DISTRACTED DRIVING TECHNOLOGY FRAMEWORK: OVERVIEW

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Canadian Coalition on DISTRACTED DRIVING

Technologies designed to mitigate distracted driving are perceived to be a solution that holds great potential to reduce and prevent collisions. In the past five years, a wide range of technologies have emerged, including advanced driver assistance systems, fleet management or driver monitoring systems, in-vehicle systems to manage navigation, communication and entertainment technologies, and telematics devices that provide feedback to drivers, and phone applications.

The functionality of these devices is quite variable and different levels of driver engagement may be required for their use. The marketing of these technologies has also been inconsistent. While some manufacturers have emphasized safety aspects, other manufacturers have reinforced, perhaps inadvertently, the misperception that these technologies allow drivers to be less attentive while driving.

In order to increase understanding of these technologies and their role in reducing distracted driving, it is important that users are able to critically assess the objective or purpose of technologies, their limitations, and the potential benefits or value offered by them. It is equally important that users recognize potential unintended negative consequences that can occur when technologies are used improperly, or in ways they were not intended to be used.

Distracted driving technology framework

To aid in assessments to determine the impact of new technologies on distraction among drivers, a framework is needed to clearly define key questions that should be asked as part of any assessment of technologies designed to reduce distracted driving. Such a framework is also helpful to identify the most viable technologies and facilitate comparisons between them as well as evaluations of them.

Answers to these questions can inform decisions related to the most appropriate and effective strategies to implement these technologies and promote their widespread use.

An outcome of the 3rd Annual Meeting of the Canadian Coalition on Distracted Driving (CCDD) was the "Distracted Driving Technology Framework".

Questions about objectives

1. **Does the technology perform a function that is essential to the driving task, or a secondary function that is not essential?**

   The focus of a given technology should be to support critical driving tasks and the performance of the vehicle and/or driver in terms of driving.

2. **Does the technology adequately balance safety and risk?**

   For example, are the risk reduction benefits of the technology greater than the potential distraction it poses (e.g., a phone application that notifies drivers of a collision ahead on their route)? The technology should be designed to safely engage drivers as opposed to causing them to disengage from the driving task.

3. **Does the technology positively reshape driver behaviour and reduce distracted driving?**

   There may also be alternative strategies and programs that can achieve the same outcome in conjunction with, or in the absence of, a particular technology. In other words, is there a "low tech" tool (instead of a technology) that can perform the same function. For example, a company may establish a call centre for family members to leave emergency messages so that the personal use of phones can be avoided while an employee is driving but loved ones can still reach their family member.

4. **Does the technology create opportunities for coaching and reinforcement of safe behaviours?**

   For example, data captured by forward facing cameras in trucks can enable employers to coach drivers on how to avoid distracted driving (Robertson & Brown 2017).

5. **Does the technology result in drivers paying less attention to the driving task?**

   It needs to be determined whether or not the technology results in drivers losing situational awareness. For example, a driver who is over-dependent upon backup cameras and/or sensors may not check mirrors or the

   surrounding area prior to or while reversing the vehicle. Furthermore, some backup safety systems may not detect poles or people (Instructional Technologies 2018).

6. **Does the technology ultimately degrade essential skills for safe driving?**

   Among commercial and non-commercial vehicle drivers, for example, over-dependence on forward collision warning or lane monitoring systems may discourage drivers from maintaining the necessary level of attention to surrounding traffic and other road users.

Usage questions

1. **Does the technology permit the safe operation of the vehicle?**

   Technologies must permit drivers to maintain situational awareness of the ever-changing road environment to ensure the safe operation of the vehicle. Technologies that contribute to declines in driver situational awareness put all road users at risk.

2. **Can the technology be blocked while the vehicle is in motion?**

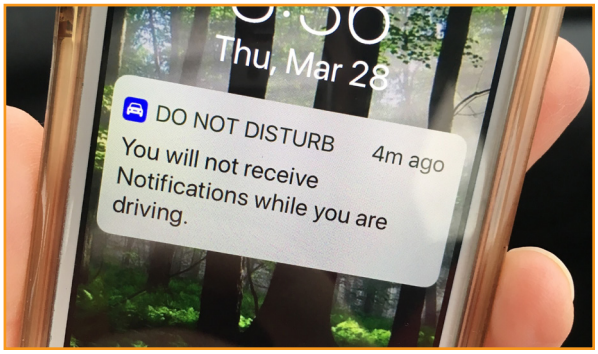
   If the functionality of the technology can be halted or limited while the vehicle is in motion, this should be clearly indicated. Also, if a vehicle is in motion, drivers should know if minimal input on their part is required, or that demanding tasks are prohibited by the technology. Similarly, if a technology should not even be used when a vehicle is stopped at a red light, this needs to be made clear to drivers.

3. **Is the usage of these devices by drivers restricted while the vehicle is in motion?**

   It should be determined whether or not the technology engages drivers when they are in risky situations.

4. **Can devices be used by passengers while the vehicle is in motion without distracting the driver?**

   If yes, then it should also be indicated how drivers are prevented from using the technology. For example, if phone applications block incoming and outgoing calls when a vehicle is in motion, but passengers are able to activate the device, how are drivers prevented from using the phone? If a single action, one-button push or finger swipe, allows use of the technology by the driver, that may not be a sufficient deterrent.



5. **Will drivers aim to circumvent or defeat the technology, and will this increase risk or reduce safety for the driver and other road users?**

   It should be explained what circumstances will activate a particular technology and whether a technology is activated by default or whether it needs to be prompted. In addition, would drivers be able to turn the technology off? Users need to know whether or not safety technologies default to "on" every time the vehicle is started. Furthermore, some consumers will neutralize vehicle safety features, even to the point of purchasing technology that disables these features. For example, NHTSA ordered an equipment manufacturer to stop selling a device that consumers can use to override Tesla's Autopilot feature (Huffman 2018).

6. **If a feature on an existing technology is improved, how does this affect the way that drivers use it, or is it more likely that drivers will aim to circumvent it?**

   For example, if the lane departure warning system (LDWS) on a new vehicle is more sensitive than the system in a driver's previous vehicle, is it possible that they will want to reset or disable the LDSW in order not to be disturbed? In the event that technology malfunctions, is there a failsafe or safety strategy to help drivers?

Implementation questions

1. **Are the purpose and limitations of the technology clearly communicated to users in advertisements and marketing materials?**

   It is important that the nomenclature of technologies differentiate between preventive versus corrective technologies. This will enable drivers to appropriately use them and rely on them. Whereas preventive technologies help drivers avoid a dangerous situation, corrective technologies mitigate the degree of harm to users already in a dangerous situation. In addition, there is a need to standardize the nomenclature of functionality of new technologies, particularly those related to

   advanced driver assistance systems. Naming of new technologies or features should emphasize what the technology does, so it is recognized by consumers regardless of the brand (e.g., adaptive cruise control, dynamic cruise control). This practice has been followed for advanced driver assistance technologies and it may be applicable to other types of technologies to mitigate distraction.

2. **Is the technology applicable to professional drivers only or is it applicable to all drivers?**

   Some technologies such as electronic logging devices are used by professional drivers whereas vehicle safety features such as lane departure warning systems (LDWS) may be available to all drivers (Robertson & Brown 2017).

3. **Is the adoption of the technology voluntary or mandatory?**

   Some vehicle technologies are mandatory as they are now standard safety features of newer vehicles. Meanwhile, other vehicle safety features and phone applications are after-market technologies that can be purchased later on. Providers of these aftermarket technologies will ideally address compatibility with newer vehicles.

4. **Is it possible to track which drivers are using the technology and which drivers are not?**

   For example, in two fatal crashes involving Tesla vehicles that were investigated by NHTSA, it was determined that the Autopilot technology was engaged and that the drivers did not have their hands on the steering wheel (Huffman 2018).

5. **How much does the technology cost per driver?**

   There are installation costs for some technologies. Other costs can be incurred in terms of repairing or replacing the technology (i.e., level of technical skill, personnel time and cost).

6. **Is there a strategy that can promote or incentivize widespread usage of the technology among drivers?**

   When possible, manufacturers should clarify strategies that will be adopted to increase penetration of the driver market. In some instances, there may also be attempts to make the technology available sooner in order to allow more drivers to benefit from it as was the case with electronic stability control. In addition, there is a need to ensure that products are rigorously tested and safe before they are made available while avoiding "paralysis by analysis."

7. **What tools are available to follow through on implementation (e.g., education, enforcement, policy, engineering)?**

   There should be a minimum standard that technologies must meet before being made available to consumers. This approach would ensure that consumers are better able to properly utilize technologies and rely on them. For example, with regard to advanced driver assistance systems, the distance selection for dynamic cruise control can be set at 1 car length, 2 car lengths, or 3 car lengths. Similarly, many safety features cannot be activated at speeds lower than 30km/hr. Utilizing some standard parameters for functionality can create some consistency across devices and help to ensure that drivers will be more familiar with the technology, regardless of brand.

8. **How are the data collected by the technology used and who has access to it?**

   If the technology collects data, it should be indicated whether or not these data can be used to shape driver behaviour through positive reinforcement or sanctions. It is also in the consumers' interest to know which third parties may have access to the data and for what purposes these data will be used.

9. **Are vehicle technologies transferrable to different makes of vehicles and other modes of transportation such as cycling or walking?**

   At the very least, the operational interface for vehicles should be similar enough so that drivers are not confused when they change vehicles and encounter technologies in another vehicle.

Performance questions

1. **How long has the technology been available and has a reasonable sample of drivers used the technology for an appropriate period to facilitate evaluation?**

   There may not be enough collision data available on vehicle models equipped with various safety

features. It may be beneficial to review near-miss data from naturalistic studies as well.

2. **Has the technology been evaluated to measure change in driver behaviour (actual vs. self-reported), or changes in violations or collisions?**

   Not only is it important to compare these data in terms of violations or collisions before and after the introduction of technologies, but in the future, it may be advisable to evaluate different models of the same technology. Systems that deliver warnings to drivers earlier and when the vehicle is operating at a lower speed may prevent far more crashes and injuries than those systems that warn later and when the vehicle is travelling at a higher speed (Kusano & Gabler 2015).

3. **Was the evaluation of the technology transparent with all relevant methods, data, and results being reported and/or was the evaluation conducted by an independent agency?**

   In the interest of objectivity, it is preferable to refer to evaluations of technology that are conducted by an independent agency without a commercial interest. Also, internal reviews of a technology by the host company may not be in the public domain.

References

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