VIAS institute

Report no. 2019-R-03-SEN

Distraction behind the wheel: the impact of infotainment

An exploratory literature study

Federal Public Service
Mobility and Transport

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Responsible publisher: Karin Genoe
Publisher: Vias institute – Knowledge Centre Road Safety
Date of publication: xxx
Legal deposit: D/2019/0779/XX
Please refer to this document as follows: Boets, S. & Teuchies, M. (2019) Distraction behind the wheel: the impact of infotainment – An exploratory literature study, Brussels, Belgium: Vias institute – Knowledge Centre Road Safety
The complete report is available in Dutch and French:

Boets, S. & Teuchies, M. (2019) Afleiding achter het stuur: de impact van infotainment. Een verkennende literatuurstudie. Brussel, België: Vias institute – Kenniscentrum Verkeersveiligheid.

Boets, S. & Teuchies, M. (2019) Distraction au volant: l'impact des systèmes d'info-divertissement. Une revue de la littérature. Bruxelles, Belgique: Institut Vias - Centre de connaissances pour la sécurité routière.

This research was made possible by the financial support of the Federal Public Service Mobility and Transport.

Summary

In-vehicle infotainment refers to vehicle systems that combine the delivery of entertainment and information for drivers and passengers. These systems typically use touchscreens, keypads, and audio/video interfaces, and allow drivers to perform a broad range of interactive secondary tasks (e.g. listening to the radio, dialling phone numbers, listening to incoming text messages, making hands-free phone calls, manipulating the navigation system, vehicle voice commands, accessing the internet or smartphone content). The use of such systems is expected to continuously increase in the coming years and even to become the norm in cars.

This exploratory literature study aims at investigating the effects of using in-vehicle infotainment on road safety indicators, essentially on driver attention (distraction).

The key results of this study are:

- Most experimental study results indicate that in-vehicle infotainment generally has moderate to strong adverse effects on drivers, but there are also indications that drivers in more naturalistic driving situations use compensation strategies to deal with the infotainment.
- The effects on the driver differ enormously according to different possible combinations of infotainment task (complexity, number of iterations…), task modality and system (provider).
- Speech-based interactions only *seem* to have the advantage of less eyes-off-the road time, but the cognitive workload related to it can also have adverse effects on the looking behaviour.
- The infotainment system's quality is highly determining: robust, intuitive systems with low complexity, and shorter task duration can lead to less driver distraction.
- Older drivers generally experience more adverse effects (distraction) of in-vehicle infotainment.

The most important recommendations for the automotive industry are

- In general it can be said that IVI-design interfaces should be such that visual distractions are minimal and the time needed to perform tasks is as short as possible. The use of IVI functions should not be more distracting than classic radio station tuning.
- The use of voice commands to interact with IVI can reduce the objective and subjective workload and time spent looking at the screen compared to IVI operated manually, but only if the systems are very robust, intuitive and reliable. On the other hand, error-prone, rigid systems can lead to a greatly increased workload.
- The use of lockout systems, where much of the IVI functionality is unavailable while driving, can help to avoid distractions. In this way, the use of the IVI while driving is limited to functions such as the car radio and navigation, and telephoning and message sending and reading are not possible. A possible disadvantage, however, may be that for some drivers it is unattractive that some functions are unavailable.
- Given the difference in impact between younger and older drivers, it is important to take this into account in the development of IVI design interfaces. Systems that are user-friendly for older drivers are also user-friendly for younger drivers, but the reverse is not necessarily the case. Older drivers may benefit, for example, from a design that keeps their attention on or near the road as much as possible, e.g. through displays closer to the field of vision on the road, or through an effective voice-controlled system. Relevant universal design principles for vehicle manufacturers include Equality, Flexibility, Simplicity, Perceptibility, Fault Recovery and Accessibility (Farage et al., 2012). These principles can provide a framework for the improvement of IVI design. For example, drivers of all ages benefit from simplicity. Elderly drivers appear to have additional problems with controls in the centre console (space between the front seats), so one should carefully consider how drivers can be better supported without offering unnatural interfaces that interfere with safe driving such as rotary knobs, multi-function pushbuttons and drawing pads. Speech commands will only reduce potential problems from other controls if they are fast and accurate, but it should be remembered that no interface has so far proved to be free of workload. All interactions should be carefully considered and limited whenever possible.

The main recommendations for policymakers and users of infotainment are:

- It is important that users are made aware of the possible risks of using infotainment while driving. Awareness-raising campaigns can help to create a social norm among the population against distraction caused by infotainment while driving.

- Employers, companies, organizations, insurance companies, etc. can also play a role in implementing a social norm against distraction by new IVI technology in the car by openly and explicitly subscribing this standard and communicating about it (e.g. by signing a commitment like in the Netherlands).

Finally, this report provides an overview of some internationally available guidelines for the automotive industry, policy makers and users of infotainment:

- USA: "Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices" (NHTSA, 2013);
- The Netherlands:
    - Human Factor Guidelines for the Design of Safe in-Car Traffic Information Services (Kroon et al., 2016);
    - Smart Mobility recommendations for users (Harms et al., 2017).

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