The Relative Influence of Fleet Safety Climate on Work-Related Driver Safety

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Biography

Andrew Wills is a PhD Scholar with CARRS-Q and holds a Bachelor of Psychology (First Class Honours) from QUT. His PhD research aims to develop and evaluate organisational countermeasures to improve safety culture/climate in fleets. He has had experience working on road safety research projects with CARRS-Q.

ABSTRACT

In the past, fleet management has primarily had an asset management focus, with safety initiatives being reactive to particular incidents or events. More recently, it has been recommended that fleet managers should work to facilitate a safety conscious organisational culture/climate, though this has not yet been empirically investigated in a fleet setting. This study investigated the influence of fleet safety climate upon three self-reported measures of work-related driver safety: 1) current work-related driver behaviour; 2) past crash involvement while driving for work; and 3) past traffic offences while driving for work. A questionnaire was completed by 323 drivers from three Queensland based fleets. There was a significant positive relationship between fleet safety climate perceptions and the safety of work-related driver behaviour (r = .42). Multiple regression analysis revealed that safety climate perceptions were a significant predictor of current work-related driver behaviour and were a better predictor than other psychological and socio-demographic factors. However, further analyses showed that fleet safety climate did not significantly predict previous work-related crash or offence involvement. Some organisational differences were also explored. These results suggest that while fleet safety climate influences current fleet driver behaviour, the long-term effect of this on crash and offence involvement remains unclear. In practical terms, organisations (particularly fleet managers and supervisors) need to consider the impact of organisational factors upon employee driver behaviour. Further research is required to investigate the association between fleet safety climate and on-road incidents (namely crash involvement and traffic offences).

INTRODUCTION

Why focus on work-related driver safety?

In Australia, work-related driver safety is an increasingly pertinent issue for occupational health and safety, as on-road motor vehicle crashes are the leading cause of work-related fatalities (Haworth, 2002). Research by the Australian National Occupational Health and Safety Commission (NOHSC) showed that an average of 26% of work-related fatalities (between 1989-1992), resulted from crashes on public roads during the course of work (NOHSC, 1998). In the state of Queensland, 37% of all fatal vehicle crashes between 1997-2000 involved a commercial vehicle (Meers, 2002). The injuries associated with work-related crashes are estimated to cost Australia over half a billion dollars each year, and are twice as likely to cause disability and fatality than other occupational accidents (Wheatley, 1997). The issue of work-related road safety is also of international relevance. For example, in Sweden

work-related driving is the leading cause of occupational fatalities (Official Statistics of Sweden, 1992 as cited in Bylund, Björnstig, & Larsson, 1997). In the USA, 33% of work-related fatalities result from motor vehicle crashes (Moser, 2001), and 25% of all fatal and injury causing crashes occur during the course of work in the UK (Bibbings, 1997).

Fleet safety strategies

These statistics suggest that reducing the incidence of crashes and enhancing driver safety is a key priority for fleet safety management and occupational health and safety (Moser, 2001; Murray & Dubens, 1998; Murray, Newnam, Watson, Davey, & Schonfeld, 2002). Under Australian Workplace Health and Safety (WH&S) legislation and duty of care obligations, employers are responsible for minimising the risks involved in driving for work (Hoskins, 2003). Primarily this involves implementing control strategies such as safety policies and procedures, ensuring vehicle safety, and providing adequate training for employees. Further to this, the introduction of chain of responsibility laws increases the accountability of employers, managers, and all other workers involved in the chain of commercial transportation (NTC, 2004).

Traditionally, the role of those involved in fleet management has centred on the economic management of vehicles as company assets (Haworth, Tingvall, & Kowadlo, 2000). Traditional strategies for improving safety have often involved implementing driver training programs. The evidence regarding the effectiveness of these techniques is mixed, and researchers have stressed that there are many other person-related influences upon driver safety and crash risk (such as psychological and cognitive factors) which may be neglected by employing only skill-based training (Watson, 2003). Gregersen et al. (1996), compared the effectiveness of four driver safety countermeasures in the Swedish telecommunications company (Televerket). These included driver training, road safety campaigns, discussion groups, and bonuses for ‘crash free driving’. Discussion groups and driver training led to significant reductions in crash risk over two years, but all strategies led to decreased crash costs. These results suggest that while the focus on improving on-road skills can be beneficial, it is not the only point for intervention. Research is needed to identify the benefits of other strategies for organisations.

Over recent years, there have been calls for safety to become a core component of professional fleet management. Not only will this reduce the costs associated with commercial motor vehicle damage, but also the hidden costs resulting from injuries (Murray et al., 2002). It has been argued that fleet managers should work to create a proactive ‘fleet safety culture’ and ‘fleet safety climate’ within organisations (e.g. Moser, 2001; Murray, 2003; Murray & Dubens, 1998). This literature is often limited by a lack of research based support. One study however, found that inter-organisational differences in drivers’ awareness of fleet safety policies were reflected by differences in drivers’ self-reported safety behaviour (Newnam, Watson, & Murray, 2002). While this result provides some support for the notion of fleet safety climate, more rigorous investigations are required to empirically establish the extent of the link between organisational climate and fleet driver safety.

Safety climate theory and research

The notion of safety climate has gained increasing attention in fleet safety literature in recent years. However in the safety sciences, researchers have discussed safety climate for over two decades (e.g. Glendon & Stanton, 2000; Guldenmund, 2000; Zohar, 1980). While there have been some points of contention, the term 'safety climate' is generally used to refer to workers' perceptions about: what is considered normal safety practice in the organisation; how committed management are to safety; safety management systems such as policies and procedures; and work pressures (Flin, Mearns, O'Connor, & Bryden, 2000). That is, safety climate is a phenomena that arises within organisations and represents the overall mental construct or framework that employees have about how safety is treated in their workplace. The research literature suggests that organisations influence the safety of their employees' behaviour through safety climate (i.e. workers' perceptions of organisational safety shape their occupational behaviours). Research from various industrial settings has shown links between self-reported safety climate and company accident rates (Diaz & Cabrera, 1997; Varonen & Mattila, 2000), occupational injury rates and severity (Mearns, Flin, Gordon, & Fleming, 1998; Mearns, Whitaker, & Flin, 2003), and workers compensation claims (O'Toole, 2002).

In this paper, 'fleet safety climate' will refer to the mental framework or set of perceptions that drivers hold about fleet safety policies and practices in their organisation. This includes for example, workers' perceptions about how committed managers and supervisors are to driver safety, how well fleet safety policies are communicated to employees, and their workload. It is also important to note that while the terms culture and climate are commonly used interchangeably, theoretical and practical distinctions have been made between these concepts (Guldenmund, 2000; Mearns & Flin, 1999; Reichers & Schneider, 1990). While a comprehensive discussion is beyond this review, this study has been designed with the distinction in mind.

Safety climate refers to employees' perceptions about safety practices, so it is psychological in nature. However, safety culture is a broader indication of organisational safety and includes for example organisational behaviours, accidents, injuries, attitudes, beliefs, practices, and rules (Guldenmund, 2000). Safety culture is complex and cannot be defined as purely psychological or behavioural, making it difficult to measure. Safety climate, on the other hand, is a phenomenon that emerges from the larger organisational safety culture and is often described as the psychological manifestation of safety culture. As such, *fleet* safety climate is nested within the wider organisation's safety climate. An organisation may have many sub-climates, and the fleet safety climate may differ depending on the nature of the organisation and the role of work-related driving within it.

AIMS

While there is evidence supporting the link between safety climate and occupational accidents and injuries, the evidence regarding a link between self-reported safety behaviour is limited. Nor has the relationship been empirically examined in the fleet setting. The aim of this study was to address this limitation by examining the association between fleet safety climate and the safety of drivers at work. In doing so, it examines the relationship between fleet safety climate and three self-reported indicators of work-related driver safety, namely: 1) current work related driver

behaviour; 2) past crashes while driving for work; and 3) prior traffic offences while driving for work.

In order to examine the relative influence of fleet safety climate, some additional variables which have been linked to driver safety were incorporated into the analyses. These included demographic and driving exposure factors, and general attitude towards driver safety. This latter variable was included due to the growing evidence indicating that attitudes are an important predictor of various driver behaviours such as aggressive driving and speeding (Parker, Lajunen, & Stradling, 1998; Parker, Manstead, Stradling, Reason, & Baxter, 1992; Stradling & Parker, 1997).

METHOD

Three Queensland based organisations with large vehicle fleets participated in the study. The study questionnaire was randomly distributed to drivers at each organisation via their internal mail systems. Instructions were included which emphasised the voluntary and anonymous nature of the research. Completed questionnaires were returned directly to the researchers at QUT to ensure participant anonymity. The study questionnaire consisted of several sets of items regarding their perceptions about: company commitment to fleet and driver safety (fleet safety climate); their attitudes towards driver safety; their current work-related driver behaviour; past crash involvement and traffic offences while driving for work; and other socio-demographic information. It is important to note that participants were asked to report crash and offence involvement for the previous three year period to ensure sufficient numbers for analysis. A total of 329 drivers responded, representing an overall response rate of 33%. Six drivers were not included in analysis due to missing information resulting in an overall sample of 323 drivers.

Fleet safety climate was measured using a modified version of the Safety Climate Questionnaire (Glendon & Litherland, 2001), and required drivers to rate on a 5-point scale the extent to which statements about fleet safety and occupational safety in general applied to their organisation. It included 6 factors which measured perceptions about management commitment to fleet safety, fleet safety rules, driver training practices, work pressures, work-relationships and organisational communication.

Current driver behaviour was measured using a modified version of the shortened Driver Behaviour Questionnaire (Lawton, Parker, Manstead, & Stradling, 1997) and was modelled on a similar scale used in previous research (see Newnam et al., 2002). This scale asked drivers to estimate on a 6-point scale how often they commit errors, traffic violations, and aggressive violations. Items were also included about fatigue, tiredness, distraction, and mobile phone use, as research has previously indicated that these are key risk factors for work-related drivers (Salminen & Lahdeniemi, 2002). Items about drivers' vehicle maintenance behaviours were also included to measure an important means through which drivers can demonstrate proactive safety behaviour. Items about reversing behaviour were also included as preliminary research and anecdotal evidence based on discussion with fleet personnel, indicated that reversing is a significant safety issue for fleets. Overall, included in the final analyses were factors which measured: driving errors, violations, psychological distraction (including tiredness and mobile phone use), and vehicle

maintenance behaviour. Driver attitudes were measured using the Driver Attitude Questionnaire (Parker, Stradling, & Manstead, 1996) which has been shown to be a useful measure of key attitudes towards driver safety. This questionnaire asks drivers to rate on a 5-point scale the extent to which they agree with statements about drink driving, close following, overtaking, and speeding.

RESULTS

Descriptive statistics

Table 1 shows demographic characteristics and driving exposure information for the sample. Across each organisation the majority of drivers were male[1] and between 40-49 years of age, possessing over 21 years of driving experience. Most reported spending under 21 hours per week driving for work, and driving under 30,000 kilometres per year for work purposes. The majority indicated that they drove a company owned or leased vehicle (87% overall), which was marked with the company's logo (96% of company owned/leased vehicles). The most commonly reported vehicle types driven were cars (38%), followed by utilities (27%), and four-wheel drive vehicles (24%).

Table 1. Demographic Characteristics and Driving Exposure Information

Variable	Organisations			
	A (n = 70)	B (n = 164)	C (n = 89)	Total (N = 323)
Response rate	36%	33%	30%	33%
Gender				
Male	84.3%	98.8%	90.9%	93.5%
Female	15.7%	1.2%	9.1%	6.5%
Age (years)				
17-24	8.6%	1.2%	1.1%	2.8%
25-29	14.3%	4.3%	5.7%	6.9%
30-39	20.0%	21.5%	23.9%	21.8%
40-49	32.9%	49.1%	40.9%	43.3%
50-59	22.9%	21.5%	27.3%	23.4%
≥ 60	1.4%	2.5%	1.1%	1.9%
Driving experience (years)				
< 1	-	-	-	-
1-3	-	0.6%	-	0.3%
4-7	5.7%	3.0%	-	2.8%
8-15	24.3%	7.9%	11.4%	12.4%
16-20	8.6%	15.2%	15.9%	14.0%
≥ 21	61.4%	73.2%	72.7%	70.5%
Exposure (hours per week)				
≤ 10	7.1%	36.0%	65.2%	37.8%
11-20	40.0%	38.5%	31.5%	36.9%
21-30	20.0%	14.9%	1.1%	12.2%
≥ 31	32.9%	10.6%	2.2%	13.1%

[1] It is important to note that due to the small number of female participants, consideration was given to excluding females from statistical analysis. However, as this ratio reflected the nature of the industries involved they were included to ensure that the sample was representative of the population of fleet drivers in these organisations.

Self-reported driver behaviour

The bivariate correlations between the variables are shown in Table 2. There were moderate positive correlations between fleet safety climate and driver behaviour, and driver safety attitudes and behaviour. There was a weak correlation between fleet safety climate and driver safety attitudes. Multiple regression analysis revealed that together fleet safety climate, driver safety attitudes and socio-demographic factors accounted for 26% of the variance in driver behaviour, F (4, 314) = 27.17, $p < .001$ (see Table 3). Inspection of the Beta (β) coefficients (see Table 3) showed that fleet safety climate was the strongest predictor, uniquely accounting for 16% of the variance in driver behaviour. Driver safety attitudes was the next strongest predictor, accounting for 6%.

Table 2. Bivariate Correlations (r) Between Variables (N = 319)

Variable	Driver Behaviour	1	2	3	4
1. Fleet safety climate	.42**	-	.18**	.00	.01
2. Driver safety attitudes	.30**		-	.11*	-.01
3. Driving experience	.13*			-	.01
4. Driving exposure (hours per week)	.15*				-

*$p < .05$. **$p < .001$

Table 3. Standard Regression Analysis for Driver Behaviour (N = 319)

Variable	B	Std. error	β	sr^2 (unique)	R^2	$Adj\ R^2$
Fleet safety climate	.26**	.03	.38	.16		
Driver safety attitudes	.20**	.05	.22	.06		
Driving experience	.05*	.02	.11	.02		
Driving exposure	.04*	.01	.15	.03		
					.26**	.25

*$p < .05$. **$p < .001$.

Self-reported crashes and offences

Logistic regressions were conducted to examine the influence of climate, attitudes, driving exposure and experience on past crash and offence involvement. Fifty-eight drivers reported being involved in at least one crash while driving for work and 86 drivers reported committing at least one traffic offence while driving for work. Logistic regression (target = no work-related crashes) revealed that overall the variables did not predict work-related crash involvement, $p = .15$. Logistic regression (target = no work-related traffic offences) also revealed that overall the four variables did not predict work-related offences, $p = .45$.

To further explore the data, a series of analyses were undertaken to examine differences in fleet safety climate and driver safety attitudes as a function of work-related crash and traffic offence involvement. As shown in Table 4, drivers who reported being involved in a crash reported significantly less safe driving behaviour than those who were not involved in a crash, t (321) = -2.19, $p < .05$. However, there were negligible differences in driver behaviour scores as a function of whether participants had committed any traffic offences ($p = .19$). Although the differences in mean fleet safety climate scores between drivers who had and had not been involved

in a crash were not significant (p = .22). It is worth noting that drivers who were not involved in a crash did report safer climate perceptions. There were no fleet safety climate differences between those who reported committing traffic offences and those who did not (p = .79). There were no differences in driver safety attitudes between those involved in a crash and those not (p = .82). However, drivers who reported traffic offences had significantly lower driver safety attitude scores than those who did not, t (321) = -2.05, p < .05.

Table 4. Mean Scores as a Function of Work-Related Crashes and Offences (N = 323)

	Yes	No	t
Fleet driver behaviour			
Crashes	4.84 (.42)	4.98 (.42)	-2.19*
Offences	4.90 (.41)	4.97 (.42)	-1.32
Fleet safety climate			
Crashes	3.56 (.60)	3.67 (.62)	-1.23
Offences	3.64 (.65)	3.66 (.61)	-.26
Driver safety attitudes			
Crashes	3.47 (.48)	3.46 (.45)	.23
Offences	3.38 (.48)	3.49 (.44)	-2.05*

Note. Values in parentheses represent standard deviations.
* p < .05

Organisational differences

A one-way ANOVA revealed that there were significant differences in fleet safety climate scores between organisations as shown in Table 5 below. Post-hoc comparisons (using a Bonferroni adjustment) showed that the mean fleet safety climate score for Fleet B was significantly greater than Fleet C (p < .05). This suggests that Fleet B drivers held more positive fleet safety climate perceptions than Fleet C drivers. There were no significant differences in driver behaviour scores between organisations. As can be seen in Table 5, although not significant the differences between organisations in driver behaviour reflected that of the fleet safety climate differences.

Table 5. Mean Fleet Safety Climate and Driver Behaviour Scores by Organisation (N = 322)

	Fleet A	Fleet B	Fleet C	F
Fleet safety climate	3.59 (.62)	3.74 (.62)	3.54 (.60)	3.61*
Fleet driver behaviour	4.97 (46)	4.99 (.40)	4.87 (.42)	2.29

Note. Values in parentheses represent standard deviations.
* p < .05

Drivers' self reported involvement in work-related crashes and offences are shown in Table 6. Drivers from Fleet A reported the most crashes, followed by Fleet B and C respectively. Further analysis showed that the difference between Fleets A and C was significant, χ^2 (1, N = 159) = 6.77, p < .01. This suggests that drivers from Fleet A were significantly more likely to have been involved in at least one crash than drivers from Fleet C. There were no differences in self-reported traffic offences between organisations.

Table 6. Crash and Offence Involvement by Organisation (*N* = 323)

	Fleet A	Fleet B	Fleet C	Chi Square
Crashes (≥ 1)	25.7%	18.9%	10.1%	
No Crashes	74.3%	81.1%	89.9%	6.68*
Offences (≥ 1)	30.0%	24.4%	28.1%	
No offences	70.0%	75.6%	71.9%	0.93

* $p < .05$

DISCUSSION

The influence of fleet safety climate

Results from the multiple regression analysis revealed that fleet safety climate was the strongest statistical predictor of work-related driver behaviour. This suggests that employees' overall perceptions about organisational fleet safety practices had a stronger association with their behaviour than other socio-demographic (driving experience and work-related driving exposure) and psychological factors (driver safety attitudes). However, logistic regressions revealed that none of the variables were significant predictors of past work-related crash or traffic offence involvement. Further analysis showed that there were no differences in fleet safety climate or driver safety attitudes between those drivers who reported being involved in a crash and those who did not. Similarly, there were no differences in fleet safety climate between drivers who reported being involved in an offence and those who did not. However, drivers who reported having no work-related traffic offences had significantly safer attitudes towards driving.

Organisational differences

To further explore the concept of fleet safety climate, differences in employees' self-reported perceptions and behaviours between organisations were investigated. There were some organisational differences between Fleets B and C, where Fleet B drivers reported more positive perceptions of organisational fleet safety practices. While there were no statistically significant differences in driver behaviour between organisations, drivers from Fleet B reported safer driving behaviour than Fleet C. Suggesting that some of the organisational differences in employee safety climate were reflected in driver behaviour. However, analysis of self-reported crash and offence involvement did not reflect these differences.

Interpreting the results: The role of fleet safety climate

The results provide mixed evidence regarding the potential role played by employees' fleet safety climate perceptions. On one hand, the evidence suggests that, when all other factors are treated as equal, fleet safety climate had a stronger statistical association with self-reported driver behaviour than the other factors considered in this study (including attitudes and demographic factors). If so, then the results can be interpreted as suggesting that organisational fleet safety practices may influence employees' level of safety when driving for work. Similarly, some of the organisational differences in fleet safety climate were reflected in differences in drivers' self reported behaviour. On the other hand, the logistic regressions found that none of the factors included in the analyses predicted self-reported crashes or offences. Nor were the organisational differences in fleet safety climate reflected by the crash involvement differences.

These findings highlight that the nature of work-related driver safety is complex. Organisations and fleet managers in particular, need to implement practices and policies which are based on both WH&S legislative requirements and the findings of current research. The results of this study suggest that the past focus on driver training should be complemented by consideration for the impact of organisational factors. While the results do not provide direct support for a fleet management focus on creating proactive fleet safety cultures, they suggest that organisations do in some way influence their employees' driving behaviour. At the very least, the results indicate that this occurs through the influence that organisational practices have upon employee perceptions. In turn, this suggests that organisations may benefit from considering the impact that their policies and practices have upon employee driver safety. In practice, this may involve taking a multi-pronged approach to fleet safety which recognises the need to focus on investigating and enhancing organisational practices, as well as driver training.

Limitations

The results pertaining to crashes and traffic offences suggest that fleet safety climate may not necessarily be reflected in past on-road events. This may be indicative of the fact that crashes and offences were measured in terms of the previous three year period. As safety climate is likely to be a fluid construct that may change over time, this may have influenced these results. Respondents may also have suffered from recall biases when thinking about past traffic incidents and behaviours. For example, those who believe they are safe drivers may suffer biases when asked to recall their own behaviour. Additionally, crashes are complex events which have a number of contributing factors such as psychological, demographic, neurological and perceptual factors, the on-road environment or situation. It was not the aim of this study to account for a comprehensive array of influences, and as such this may limit results pertaining to crashes and offences. The relationship between driver safety attitudes and offence involvement may also reflect the more static nature of attitudes as a psychological variable. That is, while employees' perceptions will change over time as a direct reflection of organisational change, attitudes may not shift as freely given their dispositional nature.

It is important to note that some methodological limitations restrict the extent that the results can be generalised to other settings and vehicle fleets. Firstly, the organisations participating in the study had already demonstrated a commitment to driver safety, as evidenced by their preparedness to participate. Secondly, although the three fleets included drivers from both metropolitan and rural areas, it should be acknowledged that they were all operated solely in Queensland (and under the legislation and regulations of that state). Thirdly, due to the voluntary nature of this study drivers were self-selected for participation. This may have minimised the response rate (although 33% is acceptable for a study of this nature), reducing the overall representativeness of the driver sample. Finally, it is important to note that the analyses included and the resulting interpretations are based on self-reported information. While this is a commonly accepted approach, this should be considered when interpreting the results.

Future directions

Past research had failed to investigate the association between employees' perceptions about their organisation's fleet safety practices and the safety of their on-

road behaviour when driving for work. This study aimed to address this by examining the statistical relationship between global/general measures of fleet safety climate and driver safety. The results suggest that overall fleet safety climate has some influence over driver safety which may be a stronger than some other psychosocial and socio-demographic factors. However, it does not indicate which specific organisational practices or which elements of fleet safety climate influence which specific on-road behaviours. Currently, further explorative investigation is being undertaken to address this research question. This research aims to examine for instance, which elements of fleet safety climate have the strongest influence upon aggressive behaviour, feeling distracted, or errors, while driving for work. Further research also needs to address the methodological issues associated with investigating the relationship between fleet safety climate and traffic crashes and offences.

Conclusions

When taking a systems approach to road user behaviour, work-related driver safety is certainly a key factor of concern. This study suggests that organisations may shape individuals' work-related driving behaviour indirectly through the organisational fleet safety climates that evolve. On the other hand, the evidence linking fleet safety climates with crashes and offences is limited due to methodological constraints. Future research needs to address these limitations. Organisations should consider the association between fleet safety climate and work-related driver behaviour when addressing fleet safety.

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Keywords

Fleet safety, fleet safety climate, work-related driver behaviour, organisational factors

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