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EcoDriving: Insight from a real world fleet-based trial

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Abstract

There is a dearth of rigorous evaluation of ecodrive training, and therefore a lack of certainty as to its benefits in terms of reduced fuel use, particularly for ongoing, real-world driving. Several factors critical to the likelihood of success of instigating an ecodriving program within a corporate fleet, and the ability to assess both the benefits and full range of costs, are tied to the organisation's management principles, policies and practices. While all proponents of ecodrive training note the importance of such corporate and management factors, no example was found in the literature assessing the reality of actually applying them. Here we describe the experience of trialling an ecodrive training program and monitoring outcomes for six months across four corporate fleets of passenger cars and light commercial vehicles; in two of those fleets the monitored vehicles were driven by dedicated drivers (i.e. one driver per vehicle), a third involved pool vehicles, and the fourth was a mix of fleet types. Initial results provide insight into the impact of ecodrive training and highlight shortcomings with existing management information systems that need to be overcome for organisations to more effectively manage fuel economy. The lessons are relevant for those who market such training, those who seek to apply it, and those tasked with determining whether it is a worthwhile expense and disruption to the business. The insight from this trial also has implications for transport policy formulation, particularly the extent to which ecodrive training might be part of an overall strategy designed to reduce carbon emissions.

1. Introduction

Volatile fuel prices, an uncertain economic environment, and increasing concerns about climate change are all focusing attention on the need for the road transport sector to improve fuel economy and reduce its CO_2 footprint. While engineering improvements are being made to reduce vehicle fuel consumption, there will a significant lag before those advancements permeate to a significant proportion of the national fleet and make an appreciable difference on a larger scale. In contrast, changing driver behaviour to a style that is less fuel intensive has the potential to pay dividends immediately, and regardless of the age and type of vehicle being driven. Such driver training or education programs have a range of names, some of them trademarked, indicating the involvement of commercial interests. We use the generic term "ecodriving" to encompass all of them. Pioneered and vigorously promulgated throughout Europe for some time, ecodriving is now gaining increasing attention in the United States and Australia.

At its core, ecodriving encapsulates a number of related activities and techniques. It involves monitoring engine revolutions to make timely gear changes, travelling at an optimum speed for the gear and engine's torque curve, and anticipating traffic conditions in order to maximally conserve momentum. Thus ecodriving emphasises a smooth driving style. Drivers are encouraged to "flow" the vehicle, anticipating potential interactions by looking further

down the traffic stream so they can brake less forcefully and less often and avoid unnecessary acceleration – maximally conserving momentum. The gear change advice might seem more relevant for Europe, where cars with manual transmissions are more popular than they are in Australia. However the driver of a car with an automatic gearbox can influence when the engine management computer "decides" to change gear through their use of the throttle, so the advice applies regardless. Other elements of ecodriving include using the air conditioner sparingly, minimising idling, optimising aerodynamic profile by removing unused roof racks, minimising unnecessary weight, adhering to a regular servicing regime, and ensuring tyres are inflated to their maximum advisory pressures.

Though it may have had a variety of names, the concept of ecodriving has been in existence for at least 15 years, and its use has been widespread in Europe – between 1993 and 1999 more than 27,000 individuals were trained in its use in Switzerland alone (Hornung, 2004). Much of the European literature cross references other European studies with the website of the main European ecodrive initiative (www.ecodrive.org) a common reference point along with Treatise (www.treatise.eu.com), an EU funded program that ran from 2005 to 2007 and focussed on training in environmental transport.

Four key points emerge from even a casual examination of the ecodrive literature. First, a relatively modest number of separate field trial studies are reported in the literature, though some of them have involved large numbers of drivers. Second, European studies clearly dominate. Third, almost without exception published studies report a positive effect in terms of reductions in fuel consumption, which is not surprising given that academic papers reporting a null result are less likely to be published, and "studies" found online are often "published" by vested interests and may be part of a training provider's sales pitch. Fourth, most studies seem to lack scientific rigour, or at least do not include sufficient detail to critically evaluate the degree of rigour and thus determine whether a bias might exist due to a vested interest or flawed design.

There are two areas in particular in which the descriptions of the studies provide little insight: the organisational context, and the details of the content and nature of the training. The former consideration is of particular focus for this paper. None of the studies reviewed by Symmons, Rose and Van Doorn (2009) describe the organisational context surrounding the ecodrive trial. Rarely was any mention made of the extent to which a program's implementation was supported by senior management, whether it was linked to occupational health and safety policies or practices, or the extent to which the organisation provided information or feedback to drivers to retain motivation and engagement with the ecodrive behaviours. Any of these factors could represent an extraneous or confounding variable depending on the design of the intervention.

Somewhat of a narrative and mostly descriptive in nature, the current paper reports on a number of organisational aspects that arose when preparing, delivering and evaluating a six month ecodrive trial in two large and two small fleets. The insight has potential relevance to future trials or programs being delivered within fleets. The evaluation of the outcomes of the trial in terms of any changes in fuel consumption will be published in detail elsewhere.

2. The trial

A preferred model for maximum evaluative rigour is a longitudinal, mixed design. A set of data – primarily fuel consumption – is required before and after the intervention in order to allow for a before versus after, or within-groups, comparison. While the before versus after comparison is by far the most commonly reported design in the ecodrive literature, it is rare for a control group to be included. The inclusion of a control group whose members are not exposed to the intervention, allows for a between-groups comparison (a mixed design includes both within- and between-groups components). That allows potential confounds that may arise during the evaluation period to be accounted for, so long as both groups are exposed to those variables. For example, a control group from the same organisation in a

similar geographic area will be exposed to the same seasonal and other wider environmental impacts as the treatment group. They will also be exposed in a similar manner to any changes related to their employer, and the employer's business and practices. The need for a control group becomes increasingly critical for longer periods of evaluation because there is more scope for other factors to have an influence.

A shorter evaluation period will be cheaper and easier, and be less prone to issues such as participant dropout. However, such an approach is less informative regarding the strength and longevity of the impact of any change in behaviour, hence the need for a longitudinal study. For instance, a driver may reduce their fuel consumption immediately after the intervention due to a heightened interest in the topic or heightened belief in its importance, or simply because they know they are being monitored. Many published studies are based on before versus immediate-after differences. However such effects are likely to have less impact over the medium to longer term.

A longitudinal mixed design requires a greater commitment from the fleet operators involved. Approximately double the number of drivers are required to participate and care must be taken to treat both the treatment and control groups in a similar manner, except for the intervention itself. Thought must also be given to the potential implications of "contamination" between the groups.

In the current project, treatment drivers undertook one of two types of intervention. An online course consisted of a collection of self-paced modules with varying degrees of interaction designed to teach participants the basic tenets of ecodriving. Drivers were asked to complete the course within a one-week window so that the data collection could begin, although the online course remained open for the duration of the trial to allow drivers to return to modules if they wished. The alternative intervention was a course consisting of a 1½-2 hour classroom session followed by an accompanied drive of 20 to 40 minutes duration with the course instructor. Both types of training were delivered by separate, independent, commercial providers.

Table 1 summarises the number of drivers involved from each fleet in the current study, the type of training allocated to that fleet, and whether the vehicles involved were allocated to specific drivers or were used as pool vehicles.

Table 1. Summary of participating fleets.

Fleet	Number of drivers			Fleet type	Intervention
	Trained	Control	Total		
1	28	27	55	Allocated vehicles	Classroom+on-road
2	45	55	100	Allocated vehicles	Classroom+on-road & Online
3	31	451	482	Pool vehicles	Online
4	250	260	510	Pool vehicles	Online
Total	354	793	1147		

The online course has a number of advantages beyond the fact that it is cheaper per driver to fund. It also has a lower cost in terms of the reduced productivity resulting from simultaneously diverting a group employees from their primary tasks for the duration of the training. There are also the practical considerations of putting a large number of drivers through an intensive course within a short window of time. Thus elements beyond simple cost determined the intervention type employed by each fleet in the current study. The opportunity to compare training types was also seen as a valuable research question, particularly given that many fleets are likely to opt for online training because it is cheaper and easier. It is further worth noting that when company management ponders whether to put its drivers through an ecodrive program, a smaller systematic reduction in subsequent fuel use is required from the cheaper online option to render it a viable, cost-effective activity.

Across the four fleets participating in this study, the vehicles were a mix of cars, utilities, vans and four wheel drives. A mixture of fuel types were present: unleaded, LPG, diesel, and unleaded/LPG dual fuel. These two facts, both very common amongst corporate fleets, complicate the study's design as different levels of fuel economy would be expected from different vehicle types and different fuel types. Three mechanisms are available to remove these variables as potential confounds; match the fleet compositions between groups, isolate and remove vehicles that do not conform to the predominant vehicle type, or if they make up a small proportion of the fleet ensure that they are randomly distributed between the groups. All three mechanisms were employed across the fleets in the current study in order to maximise participation without compromising integrity and rigour.

Across the fleets two "types" of driver were involved. In the two smaller fleets the drivers had allocated vehicles – they had a specific vehicle assigned to them by their employer and rarely if ever shared it with other drivers within the fleet – this applied to the two smaller fleets participating in this trial. In the two larger fleets the vehicles belonged to a pool and were available for use by any of the drivers belonging to that pool.

Pool vehicles present a problem that does not exist for allocated vehicles. A pool vehicle must have every trip recorded separately – whether the driver was a trained or control driver, distance travelled, and so on. Additionally, the fuel tank must be re-filled after every use. Such a requirement would be particularly onerous and unworkable if the vehicles were often used for short trips. To account for this issue multiple vehicle pools within the fleet participated. At a particular treatment office/depot each driver using a pool vehicle had to have completed the training, and each driver at a control office had to have not completed the training. It was thus important to "match" the offices/locations so that the trained and control drivers would be exposed to as many common corporate and management aspects as possible. For the larger fleets taking part in this study care was taken to achieve as good a match as possible in terms of geographic location (e.g. a metropolitan treatment office was matched with a metropolitan control office), the type of work and driving carried out by staff from the offices, the sub-fleet composition and size, and the core work undertaken at/by those offices.

Due to company and income tax reporting requirements, potential fraud detection, and other record keeping, each fleet's spokesperson was confident that their current data collection and reporting practices would be consistent with that required for the proposed controlled study. Further, given that vehicle use is funded by the company there should be no reason for a driver to not fill their tank every time they re-fuelled. This would have several advantages if it proved to be the case. It would mean that the before-intervention data could be taken from existing information already held by the fleets – the trial would not need to begin with a period of data collection before applying the intervention. In addition, if this was the predominant practice then drivers would not need to change their practices – they could proceed as before with established habits.

The predominant source of data would be the refuelling records. Each driver was already required to enter their odometer reading at the time they used a corporate fuel card. If the driver fuelled to the same point each time – the first "click-off" – and recorded their odometer reading at the service station counter when using the corporate fuel card that would be sufficient to calculate the fuel economy in litres per 100 km for that tank-full and to average the consumption over the month and the trial.

There was also an intention, as part of the trial, to use the data to reward drivers for their performance as the trial progressed. The objective was to inject a competitive element as an encouragement to improve fuel economy and to continue to record odometer readings. Depending upon the ongoing performance and the need to reward more than one driver in each fleet, performance could have been on the basis of the best fuel economy, the driver most improved from one month to the next, the driver most improved compared to pre-trial levels, the most consistent fuel economy, and so on. The timeliness and accuracy of the data

would be critical to allow such an initiative to take place. Each fleet was initially sufficiently confident in their existing data systems, policies and oversight to cater for this element of the study.

The evaluation team did not directly deal with either of the training providers, or any of the drivers, or personnel within each fleet charged with the responsibility of preparing the data for analysis. In the main that preparation involved consolidating the data – fuel and odometer readings – for each driver and each group. For privacy and commercial reasons any identifying and pricing information was also removed in-house before passing the data on for analysis. Each fleet had a project liaison officer – a representative responsible for arranging participation in the training, liaison with relevant officers and management within the fleet, and the collection of data for analysis. This individual was not the local fleet manager, and was not in each case a driver within the control or treatment fleets. They were, however, an ecodrive champion – a firm believer in the potential benefits of ecodriving to benefit their own fleet.

An online survey was used at the conclusion of the trial to explore the drivers' experience of the training and the trial. This paper draws on insight from that survey.

3. Findings

The trial resulted in a mix of outcomes in terms of fuel consumption. In brief, in one fleet fuel consumption improved by a statistically significant 5.6% compared to their pre-training levels while none of the other three fleets reported a statistical change. The outcomes will be reported in more detail elsewhere. Here we report the experience of the trial in terms of organisational elements.

It soon became clear that none of the four fleets had in place the level or completeness of data that they expected or assumed. Nor did their reporting systems for fleet vehicle use prove readily adaptable or up to the task of tracking actual fuel use in order to identify the fuel economy of drivers, or to track any changes in fuel economy. A subset of the participating fleets submitted data prior to the intervention for examination. There were very few instances of drivers diligently entering their odometer readings each time they re-fuelled – there were many empty cells. A closer analysis revealed that many of the readings that were provided were erroneous. In some cases a series of nines (or equivalent) were entered. In others the digits were credible but did not fit the series – they did not logically fall between the previous and subsequent readings. For example, a digit may have been missing, meaning that the reading was an order of magnitude out. Clearly in some instances the driver had no intention of bothering with an odometer reading and if prompted by the service station operator simply invented a figure, or they did not say anything at all if they were not prompted by the service station operator. In other cases the driver made an attempt to comply but has misremembered the reading by the time they were served at the counter.

A number of options were adopted for the trial in a bid to increase the rate at which drivers recorded accurate odometer readings. These included stickers to be placed inside the flap of the fuel tank access point, reminder broadcast emails, and equipping vehicles with pads of sticky labels so that drivers could write the odometer reading down before getting out of the vehicle to fill their car, or certainly before proceeding to the service station counter to complete the transaction.

Each fleet had a corporate fuel account. At the end of each month the fuel company invoiced the fleet. Itemised invoices identified the vehicle taking the fuel by number plate, the date, time and location, the number of litres taken, the type of fuel taken, and the odometer reading. A difficulty was encountered for fleets with more than one fuel provider in that the invoicing was not done in a consistent manner across providers, requiring manipulation of the data before it could be consolidated. The inconsistencies applied not just to the format and structure of the information, but the fact that the different providers often had different names for their products. For example, each variation on the way of denoting unleaded petrol

(and there were more than a few) had to be converted to a more generic and consistent nomenclature. Further, on some invoices fuel type was coded as non-sensical numbers that suggested that somehow the pump number may have been entered rather than the fuel type. Without the commercially sensitive pricing information it was not always possible to determine fuel type, particularly for vehicles with a history of using multiple types of fuel, such as LPG and unleaded.

Despite reminders regarding recording odometer readings, adherence fell well short of desired levels of completeness or accuracy. The issues evident before the intervention were still present after the intervention, though perhaps to a slightly lesser extent. Difficulties and delays in obtaining the data after it had been processed within-house in each fleet to remove commercial information, along with insufficient adherence to odometer readings, meant that the plan to reward drivers on the basis of their performance was never realised. Indeed for more than one fleet the majority of monthly fuel data did not arrive until after the six-month trial had concluded. It was thus also not possible to reward drivers for their diligence in recording odometer readings.

In preparing to instigate the trial the project management group explored the option of automating the data collection process. It would have been possible to instrument the vehicles to record fuel economy on the basis of trips rather than across a tank of fuel. The system would need a means of identifying the driver – either through the use of an identity code, a swipe card or equivalent. As events recorded by the vehicle's computer anyway, removing the ignition key or locking the doors could serve as an electronic signal to the system that a trip had ended, confirmed by the entry of another driver's identity to signal the start of another trip. The fuel consumption data could be taken from the vehicle's engine management system. The option to add GPS, accelerometers and gyroscopes to collect additional rich and useful data on driving style and behaviours was explored. The driver would not be required to enter odometer readings and the requirement to fill the vehicle's fuel tank to the same point each fill could be dispensed with. With GPRS communications technology included, the data for all vehicles could be centrally polled at any time and all data would be consistent and close to complete. Systems with varying levels of these capabilities are already commercially available, and could be readily expanded to provide real-time feedback to the driver; most modern vehicles already provide fuel consumption feedback with varying levels of attention paid to human factors principles of presenting information to human operators.

Ironically, the most complex and expensive element in an automated system would have been the fuel consumption data because the monitoring system would need to be married to the vehicle's engine management system, and there is insufficient standardisation across manufacturers (or even models) to allow for a one-size-fits-all approach. The other behavioural data could be collected through a set of instruments sealed into a black box that only needed to be attached to the vehicle and not integrated into any of the vehicle's systems. The cost per vehicle to develop and tailor such a system to each vehicle configuration proved prohibitive in the context of this trial. Consequently the focus was on using routinely collected fuel records to measure the impact of the ecodrive training.

Putting a hurdle into the system that will not allow the transaction to proceed without the odometer reading would stop blank odometer reading cells from occurring, which would be useful for company record keeping as well as tracking fuel economy. This was not an option for the trial as it would require a change in practice by the service station operators. An option that could serve to increase the accuracy of odometer readings would be to allow the fuel card to be used at the pump. A number of service stations are now using proximity detectors to allow drivers with credit cards equipped with data chips to pay at the pump with a swipe of their card and pin number. If fuel cards were also "chipped" and the system required an odometer reading to complete the transaction the driver would need to walk no more than a few steps between the driver's seat and the pump's pin pad to enter the odometer reading. This is a much more palatable option than returning to their car and then

back to the counter if they have forgotten the odometer reading. But again this was not an option for the trial. A national approach by the main fuel companies aimed at assisting companies to track and improve fuel economy could be seen as good corporate activity with public relations benefits. Further, it would not necessarily result in a reduction of fuel sold and would thus not be detrimental to the fuel company's business.

An online survey was administered for all participating drivers – treatment and control – across all fleets. Anonymous responses were sought on a range of topics, including demographic information and driving attitudes and behaviours for all drivers, and for the trained drivers a set of questions was asked about their experience of the training itself. All drivers were also queried about various aspects of the trial, including reasons for any lack of adherence to the request to always record odometer readings when refuelling. The survey was open for around four months, beginning from the time all groups had finished the trial.

A total of 273 drivers responded to the survey, a response rate of 24% of all drivers nominated by their line managers to be part of the trial. All participants replied to the question asking whether they had been involved in the training or they were a control driver (the "control" option read "No I didn't do any training"); the survey was set such that it would not advance unless this question was answered. It was the only compulsory question. Three-quarters of the respondents (204 drivers or 75% of all respondents) said that they had not taken part in the training, while 57 drivers (21% of the sample) had completed the online training, and 12 (4%) had been through the combination training course involving classroom instruction and an on-road component. Of the following analyses some are based on the 69 drivers who had completed the ecodrive training – online or the combination course – and some on the full set of responses. There were too few responding trained drivers to conduct reliable comparisons between fleets regarding the type of training.

An important element of the trial was to have odometer readings accurately recorded by both treatment and control drivers each time the driver re-fuelled the vehicle. However, that requirement was not often fully adhered to. The survey provided drivers with a list of reasons as to why drivers did not record their odometer reading at each fill. A total of 162 drivers (59% of all respondents) claimed that they actually did always record accurate odometer readings – indicating that 41% did not follow the protocol. The non-adherents were made up of 36 online-trained drivers (63% of this group of respondents), 6 combination-trained drivers (50% of this group), and 120 control drivers (59% of this group). None of the drivers selected the option "The whole thing was a waste of time and I didn't really want to participate anyway". Table 2 contains the percentage of drivers who nominated reasons for not recording an odometer reading each time they re-filled.

Table 2 indicates that 34 online-trained drivers, 11 combination-trained drivers and 110 control drivers provided reasons for not adhering to the request to record odometer readings. The most common reason nominated by both the online and control drivers (see bolded and shaded cells in the table) was that they had forgotten the reading by the time they got to the service station counter (and presumably elected to not make a return trip). In some fleets pads of sticky labels were provided to drivers to write the odometer reading down before getting out of the vehicle to fuel, which would negate this as a reason (in the optional comment field one driver noted that he wrote the odometer reading on his hand), though it is not known how many of the drivers thus equipped took advantage of the labels. The next most common answer was "other", for which a range of answers were provided, many of which were along the lines of 'I was not part of the project', others that overlap with the options provided, and a small number that did not really fit as answers to the question.

Table 2. Percentage of drivers from each group – online-trained, combination-trained and control – nominating reasons for not recording odometer reading at each refill.

Reason	Online	Combination	Control	Overall
Couldn't be bothered	6%	**18%**		3%
Wasn't asked	9%	9%	15%	13%
Forgot when reached counter	**29%**	9%	**25%**	25%
Just forgot	3%	**18%**	10%	9%
Pain to reinsert key	3%		14%	10%
Difficult to read odometer	9%			2%
Had to get back into car	3%		10%	8%
Problem at the counter	15%	**18%**	5%	8%
Too busy	3%	9%	3%	3%
Other	**21%**	**18%**	**20%**	20%
Total	100%	100%	100%	100%
Number	34	11	110	155

These results suggest that some respondents may indeed have not been part of the trial, that the broadcast email calling for survey participation "leaked" beyond the offices and participants who were part of the treatment or control groups. This in turn would help explain why a much larger proportion of the survey respondents were non-trained drivers. Alternatively, some of the drivers nominated to be part of the trial may have forgotten they were control drivers or may never have been told.

With so few respondents the data for the combination-trained drivers is not discussed (though their responses are included in Table 2).

Drivers were asked whether the requirement to fill the vehicle's tank to the same point each time posed a difficulty for them. Answering in the affirmative were 8% of online-trained drivers, 27% of combination-trained drivers and 8% of control drivers. The differences were not statistically significant according to a chi-square test. Those who answered yes were asked to explain their answer. Most of these responses were along the lines of 'I did not realise this was a requirement". However, other answers suggest that at least some of these drivers may have misunderstood the question and thought it referred to a (non-existent) requirement to always fuel at the same location. The question would perhaps have been better worded using the phrase '…filled to the first click-off of the trigger…" or equivalent.

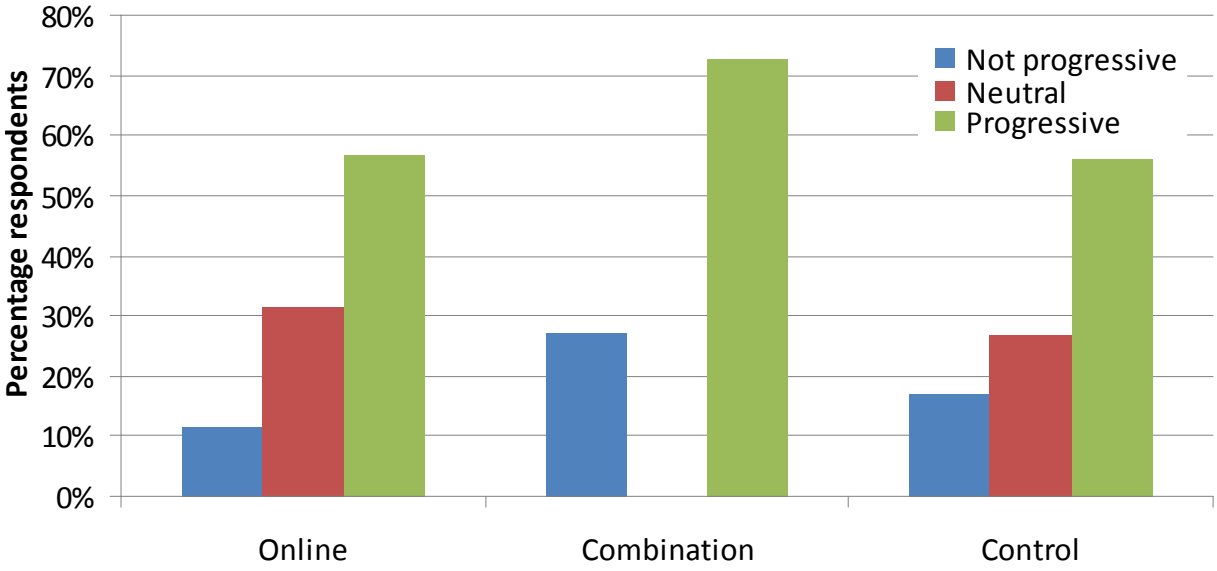
Drivers were asked about spreading the message – whether they had tried encouraging others at work or home to drive in a more fuel-efficient manner. More than half of the online-trained drivers (57%) claimed that they have always tried to encourage others to drive in an economical manner, while 13% said they have done so since undertaking the training, and 30% said that they do not seek to influence other drivers. In contrast, 64% of the combination-training drivers (7 drivers) have been encouraging others since the training, 36% (4 drivers) said they have always done so, and none of these drivers said they do not encourage other drivers at all. The differences between the groups was statistically significant ($\chi^2(2)=15.6$; $p<0.05$). Overall, 54% of the trained drivers (regardless of the training type) have always encouraged others to drive more efficiently and 21% have been doing so since the training. This suggests that any training has the potential to improve fuel efficiency beyond the employer's own fleet and thus have a wider benefit.

Drivers were asked whether they were aware of any messages from management or other drivers in their organisation about driving in a more economical manner: 40% of online-trained drivers, 36% of combination-trained drivers, and 12% of control drivers answered in the affirmative. The differences between the groups were statistically significant ($\chi^2(2)=23.1$;

p<0.05). Asked to note what those messages were, 48 drivers noted a variety of messages, many of which were not actually associated with the trial itself.

The survey asked drivers to score how progressive they thought their organisation was in terms of sustainability and environment-friendly practises on a five-point Likert scale ranging from “not at all”, through “Unsure” to “Very”. Due to the small number of responses these ratings were collapsed into three levels – “not progressive” (ratings 1 and 2), “unsure” (rating 3) and “progressive” (ratings 4 and 5). Figure 1 shows that a larger percentage of all three groups thought their organisation was progressive rather than not. However the groups did not differ statistically on this question.

Figure 1 Drivers’ assessment of the environmental progressiveness of their employing organisation



A final set of questions gave respondents the opportunity to write free-text comments about the trial, about driver training in general, and about encouraging drivers to drive more efficiently. A range of replies were proffered, with no particular recurring themes except that a few control drivers did not know about the trial and possibly felt left out when asked to complete the survey, and a number of drivers urged for more drivers to be trained in defensive-type driving courses. There seemed to be no particular negative feeling towards the trial or the survey.

Conclusions

The current project entailed a trial of two types of ecodrive training within two large and two small fleets. A number of elements make this trial somewhat unusual in the ecodrive literature: it continued for six months after the training, it involved a parallel control group that did not receive training, and the evaluation was conducted in the absence of potential vested interests. The results of that trial in terms of any changes to fuel economy are to be reported in detail elsewhere, though one fleet did achieve a reduction in fuel consumption after the training. However, there are also lessons to be learned regarding the conduct of such formal, rigorous trials in the “real-world”; and for any organisation seeking to institute an ecodrive intervention and attempt to evaluate its effectiveness.

Two critical findings are highlighted. For a variety of reasons, each of the four fleets involved have a long-standing requirement for drivers to enter their vehicle’s odometer reading when refuelling a company vehicle, and each was confident that their employees were generally complying with that requirement. Each fleet was also confident that their data management

practises in relation to fuel and vehicle use was of a high and systematic standard. Both factors are needed to track fuel use over time, regardless of the rigour applied to an evaluation of fuel efficiency. On both issues, the data supplied by each of the fleets was found wanting, primarily due to systematic lack of adherence of drivers to report the odometer reading to the service station attendant when they refueled. The four fleets that participated here consisted of both government and corporate entities and are probably reasonably representative of the general status of Australia's vehicle fleets. It is likely, therefore, that very few fleets would be able to accurately determine their current fuel efficiency or be able to identify whether any initiatives to improve it were successful or cost-effective. Such considerations will become increasingly important as Australia moves to reduce carbon emissions generally, and ecodrive training may be seen as a relatively easy means of improving a fleet's record.

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