, all databases have the same problem about lack of data verifying with the others. These problems affect road safety management since the good road safety policies have to come from good road accident data.

There are lot of accident data underreport in Thailand. Police usually have accident data of serious cases because they have to submit a road accident case to the public prosecution as Land Traffic Act B.C.2522. For slight road accident, most drivers do not want to be fined and do not inform an accident to police after they got a compensation. It makes the road accident statistics is not high accurate.

For police accident database, it is not map-based database. It is difficult to make blackspot map from police database. Normally, police do not use collected accident data in the database to manage their enforcement for road safety. The police need accident data support to find locations, time, and allegations for enforcement.

Finally, quality of road accident data in Thailand is low because some databases are designed for limited purposes only and have low advantage for road safety purposes. Due to most accident databases have the same objective to increase Thai road safety, they should develop their database to support road safety activities also especially police accident database because it is the primary accident data of Thailand. So, the road accident databases should be improved in order to support road safety management system in Thailand.

This study aims to improve road accident database for safety management in Thailand. To achieve this goal, this study follows these objectives:

- To define requirements on accident data collection
- To develop road accident report for Thai police
- To introduce map-based accident database for road safety management

2. LITERATURE REVIEW

The accident report form is a best fundamental tool for improving road accident data quality. The road safety agent should be reminded that some data may miss from report form but there is no data if there is no that variable in the form. The police accident report forms should be easy to complete, use nationwide, and include sufficient information to meet the needs of all potential accident data users (ADB, 1996).

To make road accident report form good for data analysis, it is necessary to fulfill the following basic requirements:

- Accuracy (to exactly describe the individual parameters)
- Completeness (to include all features within the given system)
- Availability (to be accessible to all users)
- Uniformity (to apply standard definitions)

However, the different agents designed their road accident report form with the different advantage as the following examples.

1) CADaS

CADaS stands for Common Accident Data Set. A CADaS has been developed consisting of a minimum set of standardized data elements, which will allow for comparable road accident data to be available in Europe. More variables and values with a common definition will be added to those contained in the CARE database, maximizing thus the potential of CARE database and allowing for
more detailed and reliable analyses at European level (Dimitri D.M., 2011). The latest version of CADaS is Version 3.11 publishing in January 2011 by European Road Safety Observatory (ERSO), European Commission.

2) STATS19
STATS19 is the set of data which has to be collected by a Police Officer in UK when an injury road accident is reported to them. The STATS19 procedure for collecting road accident data is that the details of over a quarter of a million accidents a year are originally recorded by many thousands of policemen. These records are then collated by the nearly seventy different police forces, processed by the department of the environment statistics divisions and assembled on the transport and road research laboratory computer (Chapman D.P. et al., 1973). The STATS19 is developed by Department of Transport, UK. STATS19 data is suitable for road safety analysis in various dimensions such as the rate of vehicle accidents involving pedestrians and type approval noise levels (Muirhead M. and Walter L.K., 2011).

3) DOH
Department of Highways (DOH) is the biggest road authority in Thailand. There are 51,626 kilometers highways in DOH responsibility (DOH, 2009). DOH develops road accident report form containing many road conditions. DOH use this form for input road accident data to Ministry of Transport (MOT) accident database name TRAMS. DOH also developed an accident collision diagram for coding and categorizing accident patterns in Thailand. In 2010, DOH also developed Highway Accident Information Management System (HAIMS) for collecting accident data via internet (DOH, 2010). The DOH accident report consists of 10 topics with 33 data items as in Appendix A.

4) DRR
Department of Rural Road (DRR), Thailand develops road accident report form for collecting accident data in rural road as two pages form. This form likes as DOH form but it is designed for different highway sections. There are only 11 data items in the last version (1-2555 Edition) (DRR, 2012).

5) RTP
Royal Thai Police (RTP) is a police force of Thailand. Thai police collects accident data for supporting law enforcement and develops own report form as in Appendix A. The RTP form has some limitations such as number of vehicle, number of person, and lack of accident location detail and road defects (RTP, 2011). In 2013, RTP deployed new report form with 26 data items without Global Positioning System (GPS) location (RTP, 2013).

3. DATABASE IMPROVEMENT

3.1 Accident Data Improvement
All accident data examples guide to the essential accident data. These accident data set were compared for required accident data selection. Ten required accident data were selected. The result of accident data comparison is in Table 1. It shows the required accident data in the report form should consist of these elements.

1) Date and time of accident – for accident time reference
2) Location of accident – for blackspot identification
3) Accident category by accident severity – for blackspot identification
4) Number of casualty – for accident lost calculation
5) Type of traffic units – for involved traffic unit classification
6) Characteristic of accident location – for basic accident contribution analysis
7) Pavement conditions – for basic accident contribution analysis
8) Visibility conditions – for basic accident contribution analysis
9) Weather conditions – for basic accident
10) Accident contributions – for accident counter

Figure 1 Onsite accident report form for Thai police
Detail of accident data values are depend on road environment in each country. In this study, accident data values were adopted from Thailand Department of Highways (DOH) and Royal Thai Police (RTP) as in Figure 1.

After the accident was reported by the developed form, it was entered to computer database. In this process, accident data will be checked for accident accuracy improvement. Furthermore, description of accident location was manipulated to Global Positioning System (GPS) format e.g. latitude and longitude. These steps is in Figure 2.

The accident database was designed for GPS location data and data source integration. These accident data were stored in five sections.

1. MainCase Table stores information about accident e.g. accident ID, date and time of accident, accident location, accident severity, accident type.

2. RoadCondition Table stores information about road environment at accident location e.g. location type, horizontal and vertical alignment, lighting condition, weather conditions.

3. TrafficUnit Table stores information about road users including vehicles and pedestrians e.g. traffic unit type, license plate number (if vehicle).

4. Person Table stores information about involved persons including drivers, passengers, and pedestrians e.g. personal ID, type of person, age, gender, severity, helmet using (in case of motorcycle), safety belt using (in case of car), alcohol level (in case of driver).

5. OtherData Table stores information of the others. This database is prepared for additional data such as road authority data, hospital data, and insurant data.

Table 1 Accident data comparison

<table>
<thead>
<tr>
<th>Accident Data</th>
<th>CADaS</th>
<th>STATS19</th>
<th>DOH</th>
<th>DRR</th>
<th>RTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Date and time of accident</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>2) Location of accident</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>3) Accident category by accident severity</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>4) Number of casualty</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>5) Type of traffic units</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>6) Characteristic of accident location</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>7) Pavement conditions</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>8) Visibility conditions</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>9) Weather conditions</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>10) Accident contributions</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
3.2 Accident Database Improvement

In case of Thai government policy to share accident data, this database will be the national accident database. The new case can be created by a government organization such as police. Then the other organizations will add more information in their responsibility such as Department of Highways, hospital, and insurant company. From this process, accident data underreport will be improved.

The relationship between all accident data tables is shown in Figure 3.

Figure 3 Relationship of accident tables

Road safety agents can design their software to use the national accident database. They just need the permission and database structure. The example of user interface for accident database entering is shown in Figure 4.

Figure 4 Example of database user interface

All accident data element and values for each data were arranged in the detail form as guideline of database programmer. These data should be converted from onsite reports by trained officers. There are 29 accident data in this form as in Figure 6.

3.3 Map-based Database Introduction

This study found almost all current accident databases are map-based database. A map-based database is a database which collected location data in Global Positioning System (GPS) format or latitude and longitude value. A map-base accident database has additional capabilities about map presentation, and other Geographic Information System (GIS) functions including blackspot analysis.

This study collected 1,643 accident locations from Bangkhen police station in 2009 – 2011. All accident location text descriptions were converted to GPS location format. These data were imported to PTV VISUM Safety software. This software is one of map-based software. It has some special GIS functions e.g. accident map, accident filter, and accident heat map. These functions are supported for blackspot analysis. Accident map from VISUM Safety is shown in Figure 5. Figure 7 shows accident heat map from the same accident data.
**Figure 6**Detail accident data report
Improvement of road accident database for Thailand

Accident heat map is an accident map showing the density of accident location as color. For this software, green means low accidents. Yellow means medium of accidents. And, red means high of accidents. This type of accident map is easy to make people understand accident situation on the focused area.

3.4. Application of Database

The map-based accident database can solve some existing problems and support decision making for road safety. The main outcomes of the proposed accident database are the following.

- **Budget management**
  Thai government can update accident cost and total lost for more understanding about accident situation. The budget for road safety should be managed based on road accident situation. The big investment project related to road safety can be considered with concrete cost benefit analysis support.

- **Engineering**
  The hazardous locations can be identified as blackspots following some conditions. Road authority engineer can use blackspot data for ranking and treatments. Furthermore, road authorities can use this database for accident monitoring and repair road infrastructure also.

  **Enforcement**
  Police need accident data support traffic enforcement. The existing police data situation found police record accident data by writing in daily reports and summarizing information to ordinary database. This map-based database will support police to manage their checkpoint locations, time to setup, and allegation campaign.

4. DISCUSSION

The detail accident report was tested by 70 traffic policemen. It was compared with the current police report. The survey opinion about this report are fine 51.4%, many of information 30.0%, too many of information 14.3%, low of information 1.4 %, insufficiency information 2.9%. This result shows that police have time limitation to collect accident data and fill a report. So, police should report the accident data in the onsite report form. Then these report should convert and enter detail report to the accident database by trained officers.

5. CONCLUSIONS

GPS accident location data is required for accident database improvement. Map-based accident database can support road safety work in various aspects and need for road safety works. Thai government should consider to set up national road accident database to reduce accident data errors and support road safety policies in Thailand.
REFERENCES

Chapman, D.P. and James, F.J. (1973) The STATS19 road accident data procedure and its research applications. TRL, UK.


Muirhead M. and Walter L.K. (2011) Analysis of STATS19 data to examine the relationship between the rate of vehicle accidents involving pedestrians and type approval noise levels. TRL, UK.
