Improving Road Safety through Integrated Process for Incident Traffic Management

Auttapone Karndacharuk[a], Asif Hassan[a]

[a]Australian Road Research Board (ARRB)

Abstract

Austroads has identified the lack of a mutually agreed incident management framework across the member organizations as a gap in the traffic incident management practice in Australia and New Zealand. A research project has been undertaken to develop such framework based on a review of current local and international incident management techniques and understanding. This paper presents a review outcome and the proposed framework with a focus on advanced traffic incident management techniques to minimise traffic disruption and road safety risks while maintaining a safe workplace for responders.

Background

The responsibility of implementing traffic incident management (TIM) in Australia and New Zealand primarily lies with road and traffic authorities and private toll operators who are vested with managing the public road networks. Given its complexity in managing multiagency, multi-jurisdictional responses to road traffic disruptions and the emergence of intelligent transport systems (ITS) and other transport technologies (e.g. smartphone and connected vehicle technology), the practice of TIM is evolving. By reinforcing an aim to provide a quick, effective and coordinated incident response to safely return normal traffic flow, an integrated TIM process would improve traffic safety for road users and responders.

Method

The research method involved a review of the literature on the TIM topic and a review of the current techniques employed by the Australasian road transport agencies in order to identify contemporary leading TIM techniques. An incident management framework was subsequently developed to provide overarching incident management guidance at various implementation stages, ranging from inter-agency collaboration, planning and traffic incident management through to performance evaluation and training.

Baseline and emerging traffic incident management techniques

Baseline TIM techniques for incident detection and response can be established based generally on the TIM practices discussed in the research reports published by Austroads (2007a; 2007b). These include emergency phones, service patrols and incident response units. The majority of incident detection and response practices utilise road and traffic sensing technology. In the area of traffic data collection technologies, infrastructure-based detection systems with stationary measurement devices distributed across the network have dominated. Such static sensing systems can be classified into in-road or over-road (Klein, Mills, & Gibson, 2006). Examples of these devices are inductive loops, infrared, pneumatic tubes, radar, CCTV and in-vehicle emergency sensors.

New and emerging techniques for managing incident traffic falls within the scope of advanced traffic management tools and techniques that are employed in road network operations. These techniques include:

- Smartphones and global nagivation satellite systems (GNSS)
- Cooperative-ITS and dedicated short range communications (DSRC)

- Social media, participatory sensing and crown sourcing
- Drones for traffic and incident data (Geers & Karndacharuk, 2016).

Summary matrix of incident management techniques

Table 1 shows the role and relevance of the variety of incident management techniques and practices for collecting and processing road and traffic data in response to incident management needs. The 'enable' or 'support' terms are assigned to each technique to differentiate its role in traffic management during an incident from detection to traveller information dissemination (Karndacharuk & Hassan, 2017).

It can be observed that all of the new and emerging techniques have an ability to carry out or support the implementation of all traffic management steps (c.f. only the manual operation of service patrols and incident response units in the baseline practice).

The framework and principles

Given the word limit, it is impossible to adequately include the newly developed TIM framework in this extended abstract. The framework, underpinned by principles, will provide road network managers an overarching guidance and a common understanding of the on-going process for integrating traffic incident management approaches. It incorporates contemporary leading incident management techniques that can be employed to provide a quick, effective and coordinated incident response to safely return normal traffic flow. The implementation of the framework is anticipated to not only enhance the operation of the road network, but also safety of road users and responders.

References

Austroads (2007a). Improving traffic incident management: literature review. Sydney, NSW: Author.

Austroads (2007b). Traffic incident management: best practice. Sydney, NSW: Author.

Geers, D.G., & Karndacharuk, A. (2016). Review of traffic data collection needs and technologies. Vermont South, Vic: ARRB.

Karndacharuk, A., & Hassan, A. (2017). Techniques for incident management to support network operations planning – working paper. Vermont South, Vic: ARRB.

Klein, L.A., Mills, M.K., & Gibson, D.R.P. (2006). Traffic detector handbook, (3rd ed.). McLean, VA, USA: Federal Highway Administration.

Table 1. Role and relevance of traffic management techniques in the traffic incident management process

Practice	Traffic Incident Management Step					Note
	Detection	Verification	Response	Traffic Management	Traveller Information	
New and emerging technique						
Smartphones and GNSS	Enable (Link)	Enable	Enable	Support	Enable	Features of a smartphone enable incident response and traveller information
C-ITS and DSRC	Enable (Lane)	Support	Support	Enable	Enable	C-ITS using DSRC enables traffic management by providing traffic control information to approaching vehicles
Social media and crowdsourcing	Enable (Link)	Support	Support	Support	Enable	Examples are Waze and Twitter
Drones for traffic data	Enable (Lane)	Enable	Support	Support	Support	Restricted use is allowed in Australia
Baseline technique						
Emergency phone call and hotline by general public	Enable	Support	–	–	–	
In-road sensors (e.g. inductive loop)	Enable	Support	–	–	–	Sensors provide traffic data to AID for incident detection
Over-road sensors (e.g. radar and infrared)	Enable	Support	–	–	–	
Automatic Incident Detection (algorithm)	Enable	Support	Support	–	–	AID analyses traffic data from other sources
Traffic incident watch (by professional drivers)	Enable	Enable	Support	–	–	Participants collaborate with transport agency and the Police for incident verification
In-vehicle emergency (e.g. Mayday and e-Call)	Enable	Enable	Enable	–	–	Voice link enables proper incident response
CCTV	Enable	Enable	Enable	Support	–	
Static traffic and road space management devices	–	–	Enable	Enable	Support	
Adaptive traffic control and communication devices (e.g. VMS and VSLS)	–	–	Enable	Enable	Enable	
Service patrol and incident response unit	Enable	Enable	Enable	Enable	Support	

Source: Karndacharuk and Hassaon (2017)