Crash Data System - A new-generation software product approach and a move to improved national systems

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General Description

The objective of this document is to discuss crash data issues at state & country level and also a high-level concept of a national crash data system - a new-generation software product approach' and a move to improved national data systems. The current road safety situation is one of the world's most challenging problems. The cost of road crashes is considerable. Some road safety experts suspect that, with the level of crash under-reporting for a country like India, the figure may be close to 4%. Notwithstanding the country's road building program, with the vehicle fleet numbers exploding, particularly in the two-wheeler area, the situation can only get worse if significant steps are not taken to improve the situation.

The need for action is being acknowledged by the responsible authorities, but up to now, in many motorising countries, road safety has not been a matter of public issue. It is possible to suggest that the situation is changing, and there is increased public awareness of the effect of road crashes, and resulting expectancies.

This document would cover:
- Issues at State level
- Issues at Country level
- A National Approach to Crash Data System
- Introduction to Road Safety Management System (RSMS) from IBS
- Recent Trends

1. Issues - State level:

At a state, or jurisdictional, level the basic requirement of road crash data collection is often considered as a low priority task for police even when road safety may be a major issue for the government. Some major issues that we would like to discuss are:
- Low priority task - Police
- Crash data processing and management
- Under reporting
- IT issues

a. Low priority task - Police:

The Police, who are involved in collecting crash data, are often in a stressful situation and find it difficult to collect data, especially when collecting road user evidence, locating witness, conducting interviews etc. The process is so time consuming. Generally, accident investigations are considered as a low priority task when compared to other crime investigations.

Police are motivated that helping people comes first. The crash data system should therefore help police derive immediate, direct benefits from collecting good data to help the public. We should make their job as simple and easy as possible, and this can be achieved by using technology. The use of automated data collection tools like PDA, Tablet PC's etc. and interfaces to other data systems - driver license, vehicle, roads, police records etc. will drastically reduce their paper work with a resulting in reduction of work load. We need to provide feedback to police on how their data was used by other stakeholders to reduce accidents. Such processes will help to institutionalize a commitment to road safety in senior police management.

b. Crash data processing and management:

A cumbersome, complicated, resource-intensive, personnel-dependent crash data system can be considerably improved using the technology solutions below to address most of the issues and bottlenecks faced.

Technology	Description
Enterprise Service Bus (ESB)	Enterprise Service Bus (ESB) consists of a software architecture construct which provides fundamental services for complex architectures such as integrated Crash Data Management System via an event-driven and standards-based messaging-engine (the bus) which will help to integrate and interface with a multitude of disparate systems.
Service Oriented Architecture (SOA) compatible application modulesETL (extract, transform and load) tools	Service-oriented Architecture (SOA) provides a set of principles of governing concepts used during phases of systems development and integration in enterprise-level Crash Data applications which will help to future proof the solution
ETL (extract, transform and load) tools	Extracting Data from other stakeholder systems, Transforming it to fit operational needs and finally loading it to the Crash Data System database or data warehouse.
Mobile technology	Use of portable technology such as PDAs, tablet PCs, . mobile phones and smart phones etc. for automated data collection.
GIS, GPS tools for accident locating	
Data warehousing	Data warehouse is a repository of a multi-stakeholders electronically stored data coming from various different sources and in various different formats and specifications combined together.
Knowledge Management tools/systems	Knowledge Management System refers to a system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of crash data information
Business Intelligence tools	Business intelligence tools are a type of application software designed to report, analyze and present data for supporting decision-making. The tools generally read data that have been previously stored, often, though not necessarily, in a data warehouse or data mart

Other than these tools a focus on usability, motivation & effectiveness of the system/process will increase the motivation of police personnel to collect data consistently and enhance road safety standards.

c. Under reporting:

Under reporting is a major problem for all jurisdictions and there are possible solution such as interfacing (or web forms or "screen scraping") with hospital based Injury Information surveillance systems. There are algorithms available, with 95% accuracy levels, for linking police data with hospital data without compromising confidentiality. This can ensure accuracy of reporting of accidents in both police and hospital records. Insurance agencies can also play a vital role in reducing under reporting and thus interfacing with insurance authorities for vehicle damage only data and schemes such as "No blame insurance" will help improve the quality of reporting.

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Figure 1: shows a crash data reporting framework that can significantly reduce the levels of under-reporting of crashes.
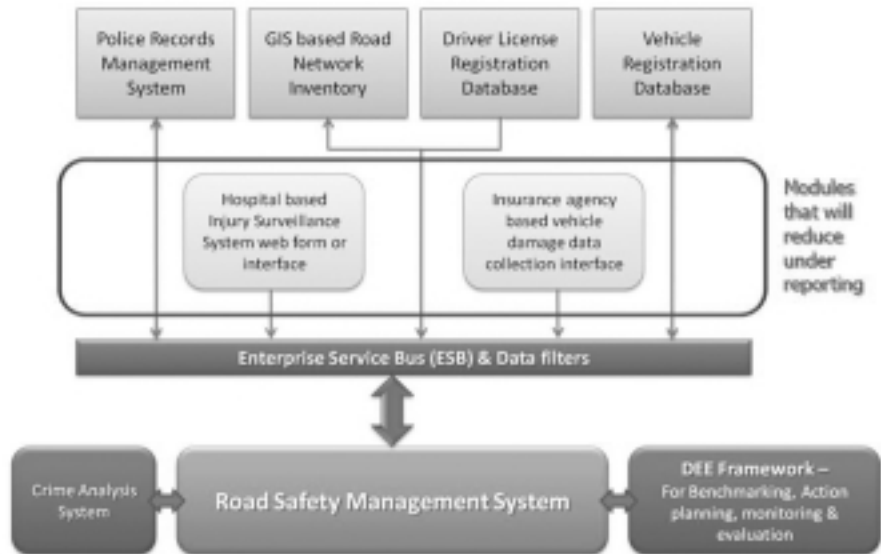
d. IT issues:

IT (Information Technology) reduces work load but it has to be managed properly using appropriate technology, vendors, support, and infrastructure. The jurisdiction should spend time and money for planning and getting their objectives as clear as possible before procurement of a system. The system selected should be low-risk, easy to adapt, flexible, cost effective (open source technologies), and a proven solution. The payment needs to be focused on meeting objectives, not for the vendor's time. Identifying the right vendor is a critical task. A vendor with a clear commitment to the solution, quality standards, support and delivery capabilities of the system should be paramount. One solution that ensures such characteristics is the "Software as a Service SAAS" model - if feasible. There are other models that can be considered such as rental and Build, Operate, and Transfer.

2. Issues - Country level:

At a country level, with many separate jurisdictions responsible for crash data, there are difficulties with entities having different data sets, methods, uses & definitions. Several countries can find it difficult to aggregate good data and produce meaningful national analysis. Listed are some of the issues at country level:
- 1+ year delay in producing reports
- Usually ends up producing standard statistical tables or annual data
- No clear strategies, planning or identification and solutioning of specific problems possible
- No scientific way to evaluate effectiveness of programs until it is too late
- National coordination of crash data done poorly around the world
- Even in countries like UK, US, Australia etc coordination of data for use nationally is poor
- Collection of crash data is often under best practice conditions
- However it is usually carried out at lower levels of jurisdictional responsibility
- This distributed collection means that the national process is usually the passive receipt of aggregated data centrally

All the issues that are raised at State & Country level can be resolved by a single comprehensive Crash Data system, which adopts a new-generation software product approach and a move to improved national systems..

3. A National Approach to Crash Data Management:

The development of road safety programs and the need for good data:

The development of effective road safety programs relies on coordination and cooperation between the various agencies that contribute to the programs, but is built upon a clear understanding of the nature of the problems faced.

On the issue of data on road crashes, the following actions are recommended based on international best practices:
- Establishing a reliable database to define the problem and measure progress through annual performance benchmarking.
- Establish the methodology for multidisciplinary crash investigation, data collection, reporting and analyses.
- Establish a procedure and methodology for data collection, transmission and analysis at appropriate levels and define the roles of different agencies involved in the process.

a. National crash data coordination:

Surprisingly, national coordination of crash data is generally done poorly around the world. Even in fully motorised countries such as UK, US, Australia etc the coordination of data for meaningful use at a national level is poor. While the collection of crash data is often under best practice conditions, it is usually carried out at lower levels of jurisdictional responsibility such as state or council level. This distributed collection mean that the national process is usually a passive one of receiving aggregated data centrally for use through further aggregations and analysis and commentary on the National situation. The detailed use of the data remains at operational jurisdiction level. This passive model of national data acquisition and use is shown in Figure 2 below.
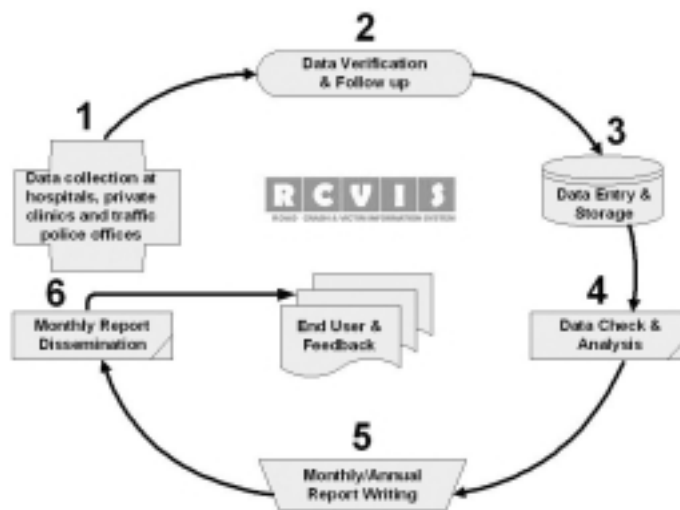

Figure 2: Passive National Level Accident Data Strategy

b. Active National Crash Data Management & Road Safety Involvement:

The concept of a 'clean sheet' for crash data collection for a country presents an opportunity for a new, proactive approach at the national level. Motorised countries have systems that have often grown in a piecemeal fashion and do not lend themselves to the form of coordinated system that is now possible for motorising countries.

In an active model of national data acquisition, the detailed data does not remain at the operational jurisdiction level. The detailed collected data, or an agreed core of data items, is made available at a national level. An appropriate system would be required at national level, probably shadowing the systems at jurisdictional level, but scalable to be able to cope with a detailed national sized data base. Such an overall system would require agreement on the level of data to be transferred to a national level and hopefully some standardisation of operational level databases to allow data transfer and analysis at and to- and from all levels. Such an active model of national data acquisition and use is shown in Figure 3 below.

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Figure 3: Active National Level Accident Data Strategy

There are considerable benefits from such a system. National analysis would be at a detailed rather than at an aggregated level mainly used for statistical reporting. Policies and strategies supported by such analysis would better meet the national needs and provide better coordination of activities at national and jurisdictional level. The need for a coordinated approach has already been indicated and a detailed national crash data base could be made available to all agencies contributing to road safety, and those in need of road crash data at a national level.

For smaller, road safety aware countries, such as New Zealand, the national agency coordinates the collection of crash data and as such has direct access to national data. New Zealand has been taking the lead in the use of such data in recent times, using it to develop national initiatives in the hazardous road location area for example.

4. Introduction to Road Safety Management System (RSMS) from IBS

a. What is Road Safety Management System (RSMS)?

Road Safety Management System (RSMS) is a new generation, web-based solution for accident data capture and road safety management. RSMS can also be used for traffic enforcement planning and management from a road safety perspective. RSMS is developed on an "incident management framework" and is a GIS-based solution for the recording and analysis of road crash data, designed to comply with international crash data standards and supports customized decision support requirements. An effective database tool coupled with a strong GIS engine, this solution enables better decision making while planning and implementing road safety programs and enforcement measures.

b. Why was RSMS developed and who are the potential end users?

A Crash Data System (CDS) is the first step in scientific road safety management as discussed in a previous section of this document. Almost all the motorised and some of the rapidly motorising countries use crash data systems in some form at various levels - District, State and Country level.

There are several good practices that can be learned on accident data management from motorised countries, specifically from that of UK, Australia and Sweden. Although they are regarded as the pioneers in this area, over the period of last 15 to 20 years, due to several factors, many inefficiencies and bottlenecks have crept into their processes, practices and systems for crash data and road safety management. The developers of RSMS have closely studied these issues and have invested and developed RSMS as a new-generation solution that addresses these inefficiencies and at the same time adopts a standards based, future-proofed approach.

Thus RSMS was primarily targeted at these markets and is the probably the only available solution in its category that addresses the needs of various road safety stakeholders and user groups at District, State and Country level.

c. Key Value propositions of RSMS:

The RSMS framework can readily be adopted for accident data & road safety management by addressing issues of quality, timeliness, completeness, accessibility of data;

- A comprehensive system that caters to different requirements of all stakeholders involved in road safety - road engineers, police, transport and motor vehicles department, Traffic planners, Government agencies, policy & decision makers, Government bodies & departments at State and Country level, local authorities etc.
- RSMS helps to develop a strong focus on result-oriented road safety management - fact based and result-oriented interventions, measuring performance, building in accountability for results and responding proactively to emerging accident patterns.
- Monitoring and evaluation of road safety interventions.
- Comprehensive analysis features in RSMS allows better planning and implementation of road safety programs at various levels - Department, District, State and Country level.
- RSMS facilitates accountability and collaboration between different stakeholders to share and improve accident data, ensuring efficient use of resources and funds.
- Information can be shared seamlessly and quickly among, state/provincial and local Government agencies through web.
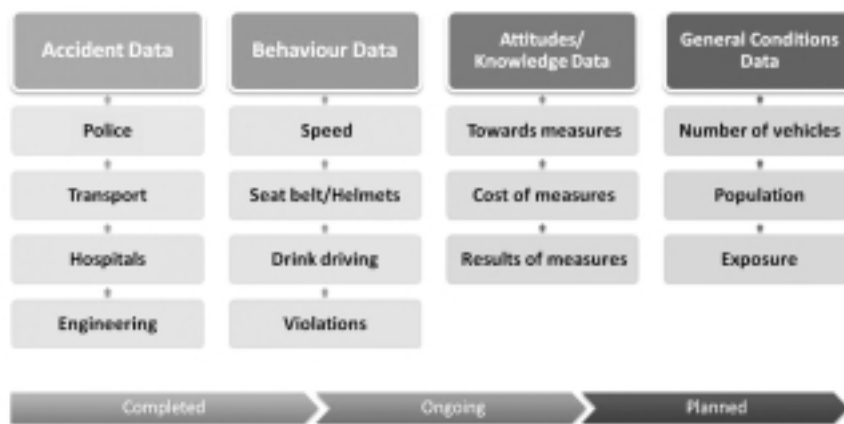

Figure 5: Intelligent Accident Analysis (IAA) in RSMS

5. Recent Trends:

Below are some of the recent trends being followed by various Governments towards a National level Crash Data System:
- Move towards one single solution for multiple stakeholders
- Low risk to client, result oriented, short-term implementation
- Increasing adoption of open standards and "enterprise" open source technology by governments
- Highly user friendly, simple to use solutions but complex technology running behind
- Systems with strong monitoring and evaluation capabilities
- Solutions with Project Management capabilities to plan, implement, monitor and evaluate road safety interventions
- Greater project size and complexity demanding scalable solutions
- Open architecture - high level of modularity
- Data Warehousing and Business Intelligence capabilities
- Web-enabled but technology and database independent solutions
- Complex spatial capabilities, without any 3rd party GIS software
- SOA enabled solutions - future proofing investment
- Interfaces to a multitude of legacy and disparate systems
- Adoption of proven solutions, instead of development from scratch (7 out of 10 Government IT projects fail)
- New modes of delivery - SAAS, rental, BOT

There are signs that the importance of crash data systems are being more widely acknowledged as the foundation for good road safety practices. It is important that as this awareness grows there are reliable, good quality crash data systems available to meet the identified needs of jurisdictions and countries alike.

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