Influence of road safety on taxi organisational economic stability – a need for proactive change

Bevan Rowland, Jeremy Davey, Darren Wishart and James Freeman

Centre for Accident Research and Road Safety – Queensland
Queensland University of Technology

2008 ATRF
31ST AUSTRALASIAN TRANSPORT RESEARCH FORUM

1 Introduction

Fleet and work-related road safety is an emerging issue for organisations in Australia and overseas. Research conducted in Australia reveal that road crashes are the most common cause of work-related fatalities, injuries and absences from work (Haworth *et al*., 2000), with the average time lost being greater than any other workplace claim (Stewart-Bogle, 1999; WA, 2003). In recent years changes in industry/employer accountability, business processes, Occupational Health and Safety (OH&S), Chain of Responsibility (COR), Workers Compensation legislation, insurance and third party coverage, and a generally more litigious environment require industry to develop better benchmarking along with more comprehensive programs to improve fleet safety (Wishart and Davey, 2004).

However, Vincent (1997) suggested that people who drive in the course of their employment form the majority of drivers on the road on any given work day, but have been overlooked by road safety and OH&S specialists (cited in Murray, 2002), despite the vehicle being classed as a workplace by Workplace Health and Safety legislation. However, this may soon change change, as OH&S appears to be moving in the direction of transport and there are increasing calls for fleet safety to be managed under an OH&S framework (Haworth *et al*., 2000; Murray *et al*., 2002).

1.1 Work-related road safety background

Previous research has consistently highlighted work-related road safety as an area that requires further attention with a focus on developing interventions aimed at improving road safety outcomes and in turn offering substantial financial savings to industry and the community (Bibbings, 1997; Murray *et al.*, 2002; Haworth *et al.*, 2000; Wishart and Davey, 2004). Traditionally, work-related vehicle crashes/incidents have been viewed as just “accidents” by organisational management, suggesting an inability or “want” to foresee the risks or contributing factors (Rowland *et al.*, 2005). Therefore, insurance claims are completed, the vehicle repaired, and work life goes on. Usually the only investigation completed, if any, is a one on one interview between the driver and his / her Supervisor / Manager for determining the appropriate information for the incident and/or insurance forms. Generally, for more serious crashes, an investigation may only be completed by the police. However, research has shown that appropriately designed, industry-based road safety interventions can reduce the number and severity of work-related road incidents. Therefore, there is an obvious and growing need for industry, government and the community to allocate resources and build the knowledge and expertise in this area (Wishart and Davey, 2004).

1.2 Work-related road incident statistics

The National Occupational Health and Safety Commission (NOHSC) conducted a study on work-related road crash fatalities during the period of 1989-92 (cited in Haworth *et al*., 2000). Results from the research revealed that there were 541 persons killed in road crashes while they were working and 628 persons killed in road crashes while they were commuting to and

from work. The fatality statistics represents 23% and 26% respectively of the 2389 work-related deaths for the 1989-92 period (Anderson and Plowman, 1999; Haworth *et al*., 2000). In Queensland from 1997-2001, 25% of fatal road crashes and 17% of hospitalisations involved a commercial vehicle (Wishart *et al.*, 2004). However, indications suggest that the true figures could actually be much higher due to issues of under reporting of some incidents and/or under identification of the type (e.g. work-related / commercial) or contributory factors of incidents. It is acknowledged that the statistics above are now somewhat dated. Furthermore, recent analysis of government statistical data (ASCC, 2008), although not published, has indicated that the statistics are similar to those reported above revealing 46% of all work-related fatalities (including commuting to and from work) in 2004/2005 were a result of vehicle incidents.

For example, Lynn and Lockwood (1998) conducted a survey in work-related driving and found that company drivers travelled more than twice the annual distance than private car drivers travelled. Furthermore, from reported incident statistics revealed in the survey, Lynn and Lockwood (1998) suggested that after differences in demographic and exposure variables had been considered, company car drivers had about 50% more incidents than private drivers. This higher crash involvement of work-related drivers is sometimes referred to as the 'work-related driver effect' (Murray *et al*., 2002).

1.3 Costs due to work-related road crashes/incidents

Based on workers compensation data work-related road crash injuries are estimated to cost approximately $500 million per year (Murray *et al*., 2002; Wheatley, 1997). Research conducted by the Centre for Accident Research and Road Safety – Queensland (CARRS-Q) has shown that costs associated with work-related vehicle crashes have more often than not been calculated in terms of vehicle damage or write off costs. Murray *et al.* (2002) suggested that work-related vehicle crash costs show an "iceberg effect" where the cost of crashes in terms of vehicle repairs is only the tip of the presenting problem. Other costs not usually identified by some organisations consist of personal injury, medical/hospital, rehabilitation, absence from work, workers compensation, downtime/loss productivity and potential loss of custom (Murray *et al.*, 2002), administration, loss of assets, retraining and insurance premiums (Mooren and Sochon, 2004). Furthermore, in determining the true costs of vehicle crashes a multiplier of between three and five times vehicle repair/replacement costs should be used (Mooren and Sochon, 2004). However, research conducted by CARRS-Q suggest that the actual vehicle crash costs could be somewhere between 8 and 36 times vehicle repair / replacement costs (Murray *et al*., 2002).

1.4 Legislative frameworks

Within Australia there is little exact uniformity of legislation in relation to work-related road safety, however the focus is essentially the same. Mooren and Sochon (2004) state that there are two key elements which primarily reflect the area of legislation. Firstly, there is road safety or transport legislation that governs general road use including driving hours for heavy vehicles as well as vehicle safety and driver qualification and regulatory frameworks. Secondly, organisations that operate vehicles for work are also governed by the Workplace Health and Safety legislation. In addition, under OH&S legislation in Australia vehicles used for work purposes are considered as a workplace when used on public roads and plant when used off public roads (Hoskins, 2003). Furthermore, in most states and territories, travel in vehicles for purposes of going to or returning from work is covered by workers compensation legislation which means that companies/organisations are liable for the relevant premiums to cover this activity (Mooren and Sochon, 2004).

1.5 Taxi road safety context

Research based on taxi driver road safety is scarce, particularly in Australia. A briefing paper reporting statistics relating to workplace safety and public safety issues associated with the taxi industry revealed potentially alarming taxi crash rates (Staysafe 36, 1997). Based on Motor Accident Authority data for the state of NSW in 1994 taxis accounted for 0.2% of all registered vehicles, 1.9% of the vehicles involved in crashes and were involved in 3.2% of all reported crashes (Staysafe 36, 1997). In addition, based on RTA data for 1994 taxis were involved in 5 fatalities, 122 serious injury crashes and 1107 non injury crashes where a vehicle had to be towed away (Staysafe 36, 1997). Furthermore, taxis were approximately 16 times more likely to be involved in a tow away crash and were approximately 4.5 times more likely to be involved in a fatality than other vehicles on register. Additionally, taxi drivers were somewhere between 1 and 2 times more likely to be involved in a fatality than other drivers. Based on such data it would appear that taxis are over represented in road crashes. However, when the number of kilometres the average taxi travels in relation to a private vehicle is considered then the interpretation is rather different. In fact in terms of fatalities per 100 million vehicle kilometres travelled taxis are about half as likely to be involved as the general driving population.

Previous research conducted with 165 taxi drivers in Sydney identified a number of influences relating to risk-taking and increased crash rates. The research revealed that taxi drivers often work shifts more than 10-12 hours and consequently due to this increased shift length is considered a fatigue related variable (Dalziel and Job, 1997). The study also suggested that as a shift extends beyond 11-12 hours, even by only small amounts, crash risk rises considerably (Dalziel and Job, 1997). In addition, aggression/expressed anger, sensation seeking and economic pressure are related to increased levels of risk-taking and crash rates (Dalziel and Job, 1997). This is accentuated by the fact that taxi drivers work long hours (50+ hours average per week) but do not seem to earn high incomes.

In regards to taxi organisations, this motoring group commonly adopt a blameworthy methodology when reporting, investigating and implementing interventions within the work environment. A blameworthy approach, usually directed toward the driver of an incident, promotes a ‘do not admit liability’ culture within the organisation which may ultimately result in failures to report some incidents. Therefore, data received from an incident report may not assist the true identification of relevant contributing factors.

How an organisation performs, or is required to perform its operations, may influence work-related driver safety, for example, high mileage travel (Collingwood, 1997; Griffith, 1997), time pressures (Downs *et al*., 1999) and in particular organisational culture (Haworth *et al*., 2000). Organisational factors may influence driver behaviour, for example, time pressure to complete jobs may influence the driver to speed which in turn may contribute to the incident. Interestingly, research conducted by Murray *et al.* (2002) claim that a number of organisations believe that safety, including work-related driver safety, is not considered an operational priority and that senior managers are often unaware of the problem and make safety a low priority behind ‘getting the job done’.

Taken together, despite the considerable exposure on public roads, relatively little research has endeavoured to examine the self-reported driving behaviours and attitude of work-related drivers, especially taxi drivers. In addition, little research could be found that examines the influence of professional driver behaviours and the subsequent potential effect on organisational economic prosperity, liveability and sustainability.

As a result, the current study aimed to:

a) examine a group of professional fleet drivers' attitudes and behaviours regarding road safety issues via two measurement tools (i.e., DBQ and DAQ); and

b) explore the relationship between driver behaviour and potential countermeasures aimed at improving road safety, including crash and offence involvement, and therefore, the economic prosperity, liveability and sustainability of the organisation.

2 Method

This study examines the results of a self-report survey of taxi driver attitude and behaviours to identify specific high risk areas for further countermeasure development. The findings are also compared to current organisational initiatives to identify potential areas for further improvement.

2.1 Survey participants

A total of 182 individuals who were all taxi drivers from a north Queensland region volunteered to participate in the study. There were 151 males (83%) and 31 females (13%). The average age of the sample was 50 years, ranging from 21 to 72 years of age. Taxi shifts driven by participants were reported to be day shift (46%), night shift (38%), 'the same of each' (10%) and 'changes each week' (6%). On average participants had held their licence for 28 years (range 1 – 54 years), had been driving a taxi for approximately eight years (range 0.1 – 37 years), with an average taxi driving exposure of approximately 53 hours per week, and 1189 kilometres per week. A total of 38 participants reported being involved in a crash while driving taxis in the last year while 52 individuals reported incurring traffic infringements and fines (i.e., demerit point loss) during the same time period.

2.2 Survey materials

Due to the nature of work for most taxi drivers, time for completing a survey is restricted to breaks between obtaining fares. Therefore, to encourage taxi drivers to participate in the survey and ensure completion rates, various survey questionnaires were reduced in length to reduce the time required to complete the survey. Factor analytic procedures combined with an examination of alpha coefficients were implemented to develop abbreviated assessment tools. In addition, unless stated otherwise (e.g. crashes and offences), drivers were asked to respond to the survey questions in relation to their work-related driving profession, namely taxi driving.

An abbreviated version of the Driver Behaviour Questionnaire (DBQ) used by Davey *et al*. (2006) was utilised in the research project. In regards to the DBQ, the measurement tool has been extensively utilised within a range of driver safety research areas (Bianchi and Summala, 2004; Dobson *et al*., 1999; Lujunen *et al*., 2003; Parker *et al*., 1995; Reason *et al*., 1990), as it distinguishes between three aberrant driving behaviours i.e., speeding, aggressive violations and errors. The DBQ used in the current study was a modified version of the original DBQ developed by Reason *et al*. (1990), changed in order to make the questionnaire more representative of Australian work-related driving conditions. Respondents were required to indicate on a seven point Likert scale (1 = never to 7 = always) how often they commit each of the errors (4 items), highway-code violations (4 items) and aggressive violations (2 items).

An abbreviated version of the Driver Attitude Questionnaire (DAQ), originally developed by Parker *et al*. (1996), is a 12-item self-report questionnaire designed to measure attitudes

regarding a range of driving behaviours. Preliminary research indicates that the DAQ has the potential to be implemented to investigate motorists' attitudes towards key road safety issues, such as drink driving, risky overtaking, close following and driving above the speed limit, with motorists generally reporting the most lenient attitudes towards speeding violations (Sullman *et al*., 2002; Wishart *et al*., 2006). Respondents are required to indicate on a seven point Likert scale (1 = strongly disagree to 7 = strongly agree) their agreement with statements regarding the appropriateness of various driving behaviours.

A number of socio-demographic questions were also included in the questionnaire to determine participants' age, gender, driving history (e.g., years experience, number of traffic offences and crashes) and their weekly driving exposure (e.g., kilometres, driving hours).

2.3 Survey procedure

The researcher assisted in the distribution and collection of survey questionnaires over a three day period. Participants (taxi drivers) were asked to travel to the local Taxi Depot if they would like to complete the survey questionnaire. This was done on a gradual basis over two full day shifts so not to disrupt service to clients. The researcher also approached taxi drivers at various taxi ranks during both day and night shifts, for example, the local airport, city centre, casino and night club areas. Participants that could not complete the survey due to receiving a fare were given a pre-paid envelope and requested to post the survey once completed. Ten pre-paid envelopes were provided to drivers and all ten were returned. A total of 184 surveys were collected and of these 182 surveys were usable, two were discarded due to insufficient completed content for analysis. In total there are 480 registered licensed taxi drivers in the survey region indicating a response rate of 38%. However, of the 480 registered taxi drivers, a lesser proportion of taxi drivers are current operational drivers. Therefore, the response rate may be considerably more than the stated 38%. Unfortunately, due to the number of individual taxi vehicle owners and the unavailability of some drivers, a final response rate could not be accurately determined.

3 Results

3.1 Reliability and structure of the DBQ and DAQ questionnaires

The internal consistency of the abbreviated forms of the DBQ and DAQ were examined through calculating Cronbach's alpha reliability coefficients, which are presented in Table 1. A larger Cronbach's alpha reliability coefficient represents a more reliable factor when assessing the characteristics of driver behaviour and attitude.

Table 1 – Alpha reliability coefficients of the DBQ and DAQ questionnaires

Questionnaire Subscales	*Items*	*Reliability*
Abbreviated DBQ		
Highway-code violations	(4 items)	0.84
Errors	(4 items)	0.74
Aggressive violations	(2 items)	0.70
Abbreviated DAQ		
Alcohol	(3 items)	0.57
Close Following	(3 items)	0.67
Overtaking	(3 items)	0.74
Speeding	(3 items)	0.70

Similar to previous Australian research (Blockey and Hartley, 1995; Dobson *et al*., 1999), and on professional drivers (Sullman *et al*., 2002), the DBQ factors appear to exhibit relative internal consistency. In contrast, there has been little research to determine the psychometric properties of the DAQ, and although only moderate, the alpha coefficients are similar to previous research (Davey *et al*., 2006; Meadows, 2002).

Table 2 reports the overall mean scores for the factors within the DBQ and DAQ scales. A higher mean for the DAQ reveals a more appropriate attitude towards the road safety factors, whereas a higher mean for the DBQ represents more active engagement in aberrant driving behaviours in the last six months. Examination of the mean scores indicates that of the four DAQ driving behaviours, participants were most likely to report that drink driving was generally an unacceptable behaviour in most circumstances (M = 6.40). The second highest factor was overtaking (M = 5.93), followed by attitudes regarding close following (M = 5.75). In contrast, participants were most likely to report that speeding was an acceptable behaviour (M = 4.39). Group analyses (between DAQ factors) demonstrated that participants' attitudes towards the unacceptability of drink driving were significantly higher than risky overtaking practices $F(1, 181) = 26.22$, $p < .0001$, close following $F(1, 181) = 44.82$, $p < .0001$ and especially speeding $F(1, 181) = 257.78$, $p < .0001$. The results indicate that drink driving is perceived as the most serious offence in the current sample, and similar to previous research (Burgess and Webley, 2000; Davey *et al*., 2006), speeding is often perceived as an acceptable behaviour in some circumstances.

Table 2 – Mean scores for DBQ and DAQ questionnaire factors

Description	*Mean, M*	*Standard Deviation, SD*
DBQ		
Errors	1.86	0.80
Highway Code Violations	1.89	0.99
Aggressive Violations	2.03	1.14
Less Safe Ranked Items:		
1. Intentionally exceed the speed limit on a highway/freeway	2.13	1.26
2. Missed 'Stop' or 'Give Way' signs	2.10	1.19
3. Become angered by a certain type of driver and indicate your hostility by whatever means you can	2.04	1.29
4. Sounded your horn to indicate your annoyance to another driver	2.04	1.38
DAQ		
Alcohol	6.40	1.04
Close Following	5.75	1.39
Overtaking	5.93	1.29
Speeding	4.39	1.89
Less Safe Ranked Items:		
1. I know exactly how fast I can drive and still drive safely	4.30	2.27
2. Speed limits are often set too low, with the result that many drivers ignore them	4.50	2.28
3. People stopped by the police for following too closely are unlucky because lots of people do it	5.46	2.05
4. Some drivers can be perfectly safe overtaking in situations which would be risky for others	5.79	1.75

Group analyses identified few meaningful differences within the DBQ scales and as highlighted in Table 2, means were similar for the DBQ. In addition, Table 2 reports the mean and standard deviation scores for the four less safe ranked items for each of the DBQ and DAQ measurement tools (n = 182). It is noteworthy that these items also generally relate to speeding behaviours.

Intercorrelations between variables

An examination was undertaken to determine the bivariate relationships between the DBQ and DAQ factors as well as socio-demographic variables. As expected, strong relationships appeared evident between the DAQ factors, with the highest correlation being between close following and risky overtaking (r = 0.70, p = 0.000). That is, those who reported an unwillingness to engage in risky overtaking manoeuvres were also unlikely to perceive close following as an acceptable driving behaviour. Similar results were also found between the DBQ factors, with the strongest bivariate relationship identified between highway-code violations and errors (r = 0.66, p = 0.000). For example, those who engaged in highway-code violations (i.e., speeding) were also more likely to commit errors while driving. An equally significant bivariate relationship was identified between highway-code and aggressive violations (r = 0.65, p = 0.000). For example, those who engaged in highway-code violations (i.e., speeding) were also more likely to exhibit aggressive acts while driving.

In regards to bivariate relationships between the questionnaires, significant negative correlations were evident between all the DBQ and DAQ sub-factors (i.e., behaviours vs attitudes), as those who perceived aberrant driving behaviours such as speeding as serious were subsequently less likely to actually engage in such behaviours over the previous six month period (i.e., r = -0.42, p = 0.000). In contrast to previous research (Davey *et al*., 2006), no significant relationship was identified between the sample characteristics (e.g. age, driving experience, road exposure, etc) and the DAQ and DBQ questionnaire factors.

Interestingly, no significant relationships were identified between the DBQ and DAQ scale factors and self-reported crashes. However, significant positive relationships was identified between the number of self-reported demerit point losses (traffic infringements) and the DBQ highway-code violations (r = 0.20, p = 0.004). For example, those taxi drivers engaging in highway-code violations (i.e., speeding) were also more likely to incur demerit point loss.

Prediction of crashes and traffic offences

Due to the relatively small number of participants who reported a work-related crash in the last 12 months (n = 38) or work-related driving infringements (n = 52), the implementation of multivariate models of prediction (e.g., logistic regression) were not undertaken due to the uneven sample sizes. Rather, a series of group analyses utilising the two measurement tools and socio-demographic factors was conducted focussing on traffic infringement notices. However, it is noteworthy that the only significant difference was identified with “years experience driving taxis” $t(1, 172) = 2.41$, p = 0.017, which revealed that relatively inexperienced taxi drivers are susceptible to incurring demerit point loss.

Current organisational initiatives

Currently, the taxi organisation’s only initiative in relation to work-related driving safety is initial new driver training. However, the emphasis of the new driver training was to introduce new drivers to the organisation’s policy and procedures, code of conduct and in-vehicle operational systems. Road safety issues were not comprehensively discussed. Rather, trainees were instructed on the organisation’s policy regarding obeying the road rules and the industry requirement of a zero alcohol limit. In addition, the organisation’s policy and procedures do not address specific road safety issues. Rather, the policy and procedures

(and other documentation such as incident reports) addresses an asset management approach. Previously, other initiatives have been planned (e.g., driver skills training, safety campaigns, etc) however have not been developed or implemented. This was primarily due to issues regarding management commitment (including taxi owners) and resourcing.

4 Discussion

Firstly, the paper aimed to report on the utilisation of a range of self-report driving measurement tools (e.g., DAQ and DBQ), to conduct an investigation into the driving behaviours and attitudes of a group of Australian taxi drivers. In addition, the research aimed to investigate whether taxi drivers' behaviours and attitudes regarding road safety issues were associated with crash and/or traffic offence self-reported involvement. Presently, only a small body of research has examined the self-reported driving attitudes and behaviours of work-related drivers (Davey *et al*., 2006, 2007; Sullman *et al.*, 2002), with less research focusing on the driving conduct of taxi drivers, despite the potential for such data to be utilised in fleet interventions designed to reduce the burden of crash involvement.

Examination of the mean scores for the DBQ and DAQ factors revealed that participants generally reported positive attitudes and behaviours towards road safety. In regards to attitudes, similar to previous research (Davey *et al*., 2006; Meadows, 2002), respondents reported drink driving as the most serious driving behaviour. This finding is not surprising, considering the industry zero alcohol requirement when driving taxis. Participants also reported risky overtaking and close following practices were an additional unacceptable behaviour, while attitudes towards speeding were more lenient. This finding is consistent with research which has indicated speeding is the most common form of aberrant driving behaviour reported by motorists (Davey *et al*., 2007; Lajunen *et al*., 2003; Parker *et al*., 1995). As a result, it appears taxi drivers core risky driving behaviours are similar to that of other fleet drivers e.g., speeding.

In regards to the relationship between the measurement tools, negative associations were identified between attitudes and the corresponding behaviours. That is, participants who agreed with the seriousness of the specified aberrant driving behaviours were less likely to report engaging in such behaviours over the past six months (e.g., DBQ speeding factor). More generally, the results also indicate that clear links may exist between drivers' attitudes and subsequent behaviours. As a result, attitude and behaviour toward speeding was identified as a major risk factor and should be targeted for specific countermeasure and intervention development.

Furthermore, it appears that demerit point loss is inversely related to taxi driving inexperience. For example, the data revealed that more inexperienced drivers were more likely to be involved in traffic offences. This may be due to pressure placed upon them by the organisation to rush to pick up clients or speed to satisfy the clients' need to get to their destination on time. Also, inexperienced or new drivers may speed to reduce time, in an attempt to gain more fares, hence, more personal financial benefits. However, initial financial gains for both the drivers' and management (e.g. increased finance due to more fares) may result in a financial loss if a crash occurs due to the aberrant driving behaviour. For example, costly repairs, legal and medical costs due to injuries, downtime, loss of productivity, and increased insurance premiums. In addition, speeding fines and other traffic offences are considered a breach of legislation (i.e., road rules) and as such, management could be liable, under certain circumstances, if this practice is continually condoned by management. Therefore, this evidence provides an opportunity for taxi company management to identify at risk drivers and initialise interventions to reduce the risks. For example, targeting new taxi drivers during their initial induction/training process by the inclusion of interventions aimed at proactively addressing drivers' attitude and behaviour.

The data provides an opportunity for taxi company management to identify "at risk" drivers and initialise interventions aimed at proactively addressing drivers' attitude and behaviour. Importantly, the use of such measures assist in the development of targeted interventions aimed at reducing the likelihood of a crash before the event occurs, rather than on the traditional post hoc basis. In practical terms, the above findings and further research into fleet drivers has the potential to assist in the development of targeted interventions and strategies, aimed at addressing factors contributing to aberrant driving behaviours, crashes, and offence involvement. Such interventions could range from brief education-based programs or the distribution of Occupational Health and Safety messages (e.g., road safety issues) to comprehensive support and training for individuals who are identified to be "at risk" of crash/offence involvement. Furthermore, introducing proactive interventions rather than reactive interventions is associated with increased economic gains. For example, the "flow on effect" from reducing incidents before they occur includes reduced costs associated with vehicle repair, insurance premiums and injury, etc. Other benefits include more productivity, less downtime and increased positive reputation.

In addition, the organisation has insufficient documentation in relation to driver/road safety policy and procedures including crash/offence/complaints procedures. Development of relevant and comprehensive systems and documentation addressing road safety specific issues and their subsequent communication to all staff (including drivers, taxi owners, call centre and other administrative/operational staff) ensures all stakeholders are aware of what is required. This may encourage the adoption of a "safe climate", whereby, all stakeholders are complying with one common goal (e.g., road/driver safety).

The current state of work-related road safety has many organisations not addressing the work related road safety issue as comprehensively as other work related safety risk issues within their workplace. For example, organisations often allocate more safety related resources to lower exposure and lower workplace risk processes in contrast to the high exposure and high risk of work related driving. Previously, in attempting to satisfy legislative needs, the taxi organisation has planned the development of work related road safety intervention strategies. However, the reality is that they often struggle to implement such interventions. The failure to effectively implement work-related road safety interventions often stems from a lack of management commitment and support, and general under resourcing. Thus there is an immense discrepancy between what the organisation plans to do and what is actually undertaken in addressing work related road safety risks and initiatives. Therefore, management commitment is a key to implementing successful interventions. The financial and safety benefits of successful targeted work-related road safety interventions may exceed the initial intervention resourcing and implementation costs. Furthermore, taxi management commitment to intervention implementation and resourcing increased following notification of the results presented within this paper. The results enabled management to target interventions addressing the identified risks, and potentially increasing safety and reducing costs associated with post hoc intervention development and implementation.

5 Conclusions

A number of limitations should be taken into account when interpreting the results of this study. The response rate of participants was low and questions remain regarding the reliability of the self-reported attitudes e.g., self-report bias. Questions also remain about the representativeness of the sample as the participant pool was drawn from one regional area and such driving styles may not be easily transferable to other taxi driving populations in metropolitan areas. In summary, further research is required to establish the reliability and validity of the scales for the Australian taxi setting, as well as the usefulness of the tool in informing road safety interventions for taxi drivers.

Nonetheless, the results may prove to have direct implications for taxi operational interventions, not only through supervising and monitoring the driving performance of drivers, but also through proactive measures to reduce the risk to drivers and supporting positive driver attitude and behaviours. Importantly, this process is aimed at reducing the likelihood of a work-related crash/offence before the event occurs, rather than by the traditional post hoc analysis of fleet incident databases (Davey *et al.*, 2007). The introduction of proactive-type interventions or countermeasures may have a positive safety and financial influence on both drivers' and the taxi organisation by reducing crashes and demerit point loss. As a result, the burden of economic and human costs and adverse reputation due to crashes (etc) are likely to be significantly reduced. For example, reduced repair costs, medical expenses due to injuries, rehabilitation and retraining costs, absence from work, insurance premiums, legal liability, downtime, administration costs, and loss of productivity. Therefore, the economic stability, prosperity, liveability and sustainability would increase for all stakeholders, including taxi drivers, owners and the organisation.

References

Anderson, W., Plowman, B., Leven, E. and Fraine, G. (1998). *Workplace Fleet Safety System*, Queensland Government / Queensland Transport: Brisbane.

ASCC (2008). national online statistics interactive (nosi) system. Australian Safety and Compensation Council. <http://nosi.ascc.gov.au>.

Bianchi, A. and Summala, H. (2004). 'The "genetics" of driving behaviour: Parents' driving style predicts their children's driving style'. *Accident Analysis and Prevention*, 36: pp. 655-569.

Bibbings, R. (1997). 'Occupational road risk: Towards a management approach'. *Journal of the Institution of Occupational Safety and Health*, 1, pp. 61-75.

Blockey, P.N. and Hartley, L.R. (1995). 'Aberrant driving behaviour: errors and violations'. *Ergonomics*, 38, pp. 1759-1771.

Burgess, C. and Webley, P. (2000). *Evaluating the effectiveness of the United Kingdom's National Driver Improvement Scheme.* School of Psychology, University of Exeter.

Collingwood, V. (1997). 'Promoting the safe driving policy in New South Wales fleets of 20 or more vehicles'. In STAYSAFE 36: *Drivers as workers, vehicles as workplaces: Issues in fleet management*. (Report No. 9/51). Ninth report of the Joint Standing Committee on Road Safety of the 51st Parliament. Parliament of New South Wales: Sydney.

Dalziel, J. R. and Job, R. F. S. (1997). *Taxi drivers and road safety.* A report to the Federal Office of Road Safety, Department of Transport and Regional Development: Canberra.

Davey, J. Wishart, D. Freeman, J. Champness, P. and Rowland, B. (2006). *Telstra fleet safety project progress report*. Unpublished Manuscript. CARRSQ, Queensland University of Technology: Brisbane.

Davey, J., Wishart, D., Freeman, J. and Watson, B. (2007). 'An application of the driver behaviour questionnaire in an Australian organisational fleet setting'. *Transportation Research Part F: Traffic Psychology and Behaviour*, 10, pp. 11-21.

Dobson, A., Brown, W., Ball, J., Powers, J. and McFadden, M. (1999). 'Women drivers' behaviour, socio-demographic characteristics and accidents'. *Accident Analysis and Prevention*, 31, pp. 525-535.

Downs, C., Keigan, M., Maycock, G. and Grayson, G. (1999). *The safety of fleet car drivers: A review*. Report 390. Transport Research Laboratory: Crowthorne, Berkshire, UK.

Griffiths, M. (1997). 'Selecting safer vehicles: Issues in vehicle crash safety'. In STAYSAFE 36: *Drivers as workers, vehicles as workplaces: Issues in fleet management*. (Report No. 9/51). Ninth report of the Joint Standing Committee on Road Safety of the 51st Parliament. Parliament of New South Wales: Sydney.

Haworth, N., Tingvall, C. and Kowadlo, N. (2000). *Review of best practice fleet safety initiatives in the corporate and/or business environment*. Report No. 166. Monash University Accident Research Centre: Melbourne. <http://www.monash.edu.au/muarc/reports/muarc166.html>.

Hoskins, K. (2003). 'Fleet vehicle safety management case study'. *Safety in Australia*, 25(1), pp. 25-29.

Lajunen, T., Parker, D. and Summala, H. (2003). 'The Manchester driver behaviour questionnaire: A cross-cultural study'. *Accident Analysis and Prevention*, 942, pp. 1-8.

Lynn, P. and Lockwood, C. (1998). The *accident liability of company car drivers*. TRL Report 317. Transport Research Laboratory: Crowthorne, Berkshire, UK.

Meadows, M. (2002). *Speed awareness training*. 67th Road Safety Congress, 4–6 March, Stratford, UK.

Mooren, L. and Sochon, P. (2001). *Fleet and corporate driving safety education*. Road Safety: Research Policing and Education Conference, Melbourne, 19-20 November. <www.Fleetsafetysolutions.com/Files/FleetandCorporateDrivingSafetyEducation.pdf>.

Mooren, L. and Sochon, P. (2004). *Employers' contribution to national road safety targets. Road Safety Towards 2010*. Year Book of the Australasian College of Road Safety.

Murray, W., Newnam, S., Watson, B. C., Davey, J. and Schonfeld, C. C. (2002). *Evaluating and improving fleet safety in Australia*, Australian Transport Safety Bureau: Canberra.

Parker, D., Stradling, S.G., and Manstead, A. (1996). 'Modifying beliefs and attitudes to exceeding the speed limit: An intervention study based on the theory of planned behaviour'. *Journal of Applied Social Psychology*, 26, pp. 1-19.

Parker, D., West, R.J., Stradling, S.G., and Manstead, A. R. (1995). 'Behavioural characteristics and involvement in different types of traffic accident'. *Accident Analysis and Prevention*, 27(4), pp. 571-581.

Parker, D., Reason, J.T., Manstead, A., and Stradling, S.G. (1995). 'Driving errors, driving violations and accident involvement'. *Ergonomics*, 38, pp. 1036-1048.

Reason, J., Manstead, A., Stradling, S., Baxter, J., and Campbell, K. (1990). 'Errors and violations: A real distinction?' *Ergonomics*, 33, pp. 1315-1332.

Rowland, B., Wishart, D. and Davey, J. (2005). *Occupational fleet safety research: A case study approach*. Occupational Health and Safety Visions Conference, 27-30 September: Cairns.

Staysafe 36. (1997). 'Injury risk and injury control in the New South Wales taxi industry: workplaces safety, road safety and public safety'. In *Drivers as workers, vehicles as workplaces: issues in fleet management.* Report No. 9/51. Edited Transcripts of a seminar held at Parliament House, Sydney.

Stewart-Bogle, J.C. (1999). *Road safety in the workplace. The likely savings of a more extensive road safety training campaign for employees*. Insurance Commission of Western Australia Conference on Road Safety 'Green Light for the Future', <http://www.transport.wa.gov.au/roadsafety/Facts/papers/contents.html>.

Sullman, M.J., Meadows, M. and Pajo, K.B. (2002). 'Aberrant driving behaviours amongst New Zealand truck drivers'. *Transportation Research Part F*, 5, pp. 217-232.

WA. (2003). *Road Safety in the Workplace. Seven steps to safer use of company cars and light vehicles*. <http://www.transport.wa.gov.au/roadsafety/Facts/workplace/workbook/index.html>.

Wheatley K. (1997). 'An overview of issues in work-related driving'. In *Staysafe 36: Drivers as workers, vehicles as workplaces: Issues in fleet management*. (Report No. 9/51). Ninth report of the Joint Standing Committee on Road Safety of the 51st Parliament. Parliament of New South Wales: Sydney.

Wishart, D. and Davey, J. (2004). *A research based case study approach to the development of fleet safety interventions in large vehicle fleets*. Safety in Action Conference, 30 March - 1 April: Melbourne.

Wishart, D., Davey, J., and Freeman, J. (2006). *An application of the driver attitude questionnaire to examine driving behaviours within an Australian organisational fleet setting*. Road Safety Research, Policing and Education Conference: Gold Coast.

Wishart, D., Davey, J., Manderson, J. and McKinnon, L. (2004). *Analysis of serious motor vehicle crashes.* Unpublished Manuscript, February, 2004. . CARRS-Q, Queensland University of Technology: Brisbane.

VicRoads. (2003). *Chain of Responsibility: Overview*. Victorian Government. <http://www.vicroads.vic.gov.au/Home/HeavyVehicles/ComplianceAccreditation/>.

Vincent, J. (1997). 'Road safety programs for occupational drivers'. In *STAYSAFE 36: Drivers as workers, vehicles as workplaces: Issues in fleet management*. (Report No. 9/51). Ninth report of the Joint Standing Committee on Road Safety of the 51st Parliament. Parliament of New South Wales: Sydney.