Checklist
In-Vehicle HMI Distraction

Editor

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Instructions

Introduction

This document consists of a checklist for assessing in-vehicle HMI based on the NHTSA Visual-Manual Distraction Guidelines (2013)[1]. Additionally, it includes a module focused on assessing the implementation of a specific function of the HMI regarding its availability and medium of interaction from a safety standpoint (Module 2a). This assessment allows for informing implementation decisions during (re-)development, and evaluating the appropriateness of existing design solutions in a structured and comparable manner.

The checklist is a voluntary instrument for evaluating the interface design of the HMI in the car, and is intended to help manufacturers, suppliers and road safety experts to identify safety optimization potentials and ergonomically sound design choices. The basic principle and structure is based on the ESOP-based checklist by Stevens et al. (2011)[2], while the specific questions were derived from and in accordance to the NHTSA guidelines. In contrast to both the original NHTSA publications and the ESOP checklist, the present checklist is divided into two separate modules: the first module is focusing on the properties of the physical devices relevant to using the assessed functions, while the second part consists of all questions regarding the implementation of specific functions, including aforementioned function implementation Module 2a. This structure was chosen to reflect the modern trend of integrating a high number of functions within the same centralised HMI-device (e.g. central touch display), instead of having dedicated devices for a singular function or small numbers of related functions. Module 2a can be used to either explore an appropriate prioritisation for a function during the planning and design phases of an HMI, or as a means to evaluate an already existing prototype or finalised solution (post-hoc).

Scope and Limitations

The goal of the checklist is to offer a publicly available tool for designers and HMI experts to identify possible concerns with specific designs of (or design plans for) in-vehicle technology in cars with a maximum automation level of 2 or less (manual driving). It was designed to be as technology neutral as possible. Therefore, it has to consider the modern trend towards integrating a plethora of features and functions into centralised HMI-devices (i.e. central touch display), while still being applicable to more traditional single-purpose devices and even basic non-digital HMI-elements used to control driving-related functions of a car, like the lever for controlling the windscreen wiper. It was primarily designed to assess distraction potential of functions and devices related to the driving task, including the assessment of basic functions of controlling the car not typically associated with In-Vehicle HMI distraction potential assessment, like direction indicators or hazard light activation. However, it can also be used to assess functions not related to the driving task, like non-navigational infotainment functions.

Furthermore, the checklist can also be used to assess functions made accessible to the driver via a smartphone tethering solution like Android Auto, Apple Carplay or the Mirrorlink interface, as long as those functions are used within the in-vehicle input/output infrastructure.

Owing to the focus of the established NHTSA guidelines the checklist is based on, it is aimed at assessing interactions with technology while driving. The properties and distraction potentials of passive output of the vehicles HMI is therefore not part of the intended scope, and should not be evaluated using the checklist. For example, while interacting with the navigation system in order to enter a destination and choose a route is a task which merits assessment via the checklist, the information shown on the display while driving is not. More appropriate tools and checklists should be used to assess legibility, distraction potential of passive etc. Additionally, only functions and devices used while driving should be assessed using the checklist. Functions and features which are exclusively used while standing (e.g. opening the petrol cap cover, folding down rear seats) are not to be examined using the checklist either.

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[1] NHTSA (2013) Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices. Technical report 81. NHTSA.

[2] Stevens, A., & Cynk, S. (2011). Checklist for the assessment of in-vehicle information systems. Transport Research Laboratory. Crowthorne: TRL.

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Table 1 provides an overview of functions included (or excluded) from assessment using this checklist.

Table 1 Scope of the checklist

Core scope	Functions related to the driving task
	
	→ Functions related to primary driving tasks
	      o steering, accelerating / braking, keeping distance, navigation
	
	→ Functions related to secondary driving tasks
	      o e.g. warning signals (horn, headlight flasher), indicator usage, lights-related functions (headlight, dim light, full beam etc.), switching gears, windscreen wiper, (de-)activation and adjustment of assistive functions (ACC, lane departure assistant, etc.)

Extended scope	Functions without relation to the driving task → Functions related to tertiary tasks (legal while driving) o e.g. AC adjustment, adjusting windows / sunroof, radio and (legal) multimedia applications, communication functions (legal)

Excluded	→ Functions not intended for active use while driving
	      o e.g.: folding down rear seats, opening car boot
	
	→ Functions which cannot be used legally while driving
	      o e.g .watching TV or online Streams (Germany), mobile phone usage without using a tethering solution (Germany)
	
	→ Functions on a device not part of (or integrated into) the in-vehicle infrastructur
	      o e.g. mobile navigation devices not fixated in a mount, handheld entertainment devices

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Setting

The checklist is an expert evaluation instrument, meaning that familiarity with basic ergonomics and road safety principles as well as the NHTSA guidelines and especially the associated measurement procedures is highly advised. Furthermore, the authors agree with Stevens and Cynk (2011) that checklist assessment should be completed by at least two experts, if possible, to allow for cross-checking and the building of a consensus.

The checklist can be completed in different examination settings (e.g. mockup prototype, stationary testing, simulator test, test drive, field study in real traffic conditions). If possible, it is advised to follow the approach of Naujoks et al. (2019) and conduct the assessment while driving, with one assessor driving and interacting with the relevant systems and functionalities while one or more additional assessor(s) fill(s) in the protocol, with all assessors building a consensus afterwards. However, if such a test setting is not feasible or viable, it can also be used in more stationary setting or even for the evaluation of mock-up prototypes. If a certain function is not (fully) available in a being stationary or prototype testing setting, every item of the checklist includes a "subject to clarification" box that can be checked to indicate need for a later completion of the assessment under the necessary circumstances.
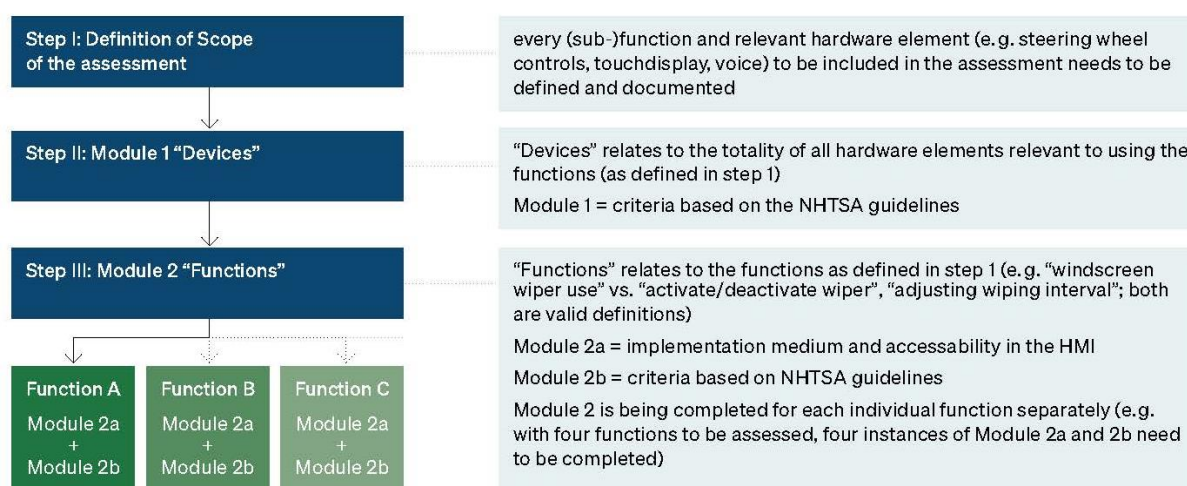
Using the Checklist

The assessment process using the checklist consists of completing three Steps, with a concluding assessment summary via an overview sheet First, the scope of the assessment needs to be defined regarding the functions and devices to be included. The devices are assessed using 11 items based on the hardware-related criteria of the NHTSA distraction guidelines. Then, every function included is assessed using modules 2a and 2b separately.

Below are the steps necessary to complete the assessment itself, and a description of every step.

Aufbau der Checkliste

Abbildung 2 · Checkliste: Übersicht über den Aufbau im Einleitungsteil

| Step I: Definition of Scope of the assessment | every (sub-)function and relevant hardware element (e.g. steering wheel controls, touchdisplay, voice) to be included in the assessment needs to be defined and documented |

Step II: Module 1 "Devices" — "Devices" relates to the totality of all hardware elements relevant to using the functions (as defined in step 1)

Module 1 = criteria based on the NHTSA guidelines

Step III: Module 2 "Functions" — "Functions" relates to the functions as defined in step 1 (e.g. "windscreen wiper use" vs. "activate/deactivate wiper", "adjusting wiping interval"; both are valid definitions)

Module 2a = implementation medium and accessability in the HMI

Module 2b = criteria based on NHTSA guidelines

Module 2 is being completed for each individual function separately (e.g. with four functions to be assessed, four instances of Module 2a and 2b need to be completed)

Function A — Module 2a + Module 2b
Function B — Module 2a + Module 2b
Function C — Module 2a + Module 2b

Step 1: Definition of assessment scope

Instructions

The assessors first need to define the scope and limitations of the assessment in regards to which functions are to be examined, and which devices and hardware components are relevant in that context. This is important because in order to design the checklist as technology neutral and universally applicable as possible to a wide range of devices and functions, a rigid definition of how broad or narrow the terms "functions" and "devices" are to be understood was avoided intentionally.

Definition of functions to be assessed

At first, the assessors need to document which functions that can be used during driving are subject to the intended assessment. Functions should be defined with the concept of tasks in mind, and it is highly advised to only group several different functions into the same assessment if there is a logical connection between them. For example, grouping several functions of the navigation system (e.g. destination choice, specifiying route parameters, starting navigation) or combining different subfunctions of windscreen wiper usage (de-/activate, set wiping interval) can be combined into one higher-level "function" definition, while mixing windscreen wiper-related functions with ADAS-parameter changes and indicators control into the same application of the checklist is not advisable.

It is to be noted that due to the basic approach of the checklist (concern based), there is no difference between a more high-level definition of a function (e.g. "windscreen wiper use", which consists of several sub-functions) and a low-level definition, which would lead to every sub-function ("activate wiper", "choose wiping interval" etc.) being treated as a separate function and separately rated in Step III. In effect, both approaches should lead to the same consequences: If there is a concern with one of the sub-functions, it will also arise if all subfunctions are treated as a high-level function and assessed in parallel. However, to ensure transparency and later comparability across development steps or systems, correct and precise documentation of the definitions applied is necessary.

Definition of devices to be assessed

After all functions to be included are defined and documented, the assessors need to define the scope for the devices to be evaluated. To do so, they need to list every device and hardware element that is involved in the interaction of the driver with the HMI when using the functions specified beforehand. The goal is to define the entirety of all devices and hardware elements the driver interacts with when using one or more of specified functions.

If one or more of the functions to be assessed are provided via a smartphone tethering solution (e.g. Android Auto, Apple Carplay, Mirrorlink), all in-vehicle hardware and devices used in those interactions are to be included in the "device" conglomeration, while the smartphone itself is not to be included.

Typically, most functions in modern cars can be accessed and used via alternative input methods (buttons on the steering wheel, touchscreen display, voice-based etc.). For the purposes of the intended evaluation, all hardware systems of all available interaction options need to included into the devices list. From this point onwards, every time the checklist mentions "devices", it refers to the totality of all devices and hardware elements specified here. A sufficient familiarity with the HMI system and all alternatives to access the relevant functions is necessary in order to avoid overlooking relevant hardware elements.

Step 2: Module 1 Devices

Module 1 can be skipped entirely, if the device group defined in step 1 already was evaluated during a prior assessment session. This can happen if the reason for the assessment is not the introduction of new

hardware or interaction concepts, but rather a software update adding or changing functionalities without changing the hardware side of the HMI, making a repeated assessment of the devices group unnecessary.

After the assessment scope is defined, the defined device group is to be assessed according to ten principles based on the according paragraphs from the NHTSA-Guidelines. The answering format for each principle is based on the checklist by Stevens & Cynk (2011), with additions based on the approach applied by Naujoks et al. (2019)[3] for their checklist for HMI in automated driving. An example can be seen below.

1. No part of any of the physical devices, when mounted in the manner intended by the manufacturer, should obstruct a driver's view of the roadway. (NHTSA 2013 A1)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					
Further References:					

Every criterion in this module has a reference to the respective paragraph of the NHTSA guidelines. The assessors have to document whether the device group prompts no concerns, minor concerns or major concerns regarding the guideline aspect in question.

→ "Concerns: none" should be ticked if the respective principle is fully adhered to, and there is no concern that the respective aspect of the device could impair safe driving for most drivers

→ "minor concerns" should be ticked if the respective criterion is only partially adhered to AND/OR there is a concern that safety could be compromised for some drivers under specific conditions

→ "serious concerns" should be ticked when the respective principle is not adhered to at all AND/OR this aspect of the device is likely to pose either a safety risk of significant severity and/or for a significant percentage of drivers

For every minor or major concern identified, the assessors should document their comments or reasoning at the "concern description" section of each principle, allowing for further examination of potential optimisation needs. This description should also include which device in the device group specifically raised the concern.

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[3] Naujoks, F., Wiedemann, K., Schömig, N., Hergeth, S., & Keinath, A. (2019). Towards guidelines and verification methods for automated vehicle HMIs. *Transportation research part F: traffic psychology and behaviour*, *60*, 121-136.

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It is important to note that every principle needs to be checked for **every device** that was included in the "devices" list during Step 1. For example, the first principle

"1. *No part of any of the physical device, when mounted in the manner intended by the manufacturer, should obstruct a driver's view of the roadway"*

should be checked for every device included in the list, before continuing with second principle. If ANY of the devices in the device group prompts one or more concerns regarding the principle, the appropriate box should be checked and the identified concern(s) detailed in the box below. If more than one device prompts one or more concerns, all those devices and the respective concerns should be documented. If both minor and major concerns are identified, both boxes should be checked.

If a principle is not applicable to any of the devices in the device group, the respective box should be ticked. This can, for example, happen if the device group does not include any hardware which gives visual feedback to the driver and / or has no display to begin with, like a lever at the steering wheel or haptic buttons.

Furthermore, if a certain criterion cannot be checked without further measures which cannot be taken during the current assessment session, the box "subject to clarification" should be checked, and the respective principle should be noted in the "Further examinations / measurements needed" section of the summary sheet. This mainly concerns principles where standardised measurement procedures need to be applied in order to adhere to the NHTSA-guidelines, e.g. measurement of "eyes off the road" times using standardised measuring procedures.

Further references regarding the criterion (e.g. additions from other guildelines included in the item, measurement instructions etc.) can be found under specific items. The respective box can also be used to include personal references or notes regarding the criterion.

After every item in Module 1 was processed for the device group, step 2 is completed.

Step 3: Module 2 Function

In contrast to Module 1, Module 2 is completed for every function specified in Step 1 individually. If there are four functions (as specified in step 1) to be assessed, four Module 2 protocols need to be completed.

Every function assessment starts with describing the task for which the function is used by answering four questions: the cause of function usage, its time-criticality, its frequency and if the function might also be used only or typically in situations considered inherently complex. When all questions are answered, the acceptable threshold for implementation options (sorted by amount of distraction expectable from the respective concepts) can be determined by following the provided decision tree (see detailed instructions provided as part of Module 2a). When the acceptance threshold is marked, all actual and / or planned implementations can and should be checked against that threshold.

After answering two concluding questions in Module 2a, assessment of the function should proceed to module 2b, which again consists of principles derived from NHTSA Phase 1 – Guidelines, and follow the same logic and format described for in Step 2 ("Devices" module).

The process described under Step 3 is then repeated for each function specified as being part of the assessment scope, until all functions were assessed accordingly.

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Step 4: Completing the summary sheets

After all functions were assessed using module 2, the assessment session is concluded by completely filling in the provided summary sheets. Every minor and serious concern that arose during assessment should be listed in the respective sections, and every item marked "subject to clarification" for the device group or specific functions should be documented, including comments and recommended measures.

If there were any minor or major concerns identified during the assessment, it is recommended to use the approach proposed by Stevens & Cynk (2011) and perform a second-level assessment by reviewing number, type and existence of any relationship between the minor concerns. The presence of a serious concern can be a clear hint that the design of the assessed HMI is inappropriate from a safety standpoint; however, an accumulation of minor problems can also lead assessors to the conclusion that the system compromises driver safety to an inacceptable degree.

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Overview Sheet

Assessment ID	Please assign a unique ID to the assessment session:
Assessors:	
Date:	

System under assessment
Skip non-applicable

Vehicle Make and Model	
Product Name(s) and Version(s)	
Manufacturer / Supplier	
Build Status (e.g. prototype, production)	
Driver Group considered during assessment	
Additional Information	

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Overview Sheet

Please write down the unique IDs of prior assessments relevant to this assessment session (i.e. past assessments of functions / devices or prior versions of those included here) (last iteration suffices)

Relevant prior assessments	
ID	Content (Assessed Devices / Functions

Please write down every function of the HMI that is to be assessed within the scope of this session.

Functions to be included in assessment	
Function	Devices relevant to the function (input / output)
1.	
2.	
3.	
4.	
6.	
7.	
8.	
9.	
10.	

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Overview Sheet

Please write down every hardware device (input /output) of the HMI that can be used to access and use the functions defined above, and is therefore to be assessed within the scope of this session.

Overview Devices to be included in assessment (from above)	
1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

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Module 1: Devices

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1. No part of any of the physical devices, when mounted in the manner intended by the manufacturer, should obstruct a driver's view of the roadway.
(NHTSA 2013 V. A1)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O

Concern Description:	

Further References:

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2. No part of any of the physical devices, when mounted in the manner intended by the manufacturer, should obstruct a driver's view of any vehicle controls or displays required for driving. (NHTSA 2013 V. A2)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O

Concern Description:	

Further References:

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Module 1: Devices

3. Every device should be in a location that is easy to see and/or reach (as appropriate) while driving. (NHTSA 2013 V. B, Stevens & Cynk, 2011)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Stevens & Cynk, 2011: *All controls needed when driving can be reached from the normal driving position. Stretching or leaning is not required. Awkward arm or body positions are not required.*

4. Each device's display(s) should be mounted in a position where the downward viewing angle, measured at the geometric center of each active display area, is less than at least one of the following two angles: • *The 2D Maximum Downward Angle, or* • *The 3D Maximum Downward Angle* (NHTSA 2013 V. C)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

NHTSA (2013) chapter V C. (pp. 253 ff.) for measuring method |

SAE Recommended Practice J941 "Motor Vehicle Drivers' Eye Locations" (2010)

Module 1: Devices

5. Visual displays that present information relevant to the driving task and/or visually intensive information should be laterally positioned as close as practicable to a driver's forward line of sight. (NHTSA 2013 V. D)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

6. All devices should not produce sound levels likely to mask warnings either from within or from outside the vehicle, or that cause distraction. All devices' sound level control should demonstrate their ability to adjust sound levels down to a fully muted level. (NHTSA 2013 V. H)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

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7. All devices should allow a driver to maintain at least one hand on the vehicle's steering control. All tasks that require manual control inputs (and can be performed with the device while the vehicle is in motion) should be executable by a driver in a way that meets all of the following criteria: (NHTSA 2013 V. I)

O When manual device controls are placed in locations other than on the steering control, no more than one hand should be required for manual input to the device at any given time during driving

O When device controls are located on the steering wheel and both hands are on the steering wheel, no device tasks should require simultaneous manual inputs from both hands.

O A driver's reach to the devices controls should allow one hand to remain on the steering control at all times

O Reach of the whole hand through steering wheel openings should not be required for operation of any device controls

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

8. Devices providing non-safety-related information should provide a means by which the device can be turned off or otherwise disabled.

All devices providing dynamic (i.e., moving), non-safety-related visual information should provide a means by which that information cannot be seen by the driver. All devices visually presenting dynamic non-safety-related information should make the information not visible by the driver through at least one of the following mechanisms: (NHTSA 2013 V. L1 & L2)

a. Dimming the displayed information,

b. Turning off or blanking the displayed information,

c. Changing the state of the display so that the dynamic, non-safety-related information cannot be seen by a driver while driving, or

d. Positioning or moving the display so that the dynamic, non-safety-related information cannot be seen while driving

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Module 1: Devices

9. Information about current status and any detected malfunction within the devices that is likely to have an adverse impact on safety should be presented to the driver. (NHTSA 2013 V. N)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

10. Every device should clearly distinguish between those aspects of the device that are intended for use by a driver while driving, and those aspects (e.g., specific functions, menus, etc.) that are not intended to be used while driving. (NHTSA 2013 V. M)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

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Module 1: Devices

11. The following electronic device tasks are recommended for per se lock out and should always be inaccessible by the driver while driving. (NHTSA 2013 V. F)

1. Device functions and tasks not intended to be used by a driver while driving.

2. Manual Text Entry. Manual text entry by the driver for the purpose of text-based messaging, other communication, or internet browsing.

The following electronic device tasks are recommended for per se lock out and should always be a) inaccessible to the driver while driving and b) inaccessible for usage by a passenger if the related display is within view of the driver properly restrained by a seat belt:

3. Video-based entertainment, video-based communication and all other non-driving related video types

4. Displaying non-video graphical images except those specified in the NHTSA Guideline (driving-related, automatically vanishing upon task completion)

5. Automatically scrolling text

6. Display text not related to the driving task (e.g. books, newspapers, social media and web content) or exceeding the acceptable amount determined by the NHTSA task acceptance protocol

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

NHTSA (2013) chapter V F. (pp. 256 ff.)

MODULE 2a: Function Implementation (_____)

Please evaluate the function regarding the context and typical trigger of usage. To do this, first answer the following questions regarding the typical cause and circumstances of function usages.

Please fill out the following checklist module separately for each function assessed.

Q1: Is the function used only due to a voluntary decision by the driver, or due to external factors <u>relevant to the driving task</u>?

voluntary:

e.g. switching to another music album, adjusting the air conditioning, answering a phone call

external / environmental factors relevant to the driving task:

e.g. windscreen wipers due to rain, approaching another car / an obstacle on the road, signalling when turning, adding an intermediate destination in the navigation system

O external cause relevant to the driving task

O voluntary decision

Q2: Is it important that a timely reaction to the cause for function use occurs? If yes, is it safety-critical that the reaction occurs as immediate as possible, or is a timeframe of several seconds after the motivating event acceptable?

No timely reaction needed: e.g. adding a gas station to the navigation after gas light lights up; switching the radio channel

Timely reaction necessary: e.g. adjusting speed limiter of cruise control system when approaching a speed limit sign

Immediate reaction necessary: e.g. braking, using windscreen wipers, activating hazard lights

O no immediate function use needed

O yes, a timely (but not immediate) function use is needed

O yes, an function use is immediately needed

Q3: Is function use (also) necessary in driving situations that are demanding in nature (e.g. approaching or crossing intersections, bad weather conditions, motorway access).

O yes

O no

Q4: How often will the function be used on average while driving?

Rarely: e.g. on average not more than once during twenty minutes of driving, only under specific circumstances like bad weather

*Frequently: e.g. more than once during twenty minutes of driving, under most driving conditions*

O rarely

O frequently

MODULE 2a: Function Implementation (_____)

After answering all four questions, please use the following flowchart to determine the acceptable minimum of the function regarding its implementation (accessibility, medium). The proposed categories of implementation are sorted after conceptual distraction implications, from highest distraction risk on top to least distraction risk at the bottom. For example, implementing the function in a way that it can be accessed via a single verbal input into a standard speech recognition system (lower light green box) is typically considered less distracting than a touch access where the user has to navigate through a menu more than one step deep to access a function (red box).

After determining the minimum acceptable implementation option by following the decision diagram, please mark the respective acceptance threshold by checking the corresponding circle to the right of the diagram. Every option below the marked threshold is to be considered potentially acceptable regarding ease of access and medium.
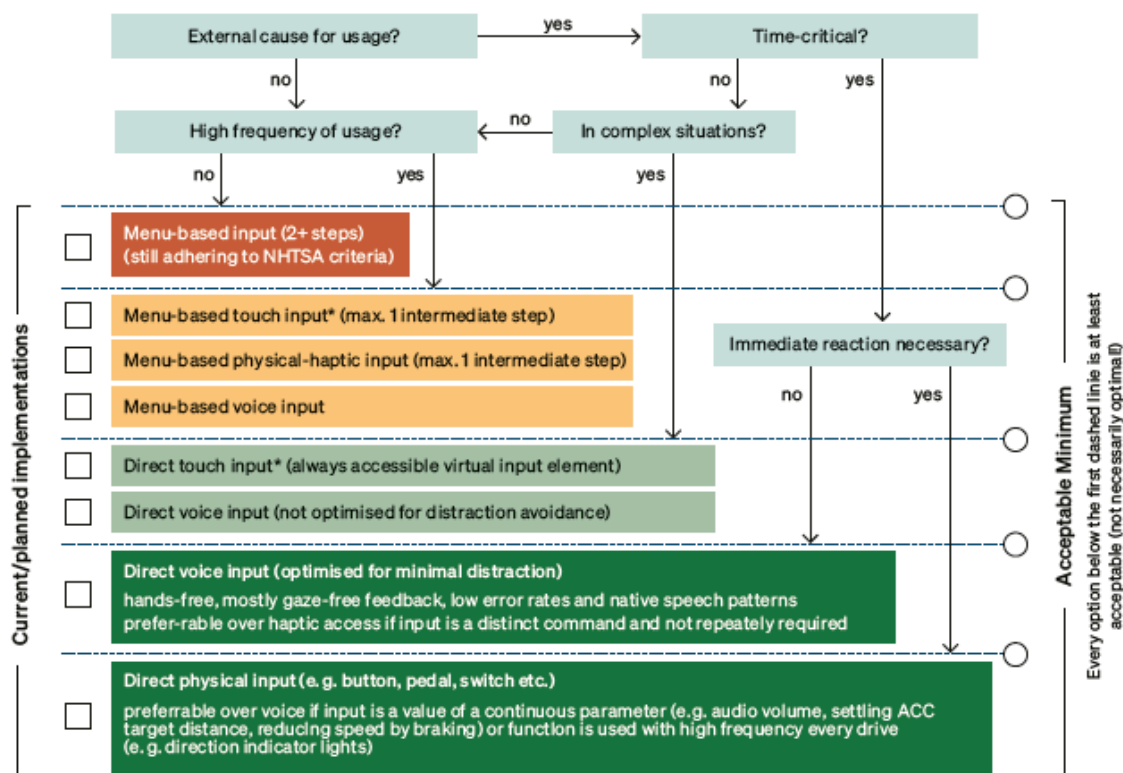
* Can be treated as "physical input" if haptic feedback sufficient for gaze-free operation.

Next, document all implementation options that were in fact used or are planned to be used, by checking the corresponding boxes to the left of the specific categories. Please mark every implementation option that is available / planned for accessing the function. For example, if a function can be accessed and used either by voice command or via the touchscreen monitor, both options should be marked accordingly in the implementation column. As a result, all realised / planned implementations can be compared to the acceptance threshold determined from the flowchart. The presence of any implementation higher (i.e. more distracting) than the proposed minimum implementation advice should be considered relevant for further examination. Please continue by answering the following questions.

12. Are one or more of the real / intended implementation options for the function of a category that is located above the determined acceptance threshold in the flowchart?

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

13. Are all input elements that can be used to access and use the function designed in a way that finding and operating them is as easy and least error prone as possible?

I.e. are physical input devices distinct, easy to find and operate? Are virtual buttons sufficiently easy to detect and big enough, and therefore easy to hit? Are the voice commands (if any) easy to memorize and sufficiently well recognised by the system?

Please specify which input elements (if any) invoke concerns in the "problem description" section, and in what way their specific properties could be cause for concern.

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

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Module 2b: Function Assessment (_____)

Please fill out the following checklist module separately for each function assessed.

14. Visually presented text during function use should meet the legibility recommendations contained in ISO International Standard 15008:2003 (or newer)? (NHTSA 2013 V. E)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

ISO 15008:2017 "Road vehicles – Ergonomic aspects of transport information and control systems – Specifications and compliance procedures for in-vehicle visual presentation."

15a. Multi-step function use should not require uninterruptible sequences of visual-manual interactions by a driver. A driver should be able to resume an operator-interrupted sequence of visual-manual interactions with a device at the point of interruption or at another logical point in the sequence. (NHTSA 2013 V. J) *(If function use is always single-step, choose "not applicable" and skip Items 15b-15e)*					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Module 2b: Function Assessment (_____)

15b. No system-initiated loss of partial driver input (either data or command inputs) should occur automatically during multi-step function use, with the exception below. *Devices may revert automatically to a previous or default state without the necessity of further driver input after a function specific time-out period, provided:* *a. It is a low priority device state (one that does not affect safety-related functions or way finding), and* *b. the state being left can be reached again with low driver effort. In this context, low driver effort is defined as either a single driver input or not more than four presses of one button.* (NHTSA 2013 V. J1 & J5)					

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Module 2b: Function Assessment (_____)

15c. Drivers should be able to initiate commands that erase driver inputs during multistep function use. (NHTSA 2013 V. J2)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

15d. A visual display of previously-entered data or current device state should be provided to remind a driver of where the task was left off. If feasible, necessary, and appropriate, the device should offer to aid a driver in finding the point to resume the input sequence or in determining the next action to be taken. Possible aids include, but are not limited to: a. A visually displayed indication of where a driver left off, b. A visually displayed indication of input required to complete the task, or c. An indication to aid a driver in finding where to resume the task. (NHTSA 2013 V J3 & J4)					
Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Module 2b: Function Assessment (_____)

15e. This subsection 15 is not applicable to device output of dynamically changing data. The system should control the display of information related to dynamic events that are not within the driver's direct control (e.g., distance to the next turn). (NHTSA 2013 V. J6)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

16a. All system responses (e.g., feedback, confirmation) following driver input should be timely and clearly perceptible when using the function. As a "best practice," the maximum device response time to a device input should not exceed 0.25 seconds. The measurement of this time should begin starting at the completion of the driver's control input. (NHTSA 2013 V. K1 & K2)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

16b. If system response times during function use exceeds 2.00 seconds, a clearly perceptible indication should be given indicating that the system is responding. Again, the measurement of this time should begin starting at the completion of the driver's control input. (NHTSA 2013 V. K.3)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

16c. All output devices' responses are clearly perceptible if it is obvious to the driver that a change has occurred in the device and that this change is the consequence of the input. If this change in the device resulting from an input is not always the same but depends on one or more previous inputs, it would be advisable to offer help (i.e., provide help if requested by the driver). (NHTSA 2013 V. K.4)

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

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der Versicherer

Human Factors Consult

Module 2b: Function Assessment (_____)

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17. A function requiring multiple inputs before completion that diverts a driver's visual attention from the primary driving task to the point it does not conform with one of the task acceptance methods contained in NHTSA Phase 1 Section VI, should be optimised in its implementation accordingly or locked out while driving. A function (single or multiple inputs) should never divert the visual attention of the driver for more than two seconds per gaze (average), or be locked out. (adapted, based on NHTSA 2013 V. G)

Please choose which method was used to measure task acceptability for this function, and mark every criterion that was successfully fulfilled. If no standardised task acceptance test has been conducted yet, please check "subject to clarification".

Eye Glance Measurement using Driver Simulator Testing (conducted according to NHTSA specifications):

O no more than 15% (rounded up) of glances were >2.0 seconds

O mean glance duration was 2.0s or less

O the sum of durations of glances was less or equal 12 seconds

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Occlusion Testing (conducted according to NHTSA specifications):

O Total Shutter Open Time was 12 seconds or less

Other task acceptance method:

Results:

Concerns:	O none	O minor	O serious	subject to clarification O	not applicable O
Concern Description:					

Further References:

Setting:	
Mockup Testing	
Static Assessment	
Driving Simulator Study	
Assessment while Driving (Test Drive Course)	
Assessment while Driving (Traffic)	
Other:	

Build Status:	
Partial software mock-up	
Prototype	
Market-ready	
Overall IVIS / ADAS assessment	
Other:	

Assessment Scope

Functions included in assessment	Devices included in assessment

Subject to clarification

Device / Function	Checklist item where clarification is needed	Recommendations / Comments

DEVICES

Serious Concerns and Reasons:

Minor Concerns and Reasons:

Additional Comments / Recommendations:

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Human
Factors
Consult

Functions

Serious Concerns and Reasons:

Minor Concerns and Reasons:

Overall Assessment:

For explanations of the checklist see:

Unfallforschung Kompakt Nr. 125 „Ablenkung durch Fahrzeugbedienung"

UDV-kompakt Nr. 125 „Ablenkung durch Fahrzeugbedienung"

For research background of the checklist, see:

Forschungsbericht Nr. 88 „Ablenkung im Fahrzeug"

Forschungsbericht Nr. 88 „Ablenkung im Fahrzeug"