NRSPP
NATIONAL ROAD SAFETY
PARTNERSHIP
PROGRAM

NRSPP Fleet Safety Benchmarking Project: Literature Review

Project No 009006 was finalised 04/06/2015

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Sponsored by a grant from the NRMA-ACT Road Safety Trust

ABOUT THE NSRPP

The National Road Safety Partnership Program (NRSPP) was established to offer a collaborative network for Australian organisations to build and implement effective road safety strategies in the workplace. The NSRPP is proudly delivered by ARRB Group at the direction of an industry-led steering committee.

SUMMARY

The purpose of this literature review was to guide the development of the benchmarking framework for the NRSPP. A review of national and international scientific literature was conducted on the most important safety management performance indicators, as well as resources and established programs. The literature search focused on information and materials relevant to safety management and safety benchmarking in the light and heavy vehicle occupational driving context.

An evaluation matrix and selection criteria was used to guide the selection of articles. The selection criterion was developed through a collaboration of the lead researchers involved in the project and then peer reviewed by the researcher review panel. Each paper/report was evaluated for relevance, importance, and effectiveness (of process or performance measure). Only those references, in academic and grey literature as well as websites that were assessed to be most relevant and helpful were included in the review. A total of 81 studies/reports were included in the final report.

The results from the literature review covered four sections.

The first section discussed the role of benchmarking in operationalising organisational performance, with a particular focus on safety. Some people have confusion over the terms benchmarking and performance measures. Benchmarking is the process that starts from identifying an area for improvement and ends in enhancing the outcomes. Performance measures are more of a comparison between outcomes that are used as a “benchmark”, for example company A can make 10 units in an hour while company B can produce 15, therefore some may call 15 units a benchmark to work towards, it is actually a performance measure. The second section provided an overview of performance indicators. Lag and leading indicators were defined and critiqued. The discussion on leading indicators included a review of existing models that are designed to prioritise risks and address the likelihood of incidents occurring and the level of consequence.

The third section presented a review on existing fleet safety benchmarking projects conducted in the UK, US and Australia. This section also included a review of existing audit tools used to assess corporate road safety against a set of safety management standards. It should be noted that none of the identified benchmarking initiatives or research papers provided an empirically tested or robust evaluation, therefore the evidence of the effectiveness of the identified initiatives was very limited.

The final section addressed the challenges associated with establishing a benchmarking exercise. The challenges include, but are not limited to, the following:

- identifying the most important lead and lag performance indicators
- ensuring consistency in the way indicators are measured
- ensuring accurate data analysis and secure data management
- making the process easy and time efficient, regardless of organisational size
- establishing the right benchmarking partners to work and learn with
- establishing a trusting relationship with benchmarking partners.

Benchmarking is not yet widespread in corporate road safety management. However, it was identified by industry, during the development of the NRSPP, as a gap and an opportunity for the program to provide industry a tool for structured improvement.

ACKNOWLEDGEMENTS

In preparing this report, support was provided by Dr Sharon Newnam, Monash University Accident Research Centre; James Newton, Transport Safety Collaboration and Project Leader; and Sarah Van Dam, ARRB Group.

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1 BACKGROUND

The development of a benchmarking tool for the purpose of improving organisational road safety was one of the core elements identified by stakeholders during the consultation period for the program's development. The NRSPP secretariat has been exploring options for developing the tool and the website has been structured to include the tool once developed.

The secretariat has initiated the National Benchmarking Project to develop the online benchmarking tool which comprises of five stages. Each stage will be developed collaboratively with government, industry and research and includes:

Stage one

- Literature review and report recommendations, engage national and international stakeholder research.

Stage two

- Identify and engage with core stakeholders ACT and national for the collaborative development of qualitative and quantitative measures (establish industry and government project reference group).
- Identify and recommend a staging process for implementation aligned to stakeholders requirements.

Stage three

- Test benchmarking tools with identified stakeholder groups and seek feedback to ensure value add to stakeholders and ease of use.
- Develop and deliver a secure user-friendly online benchmarking process for seamless implementation into the NRSPP, linking resources, case studies and the knowledge bank to benchmarking outcomes to support the end user.
- Identify and develop international benchmarking linkages.

Stages four and five

- Provide a review, monitoring and evaluation process for 2 years in relation to end user value add and ease of use.

The end result will be a user-friendly online benchmarking tool with a securely stored online analysis and summary of fleet performance, road safety cultural maturity and trends over time which is annually repeatable and can be utilised directly for corporate reporting. This project will interlink with the NRSPP website.

The NRMA ACT Road Safety Trust has provided a grant to develop stages one and two of the National Benchmarking Project.

This literature review is stage one and was prepared for the purpose of guiding industry discussions leading to the development of a work-related road safety benchmarking framework for the NRSPP. The document was based on collaborative research and review of national and international scientific literature on the most important safety management performance indicators, as well as resources and established programs that might assist in the foundational development of the National Benchmarking Project.

2 INTRODUCTION

Fleet vehicle crashes are costly and preventable. With relatively small investments, organisations can achieve large savings in their operating costs/losses. Importantly, work-related road crashes are the biggest occupational killer in Australia.

There are a number of ways to address work-related road safety. These include:

- implementing a single countermeasure, such as driver training
- applying a road safety model for systematic review of crash and injury risks
- using a traditional form of OHS auditing
- benchmarking and continuous improvement.

A critical review of these options found that benchmarking was likely to be the most effective method of improving work related road safety outcomes (Mooren et al. 2012). However, implementing evidence-based countermeasures should be done as part of this process. Moreover systematic reviews based on known road safety risk factors, or safety management elements that are thought to be effective are sensible things to do as well.

Traditional OHS compliance audits are useful, but whether they are conducted for regulatory or voluntary 'alternative compliance' schemes, they are by their nature *verification* processes rather than *continuous improvement* processes. Moreover, Blewett and O'Keeffe (2011) identified five problematic aspects of OHS auditing that may account for failure of audits to be effective. They are:

- lack of worker participation
- paperwork for the sake of the audit
- goal displacement of audit scoring
- confusion of audit criteria
- lack of auditor independence.

They argue that, 'OHS auditing has become a ritual rather than a means of improving workplace health and safety.'

Benchmarking is a process of comparing strengths and weaknesses of organisations with the aim of learning how best to make improvements. The kind of benchmarking that would be suitable for OHS objectives encouraged by WorkSafe Australia is one that provides a continuous improvement process. Blewett and Shaw (1996) conclude that 'Benchmarking provides a creative impetus that can lead to highly innovative solutions to OHS problems' and that it is a powerful tool for encouraging broad involvement in OHS within an organisation. The type of benchmarking that would be most fruitful for achieving improved work-related road safety outcomes is one that goes beyond comparing results (incident rates, injuries and costs) to one that also looks at the processes by which results are achieved.

3 METHODS AND SCOPE

This small review of the literature focused on information and materials that are relevant to safety management and safety benchmarking in the light and heavy vehicle occupational driving context. As the budget did not permit a full review, the advice is limited to what could be analysed in the time available.

The team utilised an evaluation matrix and selection criteria for inclusion in the review. Searches were conducted through Google Scholar, ARRB Library and University databases using the search terms: safety benchmarking, fleet benchmarking, OHS performance indicators, safety performance indicators as well as annotated resources held in the author's files. In addition, the bibliographies in some of the resources obtained were also examined. An initial list was compiled and culled on the basis of agreed criteria shown in Table 3.1.

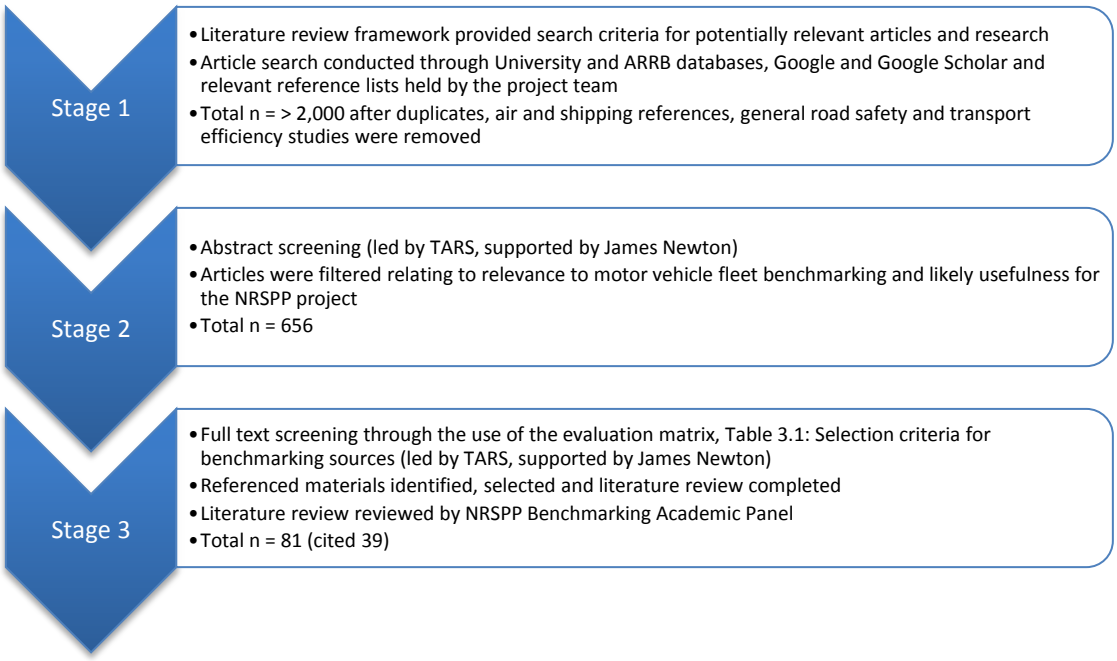
Table 3.1: Selection criteria for benchmarking sources

Selection criteria - for culling abstracts, papers, web pages		
	✔	✗
≥ year 2000		
Australian		
Adds to a mix of large and small organisations		
Operations with light or heavy vehicles		
Benchmark fleet safety		
Sound evaluation		
Can be applied to fleet safety		
Can be scaled up or down		
Peer reviewed		
Evidence based		
Provides analytical descriptions of benchmarking measures		
Identifies definitions, e.g lead, lag and process indicators		
Addresses data process control		

The idea was to include those sources that ticked all, or most, of the boxes. In all, 81 sources were included in the review.

Once selected for examination, each paper/resource was evaluated for relevance, importance, and effectiveness (of process or performance measure). Only those references, in academic and grey literature as well as websites that were assessed to be most relevant and helpful were included in the review. The research methods are described in Figure 3.1.

Figure 3.1: Literature review staged methodology



This review examines key measures and processes for successful benchmarking initiatives; evaluates strengths, weaknesses and appropriateness of various performance measures from the identified materials and research papers; and makes recommendations drawn from this analysis for consideration in the National Benchmarking Project consultation process.

4 WHAT IS – AND IS NOT – BENCHMARKING[1]

Simply put, *benchmarking* is a business excellence tool for finding, adapting and implementing outstanding practices. Benchmarking is a process involving learning from others how to improve practices rather than reinventing the improvements in isolation. Benchmarking is one of the longest-lasting improvement tools and has been popular since the 1980s. However, benchmarking needs to be done well to ensure successful implementation of improvements. Benchmarking can lead to very large improvements and also rapid implementation through adaptation of others' experiences.

There are misconceptions and traps to avoid. For example, there is an important distinction between benchmarking as a process and specific benchmarks (comparisons of fleet safety output key performance indicators (KPIs) like incidents per kilometre travelled). Benchmarking is the process that starts from identifying an area for improvement and ends in enhancing the outcomes. Performance measures are more of a comparison between outcomes that are used as a "benchmark", for example company A can make 10 units in an hour while company B can produce 15, therefore some may call 15 units a benchmark to work towards, it is actually a performance measure.

Managers are often traditionally interested in benchmark comparisons for a quick 'snapshot' comparison and treat this as benchmarking, when in fact benchmark comparisons are only a small part of the benchmarking methodology which is focused on continuous improvements through a learning process. Properly designed performance comparisons between organisations can help to identify real gaps in the performance of management processes. Then it is possible to isolate them and motivate relevant improvement opportunities that can be closed through learning how to improve from the better performing organisations.

Distinguishing between benchmarks and benchmarking will ensure that the focus of effort is on improvement rather than performance comparison, which in itself can be misleading. Misleading because almost always there are differences in the way KPIs, that appear the same, are measured – or differences in the ways the data is collated and reported. These differences are often due to different strategic intents and/or the way data is measured, defined and managed. For example, if comparing 'crashes per employee driver', the term 'employee' needs to be defined – part-time, full-time, casual, fully committed to the task being measured or doing other tasks too, and so on.

Choosing and defining performance indicators are crucial to the effectiveness of any benchmarking effort.

[1] Much of this discussion was derived from comments and collaborative work by Bruce Searles, Benchmarking Partnerships, and Lori Mooren and their unpublished consultant report. See http://www.benchmarkingpartnerships.com.au for more information.

5 PERFORMANCE METRICS – LAG AND LEAD INDICATORS

It is important to distinguish the kinds of performance indicators and what they are best used for. Leading and lagging indicators are used to measure performance prior to adverse events and after adverse events. Hopkins (2007) also stresses that a further dimension is needed to assist identification of remedial actions. He says that lead and lag indicators should be considered separately for *personal* and *process* safety hazards. Process hazards arise from the processing activity an organisation carries out. In the driving task a process hazard may be faulty vehicles or time schedules that are too tight. A personal hazard is more to do with human errors or violations.

Lag indicators are those used for measuring outcome performance. In fleet safety they can include, numbers or rates of incidents, injuries, crash costs and near misses. As mentioned above, these indicators are used for comparing ultimate safety performance and can verify good, poor or better safety performing organisations.

Within organisations, these lag metrics often form the basis for setting and measuring KPIs for managers and other employees. These are important to measure for validation of improvement against the bottom line (safety incidents). They are also important safety motivators. For example, a fleet safety benchmarking program in the United States (US)[2] conducted a study of 36 companies with a total number of 350 000 passenger vehicles and found that companies with the lowest employee crash rates had in place safety management practices that included tracking crashes (per million miles travelled) on a monthly basis.

When setting out to benchmark it is important to identify the indices of measurement to enable consistent and objective comparisons of performance. Indeed Hale advises that safety performance indicators should meet six other criteria – those that are used generally in scientific measurement instruments (Hale 2009).

These are:

1. **Validity** – do they measure what we want it to measure?
2. **Reliability** – do they give the same answer regardless of who uses it and in various circumstances?
3. **Sensitivity** – do they show sufficient differences over time or across entities being measured?
4. **Representativeness** – do they cover all aspects that are relevant?
5. **Openness to bias** – can they be manipulated to show a different result?
6. **Cost effectiveness** – does the cost of collecting the data outweigh the benefit?

If these criteria are not applied, the benchmarking process could be flawed and misleading. For example, if the data can be manipulated benchmarking partners could show themselves in a better light than they really are compared with others.

Dann and Fry (2009) also point out particular conundrums when measuring success of road safety interventions. For example, what is quantified and articulated as a success in road safety from a practitioner's viewpoint, e.g. fewer deaths, may seem at a community level to be a failure as road

[2] This was an initiative of the Network of Employers for Traffic Safety (NETS) a US not-for-profit company, supported by the US Government and a number of large American companies. It was established in 1989.

deaths are still happening. Increasingly, road safety targets are aiming to convey the number of lives saved. For example the NSW Road Safety Strategy to 2010[3] set a target of 2000 lives saved. This can be calculated by projecting death rates from road crashes based on the rate for the previous year and adjusted for projected population growth to find the lower boundary for assessing road safety performance. Then based on expected reductions from countermeasures, targets for improvement can be estimated. This type of approach could also be applied to fleet crash incidents or costs, particularly in large organisations.

For benchmarking purposes, the measurement of outcomes theoretically enables a validation of the effectiveness of safety management interventions. However because the outcomes of a vehicle crash are the result of a complex set of events, outcomes on their own do little to assist in decisions about where and how to take action (Hale 2009). So, while these are important indicators for monitoring levels of safety over time and can provide motivation for taking action, process indicators need to be used in measurement in continuous improvement programs such as benchmarking.

Murray et al. (2003) say that while there is no set of agreed KPIs for measuring fleet safety outcomes, the most common way is to measure insurance claims per vehicle. They divide the types of potential fleet safety KPIs into three categories: crash-based, cost-based and qualitative process indicators. Further, they recommend that crash rates should be presented as simply as possible and reporting should include clear trend graphs. This enables an objective measure of whether safety levels are improving, staying the same or worsening, providing a rough measure of success of safety management or otherwise.

Crash costs are good indicators to use in that they help to secure commitment to action within organisations. Typically, insurance companies apply a multiplier of 3–5 to direct damage costs in order to reflect the true costs of fleet crashes.

Applying the multiplier to crash costs – even at a conservative level – provides a good incentive to invest in safety management. Take for example, an organisation that loses $100 000 per year in direct crash costs. The real cost is $300 000 if indirect costs raise the actual cost by a factor of three. If a set of safety interventions reduces crash costs by one quarter, or by $25 000, the actual savings is $75 000.

Benchmarking safety outcomes can assist to demonstrate the business case for a pro-active corporate road safety program.

In between the measurement of (harm) outcomes and efficacious safety management processes, it is helpful to measure driving or fleet risks, i.e. ‘lead’ indicators.

Lead indicators are those performance measures that represent the metrics for risk/safety performance that may result in a safety outcome (lag performance).

Safety performance indicators (SPIs) are tools to assist in the assessment of safety conditions of a road travel system, evaluation of progress, measurement of impacts of safety interventions, and making comparisons. Hakkert and Gitelman (2007) advise that agreeing on specific SPIs to be used in these activities enables road safety improvements through benchmarking. Their focus was harmonisation of SPIs across the European Union; and they managed to develop detailed SPIs for seven road safety topic areas – alcohol and drug use, speeds, protective systems, daytime running lights, vehicles (passive safety), road infrastructure and trauma management systems.

[3] See www.rta.nsw.gov.au/roadsafety/downloads/rs2010.pdf

However, whether at a country level or organisational level, the SPI's need to be treated with care. Tingvall et al. (2010), Elvik (2009), and Nilsson (2004) have shown that it can be misleading to treat contributing factors to road injury as discrete contributors, as there are usually a number of factors interacting in a complex process to produce a road injury. For example a drink driver is more likely to drive without wearing a seatbelt. Conversely, models are yet to be developed to confidently measure the combined effects of road safety interventions. For example, there is no agreed method of determining the effects of one intervention on another such as whether seat belt interlocks would encourage or discourage speeding or have no mediating effect on anti-speed interventions. As part of the European Union's SafetyNet[4] program, Hakkert and Gitelman (2007) examined seven problem areas for road safety and developed sets of risk indicators that can be used by jurisdictions to measure and benchmark performance (mentioned above). With reference to speed risk the indicators that they recommend for tracking road safety risk levels include:

- average speed for light vehicles during day
- average speed for light vehicles during night
- standard deviation of speed for light vehicles during day
- standard deviation of speed for light vehicles during night
- 85th percentile of speed for light vehicles during day
- 85th percentile of speed for light vehicles during night
- percentage of light vehicles over the speed limit during day
- percentage of light vehicles over the speed limit during night
- percentage of lightvehicles10km/h over the speed limit during day
- percentage of lightvehicles10km/h over the speed limit during night.

Stuckey et al. (2007) reviewed occupational light vehicle (OLV) safety risks, finding that occupational risk factors including: work-related alcohol consumption, long periods of driving, fatigue, using the vehicle as an office, driving in poor traffic and weather conditions, not using a seat belt and driving an unsafe vehicle are critical risk factors in OLV use.

Lead indicators measure the level of driver risk, vehicle risk and journey risk. These risk indicators can point to areas of need for safety improvements. This is important in benchmarking to ensure that attention is well focussed to areas of greatest need.

Where there are multiple possible risks identified, it is also sensible to prioritise the risks to address by assessing the likelihood of incident occurrence and the level of consequence. There are several models for doing this. Figure 5 is adapted from Standards Australia Risk Management AS/NZS 4360:2004 (2002).

[4] For more information go to: http://ec.europa.eu/transport/wcm/road_safety/erso/safetynet/content/safetynet.htm

Figure 5.1: Risk assessment matrix

E – Extreme risk – detailed action plan required

H – High risk – needs senior management attention

M – Medium risk – specify management responsibility

L – Low risk – manage by routine procedures

Note: **High** or **Extreme** risks must be reported to senior management and require detailed treatment plans to reduce the risk to **Low** or **Medium.**

					Consequence				
				People	Injuries or ailments not requiring medical treatment	Minor injury or first aid treatment case	Serious injury causing hospitalisation or multiple medical treatment cases	Life-threatening injury or multiple serious injuries	Death or multiple life-threatening injuries
				Reputation	Internal review	Scrutiny required by internal committees or internal audit to prevent escalation	Scrutiny required by external committees or Government auditor, or inquest	Intense public, political and media scrutiny	Public inquiry or adverse national media
				Business process & systems	Minor errors in systems or processes requiring corrective action or minor delay	Policy procedural rule occasionally not met or services do not fully meet needs	One or more key accountability requirements not met. Inconvenient but not client-welfare threatening	Strategies not consistent with government's agenda. Trends show service is degraded.	Critical system failure, bad policy advice or ongoing non-compliance. Business severely affected.
				Financial	1% of budget or <$5k	2.5% of budget or <$50k	>5% of budget or <$500k	>10% of budget or <$5 million	>25% of budget or >$5 million
					Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
	Probability	Historical			**1**	**2**	**3**	**4**	**5**
Likelihood	>1 in 10	Is expected to occur in most cases	5	**Almost certain**	Medium	High	High	Extreme	Extreme
	1 in 10-100	Will probably occur	4	**Likely**	Medium	Medium	High	High	Extreme
	1 in 101-1,000	Might occur some time in the future	3	**Possible**	Low	Medium	Medium	High	Extreme
	1 in 1 000–10 000	Could occur but doubtful	2	**Unlikely**	Low	Medium	Medium	High	High

	1 in 10 000–100 000	May occur but only in exceptional cases	1	**Rare**	Low	Low	Medium	Medium	High

The risk assessment matrix in Figure 5.1 assists the organisation to categorise risks across the risk types, people, reputational, business and financial. In managing employee driving risks, the most important aspect to consider is the likelihood and consequence of an injury crash related to the risk to people (employees and non-employees). For example, the risk of a petrol tanker crash when using a faulty coupling could well be categorised as an Extreme risk with a level 5 consequence and a level 4 likelihood. By contrast a Medium risk may be a manager's use of a light vehicle with a 3–star NCAP rated vehicle.

Taking any type of risk through this kind of assessment involves determining whether the risk is very likely to manifest in an unwanted event by estimating the 1 in 10 (highly probable) to 1 in 100 000 chances of occurring (low probability). It also calls for an estimation of the level of consequence from insignificant to catastrophic. This is useful to do when an organisation needs to set priorities on which risks should be allocated the attention and resources to reduce the risks.

Performance indicators for safety management processes are useful for evaluating strengths and gaps in fleet safety management systems (SMS). While there is not yet a universally agreed SMS for work-related road safety, the literature highlights a number of important safety management characteristics that may be suitable for light and heavy vehicle safety management (Mearns et al. 2003). Safety management characteristics that are found in OHS are largely applicable to fleet safety management (Mooren et al. 2009).

A précis of research findings relevant to light and heavy vehicle corporate road safety management may be broken down into topics including:

1. policies and accreditation
2. driver selectivity and tenure
3. training and safety information
4. driver participation in OHS
5. driver management and discipline
6. journey risk assessment and work scheduling
7. incentives for safety performance
8. vehicle selection and maintenance
9. incident analysis and record keeping
10. safety climate.

A recent study by Mooren et al. (2014) examined the management characteristics of Australian companies that operate heavy vehicles, comparing those with low insurance claims and those with higher insurance claims. The study found, for example, pay and pay systems, driver participation in OHS decision-making and responsiveness to safety concerns were characteristics that distinguished low and higher claimers. More research is needed to be certain about the optimal safety management characteristics for best outcomes, but some studies are finding good evidence about what works.

Proactive safety management also emerged in the Mooren et al. (2014) study and in a number of others. In the occupational safety context, Vredenburgh (2002) found that what differentiated US hospitals with low injury rates was a proactive approach to preventing accidents. In the transport sector, Moses and Savage (1994) examined motor carrier safety audit records for 75 577 US firms and found that keeping records of crashes and disciplining or educating drivers involved in ‘preventable’ crashes are effective safety practices.

An analysis of the opinions of safety officers in Spanish firms (various industries) found that operational control of safety procedure compliance and equipment audit/maintenance is the most important element in a safety management system (Fernandez-Muniz et al. 2007). Lantz (1994) found a strong relationship between quality maintenance and inspection procedures and a decline in accidents related to defects in US trucking firms.

Learning from incident and risk assessment is also beneficial for improving safety performance. In a study of four Portuguese chemical companies and one aviation company, Silva and Lima (2005) found that of the companies examined, the one that most fully used information learned from the analysis of accident factors had lower accident rates. Phimister et al. (2003) conducted 106 interviews of safety managers in 20 US chemical companies and concluded that analyses of near-miss events are beneficial to accident prevention.

Demonstrable management commitment to safety has repeatedly been found to be a significant factor in companies that are actively and effectively managing safety (Boyle et al. (2010), Mearns et al. (2003) and Wills et al. (2005)). Mearns et al. (2003) researched safety culture, safety management practices and behaviour and accident outcomes in 13 offshore installations operating on the UK continental shelf. They found that management commitment is a key predictor of lower rates of accidents. Seo et al. (2004) tested management commitment, as an important indicator of safety and safety culture (n = 620 safety managers in US grain companies) and management commitment was found to be positively correlated with other safety culture factors and is an important safety influence. Silva and Lima (2005) found that organisations with the same 'espoused' safety values can have different safety 'values in use' and that establishing safety as an organisational value requires full management and supervisor commitment to safety to achieve good safety outcomes.

While management commitment is fundamental, shared values for safety create and maintain a strong safety climate. For example Newnam et al. (2008) found that the influence of supervisors and fleet managers interacted such that drivers were more motivated to drive safely if they perceived both their supervisor and fleet manager to value safety. Fogarty and Shaw (2010) emphasise that management commitment to safety is a pervasive influence in all safety behaviours, and that this influence is mediated by other factors such as group norms and work pressure.

There has been extensive research in the development of measurement tools for assessing safety culture or climate (Dedobbeleer and Béland (1991), Flin et al. Frazier et al. (2013), (2000), Griffin and Neal (2000), Grote (2008) and Parker et al. (2006)).The important aspect of this in terms of safety management is that the value placed on safety by people within an organisation can have a powerful mediating influence on the other aspects of a safety management system.

The measurement of process indicators incorporated into benchmarking can be done in a number of ways. The next section provides some examples of fleet safety benchmarking approaches.

6 FLEET SAFETY BENCHMARKING PROGRAMS

6.1 Fleet Safety Benchmarking (United Kingdom[5])

A Fleet Safety Benchmarking Project that has been in place in the UK with Department for Transport support since the year 2007. The project allows participation by any organisation, providing the following tools:

- benchmarking report, best practice guides and case studies
- five-minute, 10-question self-audit and feedback (free online)
- 30-question process benchmarking (for a fee)
- outcomes benchmarking
- proactive and reactive KPI comparisons
- 168-question fleet audit (for a fee).

By the time the program was reviewed in 2009, more than 500 organisations, operating well over 600 000 vehicles, had completed the (online) 10-question fleet audit. This audit entailed participants rating their safety processes and systems as ‘average’, ‘good’ or ‘poor’ on ten criteria, including:

- fleet safety, health and environment policy and risk assessment
- legal compliance and brand enhancement
- organisation, responsibilities and leadership
- organisational safety culture
- recruitment, selection and induction
- driver monitoring, wellbeing, assessment and improvement
- vehicle selection, checking and maintenance
- safety/fuel reporting, investigation, recording, analysis, data cascading, KPI monitoring and evaluation
- managing specific issues such as reversing safety, temporary/agency labour, cash for cars/people driving their own vehicles for work, fraud/theft.

This program is ongoing, but while it has been well patronised and participants have expressed satisfaction with its usefulness, there is no independent data analysis about the safety outcomes that could be attributed to the program. Murray and Keeler carried out a review of this program (Murray & Keeler 2009). One issue that was highlighted is the variation in the way outcomes data was recorded. The consensus process of establishing performance measures resulted in overly intricate data collection processes. They advise that future benchmarking projects should try not to overly complicate the data collection process.

[5] www.fleetsafetybenchmarking.net

6.2 Strength in Numbers Fleet Safety Benchmarking (United States)

A fleet benchmarking program, managed by the Network of Employers for Traffic Safety (NETS)[6], was reviewed in 2009. A study by NETS of the Strength in Numbers initiative, involving 36 companies with a total of 350 000 passenger vehicles, found that companies with the lowest employee crash rates had in place safety management practices that included:

- tracking crashes (per million miles travelled) on a monthly basis
- published a monthly road safety 'scorecard'
- included safety as a 'company credo'
- were more likely to ban mobile phone use while driving on company business
- shared lessons learned from serious collisions with the entire organisation.

NETS holds annual conferences for members to share good practices, but the organisation will not reveal publicly, the performance criteria used in their benchmarking program. Little detail is provided about this program as it is a commercial undertaking where only those participating are advised of the specific indicators used. However, Table 6.1 provides a list of program data elements for 2009.

Table 6.1: Strength in Numbers 2009 program elements

▪ policy	▪ apmm frequency (accidents per million miles)
▪ training	▪ metrics tracked
▪ high risk drivers	▪ reporting of metrics
▪ commentary drive	▪ use of a 'severity index'
▪ collision review process	▪ vehicle safety communication
▪ preventable versus non-preventable	▪ outreach programs
▪ charging drivers deductible (excess)	▪ green fleet initiatives
▪ monitoring technology	▪ critical success factors
▪ safety technology	▪ preferred training topics
▪ scorecards	▪ mobile phones
▪ spouse programs	▪ senior management support
▪ most common collisions	▪ questions to facilitate networking
▪ bent metal costs	▪ identifying high risk drivers

6.3 Trucking Industry Benchmarking Program (United States[7])

A comprehensive program managed by the University of Michigan has been developed over the past five years and provides trucking company performance measurements that are reportedly useful for motor carrier management. This program captures most of the essential elements of motor carrier operations with an online system allowing for efficient data entry and rapid turnaround of benchmark output. Benchmarks reported include:

General information

- primary business type
- average driver age

[6] NETS is a US not-for-profit company, supported by the US Government and number of large American companies. It was established in 1989.
[7] http://www.ilir.umich.edu/tibp/index.cfm

- percentage of drivers with formal driver training.

Safety outcomes

- average number of points on employee driver licences
- number of moving violations per driver
- number of moving violations per million miles
- number of crashes with over $500 in damage per million miles
- number of crashes with over $5000 in damage per million miles
- number of crashes with injuries per million miles
- number of crashes with fatalities per million miles
- number of lost work days / number of crashes with over $500 in damage
- total cost of crashes per million miles
- total cost of crashes / number of crashes with over $500 in damage
- cost of injuries to employee drivers and helpers / number of crashes with over $500 in damage
- cost of loss runs from crashes / number of crashes with over $500 in damage
- number of level I inspections per million miles
- number of level II inspections per million miles
- number of level III inspections per million miles
- number of equipment violations / total number of inspections
- number of trucks put out of service / total number of inspections
- number of drivers put out of service / total number of inspections
- number of driver violations / total number of inspections.

Operations and personnel

- total fleet miles in company-owned equipment
- company has a safety officer
- company has a formal safety program
- company has scheduled safety meetings
- number of safety meetings
- company has safety contests.

Human resources

- new hire rate
- termination rate
- employment growth rate
- primary pay type
- mileage pay rate

- hourly pay rate
- per package pay rate
- company pays overtime
- overtime pay rate
- annual earnings per driver
- hourly rate for loading and unloading
- hourly rate for waiting to load or unload
- hourly rate for waiting while shipper or consignee loads or unloads
- annual cost of health insurance benefits per driver
- annual cost of family health insurance benefits per driver
- drivers pay extra for family health insurance
- pension type
- pension contributions per driver
- life insurance contributions per driver
- average paid time off
- production bonus per driver
- company rewards safe drivers with cash bonuses
- value of cash safety bonus per driver
- company rewards safe drivers with gift bonuses
- value of gift safety bonus per driver.

Work process

- typical percent of time drivers spent physically loading
- typical percent of time drivers spent physically unloading
- typical percent of time drivers spent waiting to load
- typical percent of time drivers spent waiting to unload
- typical percent of time drivers spent waiting for shipper loads
- typical percent of time drivers spent waiting for consignee unloads
- typical percent of time drivers spent on other non-driving tasks
- typical percent of time drivers spent on non-driving tasks (not broken out).

Dispatching and scheduling

- percent of dispatches that begin from 6:00 AM up to 12 noon
- percent of dispatches that begin from 12 noon up to 6:00 PM
- percent of dispatches that begin from 6:00 PM up to 12 midnight
- percent of dispatches that begin from 12 midnight up to 6 AM.

Subcontracting

- company uses owner-operators
- percent of drivers who are owner-operators
- company has lease-purchase program
- percent of owner-operators participating in lease-purchase programs
- pay method for owner-operators
- average revenue paid to owner-operators
- average miles run by owner-operators.

Operational characteristics

- average number of power units
- average number of tractors
- average straight trucks/bobtails
- employee drivers per power unit
- company uses speed governors
- speed of governors
- annual spending on truck and trailer maintenance.

Financials

- gross earnings from trucking operations
- gross expenses from trucking operations
- operating ratio
- annual company payment for workers compensation insurance
- annual PL and PD insurance deductible
- level of PL and PD insurance carried
- annual company payment for PL and PD insurance
- annual company payment for PL and PD insurance / average number of company-owned power.

Units

- PL and PD insurance cost per driver
- PL and PD insurance cost per million miles
- annual deductibles paid
- annual deductibles paid/number of crashes with over $500 in damage.

This benchmarking program is the most inclusive program discovered thus far. Generally, heavy vehicle transport fleet operators have a more complex set of road safety risks and a much greater risk exposure than light vehicle fleet operators.

7 AUSTRALIAN FLEET MANAGERS ASSOCIATION (AFMA) FLEET SAFETY BENCHMARKING

The Australasian Fleet Managers Association (AfMA) provides a safety benchmarking program to members. Members send in their data and they are rated against all the participants in their industry in particular (for example manufacturing, media, transport). To be rated they have to provide data on the following categories:

- the total number of motor vehicle accidents in a year
- number of vehicles in the fleet
- number of driver-at-fault accidents
- total cost of claims in the year
- total number of kilometres travelled in the year.

While AfMA resources a help desk to assist members to extract data and analyse their safety outcomes against other members it does not include analysis of risks nor safety management processes.

The small sample of fleet safety benchmarking programs exhibit a range of simple to extensive and complex sets of measurement indicators.

7.1 Standards and Self-audit Tools

Benchmarking programs can use specific tools to assess corporate road safety against a set of safety management standards. Four examples of corporate road safety audit tools are:

- Workplace Fleet Safety System, developed by Queensland Transport
- Fleet Safety Audit Tool, prepared through a research project funded by a NSW WorkCover Assist grant
- TruckSafe Implementation Kit
- Twelve-Element Fleet Safety Maturity Tool.

7.1.1 Workplace Fleet Safety System

The Workplace Fleet Safety System was a Queensland Transport initiative that consists of the Workplace Fleet Safety: How to Conduct a Self-Audit booklet and the Workplace Fleet Safety Self-Audit Workbook. The Workplace Fleet Safety System was designed for use by organisations with light vehicle fleets. The aim of the system was to help organisations identify whether they are using best practice fleet safety practices, and areas in which the organisation should strive to improve.

The Workplace Fleet Safety System introduced and explained the seven elements of best practice fleet safety, each of which contains sub-elements of best practice. It also showed how the fleet safety elements are linked to Australian Standard AS/NZO ISO 9001:1994 – Quality systems – Model for quality assurance in design, development, production, installation and servicing (1994).

The seven elements of best practice recognised by Queensland Transport included:

- **Fleet safety policy**: Including fleet safety and safe driving policy in organisational policy and objectives.

- **Recruitment and selection:** Hire drivers based on safe driving records and awareness of safety issues.
- **Induction programs:** Induct all new recruits and supervisors using an official program containing fleet safety and safe driving components.
- **Fleet selection and maintenance:** Adhere to best practice in fleet selection and fleet maintenance.
- **Vehicle crash involvement:** Maintain an efficient system of recording and monitoring overall fleet, individual driver, and individual vehicle crash involvement.
- **Incentives and disincentives:** Recognise good/bad driving performance through an official scheme of commensurate incentives and disincentives.
- **Training and education:** Support training, education and development programs to engender safe driving.

Queensland Transport officially gave recognition to organisations that had achieved 'best practice' requirements in fleet safety. Organisations that met the criteria received a certificate from Queensland Transport, suitable for display in the workplace.

Three levels of achievement – Bronze, Silver and Gold – reflect levels of fleet safety maturity. Organisations had to first meet the Bronze level of best practice. On gaining recognition at Bronze level, organisations could then apply for the Silver level. Recipients of Bronze and Silver level certificates could apply for a Gold Plaque if they could demonstrate that the organisation had in place appropriate best practice procedures. Organisations applied for recognition by contacting Queensland Transport for an application booklet (note that this program is no longer operating).

The advantage of Fleet Safety Self-Assessment included the ability to provide a self-assessment tool that was of little cost to the government to facilitate after set-up, and was of no cost to the organisation to engage in the initiative other than their own time investment. The program also provided a progressive attainment rating and certification from bronze to gold that could motivate organisations to become more engaged with the management of road safety and gain a higher rating. The program was also developed and governed through certification audits by the State Government therefore providing a level of independence and creditability.

The major disadvantage for the Fleet Safety Self-Assessment was that the uptake of the program was poor. It was also an initiative that was designed for light fleets and not all fleet types or industry sectors. The Fleet Safety Self-Assessment is a descriptive guide for the implementation of the seven steps for safe fleet management and not overarching principles or methodology. The initiative was very limited on the promotion or acknowledgment of the organisations that had engaged in the program, therefore there was little opportunity for corporate leverage or market promotion. The initiative also appears to be lacking central management or coordination of networking, publications and case studies promoting any organisation's successes. Moreover, because it was a voluntary system, it did not address those companies that did want to join and which had a bad safety performance.

7.1.2 Fleet Safety Audit Tool

The Fleet Safety Audit Tool (Tool) was researched and developed by Transport and Road Safety (TARS), University of New South Wales. Through collaboration with the AfMA, supported by NSW WorkCover, TARS conducted an extensive literature review, surveyed fleet managers and drivers in 15 organisations, developed a fleet safety audit tool and tested the usability of the Tool. There was a strong level of consensus on the content of the audit and support for the use of the Tool by fleet managers.

The information obtained from the fleet safety and OHS literature supplemented by data obtained from the fleet manager and driver interviews was used to inform the development of a draft fleet safety management audit tool. Triangulating information from these three sources assisted in the identification of the necessary and sufficient audit dimensions, or categories, and the creation of objective, 'best practice' criteria against which to assess fleet safety management performance.

Five main categories of operations management were included in the draft tool. Each of these categories had between 1 and 3 sub-categories as shown in Table 7.1.

Table 7.1: Categories and sub-categories of the Fleet Safety Audit Tool

Main categories	Sub-categories
Management, systems and processes	1.1 Management commitment 1.2 Fleet safety management 1.3 Communication regarding fleet safety
Monitoring and assessment	2.1 Monitoring fleet safety performance 2.2 Vehicle crash and incident investigation 2.3 Performance monitoring and recognition
Employee recruitment, training and education	3.1 Driver selection and assessment 3.2 Employee fleet safety induction 3.3 Driver training
Vehicle technology, selection and maintenance	4.1 Fleet vehicle selection 4.2 Fleet vehicle maintenance
Vehicle journeys	5.1 Journey management

The tool provides a general description of management operations (strategic criteria) together with examples of specific, verifiable practices (operational criteria) corresponding to four different levels performance on each sub-category. Organisations can use the descriptive information to rate their performance on each sub-category at one of the four levels. Level I performance indicated current best practice, whereas Level IV performance indicates poor performance relative to best practice. Scoring the four levels from 0 (Level IV) to 3 (Level I) and summing the 12 sub-category scores yield a total score out of 36 which provides a guide to the organisation's overall performance relative to best practice across all the categories.

An advantage of this tool is that while organisations are rated on the level of their fleet safety management maturity (which can be subject to bias), the rating criteria are specifically described to enable consistency of interpretation (thus removing some subjectivity). It is also free. A disadvantage is that being similar to the process adopted in the Queensland Workplace Fleet Safety System, the uptake may be weak. The uptake of the Tool is unknown at this stage (as it is freely downloadable and downloads are not tracked) and ideally it should be trialled in a sample of organisations and independently evaluated for its effectiveness.

7.1.3 TruckSafe Auditable Safety Management Scheme

TruckSafe is an accreditation program that is owned by the Australian Trucking Association (2014). It has four core modules that aim to assist safety management improvement in companies that operate trucks.

The modules cover:

- **Management –** Aimed at ensuring that a trucking operator has a documented business system which covers each of the standards.

- **Maintenance –** Aimed at ensuring vehicles and trailers are kept in a safe and roadworthy condition. This standard covers the requirements for daily checks, fault reporting and recording, fault repair, scheduled maintenance, maintenance records and documentation, maintenance responsibilities, internal review, and maintenance training and education. TruckSafe maintenance also complies with National Heavy Vehicle Accreditation Scheme (NHVAS) maintenance standards.
- **Workplace and driver health –** Aimed at ensuring that drivers are fit and healthy and occupational health and safety requirements are met. This standard covers requirements for workplace health and safety, driver health screening (including medicals), the role of the medical practitioner, rehabilitation and fatigue management.
- **Training –** Aimed at ensuring that drivers are licensed, authorised and trained for the tasks, which they are undertaking.

In addition, there are two other modules:

- mass management
- fatigue management.

Very small as well as very large transport companies have implemented TruckSafe with the assistance of a TruckSafe Implementation Kit[8]. To be accredited TruckSafe assigns an independent auditor to audit the companies seeking accreditation. There is some indication that this program is effective (Baas & Taramoeroa 2008). However, it has not been empirically tested or evaluated (NTC 2009).

In addition, the Australian Logistics Council (ALC) develops and promotes industry safety codes to assist compliance with chain of responsibility requirements, recognising all parties in transport logistics operations: customer, consignor, transport company, and others that can influence safety in the delivery of goods and services. Again, while these codes appear to be soundly based and are embraced by Australian industry leaders, the Codes have not been evaluated for effectiveness in reducing crashes and injury. See http://austlogistics.com.au/safety/national-logistics-safety-code/ for more information.

[8] http://trucksafe.wordpress.com/about/

8 TWELVE-ELEMENT FLEET SAFETY MATURITY TOOL

A twelve-element fleet safety management model system was used to conduct a gap analysis of fleet safety management practices of transport and depot operations of a dangerous goods transport company (Mooren and Grzebieta, 2010). This formed part of a holistic and systematic review, leading to the preparation of a safety management improvement plan. The review took a systems approach to identify and analyse elements of the company's management system to assess if there were any deficiencies. The review method included a fleet safety 'maturity' survey of drivers, managers and executives of the company, in-depth interviews with a selection of staff, driver and manager focus groups, and specialist inspections of truck fleet purchasing and maintenance practices and fatigue risk management practices.

Figure 8.1: 12-element fleet safety management model

Source: Wikipedia http://en.wikipedia.org/wiki/Global_road_safety_for_workers

Neither the model, nor the Maturity Tool has been empirically tested or evaluated, but could be a useful type of tool for the purpose of data collection for benchmarking.

While there are other industry standards and audit systems, such as a safety management guide for bus and coach operators (Ministry of Transport 2007), the three mentioned in 7.1 above are the most relevant for light or heavy vehicle, or mixed vehicle fleets.

9 DISCUSSION

The programs described in section 7.1 vary in terms of the numbers and types of indicators used, as well as the method used to assess performance. It may be useful to use Hale's criteria for the assessment of the efficacy of lead and lag indicators.

Table 9.1: Assessment of benchmarking performance indicators

	Fleet Safety Benchmarking (UK)	Strength in Numbers (NETS – US)	Trucking Industry Benchmarking (US)	AfMA Fleet Safety Benchmarking (Australia)
Validity – do they measure what we want it to measure?	They cover some important safety management areas	Some, like commentary driving, may not be agreed.	They cover nearly everything	Only outcomes are measured
Reliability – do they give the same answer regardless of who uses it and in various circumstances?	No. The ten questions are subjective ratings	Many are subjective measures	They are all objective measures.	They are all objective measures
Sensitivity – do they show sufficient differences over time or across entities being measured?	The indicators are grouped into broad categories	Most of them would	Small company results might vary to a larger degree than large companies	Small company results might vary to a larger degree than large companies
Representativeness – do they cover all aspects that are relevant?	Maybe for light, but not for heavy vehicle operators	Vehicle safety and journey planning are missing	Apart from pay, work process and despatch categories they are all outcome indicators	Only as a check on relative outcome performance
Openness to bias – can they be manipulated to show a different result?	Yes, as they are subjective ratings they are subject to bias	Especially if self-assessment is used, yes	Calculating percentages – need to ensure agreed denominators	No, they are objective/factual
Cost effectiveness – does the cost of collecting the data outweigh the benefit?	The online questions are quick and easy	Maybe, depending on how much detail is required	The list of indicators is massive.	They are easy to measure
Effectiveness – are they empirically tested or include a robust evaluation?	Nothing publicly available to provide evidence of the effectiveness	Nothing publicly available but the program continues to grow and develop demonstrated by its annual conference and growing member base	Nothing publicly available to provide evidence of effectiveness	Nothing publicly available to provide evidence of effectiveness

All four of the benchmarking programs described, use online data collection methods. This makes safety benchmarking fairly easy and efficient. There are few details readily available to show how companies have made improvements as a result of their participation.

There are fairly clear indications in the literature about the important elements of work-related road safety management that can suggest areas for performance indicators to be developed. Moreover, there are tools available for measuring fleet safety performance that can be used or adapted for use.

10 CONCLUSIONS AND NEXT STEPS

There are challenges involved in setting up a successful benchmarking program. The challenges include, but are not limited to, the following:

- identifying the most important lead and lag performance indicators
- ensuring consistency in the way indicators are measured
- ensuring accurate data analysis and secure data management
- making the process easy and time efficient, regardless of organisational size
- establishing the right benchmarking partners to work and learn with
- establishing a trusting relationship with benchmarking partners.

Benchmarking is not yet widespread in corporate road safety management. Even though there are no agreed safety management systems for corporate road safety, there is enough research evidence to be confident in selecting important data topics and measurement indices for internal and external comparisons.

The best way to establish a set of performance indicators to include in a benchmarking program is to involve all interested parties in a workshop aimed at achieving consensus on these indicators and the benchmarking process.

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