

Finding the next cultural paradigm for road safety

Lawrence P. Lonerio

Dilbert: What was that popping sound?

Dogbert: A paradigm shifting without the clutch.

Scott Adams (1997)

Overview

Cultural paradigms determine both how we view road safety and the actions we take to improve it. While there may be many different competing paradigms for dominance, one paradigm can be seen as dominant. The dominant paradigm has changed a number of times over the century of motorization. The Finnish scholar, Valde Mikkonen (1997) has characterized conceptual development in road safety as a slow evolution punctuated by brief revolutions, which he sees as leading to a new dominant paradigm.

The 1960s paradigm shift

A paradigm shift of earthquake proportions that took place in the 1960s is responsible for the current high level of road safety in U.S. and Canada. A number of developments prepared the way for a major shift in thinking and action. Roadway development had made great progress, with the birth of the Interstate system. Cars had made technical advances in style and comfort, and especially engine performance; the mid-60s muscle cars still stand among the fastest production cars. The straight-line acceleration of these cars was not, however, well balanced with overall engineering sophistication, especially in terms of occupant protection. Also in the 1960s, emerging fuel economy concerns led to new lines of compact cars, which were even less safe.

The 1960s paradigm shift was also facilitated by some basic theoretical and scientific developments following World War II. A number of new and improved intellectual tools contributed to the shift, including systems analysis, decision theory, and epidemiology. The human factors engineering that developed out of military aviation during the war and the innovative biomechanics work of Hugh DeHaven and Col. John Stapp were also critical.

These intellectual fundamentals might have remained academic, except for the political agitation of consumer advocates; it is clear that even solid knowledge, well-founded theory may not be acted upon if contrary to the dominant paradigm. However, in the mid-60s, Ralph Nader focused attention on deficiencies of the Corvair, one of the new compact cars. This led road safety on to

the public and political agenda, greatly aided by publicity resulting from the bungled attempt of a major auto builder to discredit Nader personally (Albert 1997).

In addition to pointing out the failings of the primitive automotive engineering of the times, Nader's book, *Unsafe at Any Speed* (1965), addressed the relative merits of vehicle-focused and human-focused approaches to safety:

... our society knows a great deal more about building safer machines than it does about getting people to behave safely in an almost infinite variety of driving situations that are overburdening the drivers' perceptual and motor capacities. In the twenty to forty million accidents a year, only a crashworthy vehicle can minimize the effects of the second collision. Vehicle deficiencies are more important to correct than human inadequacies simply because they are easier to analyze and remedy. And whether motorists are momentarily careless or intoxicated, or are driving normally, when they are struck by another vehicle is entirely irrelevant to the responsibility of the automobile makers to build safer cars (p. 186).

The motor vehicle industry's reaction to this view can be summed up in the following comment from Henry Ford II, Chairman of Ford Motor Company, to a biographer then working on a book about the Ford family:

I'll tell you what I want you to put in your book about Nader. You say, from me, he's full of crap. ... Look, we could build a tank that would creep over the highways and you could bang 'em into each other and nobody would ever get a scratch. But nobody would buy it either. We'd last about two months putting out stuff like that. The American people want good cars, good looking cars, fast cars, cars with power and styling, and that's the kind of cars we build. We spend a hell of a lot of time and money trying to make them better and safer, and then some pipsqueak who doesn't know a thing about the industry, comes along and tries to tell us how to do what we've dedicated our lives and billions of dollars to doing (In Lacey 1986, 580).

The public and political weight came down on the pipsqueak side. Dr. Bill Haddon, as director of the nascent National Highway Safety Board, applied the epidemiology model from public health, and this model also led to a focus on occupant protection. This focus led in turn to technology-forcing regulation addressed to the car builders under the U.S. and Canadian Motor Vehicle Safety Acts and, in the U.S., federal standards for highway improvements and some driver oriented programs. Later unravelling of the federal driver-oriented standards was recently outlined by Brian O'Neill (2005). Without the driver component, the dominant paradigm focused largely on occupant protection. Although this paradigm has been seen by some as too narrow (e.g., Evans 2004; O'Neill 2005), it has been very successful (e.g., Farmer and Lund 2006). The improvement in fatality rates has been so great that there has been a reduction in the absolute number of fatalities, compared to the peak numbers in the mid-1970s, despite huge increases in travel. Despite initial reluctance and skepticism, the car builders and state highway authorities rose to the challenge, and the resulting safety improvements have been recognized as one of the leading public health accomplishments of the 20th century (Jones et al. 1999). Going beyond simply responding to regulatory pressure, the car companies and their parts suppliers have become highly innovative, and safety features have become a competitive factor in vehicle sales—putting the lie to old wisdom that “safety doesn't sell.”

This history provides an important lesson about the importance of science, as well as broader culture factors on road safety. Scientific knowledge and theory can identify potential innovations, but what we can actually do depends on the dominant paradigm, which also includes economic, political, and bureaucratic interests. Set patterns of thought and action persist until sufficient weight of influence forces a paradigm shift toward a better model or theory. As Scott Adams pointed out, the shifting of paradigms is not quiet or comfortable. It is difficult enough for individuals to change how they think, but it is especially disruptive to change the organizations that have been structured around an old paradigm. Powerful interests invariably develop around established ways of thinking and doing things, and it is painful to have to change them.

It is an ironic sidelight that, as passenger cars reached a remarkably high level of safety and efficiency by the end of the 20th century, half the personal vehicle market shifted over to less-safe light trucks and sport utility vehicles (SUVs). Somewhat reminiscent of Ralph Nader's efforts in the 1960s, Leon Robertson (1997) and others have criticized manufacturers and federal regulators because of a tendency for some of these vehicles to roll over and injure their occupants. SUV design has developed rapidly to address these concerns, and increases in fuel prices seem to be reducing demand, at least for larger SUVs, at the time of this writing. However, utility vehicles seem to be better suited to North American automotive culture than are modern sedans, for which the ideal model seems to be the Autobahn-oriented European sport sedan. North Americans typically drive relatively slowly on wide, straight roads, and they often carry or tow great quantities of personal goods, so SUVs and trucks as personal transport are probably here to stay. In the current paradigm, the manufacturers should be required to make them as safe as cars. A new paradigm would require drivers to be equal parts of the safety solution, perhaps also requiring that drivers be properly prepared for use of the full range of vehicles and of new highway and vehicle technology as it comes into use.

Former NHTSA administrator, Martinez (2000), said that the easy safety gains from occupant protection have now have been largely realized, suggesting that major additional gains from passive occupant protection may be progressively more difficult and expensive in the future. If this view were not unduly pessimistic, an immediate paradigm change would be needed to focus on crash prevention, either through vehicle and highway technology or through alteration of driver behavior. Clearly, however, the pessimistic view of the future benefits of vehicle technology is wrong, as occupant protection technology in new vehicles is still improving. Furthermore, even if cost-effective occupant protection innovation eventually plateaus, it will still take many more years for the existing fleet of vehicles in use to be replaced so that most vehicles on the road have all the latest occupant protection features.

Relative to occupant protection technologies, in-vehicle crash avoidance technology is relatively new and unproven. An early attempt (ABS) was not, at least initially, very successful, probably because of how unprepared drivers interacted with the technology. On the other hand, electronic stability control (ESC) shows highly promising effects (IIHS 2006), and a host of crash detection and avoidance technologies are in the development pipeline. It will be another generation until occupant protection and crash avoidance technologies, even those we can envision today, are mature and deployed throughout the vehicle fleet. We could wait until that happens until trying to force a paradigm shift toward effective behavioral programs. Better, we could recognize that more effective behavioral approaches could be preventing crashes and saving lives now, and eventually it will be absolutely necessary for drivers to contribute more if safety improvement is

to continue. However, acting on this recognition would require a paradigm shift much more controversial and uncomfortable than the 1960s shift. A new paradigm that tries to make drivers part of the solution would require changes in legal culture, media culture, and driving culture, rather than putting the whole responsibility on a few car companies and highway authorities.

Legal culture in road safety—regulating the freedom machine

Law has always been a fundamental part of the cultural paradigm for road safety. In principle, law expresses society's values and expectations. For road safety, it lays down the formal rules for use of the public roads and structures organizational responsibilities and powers. While law typically reflects past culture, it occasionally attempts to lead to new actions and perspectives, as was the case in the 1960s paradigm shift.

Despite its importance, relatively little legal theory has appeared in the road safety literature. Mashaw and Harfst's (1990) book suggested there has always been a profound ambivalence about regulating "the freedom machine," the private car. They recognized that vehicle regulation was the dominant paradigm after the '60s but suggested that it slipped in the 1980s back toward earlier, "discredited" behavior change strategies, such as driver education. "These projects do not appear to have much effect on safety, but they fit the culturally approved paradigm of automobile law" (p. 231). There may have been a lull in new vehicle standards and rule making, but there was clearly no great movement to support driver oriented initiatives. Actual support for driver education in particular was greatly reduced during the '80s (Lonero et al. 1995), although the common rhetoric that education is the only solution to road crashes no doubt continued unabated.

Canadian legal scholars Friedland and colleagues (1990) contrasted their view of traditional legal culture with the epidemiological approach. Law seeks out and punishes fault or "blameworthy behavior." The scientific, epidemiological approach seeks whatever changes will be most effective in reducing injuries. Legal scholars have not only expressed concerns about the focus on single causal factors and fault in the law but also what Kent Roach (1999) defines as the "criminalization of politics." This occurs when the criminal sanction is offered as the primary response to issues that have complex and multiple social, economic, cultural and other factors. New crimes such as impaired or dangerous driving causing death may be presented as simple solutions to traffic safety that is much more complex. Roach saw a danger that justice agencies will not engage in adequate coordination with transport, consumer, and health agencies whose policies have effects on traffic safety. This tendency could resuscitate the much earlier "nut holding the steering wheel" paradigm, which may be reflected in recent concentration on deviant drivers and aggressive driving. Despite the rhetoric addressed to deviant drivers, many jurisdictions have actually cut back on proven driver improvement programs in favor of cheaper diversions into violator schools.

Civil liability, operating through insurance premiums and incentives has been suggested by Lawrence Ross (1991) as a possible area of future promise for influencing driver behavior. The incentive effects of the threat of civil liability have, however, probably been diminished by no-fault insurance (Cummins and Weiss 1999). Ross also suggested a renewed focus on licensing,

such as graduated licenses. GDL has been widely implemented and shown measurable effectiveness—a rare bright spot in driver regulation.

For use of the public roads, legal theory accepts restrictions on liberty, such as requirements to use seatbelts, which might not be acceptable elsewhere. Implied consent laws require drivers to give up incriminating evidence, such as breath samples for alcohol analysis. Whether driving on the public roads is a privilege or a right has been subject to a long and rather fruitless debate (Reese 1965). Driving is more plausibly seen as a right with limits—no right is absolute, without limits. Calling driving a privilege was apparently thought to influence drivers to behave properly to “earn” the privilege. This old language debate is similar to the modern one, in which most safety experts stopped using the word accident, supposedly to motivate the public to take more responsibility for avoiding “crashes,” rather than accepting unavoidable accidents. There appears to be little evidence that these language shifts have any effect beyond providing diversion to experts waiting for ideas and opportunities to undertake more substantive interventions.

More contentious currently are issues of privacy, which are used as arguments against automated enforcement, such as red light cameras. A related developing issue is whether enforcement authorities and litigators should have access to data from onboard data recorders present in many recent vehicles.

Despite difficulties and uncertainties, legislation provides an important foundation for the management of road safety. Legal theorist Bonnie (1985) noted the great behaviorist B.F. Skinner’s idea that rules are society’s way of telling its citizens how to learn from the mistakes of others. This is necessary because people do not directly “experience the risks evidenced by accident statistics. Individual levels of perceived risk are low” (Rumar 1988, 507).

Mashaw and Harfst (1990) suggested finding new market regulation strategies to advance road safety at the individual level, such as incentives which are less abrasive to personal freedom than bureaucratic regulation. They concluded, “The relentless pressure of well designed economic incentives is, as Adam Smith so aptly put it, invisible” (p. 243). Of course, psychologists have also called for incentives (Wilde 1994).

Mashaw and Harfst also pointed out a number of lessons for regulators, suggesting that a “top-down,” science-based approach ignores politics and the inertia in legal culture. Health and safety regulators have few reliable allies, and public support is “widespread, but very thin.” Citizens favor health and safety but not restriction of freedom or comfort. Mashaw and Harfst suggested that education about regulation is hard to get to the public because competent, effective regulation is not news, while “bureaucratic bungling, villainous behavior, and dangerous defects” make entertaining copy.

Contingencies might be arranged to induce lower-tier governments or other institutions to develop more effective programs. The U.S. federal government has the authority to coerce the states, while the Canadian government does not. This authority permitted the U.S. federal government to require states to achieve certain levels of compliance with the national speed limit and to raise the legal drinking age to 21. Influence might be more acceptable if structured as a positive incentive rather than a threat of withdrawal of funding, as might be argued in the U.S. examples, although this theory has not yet been proven. Brian O’Neil (2005) identified the lack of use of federal authority to require states to develop more effective programs as one of the major failures in road safety in recent times. In societal or cultural terms, it may come down to

what is more highly valued, the inviolable autonomy of the states and provinces to keep operating weak programs, where most of the driver regulation takes place, or a few thousand crash deaths more or less. A major new U.S. transportation bill (SAFETEA-LU) passed later in 2005 again provides incentives for various state safety programs and for more comprehensive strategic planning at the state level (FHWA 2005).

While the leverage of laws is critically important, laws directed to drivers do not always have the desired effect (e.g., McCartt and Geary 2003). In unskilled hands, the law is a blunt weapon and also a rather fragile one. In the popular conception, “If there is a problem, pass another law” seems to be the reflexive reaction to most concerns. In fact, law must be implemented very carefully if it is to be (and remain) effective, and if it is not to cause unmanageable problems of resource demands in enforcement, courts, and corrections (Carroll and Solomon 2000; Lonerio et al. 1994). This is particularly true where the requirements of the law run counter to dominant cultural practices.

Visible enforcement on the roads has long been considered a critical basic support for road safety. However, naturally occurring quasi-experiments, such as police strikes and enforcement blitzes, suggest that modest changes in the amount of enforcement have little direct, immediate impact. In their overview of the enforcement evaluation literature, Bjornskau and Elvik (1992) concluded that the effects of enforcement are local and transient in nature, and that no studies show that traditional enforcement alone produces a permanent change in violation rates. Bjornskau and Elvik’s meta-analysis of speed enforcement studies pointed out a particularly interesting finding in a pair of Swedish studies. There appeared to be a threshold of noticeability and effectiveness if enforcement increased between 3 and 5.5 times the base level, smaller increases went unnoticed.

Clearly, short-term changes in enforcement have to be substantial and well-publicized to be noticed by drivers—in the short term. Nevertheless, short-term effects may not reflect possible long-term effects. Typical evaluation studies cannot assess effects of different levels of enforcement intensity on drivers’ expectations and habits over the long term (Lonerio et al. 1994). It is possible that our relatively orderly driving culture in North America results partly from past enforcement levels, however modest they may have been.

There currently is little tracking of enforcement changes across time or across jurisdictions, but there is reason for concern that traffic enforcement has declined in recent years. Ontario saw a 45% drop in convictions registered annually between 1988 and 1996. If the conviction rate had stayed at 1988 levels, there would have been over 650,000 more convictions in 1996. Ontario was not alone in this trend. In some states, convictions registered in driver improvement systems have declined. In California, convictions registered in the driver improvement system declined by about one-third between 1991 and 1994 (Peck and Healy 1995). An NHTSA-sponsored study of eleven police agencies suggested an overall decline of tickets written activity, although county sheriff departments produced increases (Wiliszowski et al. 2001). If there has been a sustained decline in enforcement in North America, its consequences may be reflected in the simultaneous growth in concern about increases in aggressive driving, although it is not clear if such an increase has actually taken place.

A perspective on the role and limitations of enforcement, as well as a direction for improving it, come from the seemingly unlikely direction of game theory (Bjornskau and Elvik 1992; Kim and Kim 1997; Tsebelis 1989). Game theory is a special type of mathematical decision theory that

describes how change in the behavior of one player influences the optimal strategy of the opponent and leads to changes in the opponent's behavior. For instance, if more drivers speed, more enforcement might be applied. If effective, the additional enforcement would cause fast drivers to slow down. Then enforcement would be reduced, diverted to other duties because of the lower perceived benefits of speed enforcement. With less enforcement, speeding would increase again. The game model shows that rational, predictable behavior can lead to less-than-optimal safety outcomes. Tsebelis (1989) suggested that incentives or disincentives *for enforcement authorities* must be altered in order to permanently change drivers' behavior. It would require a broader paradigm to apply organizational incentives to police and other agencies.

While deviant drivers contribute a very small part of the whole crash problem, the crashes of identifiable bad and outright criminal drivers are both frequent and especially severe. These crashes may also be less acceptable culturally than those caused by the occasional errors of normal drivers, although the victim may be just as dead. In a similar way, injury by "deliberate" violent means, such as assault, appears to be more feared than injury by the violence of a motor vehicle "accident." Nevertheless, a balance of concern for the crashes of both "good" and "bad" drivers needs to be part of a new cultural paradigm.

The enforcement, adjudication, and administration of traffic laws have changed substantially in recent times. Diversion moves traffic offenders away from courts and state driver improvement actions into violator schools or other local programs. These diversions seem to mean that traffic law no longer has sufficient priority to warrant the required expenditure of resources. Courts and municipalities have "voted with their feet" against legal penalties and administrative licensing sanctions for violators. As fatalities declined through better cars, roads, and medical intervention, the withdrawal of driver-oriented legal measures may have been considered justified. In the longer term, however, the impacts of law on driver behavior will need to be improved. A new, more comprehensive paradigm will be needed to restructure organizational incentives and raise the level of coordination necessary to achieve an improvement in driving culture and the way people actually drive.

Driving culture and the media

Driving behavior is powerfully influenced by driving culture—that is, the common practices, expectations, and informal rules that drivers learn by observation from others in their communities. Driving cultures vary among regions and communities. On and off the roads, drivers are immersed in information about driving and related matters daily. Driving information is buried in the media buzz of information about thousands of issues and events. Driving-related information in the media comes through:

- Explicit advertising messages, whether paid or public service.
- Deliberately placed public relations, by commercial businesses, trade and lobbying groups, and not-for-profit public service organizations.
- Multi media campaigns.

- Routine news coverage of collisions, technical developments, legislative and regulatory matters, litigation, and political and fiscal matters.

Ideally, the media would provide people, both as drivers and citizens, with a steadily growing insight to support more rational decisions and reinforce road safety values. We are still a long way from having communications media that consistently provide positive support to safe and healthy driving cultures. Changes are taking place, however, as mass media "... encompass more interactive features of the local environments and 'media advocacy' as a means of mobilizing social and political support for policy and regulatory changes..." (Green 1999, 78).

Much effort and resources have been expended to deliberately influence drivers' behavior through paid or public service advertising and public relations approaches. While they may make us feel better that "something is being done," isolated, sporadic "awareness campaigns" probably have objective value only as public relations for their sponsors. A review of research on methods of influencing behavior (Lonero et al. 1994) concluded that public education and advertising promotions typically have little effect on their own, in terms of directly influencing drivers' behavior, but they have a strong role to play in broader programs, such as in support of community-based selective enforcement. There can may be important indirect effects, at least when communication is concentrated and prolonged. Communications researchers (Yanovitsky 1999) found that the huge volume of anti-DWI promotion in the media during the 1980s was effective, but the direct effect was on politicians and bureaucrats who changed laws and programs, which in turn affected driver behavior.

There is a clear need to strengthen the role of safety organizations and media in educating drivers and other road users. The most successful approaches may require a "backing up" to set preconditions for progress. Preusser and Blomberg (1984) wrote, "The process of generating a public education countermeasure idea and then transforming that idea into messages that yield an accident reduction is complex and highly uncertain" (p. 48). However, they developed a successful mixed media program for young pedestrians using an explicit stepped process, requiring intermediate assessment at each step. This successful pilot program was never followed up.

A great deal of study has gone into trying to identify the factors that make a media message effective. In a review of the effects of media communication on health and safety habits, Wilde (1993) categorized four principal elements in mass media communication and the critical factors that determine effectiveness, as follows:

1. The source—Credibility, expertise, trustworthiness, and similarity to the recipient.
2. The content—"Distance" from recipient's views, positive message first, concrete effectiveness, personally relevant, modelling and imitation, arousing attention, motivating appeals, not humor or fear.
3. The channel of communication—Rates of exposure, immediacy to targeted behaviour.
4. The recipient—Self-selected exposure, opinion leaders/followers, conspicuous target behavior, multi-stage communication through personal influence, persuadability, reactance.

While specific attempts to influence behavior through the media are uncertain of success, it is clear that media communications have important effects. Media may not tell us what to think, but

they can establish agendas, influencing *what we think about*. Wilde (1993) conceives of the media audience as “active decision makers,” rather than “passive message absorbers.” The more broadly the media inform people on an issue, the more likely they are to make sensible decisions with respect to that issue. This suggests public education should be different from tradition—much richer, better informed, more extensive, more informative, and less directive if it is to be part of a new cultural paradigm.

In addition to targeted public education, reporting in the news media is part of the information culture. An extensive pilot study has shown considerable untapped potential for safety benefits in the news media. Wilde and Ackersviller (1981) experimentally altered the newspaper treatment of local collisions in Kingston, Ontario. More information was presented, along with the human interest context of the crash. A series of feature stories conveyed general safety information. Surveys showed that public perceptions of road safety in Kingston had changed. No change was seen in a control community. This approach has potential for improving knowledge and raising road safety on the agenda of public concern. Again, a highly promising pilot program has not been followed up. To remedy this, Lonero et al. (1994) suggested recruitment and training of media to improve the superficial coverage of road safety. Proposals to implement this suggestion have not yet been supported.

It is important to have people become more concerned about road safety both as citizens and as drivers. As citizens, they may become more supportive of effective legal and policy actions, and demand demonstrated effectiveness in programs. However, by itself, more concern for road safety will not necessarily improve drivers’ behavior on the roads. Tyler and Cook (1984) showed that even conventional media coverage influenced risk-related judgments. The resulting increases in peoples’ judgments about risk, however, were at a societal level rather than the personal level. That is, people seem to feel, “It is a big problem, but it’s not my problem.” Wilde and Ackersviller found a similar effect. Unless there is a reason to identify with a problem, people prefer to think of it in general terms, removed from their personal concerns. This may help explain how information programs can change attitudes toward legislation, without changing behavior, as occurred in Ontario before the introduction of seat belt legislation (Lonero et al. 1994; Lonero and Pierce 1981).

A novel approach to media was developed by the government insurance company in Victoria, Australia. Due to weak evaluation reporting, it offers more promise than proven success. The approach, referred to as “marketing traffic safety as a consumer product,” used advertising as marketing, not as public education. It involved hard-hitting messages, targeted to specific behaviors, such as DWI. The program developers concluded:

All the evidence suggests that when the ads are off-air, the road toll goes up. And when the ads are back on-air, the road toll goes down. We are beginning to conclude that road safety is not a rational considered-purchase decision. Road safety is an impulse decision that requires constant, high, top-of-mind product promotion (Forsyth and Ogden 1993, 1440).

The same effects could be understood, from a behavioral psychology perspective, as resulting from the ads acting as cues and prompts, reminding drivers in real time about behavioral alternatives and choices. Either way, the approach is worth further exploration, but this appears not to have happened.

Finding ways to personalize risk seems to be a key to media effectiveness in safety. Leiss (1990) suggested the relevance of the rapidly developing field of “risk communication,” which is focused on informing people about health and environmental risks in general (Gerrard, Gibbons, and Resi-Bergan 1999; Rothman and Kiviniemi 1999). Risk communications normally take place between two disparate groups: 1) experts who have data about some sort of objective technical risk and 2) the media and general public who lack objective technical data but experience varying levels of subjective, perceived risk. Governments and safety organizations are positioned in the middle, facing both ways and trying to communicate in the language of both groups.

Media personnel have an enormous task to maintain sufficient knowledge in all areas of risk communications. But without some basic knowledge of content and statistical methods, reporters are unable to serve as an effective conduit for risk and safety information. This is as true in road safety as in other important risk areas, such as security and environmental threats. The difference with road safety is that commonness of experience may render the media less critical of information sources and of their own common sense understanding. Media personnel are mostly drivers, and what drivers do not think that they are, at least, minor experts on driving?

News media often focus on trends, either real or imagined, such as increases in road rage, without much understanding of what they mean or how they work. Mistakes can be made either by ignoring trends or assuming that they are more powerful than they actually are. Even a real current trend does not mean that everything and everybody is going that way, nor will an actual trend necessarily continue. Change is continuous and inevitable, but trends tend to be self-limiting or cyclical, so today’s hot trend may be next year’s old news. Road safety needs to be understood within a changing world and managed within a structure that is sufficiently knowledge driven and flexible to keep pace with a broad array of changes.

Geller (1998) uses the phrase “increasing actively caring behaviors” to reflect “both the ultimate goal and the fundamental challenge of a Total Safety Culture: where everyone must periodically go beyond his or her personal routine for the safety and health of others” (p. 274). The emphasis on culture is part of a broader trend, as other behavior analysts have come to address questions of how to build stronger, healthier cultural institutions in more general areas of social concern (e.g., Mattaini and Thyer 1996).

In a paper on behavioral adaptation to safety countermeasures, the OECD (1990) pointed out that negative, perverse effects of some measures are possible, making careful planning and empirical evaluation even more critical. Research and theory on behavioral adaptation to safety measures has continued (Jiang, Underwood, and Howarth 1992; Traynor 1993), although the concept remains controversial (Wilde 2001).

A more informed, sophisticated, and demanding public would be highly positive for road safety, while making life much more difficult for bureaucrats and politicians. Arguably, the highest-level driver skill is that of a concerned, active citizen, motivated and able to ensure that the driving world becomes a better place for mobility, safety, and equity. The principle of good regulation and good program management—that regulations and programs must be reasonable and effective—has been widely neglected. However, for our hypothetical future driver/citizen, political expediency, and common-sense ideas of “what ought to work” would not be good enough. In a new paradigm that really values quality and accountability, state and provincial governments would have to evaluate and improve their driver programs. Skilled citizen-drivers

of the future would demand transparency, and they would be equipped to understand and *act upon* the unvarnished truths about road safety. As will be discussed later, telling the truth was proposed as an innovative road safety strategy by Frank Haight (1985).

The traditional bureaucratic constraints on the ability of governments to influence crash prevention through driver behavior must be faced and overcome. To facilitate this, organizational behavior change must become a legitimate area for study and action in road safety. Critical issues are coordination, evaluation, and accountability in program management. Coordination is critical because the multi-causal nature of crashes requires multifaceted programs for effective change. Coordination of programs, however, runs against organizational boundaries and bureaucratic interests. Better safety management may depend on finding what organizations need to support their own specific objectives and providing it as exchange for the organizations' support of safety objectives.

Evaluation is critical for safety interventions. Interventions should be seen as experiments and evaluated as such. No program, however carefully planned, can be assumed to be effective without empirical data. If there is to be progress in safety management, it will be knowledge driven (Cirillo et al. 2000). The needed development of an expanding pool of knowledge for continued refinement of behavioral technology will only become available through objective, empirical evaluation.

Accountability for safety outcomes is critical because organizations, like individuals, will only change when change is motivated, enabled, and rewarded. The "payoffs" received by organizations with responsibility for road safety are rarely contingent upon success in reducing the severity of the problem. Transfer of program technology, coordination of multifaceted programs, and the evaluation and refinement of interventions will not likely occur more effectively in the future under existing organizational structures. Strategic reorganization and techniques of inducing organizational behavior change are needed for more effective road safety management.

Ivan Brown (1986) concluded an Ergonomics Society Lecture with this statement:

... our current problems in road safety seem largely institutional. ... Road safety thus appears to have a low status among government policy makers and I can see little prospect of improving safety until this roadblock is removed... (p. 1503).

Brown pointed out the need for accountability for safety and, perhaps, a central agency, much like Frank Haight's call for a public health type of structure for road safety, clear of the conflicts inherent in transport departments.

The public seem to lack sufficient interest to process more than short sound bites and quick-fix simplifications. The media lack sufficient interest to provide critical analysis. In such a situation, transparency is not demanded and not offered by authorities. While there has been little study of the political science of road safety, one researcher pointed out that politicians and bureaucrats can use apathy to their advantage, proposing unchallenged, only vague reasons or explanations for actions, or for inaction (Koltzow 1993). The media and political oppositions seem rarely able to challenge on matters of road safety policy, planning, and effectiveness. For example, safety program plans often contain the word "hopefully" with respect to expected results, and typically have no objective evaluation component which could find out if the hope was fulfilled. Without

evaluation, there can be little progress toward more effective programs. Without accountability, evaluation loses its potential impact.

Much knowledge now exists that is not used. We need to place a high priority both on accelerating generation of new knowledge and using all available knowledge to encourage safer driving culture.

What would a new paradigm look like?

The dominant cultural paradigm for road safety in North America has been one set in place in the 1960s. It is based on two key assumptions. First is the ability of federal technology-forcing regulation to require automobile manufacturers and highway authorities to continuously improve the protection of vehicle occupants. This assumption was initially highly controversial, but it proved to be correct.

The second key assumption is that prevention of crashes is impossible, at least as it is attempted through influencing how hundreds of millions of people choose to drive. This too has proven to be correct, at least in part. There have been spectacular successes in some safer behaviors—seat belt use and avoidance of DWI have become part of mainstream driving culture. However, influencing on-road driving behavior to any significant degree has remained elusive. It is probably beyond the ability of the diffuse, decentralized responsibilities within the states and provinces. Of course, no central authority has been requiring these jurisdictions to produce ever-more-effective programs in order to stay in business. In fact, many driver programs are probably significantly weaker than they were decades ago. We need to ask why we require rigid compliance with performance standards on the part of the auto makers, while leaving drivers and the governments that regulate them to be largely self-regulating. We accept as normal in our cultural paradigm that nearly everybody will stretch the driving rules—for example, routinely driving well above speed limits.

About twenty years into the modern era, Frank Haight (1985) outlined a clear summary of received wisdom to that date and a six-component program to move road safety ahead. Broad strategic analysis is rare in this field, and Haight's short but highly astute paper stands as nearly unique for its time. Haight concluded with six prescriptions for progress:

1. Reorganize road safety under an independent public health type agency.
2. Plan for the long range.
3. Disengage road safety from public concern and public relations.
4. Commit to full truthful disclosure to the public and politicians.
5. Reorganize professional education and public information.
6. Formulate a coherent modern research program.

Significant overall progress is lacking in implementing these prescriptions. They require organizational change and a level of commitment and seriousness that has not yet been available politically, bureaucratically, or among the media and the public. Haight pointed out that scholars and researchers figured out, only about thirty years ago, that the crash problem was not going to

be solved automatically and effortlessly. If we have learned anything in the years since Haight's trenchant 1985 insights, it is that the cultural paradigm is critically important.

From the perspective of another twenty years beyond Haight's 1985 attempt to reshape the road safety paradigm, a paradigm shift is even more clearly needed to guide road safety strategy and development. Road transport is entering an era of revolutionary development; partly driven by the need to make better use of a finite and mature roadway network, and, partly driven by the convergence of communications and transportation technologies. The advent of new technologies including Intelligent Transportation Systems (ITS) and Intelligent Vehicle and Highway Systems (IVHS) will lead to a major rethinking of road safety. These developments need to be enhanced, both for road safety and potential economic benefits.

The global scale of the road accident problem is now more apparent too. Almost 90% of road casualties take place outside North America and the other industrial nations. Taking leadership in road safety, within OECD, WHO, and other international structures, would be consistent with earlier tradition, and it would also probably help in setting our own house in order. Our dominant cultural paradigm, vehicle-occupant protection through vehicle and infrastructure technology, does not translate well to low- and middle-income countries, where most casualties are not vehicle occupants. Developing a leadership role relevant to global road safety could be set in motion by establishing the intellectual and organizational foundation for a more comprehensive, cultural approach to road safety. This is important for further improvement in the already relatively safe roads of North America, but especially important for the long term mitigation of the bulk of the global road injury problem. A new cultural paradigm must incorporate effective influence of road user behavior, both for our own long-term safety improvement and for leading improvement of the staggering global losses, now exceeding 1.2 million deaths annually.

Behavioral outcomes change when organizations, rules, and programs change, however uncomfortable it may be for the organizations involved. Incentives and disincentives for organizations need to be better understood and altered in order to permanently change drivers' behavior. It is recognized that it would require a very high level of commitment and management perspective to apply organizational incentives to organizations that hold the keys of program effectiveness, such as driver administrators, courts, and police agencies, but this commitment and perspective needs to be an explicit part of a cultural paradigm for road safety. The need for a comprehensive perspective has been recognized for a long time in some other fields, such as health promotion (e.g., Green and Kreuter 1991)

Road safety can benefit significantly from improved cooperation in R&D and harmonization of regulations and standards. This is clearest internationally but is a significant issue even nationally within the U.S. and Canada, with their highly decentralized responsibilities for road users and highly eclectic, diverse programs. With respect to safety programs and results, O'Neill (2005) suggested the states are more like 50 different countries. Cooperation in R&D and programs could greatly leverage the limited resources typically available in any one jurisdiction, but this is rare. Harmonization can introduce a wholesome discipline and force a careful look at practices and programs—something that has been sorely lacking among the states and provinces of North America. Even granting local differences in conditions, there probably are not 50 or 60 of effective ways to design and implement driver regulations and other safety programs. This is not to say that optimal programs cannot be modular, with some variation in components and emphasis. Indeed, with strong program evaluation and continuous improvement, local variation

in programs would redevelop in a rational way, driven by innovation and effective results. With pressure to demonstrate objective success, some diversity would be healthy.

Our understanding of the forces and factors influencing road safety and the social, political, and economic context in which they operate is now more complex, more dynamic, and more comprehensive than in 1965, or even in 1985. It is safe to say that Ralph Nader's 1965 dogma, "... our society knows a great deal more about building safer machines than it does about getting people to behave safely..." is less true. We now know a great deal more about influencing behavior (e.g., Lonero et al. 1994). Knowing is not the problem. Where little progress has occurred is in finding the political and bureaucratic will to develop and apply sound, evidence-based knowledge in operational programs addressed to how people drive.

The dominant cultural paradigm determines both how we view road safety and the actions we take to improve it. At the most fundamental level, road safety's cultural paradigm consists of *the implicit shared values and beliefs that determine the way in which the society organizes and acts to assure safe, sustainable mobility*. As Scott Geller has pointed out, safety is too important to be a mere priority, which is negotiable against other priorities. Rather, safety must be a value that is considered in all decisions as are other fundamental societal values, such as freedom and equity, and more recently, security. Bureaucratic turf protection and firewalls make life comfortable and rewarding for bureaucrats, but they impede society's ability to manage safety as a shared value. Failing to improve or reducing potentially cost-effective types of programs, such as driver improvement, can take pressure off some bureaucracies' budgets, but these actions create greater costs elsewhere. Weak programs, in effect, externalize costs of those bureaucracies on to other societal budgets, such as health care or insurance. Weak programs also waste resources that could otherwise be used for effective programs.

Certainly, there are many specific safety studies, projects, and reforms that are needed, but piecemeal solutions are not enough to create safe roads for the world. Both national and sub-national levels need coordination, authority, resources, and accountability to energize operations and policy within diverse government agencies and among public and private partners. To shift to a more comprehensive paradigm in North America would require a stronger and longer-term vision of possible futures for safety because vehicle technology will keep saving more lives for many years. Some nations have taken a long vision, such as the Vision Zero target developed by Sweden. Closer to home, we tend to have either no targets or very modest targets that probably can be reached through the old paradigm and vehicle technologies as new vehicles improve and old vehicles are retired from the fleet. Success in implementing a new cultural paradigm for road safety could create world leadership and ensure the achievement of sustainable safe mobility on the roads of North America, and eventually for the world. North America's apparent apathy looks callous in light of the 1.2 million deaths per globally.

The new paradigm would:

- Recognize the cost of all crashes rather than just the fatality tip of the iceberg—taking action to prevent crashes, not just fatalities.
- Recognize the full cost of crashes that could have been prevented by better programs—balancing accounts for crash losses and program cost at the state or provincial level, as well as nationally.

- Recognize that road crashes are a major drag on national and world economies—money talks loudly and to everybody, not just those who feel concern for victims.
- Recognize that program costs flow out through transportation, enforcement, and other agencies, while losses (or cost savings from improved programs) accrue to health, insurance, and other sectors, and that these costs are not balanced under current safety administrative structures.
- Recognize that institutions originally developed as a solution can become part of the problem, if lacking vigorous leadership, vigilant oversight, and a demanding public and media.
- Make it self-evident that targets for improvement should require real effort and the full use of relevant knowledge and resources.
- Focus on crash prevention through improvements in on-road behavior of drivers and other road users—concentrating on developing and applying the best knowledge.
- Lead responsible authorities to treat safety seriously as a value—not just giving lip service or going through the motions.
- Require all programs to be objectively evaluated and continuously improved—including driver programs.
- Make unacceptable the willful neglect of well-established knowledge—including the suppression of uncomfortable research and evaluation findings.
- Make obvious that responsibility for safety must be located at the highest level of governments—giving authority to force different agencies to work together toward common safety improvement targets.
- Insist on improvement of driver programs through technology-forcing regulation and incentives.
- Support movement to self-sustaining development and competition in safety program innovation among jurisdictions and responsible authorities.

What would it take to catalyze a paradigm shift?

Obviously, shifting the paradigm is a much taller order this time than it was in the 1960s. There has been enough safety improvement, through occupant protection and crash severity reduction, over recent decades that a certain amount of apathy toward road safety is publicly acceptable and politically expedient. From the perspective of the 1960s paradigm, the road safety battle is over, and we won. A new paradigm would say that the 50,000 or so North American deaths, the 1.2 million global deaths, and all the other crash costs, are still unacceptable. Clearly SAFETEA-LU represents a major investment for the U.S., but it remains to be seen whether its incentives and comprehensive planning requirements will catalyze a new way of thinking about the problem. Getting state and private organizations to buy into a new paradigm will be difficult because acting appropriately in line with such a paradigm is not easy. Many things will have to be done

differently to bring drivers on board as part of the solution. Identifying all the specific steps that would help move us toward a tipping point and paradigm shift is beyond the scope of this short paper, and, perhaps, beyond the author's knowledge and vision. A few examples of potentially catalytic steps are presented below, hopefully to provoke discussion and elaboration by those with different, and, again hopefully*, broader perspective and deeper understanding. Clearly, the present volume is a good step toward broadening our common understanding of the problems and potential further solutions. A few examples of ideas for additional steps that might irritate authorities and the public sufficiently to start change include:

- Implement Frank Haight's suggestions from 1985—reorganize, plan long range, have courage in public relations, tell the truth, and educate professionals and the public.
- Create an authority (or czar) for road safety with the vision and clout analogous to that of Bill Haddon in the 1960s, but informed by a new, broader paradigm.
- Track and publicize the annual total economic and social costs of road crashes to the nation, to the states and provinces, and to individuals.
- Create and publicize full-cost scorecards for jurisdictions to indicate how they are balancing costs and losses and where they are externalizing costs.
- Do cross-sectional jurisdiction survey and modeling studies to find out to what extent program differences contribute to different crash records for different states and provinces and what can be learned from these differences, and then act on the findings.
- Do the longitudinal analysis of the fatality reductions over the last forty years to identify the contributions of vehicle, highway, and driver interventions.
- Do the cross-sectional analysis to see how much the age of their private vehicle fleets contributes to differences in fatality rates among states and provinces.
- Establish national tracking and enhance research on current traffic enforcement levels and trends.
- Do the historical data modeling and cross-jurisdiction studies to find the factors that produced the orderly driving cultures of North America.
- Analyze the budgetary savings and crash costs of reduced traffic enforcement and diversion of offenders from judicial and administrative actions and balance these against the crash costs produced.
- Support development of vigorous interdisciplinary research and graduate training on road safety management, recruiting participation particularly from previously quiet fields, such as political and administrative sciences.
- Identify the strongest and weakest safety programs in North America, then produce mentoring "buddy groups" consisting of one of the weak jurisdictions, a strong jurisdiction, and one of the low or middle income nations, all with some geographic or economic commonalities.
- Search out promising pilot programs from the existing safety research literature and follow up on the more solid-seeming findings.

This list is clearly pretty limited and demonstrates the halting fluency that we have (or at least that the author has) in formulating well-supported strategies for changing our own cultural paradigm. It is always hard to think about how we think, and especially how we might change it. The nature of culture is to be pervasive and mostly invisible to us, like the air we breathe, unless we take steps to make it visible. In road safety, we have not had a great deal of practice at this in the last forty or so years. With practice, we can become better at it and produce the shift necessary to bring drivers to the safety party as full participants—hopefully*.

* The word “hopefully” is used here deliberately as an example of how it often is used in program plans. Here, as always, it should be seen as a subtle indicator that the writers may be out of their depth.

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Biographical statement

Larry Lonero has over 30 years experience in many aspects of road safety, including human factors research, program development and evaluation, field operations, strategic management, and policy. He holds degrees in psychology. In 1990, he co-founded Northport Associates, a consulting firm that has conducted studies in driver education, novice driver decision making, driver improvement, driver and health-related behavior change, and road safety policy and strategic overviews for government and private sector clients. The extensive list of projects includes the influential project to "reinvent" driver education sponsored by the AAA Foundation for Traffic Safety. Major projects followed to evaluate and develop new driver education curriculum for Manitoba Public Insurance, and projects to develop guidelines for evaluation of driver education and then implement the guidelines, again sponsored by the AAA Foundation.

Before entering consulting he worked in a large integrated transportation department—coordinating research, program development, policy, and corporate strategy. He has championed research-based program development and empirical program evaluation. He coordinated the preparatory research, policy support, and public education that enabled introduction of North America's first seat belt law. He has long promoted the use of public-health approaches in road safety, and he served on the Working Group developing the Motor Vehicle Injury Prevention Research Agenda for CDC/NCIPC and as an advisor to the WHO/World Bank 2004 initiative. He is active in driver factors analysis for civil litigation in road crashes. He maintains interest and contacts in automotive industries and currently serves as a judge in the PACE Awards for Innovation in Automotive Technology, sponsored by Automotive News, Microsoft, SAP, and the Transportation Research Center of Ohio. He is a member of the TRB Committee on Operator Education and Regulation, the Canadian Association of Road Safety Professionals, the American Driver and Traffic Safety Association, and the American Evaluation Association.