INTELLIGENT ENFORCEMENT – THE KEY TO ROAD SAFETY

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Abstract

This paper examines the strategic effect of traffic law enforcement methods on road safety outcomes. A roadmap is outlined, which emphasises the importance of structured interaction between intelligent enforcement, progressive infringement and traffic data processing and road safety education.

Public **education** is pivotal in changing road-user behaviour and improving public perception of road safety enforcement and its benefits.

Strategic enforcement must be evidence-based and outcome-focused to reduce the prevalence of speeding and the potential for crashes. An 'anywhere anytime' philosophy coupled with diverse enforcement technologies and methods will increase the detection rate of high-risk traffic offenders and reduce the average speed.

Intelligence from crash statistics, trend analysis from traffic infringements, speed survey analyses and information from police enforcement activity is collated using **intelligent processing systems**. Feedback from this collation ensures sustainability of enforcement counter-measures by improving the coordination of an integrated system of automated camera technologies and visible, active 'on-road' police enforcement, all with an overt/covert balance.

The combination of efficient and transparent infringement processing provides feedback to drivers and helps build public confidence in the system.

Reducing road trauma by modifying road-user behaviour requires a holistic approach where education, enforcement and infringement processing are part of one system, and where each of the three elements is interdependent. Analyses, strategic planning, decisive action and evaluation in a cyclic review provide a sustainable base to achieve a cultural shift in driver behaviour.

Problem Analysis

The key approaches recognised internationally to achieve road trauma reduction are the 3 Es; Education, Enforcement and Engineering. It is also accepted that rugged "evaluation" processes must reinforce these approaches. However, the sustainability of jurisdiction-wide interventions, treatments or initiatives is always subject to question. Many programs have a short term effect or achieve a decrease in road trauma to a ceiling, but then the improvements plateau.

Many drivers display an inherent propensity to speed and operate with a self-legitimised rationale for their actions. Numerous studies have shown the correlation between inappropriate speed and road trauma[3]. Speeding, whether deliberate or careless, has the same potential risks, i.e. missing hazard cues, longer perception and reaction travel distance, greater braking distance and longer stopping distance in an emergency causing greater impact speed. Excessive speed is regarded as one of the principal factors in road crashes leading to serious injury or death[1] and is a contributing factor in 30% - 40% of road trauma in most jurisdictions. Changing driver behaviour to reduce speed is a key factor in reducing road trauma.

Some drivers ridicule the concept of dangers involved in low end speeding while openly supporting excessive speed prosecutions. They perceive their own actions as "safe". However, in a 60km/h speed zone, research shows that for every increase in travel speed of 5km/h above the 60km/h limit, the risk of casualty crash involvement doubles.[2]

Enforcement

Simple philosophies of general and specific deterrence for drivers provide the traditional foundation for enforcement strategies with some individual initiatives acclaimed as being highly successful.

Specific deterrence is a direct impact upon the individual such as fines, loss of demerit points or loss of licence. Specific deterrence against speeding is

provided by the issuing of fixed penalty payments to drivers who have not responded to general deterrence.

General deterrence against speeding is provided by advertising about the risks of speeding, as well as the visibility or awareness of Police enforcement on a daily basis. A mix of overt and covert speed camera deployment provides both visibility of enforcement and an uncertainty in the mind of the driving public as to where enforcement will be effected. Greater road safety benefits are achieved by influencing the culture of safer driving rather than punishing the individual driver.

Armour (1984), identified that embedded in the philosophical context of enforcement are a number of pressures which influence a driver's behaviour including the perceived risk of detection and the severity and immediacy of any subsequent punishment. The size of the penalty has less impact than the *certainty* of a penalty.[3] Armour's study found that the presence of a police vehicle on an urban road may reduce the number of vehicles speeding by approximately two-thirds. However, the same study also indicated that drivers return to their normal driving behaviour very soon after passing a police vehicle[4].

A major literature review on Traffic Law Enforcement undertaken in Australia (1994) cited over 550 references and provided recommendations to increase the effectiveness and efficiency of enforcement operations[5]. Zaal concluded that "*significantly increasing the actual level of enforcement activity is the most effective means of increasing the perceived risk of apprehension*"[5]

Traditional traffic law enforcement strategies include regular road patrols identifying and intercepting offenders usually for speeding or other moving vehicle violations coupled with the occasional "blitz" targeting high risk locations or high risk activities. Road patrols can only achieve a limited coverage and blitzes are labour intensive, short lived, unsustainable and sometimes with dubious long term outcomes[6].

Recently more sophisticated traffic enforcement agencies have begun to operate with targeted strategies, integrated intelligence interventions and use complementary technological equipment or systems to achieve a universal impact. The most productive emerging strategies seek to gain community acceptance to achieve that cultural shift in driver behaviour – to change the focus to a road safety mentality. This is really emphasising the benefits of education coupled with enforcement – neither will work optimally in isolation. The most effective speed control outcome occurs when the community adopts self-regulation brought about through a combination of education and enforcement.

Strategic Enforcement

A well developed Road Safety Strategic Plan complemented by efficient operational planning and focused evaluation can be effective in reducing road trauma in the short term. However to achieve sustainable results there is a need to identify strategies and programs, which have a long term effect on human behaviour building a culture of road safety.

A Road Safety Intelligence System is required to use information from both regular and previously untapped sources to provide a systematic assessment of speed related behaviour on the road network. It identifies risk areas based on evidence of driver behaviour.

A key to being able to achieve continuous improvement is to use a feedback loop of operational output performance measures and other traffic statistics to help formulate improvement strategies. The key to the success of this tenet is to select the right data, benchmark operational measures and observe operational output trends. The availability of reliable data sources to assist in this process is also of utmost importance.

Strategic enforcement involves multiple and varied technologies including:

- mobile car mounted safety (speed) cameras (overt or covert);
- patrol car mounted speed measuring equipment;

- fixed site covert or overt;
- point to point cameras assessing speed over a substantial distance of the road infrastructure; and
- red-light/speed cameras.

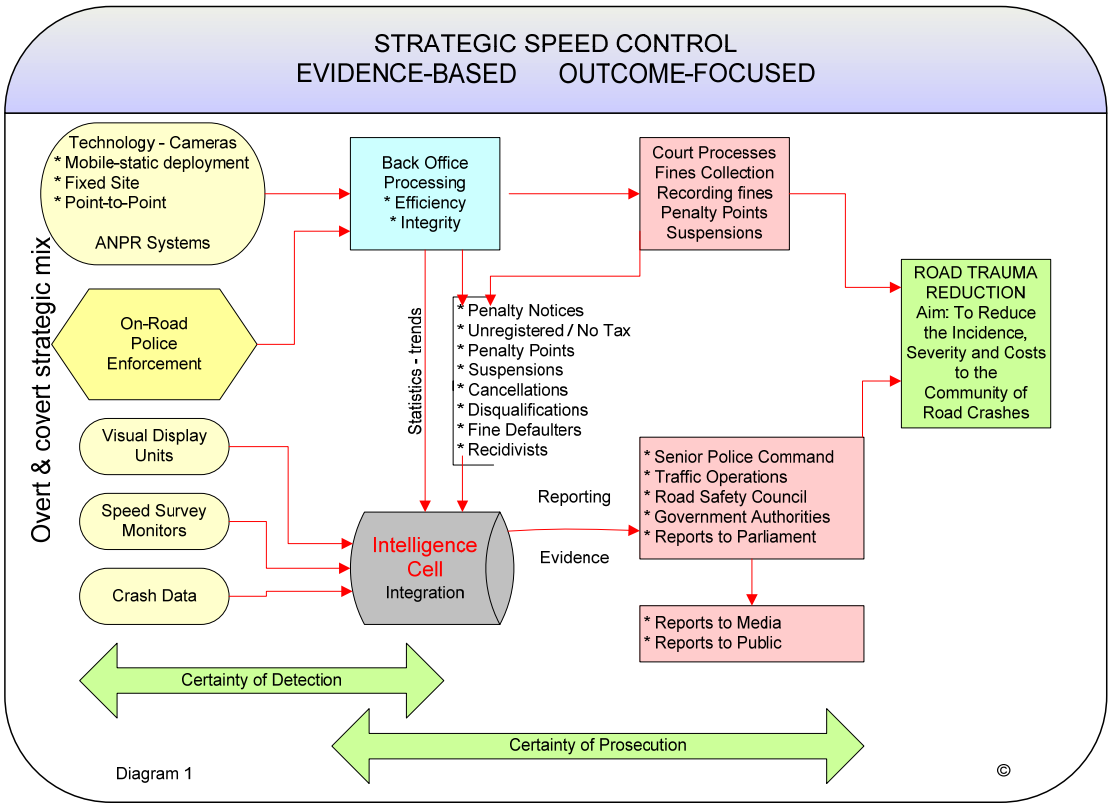
This technology must be combined with a two-way feedback process with visible and effective police deployment, community education and a strongly aligned media strategy. This structure increases the perceived risk of detection and sanction. This must be supported by quality and integrity of the 'back office' processing from the point of image capture to the delivery of a fixed charge penalty notice to ensure the swiftness and certainty of penalty.

Some of the key questions that need to be answered in improving dangerous driving behaviour and by extension road safety is:

- What is the 'real cause' of the crash?
- Why was the individual speeding in the first instance?
- Why did that individual feel they could speed without being caught?
- Is speeding prevalent in that general location?
- What police interventions are occurring in the general location?
- What remedial action can be taken to prevent future occurrences?

"*To achieve their objective, road user safety measures need to be based on sound behavioural principles rather than on 'common sense' or intuition.*"[7] The underlying principle is the need to obtain an 'evidence-based framework to better identify and thoroughly understand the relevant local risks to determine the most productive and cost-effective counter-measures to road trauma. The evidence incorporates intelligence including collision data, causation factors, trend-analyses and performance benchmarks.

The following diagram is designed to portray the strategic approach recommended for speed control.



This model provides a strategy that delivers both an on-road enforcement and on-road education package supported strongly by intelligence gathering, which translates into evidence to justify further actions. While it may only appear as a conduit, it forms an integral role to assist in the decision-making of the future.

If used in conjunction with visual speed displays, speed survey units and Automatic Number Plate Recognition, a road safety intelligence system is an essential element of modern policing. It provides high value returns to policing, governments and the community.

What trends should be monitored?

- Average speed above the threshold limit.
- Trends in different counties.
- National trends.
- Trends following education, marketing and media campaigns.
- Trend analysis rural and urban areas.

These trends can feedback into the Road Safety Strategy to continue to improve driver behaviour.

- By providing evidence to the Police for immediate proactive planning and operations
- By providing evidence to the Road Transport Authority to assist strategic planning
- By providing information to Government Agencies for feedback to education providers
- By providing information to Community Safety Councils at local level

Police internationally currently rely on crash statistics and public complaints as well as the number of infringements issued in the various locations, to form the basis of their enforcement strategies. Research on community attitudes also provides valuable information.

From both a strategic and operational perspective, police need to:

- Identify what is happening, when, how often and where – situational analysis
- Formulate a strategy
- Take action to correct the problem
- Monitor and evaluate the results
- Evaluate ongoing trends in statistics as a result of the corrective action.
- Repeat the process to support continuous improvement.

Safety Cameras

The strategic purpose of using safety cameras is to educate or coerce drivers to drive at or within the speed limits. This is intended to produce a 24/7 sustainable change in driver behaviour, thereby reducing both the average and excessive speeds across the infrastructure, not just at identified camera and enforcement locations. This lowers the risk of casualties in collisions

There are substantial resource efficiencies in the deployment of automated technology over traditional enforcement.

Positive aspects of automated enforcement:

- The capacity to operate as a high impact deterrent and enforcement tool 24 hours a day, 7 days a week;
- Increasing the perception of certainty of detection;
- Overcoming the limits, costs and labour intensity of traditional traffic enforcement;
- Reducing the risks of high speed interceptions in high risk locations;
- Enabling the redeployment of traffic officers to other policing priorities;
- The ability to cover larger sections of the road network ; and
- Providing a complementary resource to other enforcement strategies.

Negative aspects of automated enforcement:

- Interception and sanction is not immediate allowing errant behaviour to continue for a short period
- Political exposure to allegations of revenue raising

Safety cameras if configured correctly can record data on all traffic, not just those which infringe. Scientific evaluations have demonstrated the positive contribution of automated enforcement technologies in reducing road trauma.[8]

Intelligent Processing Systems

The implementation of all enforcement components (including on-road policing) should be supported by an efficient and effective back office processing system. A comprehensive equipment calibration and certification regime must be in place to ensure the validity of the evidence and once captured the evidence chain must be secure. Vehicle identification, offence verification and processing integrity are critical. Ideally, the system should be streamlined, totally integrated with driver licensing and registration and the penalty points/demerits data base.

If the criteria defined above are met, the model complies with two basic concepts of general deterrence and specific deterrence for successful traffic police enforcement:

Certainty of Detection – if you speed you will be caught, and

Certainty of Prosecution – if you are caught, the evidence obtained will ensure a successful prosecution.

Information from all sources is fed through the “intelligence cell”, analysed and provided as feedback to Police and the Road Traffic Authority for public education as well as providing a systematic assessment of speed related behaviour as a foundation for future strategies.

Cooperation and Coordination of the enforcement and processing systems is essential for efficiency, reliability, effectiveness and sustainability. Hallmarks of successful operations include:

- The integration of the disparate components under one management structure;
- The provision of quality control over detection, evidence management, infringement processing, collections and enforcement;
- The unification of camera operations, customer contact facilities, infringement verification and back-office processing;
- Consistency of objective, rigor, fairness and enhanced administrative efficiency;
- State of the art technology and business processes to enable earlier dispatch of infringements, proactive debt collection and reduced court contests;
- Processing capacity to manage large volumes, surges and time critical infringements (imperative to traffic enforcement integrity); and
- Demonstrated efficiency in offence verification, data transactions, call centre management, customer service interactions, administrative processing, audit capacity, service standards and performance measures.

The NSW Auditor General identified that "reducing back logs and data matching are critical"[9]. Jurisdictions without robust "back-office" processing experience large processing delays, negative media publicity, continued negative driver-behaviour, embarrassing court contests and increases in the non-recoverable debt pool.

Streamlined infringement verification and adjudication services use an 'Evidence Management System' which manages image tracking, pre-verification, adjudication and administration. Remote uploading and automation of digital offence images enables infringements to be processed on the same day. Meticulous application of standards ensures processing accuracy and provides quality benchmarks. Sound policy and data privacy ensures confidentiality.

Regular audits and analyses result in fine-tuning of equipment, processes and staff management including:

- Strict performance standards in call answering, payment collection rates and all hand-written police-issued infringements are processed within the day;
- Demonstrated efficiency in handling correspondence, complaints and reviews;
- Performance targets for camera systems, adjudication, infringement turnaround and prosecutability;
- An ISO9001 accredited support and development facility with prompt engineering support for both fixed and mobile camera systems;
- Regular scheduling of speed measurement devices for re-certification; and
- A secure Internet Protocol Virtual Private Network with wireless and dedicated connections to enable secure real-time delivery of images from digital cameras.

The effectiveness, efficiency and integrity of the infringement processing system provides a direct relationship to voluntary compliance through attitudinal and behavioural change with consequential road safety outcomes.

From the author's experience in oversighting the implementation of a government outsourced model in Victoria from 1998 to 2003, together with examination of the operations of many safety camera partnerships in the United Kingdom and camera programs in United States, the key issues to provide a best practice guide include:

- ***Timely issue of Infringements:* -** The shorter the gap between detection and the offending driver receiving the infringement, the more immediate the impact on driver behaviour and community safety (especially when licence suspensions, demerits and financial penalties apply).
- ***Percentage prosecutability:* -** Drivers who are photographed speeding through camera sites and remain unprosecuted will continue with adverse driving behaviour unaware or unconcerned that they were detected. Images may be unsuitable for prosecution due to deliberate, careless or unintended actions such as obscured number-plates or environmental conditions. The photographic quality, scanning, scrutiny and digital imaging can impact positively upon the numbers of offending drivers prosecuted.
- ***Processing capacity*: -** The ability to manage large volumes and time-critical infringements. Backlogs can result in cumulative older infringements being issued to the same drivers resulting in adverse media publicity for inefficiency, allegations of unjustified revenue raising, non payment of the tickets, court contests and an increase in the debt pool.
- ***The availability of timely statistics for quality marketing and publicity:* -** Intelligently using the statistics generated from the infringement processing system will lead to better compliance in the field with a consequential road safety benefit. Many jurisdictions fail to effectively use available data.

- ***Police control over enforcement activity***: - This includes camera sites, pleas, adjudication, infringement issue and prosecutions to ensure system integrity and a higher level of public acceptance.
- **Integrated Processing**: - A streamlined and seamless process in image verification, infringement issue, continuity of evidence, accurate demerit points deduction, processing of briefs, court actions, and debt collection, as well as timely, accurate and consistent advice to customer enquiries, payments, pleas, and the clearance processing of fines.

Quality control measures are the foundation of system integrity. In 2006 the Victoria Auditor General stressed the importance of quality control measures including the maintenance and accuracy of all speed detection devices, compliance to policies as well as the accreditation and verification of processing systems.[10]

Overall, system and processing integrity impacts directly upon the perceptions of the offending drivers and the public – and what they think they can get away with (especially speeding). Swiftness and certainty of penalty rapidly brings about behavioural and cultural change. ***The integrity of the processing chain is therefore critical to the community cultural change process***

Education

To achieve essential community support and ownership there must be a belief that enforcement is fair, impartial and objectively administered in the community interest and wholly dedicated to the achievement of road safety objectives. For enforcement to affect behavioural change there must be a broad community perception through general and specific deterrence that the chance of detection is so high, and the certainty of penalty is so great that speeding is not worth the risk.

"*In Australia and elsewhere, education and publicity have been most successful in modifying behaviour when combined with laws that are themselves directly related to safety, and that are strictly enforced*"[11]

The Australian National Road Safety Action Plan 2003 and 2004 emphasised that speed enforcement programs backed by extensive publicity were a significant factor in the reduction in road fatalities that occurred between 1989 and 1997.[12]

High profile publicity is essential to increase road safety knowledge and awareness as well as sensitising the community to the probability of enforcement. There must be a specific aim to magnify the perceived risk of detection with a balanced approach to engender community acceptance and support. Further, the use of advertising for enforcement programs should increase the program's effectiveness and cost-benefits. [13]

South Australia's Road Safety Media Evaluation Study concluded that television advertising has an immediate effect on speed behaviour statistically independent of enforcement.[14]

Victoria's Transport Accident Commission (TAC) provides high profile road safety advertising which in its structure incorporates three phases:

- Enforcement; increase awareness of chance of detection
- Educational and Instructional; providing the rationale for behaviour modification and
- Emotive; providing the moral case.

Scientific evaluations have shown substantial reductions in road trauma in Victoria associated with the speed camera program supported by TAC advertising.[15]

Visual speed display monitoring units and data collection systems, sometimes on mobile trailers, provide visual speed checks and 'on-road' education for motorists. They provide a strong educational and psychological message for drivers (and passengers, assisting peer group compliance), as well as

negating any ‘excuse’ which may be put forward by the errant motorist if they are later detected and prosecuted. It also sends a message of “system fairness”.

Conclusion

Driver behaviour, and in particular travelling at speeds in excess of the allowed limit, is one of the largest contributors to road trauma. Enforcement programs have been used to punish speeding drivers by imposing a fine or using a driving licence demerit point system and media campaigns have been used to alert drivers to the dangers of speeding. Both approaches have been successful to varying degrees. The largest reductions in speeds and subsequently injury crashes have been observed when the enforcement and media programs support one another to deliver a unified message.

To achieve further sustainable reductions a more advanced approach is required to specifically target changing driving culture. The foundation of this culture must be built through education. Children must be taught about road safety and the risks associated with dangerous driving behaviour before reaching driving age. Driving lessons and tests must be focused more on safe driving and crash situations rather than just an ability to operate a vehicle.

The educational foundation must then be supported by strategic enforcement, utilising feedback from an intelligent infringement processing back office to appropriately target problem areas and the causes of excessive speed. The processing operations must be efficient and transparent providing fast and error free feedback to speeders. Media should be used to support the messages of the enforcement program, advertising the program structure, ensuring transparency, and providing emotional, statistical and enforcement messages to the public.

Active interaction and feedback between education initiatives, intelligent processing operations and a strategic enforcement program will provide the sustainability required for long term changes in driver culture producing continual decreases in speed related road trauma.

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