Information Society Technologies (IST) Programme

AIDE

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Final Exploitation Plan – Public version

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1	31.03.2008	Final version generated based on the final exploitation information of all AIDE partners
2	03.04.2008	One more result added. Version submitted to EC.
3	20.05.2008	Refined version based on input from final review.
4	09.08.2008	Dissemination Level corrected to PU by Coordinator.

List of Abbreviations

ADAS	**Advanced Driver Assistant System**
ADASRP	**Advanced Driver Assistant System Research Platfrom**
AIDE	**Adaptive Integrated Driver-vehicle Interface.**
DVE	**Driver-Vehicle-Environmen**
ESOP	**European Statement of Principles**
HMI	**Human Machine Interface/Interaction.**
ICA	**Interaction and Communication Assistant.**
IP	**Integrated Project**
ISO	**International Standardisation Organisation.**
IVIS	**In-Vehicle Information System**
MOU	**Memorandum of Understanding**
NASA-TLX	**NASA Task Load indeX.**
OEM	**Original Equipment Manufacturer**
PDT	**Peripheral Detection Task**
RTD	**Research and Technological Development**
S&T	**Science and Technology**
SP	**Subproject**
TERA	**Traffic & Environment Risk Assessment.**
TIER-1 supplier	**Direct supplier**
WP	**Workpackage**

Table of Contents

Executive summary

This final exploitation plan gives an overview over the results that were achieved in the subprojects of the integrated project “Adaptive integrated Driver Vehicle Interface (AIDE). All results are listed and described in detail considering their impact and possible application.
The document separates the results following the project structure into four subproject sections. The details on results are given grouped per subproject in the annex of the document. It is obvious that each subproject puts the focus to a different direction which represents the inherent structure of this IP. Whereby subproject 1 mainly discusses results that are made available to the basic research and driver modeling, the methodological focus of Subproject 2 is on the adaptation of evaluation procedures and methodologies to the industrial context and their application on the subproject 3 demonstrator. Subproject 3 discusses results that target the implementation of future HMI concepts and technical aspects due to requirements of adaptive systems and the need for more integration; partially they are based on modeling concepts delivered by Subproject 1. Subproject 4 results are more related to standardization and dissemination.
Due to this heterogenity all results are discussed in a standardized format that describes the content and gives a contact person for further information.
The procedure to gather this information also followed the subproject structure of the IP. Results were collected and synchronized by subproject -leaders and Workpackage leaders. Content and description was delivered by task leaders and partners. This procedure was established in the consortium by the initial exploitation plan.
Following the AIDE nomenclature confidential results are not listed in this deliverable but directly forwarded to the commission bypassing the review process.
It is important to note that AIDE reports a lists of 32 final results that cover a broad spectrum and were in several cases already made available to external parties (cf. Standardization bodies, international partners, projects). This shows that the process that was started with the initial exploitation plan could be continued and was successfully finalized.

1. Introduction

The purpose of this final exploitation plan is to describe how the main results of the AIDE project will or can be exploited, by project partners or others. By defining this exploitation plan, the project wishes to show clearly that the work carried out in AIDE has generated substantial contributions with a great potential for beneficial socio-economic impact on national, European or world wide arenas. Also, it is a purpose of this document to facilitate exploitation of AIDE results, and encourage further exploitation, by providing a description of and a contact person for each exploitable result.

This final exploitation plan is a follow-up to the initial exploitation plan that was delivered at the project midterm. It complements the Final Activity Report of the AIDE project. (Please refer to that document for more information on the actual work carried out in order to generate the exploitable results described in this exploitation plan)

The procedure adopted to define the final exploitation plan has been both bottom-up and top-down. Results were collected and synchronized by subproject-leaders and workpackage leaders, and content, description and detailed information were delivered by task leaders and partners in a bottom-up fashion. Also, the AIDE Coregroup has acted as a continuous reviewer of the list of exploitable results, giving top-down recommendations on inclusion of missing items, etc.

It should be noted that results and/or exploitation plans that partners cannot publicly disclose are not listed in this deliverable but have been directly forwarded to the European Commission by individual partners, bypassing the IP-level review process.

The exploitation plan document is organised as follows: In a first overview section, a brief background and motivation for the AIDE project is given, as well as an overview of the project and its main results, to indicate in what domains and to what ends AIDE results are expected to be exploitable. Then one section per AIDE subproject follows. In these sections, exploitable results from each subproject are listed, and summary discussions on corresponding overall exploitation plans are drawn. Finally, an IP-level summary is given, and conclusions are made. Detailed descriptions of all exploitable results and envisioned exploitation plans, including contact details of main contact persons for each result, are given as an annex to the report. (the subproject-level discussions presented inside the main document are based on these detailed descriptions.)

2. Overview of the AIDE Integrated Project

Road safety is identified as a major European health problem. Every year, about 45 000 people die and 1.5 million are injured in traffic accidents in Europe. AIDE has been oriented to the “White Paper on European Transport Policy for 2010”, in which the European Commission declared the ambitious objective to reduce by 50% the number of fatal accidents on European roads by 2010.

The development of new Advanced Driver Assistance Systems (e.g. collision avoidance, lane-keeping aid and vision enhancement systems) offers great potential for further improving road safety. However, drivers’ use of in-vehicle information systems and nomadic devices (portable devices brought into the vehicle for use while driving, the use of which also has increased dramatically during the lifetime of the AIDE project), is beneficial in terms of mobility and productivity, but represents a potential safety risk. Optimisation of the human-machine interaction (HMI) is one way of minimising this risk, and thus, as identified in the Final Report of the eSafety working group on Road Safety, HMI remains a key building block for integrated safety.

The AIDE Integrated Project (IP) started in March 2004 and was set up as a four year project, with four separate subprojects. The project consortium includes OEMs, suppliers and scientific research institutes. The general objective of the AIDE IP has been to generate the knowledge and develop methodologies and human-machine interface technologies required for safe and efficient integration of ADAS, IVIS and nomad devices into the driving environment.

The AIDE IP has designed, developed and validated a generic Adaptive Integrated Driver-vehicle Interface that employs innovative concepts and technologies with the goal of: (1) maximising the efficiency, and hence the safety benefits, of advanced driver assistance systems, (2) minimising the level of workload and distraction imposed by in-vehicle information systems and nomad devices and (3) enabling the potential benefits of new in-vehicle technologies and nomad devices in terms of mobility and comfort, without compromising safety.

A brief summary of the main results per subproject is given below:

- **Subproject 1**
  Basic understanding, modelling and simulation of the driver-vehicle-environment (DVE) interaction and how it is affected by ADAS and IVIS.

- **Subproject 2**
  Development of a methodology for evaluation and assessment of integrated and adaptive HMI solutions, including the necessary evaluation tools, metrics and process descriptions.

- **Subproject 3**
  Design and development of the AIDE integrated and adaptive HMI. Implementation and validation of the AIDE HMI in three different demonstration vehicles
  (city car, luxury car, heavy truck).

- **Subproject 4**
  Dissemination, contribution to guidelines and standards activities.

In terms of result exploitation target groups, all subprojects have targeted several interest groups: End users (private users, fleet owners), automotive industry, research community, public administrations, organisations and networks, national and international standardisation bodies and other related research projects (in the Sixth Framework Programme and other research initiatives).

3. Exploitation Plans per AIDE Subproject

3.1 Subproject 1

Subproject 1 has been conceived with the aim to create a model for Driver, Vehicle and Environment and to integrate it into a simulation system.
This system allows to predict Drivers' behaviour according to different driver, vehicle and environment conditions and to evaluate the effect of an information/driving assistance device active on board.

These aims have been translated into a theoretical model for predicting dynamic Driver-Vehicle-Environment (DVE) interactions (*DVE framework*), implemented in a computerised numerical simulation called *SSDrive.*
In order to identify the parameters of the DVE model:

- experimental tests have been carried out to know how Driver's behaviour changes when driving in different scenarios, as traffic, road and weather conditions change;
- an analysis of Driver's response to Advanced Driver Assistant Systems (ADAS) was carried out by providing assistance to Vehicle control (lateral and longitudinal) during learning, appropriation and long-term phase;
- advanced modelling techniques have been applied to identify Driver's Task Demand, Distraction due to In-Vehicle Information System (IVIS) activation and Driver's propensity to incur in a safety critical condition. Specific numerical simulation approaches have been selected in order to tune and validate these parameters according to data collected during tests run on a driving simulator.

SSDrive is a driving simulator, whose configuration can be completely changed at user's discretion.
It is a flexible tool, allowing to reproduce different vehicle, environment and driver's status conditions. Some of them are already available, while more specific others can be shaped on user's needs. Possible SSDrive applications can be:

- evaluation of safety critical conditions inside a simulated environment;
- integration of Driver-Vehicle-Environment adapted to user's needs;
- reproduction of the effects of on-board IVIS/ADAS on driving behaviour.

SSDrive system allows Automotive manufactures and suppliers to analyze drivers' and vehicles' behaviour in different driving environments (e.g. City, Rural and Highway roads, different traffic conditions, obstacle avoidance, lane changes), and it allows the observation on how the presence of one or more IVIS (here configured as a distraction source) can have an impact on the driving task, especially in some particularly critical scenarios.
In this way, IVIS designers will have the possibility to modify their systems, better adapting them to the driving tasks. This means it will be possible to do more rapid and economic tests and analysis, compared to traditional simulation systems with users, allowing significant accelerations in test and design processes.
SSDrive, moreover, can be a test-bed to develop innovative functions which allow an adequate tuning of all the ADAS systems active on the vehicle, adapting them to driving.
SSDrive can identify particularly critical manoeuvres which can have a dangerous impact on driver's perceiving of environment and risks, suggesting in such situations the introduction of an ADAS.

The achievements of SP1 and ongoing improvements of the *SSDrive-Driver, Vehicle and Environment model* provide an important starting point to have a future total control and integration of devices and systems active on board vehicle, to make driving a more and more comfortable and safe experience.

Overview Table of Results Subproject 1

Details can be found in ANNEX A

No.	Self-descriptive title of the result	Cate-gory A, B or C*	Partner(s) exploiting the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use	Type of Result
1	Parameters and indicators of behavioural adaptation to ADAS/IVIS for inclusion in DVE model for preliminary design of AIDE system	A	KITE, JRC, ICCS, CIDAUT, CERTH, INRETS, LIU, UNILEEDS, VTI	Scientific
2	Final DVE model structure	A	KITE, CIDAUT, INRETS, CRF, UNIMORE, RENAULT, PSA.	Scientific
3	Literature review of behavioural effects	A	JRC, ICCS, CIDAUT, PSA, TNO, REGIENOV, CERTH, INRETS, LIU, UNILEEDS, VTI.	Scientific
4	Measurement of the long-term effects of ADAS	A	JRC, ICCS, CIDAUT, PSA, TNO, REGIENOV, CERTH, INRETS, LIU, UNILEEDS, VTI.	Scientific
5	Investigation of learning and appropriation phase of ADAS and adaptive ADAS	A	PSA, AIDE partners	Demo Trials
6	Computer simulation of Driver-Vehicle-Environment – SSDRIVE	A	KITE (source code), All AIDE partners	Software

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results

3.2. Subproject 2

The main goal of SP2 was to further develop well established evaluation methodologies especially to tailor them for the assessment of integrated adaptive solutions and propagate them within and around the AIDE IP. This means that ongoing work was continously disseminated on international level (ISO and conference contributions) and in connection with other FP6 activities like e.g. the HUMANIST NoE or PREVENT to get further input and establish achievements in evaluation activities of other projects.
Main targets were to make existing evaluation approaches more efficient in use like e.g. visual behaviour analysis which is one main column to understand driver behavior in interaction with integrated solutions. Another target of research was to further develop objective metrics for mental workload measurement based on the detection task paradigm, which lead to the tactile detection task setting.
As an increasing number of evaluation methodologies are being developed and (with the support of AIDE) being set in guidelines or standards, it is important to ensure that those methods are correctly applied by HMI evaluators. An important input for this issue is the so-called “AIDE cookbook” which will not replace basic methodological literature but shall be a helpful procedural assistant document for the laboratory staff.
It can be seen that the AIDE SP2 activities lead in some cases to commercialised evaluation kits and packages as well as process descriptions for efficient planning of evaluation activities. Those refinements and exploitable results are based on the experimental activities within SP2 in relation with the other subprojects. Therefore, not only method construction but also the proof of concept and application of measurement equipment and procedures have been fulfilled by SP2
The exploitable results in the area of methodologies cover new approaches for subjective workload assessments, as well as software (e.g. for advanced visual behaviour analysis) or hardware equipment (e.g. different realisations of detection tasks).
Moreover different metrics were combined to achieve the modeling of risk based on behavioral data which were gathered in evaluation experiments. Finally a selection of techniques and metrics was used to conduct the evaluation of the AIDE demonstrators. This represents the final application of the AIDE methodology and proof of concept.
Therefore the exploitable results of SP2 serve as a valuable and practical input for human factors evaluators in the industry and research and should help to extend their laboratories and facilitate the evaluation of complex HMI solutions integration IVIS and ADAS functionalities.

Overview Table of Results Subproject 2

Details to be found in ANNEX B

No.	Self-descriptive title of the result	Category A, B or C*	Partner(s) exploiting the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use	Type of Result
1	The Visual Demand Measurement Tool	A	VTEC, BMW, TNO, CTAG PSA VTT VTI REGIENOV PSA	Method
2	Development and validation of existing subjective tools and methods for the evaluation of driver mental workload	A	PSA CTAG KITE BAST VTEC	Scientific, Method
3	Taxonomy of IVIS/ADAS applications	A	ICCS; BMW; BOSCH	Database
4	Modular subjective instrument to evaluate usability and other aspects of ADAS and/or IVIS systems	A	INRETS KITE UNIMOD CTAG VTT VTI TNO PSA	Method
5	Development and Refinement of Evaluation Tools and Methods: Tactile Detection Task and Peripheral Detection Task	A	TNO BMW	Scientific, Method
6	Development and Refinement of Evaluation Tools and Methods: Enhanced Occlusion Test	A	BAST BMW	Scientific, Method
7	Development and Refinement of Evaluation Tools and Methods: Lane Change Test in Driving Simulation	A	BMW VTEC FORD PSA DC CTAG	Scientific, Method
8	Review of existing techniques and metrics for IVIS and ADAS assessment	A	VTEC, BAST, CRF BMW PSA TNO VTI CTAG	Scientific
9	Quantitative relationships for accident risk effects estimates	A	VTI ULEEDS	Scientific
10	Trade-off between driver state and behaviour with respect to effects on accident risk	A	TNO	Scientific
11	AIDE evaluation methodology ('AIDE Cookbook')	A	TNO, CRF, BMW	Method
12	Experimental results (evaluations)	B	VTI, TNO, CIDAUT, VTEC, CRF, SEAT	Scientific, Demo Trials

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results

3.3. Subproject 3

SP3 main objective was to design and develop the AIDE integrated adaptive HMI for all types of vehicles. To do this a number of activities were planned and performed. These included:

- Design of a generic HMI functional architecture.
- Design and development of a number of Driver Vehicle Environment (DVE) monitoring modules.
- Design and development of an information management system (ICA) able to manage the available information/messages within the vehicle taking decisions on which information, when and how will be presented to the driver.
- Design and development of a set of innovative and SoA I/O devices with special attention on their integration.
- Integration of Nomadic devices through the creation of a Bluetooth based Gateway.

These activities led to a number of exploitable results both as stand alone modules but also as integrated solutions.

The first set of exploitable results includes a number of modules that can be exploited as stand alone modules. Examples can be the different DVE modules which can be used both as supportive modules for the integrated, adaptive HMI but also as single modules that can be used in a number of applications related to or depend on monitoring modules. In this respect these modules can be exploited both by the partners developed them (usually Research Institutes) but also from automotive suppliers and OEMs.

In this category one can add the core of the AIDE system which is the ICA module. ICA can be exploited either as part of an integrated HMI concept or as a stand alone expert system able to upgrade the capabilities of existing HMI solutions or to add intelligence in managing information and messages/warnings within a vehicle. In this respect ICA can be mainly exploited by OEMs and automotive suppliers.

Finally in this category the I/O devices developed or upgraded in AIDE are included. Examples of that are the speech interface and the haptic barrel key. Obviously the key interested partners for exploitation of these results are the I/O developers and of course OEMs that would like to see these devices in their vehicles.

A second set of results are related to more horizontal or integrated results. One can add on this the AIDE HMI architecture that allows in a transparent, open and modular way the design and implementation of different HMI concepts. In this respect this is a result not of direct commercial exploitation interest but of great exploitation interest as it is in reality an enabling factor for the future HMI solutions. This means that all types of Organisations (OEMs, Suppliers, and Research Institutes) are interested in the active exploitation of this result.

Also at this set of results the AIDE HMI concepts are included (as integrated adaptive HMI solutions). These concepts which have been already implemented at the demonstrators of the project provide the basis for commercial future HMI solutions tailored in the needs and marketing identity of different vehicles. Main stakeholders here are the OEMs, followed by Tier-1 suppliers.

A separate set of results are related to the Nomadic devices integration within automotive vehicles. The work in AIDE SP3 in this aspect focused on the demonstration of integration solutions based on the concept of a Gateway that is following the general AIDE HMI architecture and allows the exchange of content, driver inputs and devices outputs between the vehicle and the ND. This Gateway has a potential for a short-mid term exploitation. Clearly the main stakeholder here is the Devices manufacturers together of course with the OEMs. In addition to that, AIDE demonstrated the capability of NDs to be the host of functions and applications related to the commercial use of vehicles with strong exploitation character.

All the above results have a mid and long term horizon for their implementation. Some of them are expected to enter the market sooner than others depending on the strategies of the responsible for exploitation companies.

At the same time the above results are planned to be exploited both commercially but also scientifically. Obviously the commercial companies of the consortium (OEMs and suppliers) have a strong interest to exploit the results of the project. Examples of such cases are the ICA, the DVE modules, the nomadic device gateway. On the other hand Research Institutes (but also companies' research departments) have a strong interest to exploit the project's results scientifically by using them for further research but also for high level training and education activities. Almost all results can be used under this perspective while some of them have mainly a research related exploitation value. Such an example is the AIDE HMI architecture which can be used as the enabler for creating other research activities or to design new HMI concepts.

Overview Table of Results Subproject 3

Details can be found in ANNEX C

No.	Self-descriptive title of the result	Category A, B or C*	Partner(s) exploiting the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use	Type of Result
1	Drivers characteristics module	A, B	CERTH/HIT	Demonstr
2	AIDE system logical and functional architecture	A, B	Bosch, CRF, ERTICO, ICCS, Motorola, Nuance, PSA, VTEC, VTT, SEAT, OPEL, ICCS, VTT	other
3	ICA Module	A, B	CRF, ICCS, VTEC, DIBE, SEAT UNIMOD TNO PSA OPEL	SW code
4	HMI virtual prototypes	A, B	USTUTT, CRF, VTEC, NUANCE, REGIENOV	Lab Protot., Demonstr
5	DVE modules on Real Time in Vehicle Platform	A, B	ICCS CRF UNIMORE	SW code
6	Traffic and Environment Risk Assessment module	A, B	ICCS	SW code
7	S/W Prototype of a Driver Availability Module	A, B	INRETS, CTAG, UNIMORE, OPEL	SW code
8	Speech I/O Software Device for in-car operation of phone or media player	A, B	NUANCE VTEC BMW	SW code
9	Architecture and data flow for integrated HMI system implementation	A, B	PSA	Method, Tech drwg
10	Adaptation and Warning strategies	A, B	REGIENOV, VTEC, CTAG	Scientific
11	Proof of Concept: Implementation of AIDE system in prototype vehicles	A, B	VTEC, CRF, SEAT	Protoype Demo
12	Cockpit Activity Assessment module	A, B	VTEC, VTT, OPEL, UNIMORE	Protoype Demo
13	Nomadic Device Gateway and applications	A, B	VTT, MOTOROLA, VTEC, BMW, CRF, ICCS, VTT, UNIMORE, NUANCE	SW code
14	A European Nomadic Devices Forum exploring a number of issues related to Nomadic Devices use by drivers	A, B	ERTICO, ICCS, VTEC; All AIDE Partners	other

3.4. Subproject 4

The main aspect of SP4 is to organize, manage and communicate the AIDE IP structure. Moreover, SP4 covers the interface to relevant standardization and eSafety activities. Within the first project phases, AIDE could deliver a remarkable contribution to support the finalization of Revised European Statement of Principles, give empirical input to the work of ISO SC13 WG8 and gained international reputation.

Overview Table of Results Subproject 4

Details can be found in ANNEX D

No	Self-descriptive title of the result.	Category A,B or C*	Partners exploiting the result	Type of Result
1	Review of existing HMI design guidelines and standards.	A	BASt, BMW, Bosch , JRC, Ertico, ICCS	Guideline
2	Recommendation for HMI Guidelines and Standards	A	BaSt, BMW, VTEC	Guideline

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results.

4. IP Level Summary and Conclusions

This deliverable gives an overview of the topics that are targeted for exploitation within the AIDE project after a period of two years. It can be shown that each subproject within the IP succeeded – following to its workplan - to reach remarkable results that serve as an important input for different exploiting parties. The effect of different exploiting parties is due to the profile of each subproject and its mission within the IP.
The results were compiled following the IP structure. But it was necessary to install a new process to compile the information inside AIDE that was suited to the huge number of individual and heterogeneous partners. This process had to be suitable for an IP including its subprojects.
For the initial exploitation the level of Subproject leaders and workpackage leaders was chosen to summarize and structure the results bottom up to the IP-level using a standardized format without loosing detailed information. This process can be reused for the final exploitation deliverable. As this document is an initial version of the exploitation plan, final statements cannot be made describing typical items related to exploitation. Therefore time to market, target market, volume, pricing and socio-economic impact are not rated in this document. Those information and data shall be given in the final exploitation plan and be collected following a comparable bottom up process.

Contribution to developing S&T co-operation at international level. European added value
AIDE addresses in its four subprojects HMI issues within a general European joint effort including research, suppliers, OEMs to address the main hurdles for integrated HMI solutions and identify the potential for adaptive solutions.
This cannot be accomplished by individual companies or member states alone, but requires large-scale European collaboration. Such collaboration will also strongly facilitate the industrial take-up of technologies, methodologies, HMI design guidelines and standards, which will increase the penetration rate of HMI RTD results and enable them to have a real impact on road safety. Especially the section on SP3 results show that the cooperation between OEMs, suppliers, nomadic device producers and research institutes leads to important results.

Contribution to policy design or implementation
AIDE as an IP is structured to contribute with latest scientific and experimental results to the work on the European Statement of principles (eSafety Working Group) and is linked to ISO WG8 SC13. The results in this area are described in the SP4 results section. During the AIDE project the European Statement of Principles II was formulated. The AIDE project could deliver substantial support to this working group and several AIDE partners were actively involved. Furthermore ESOP I and ESOP II were disseminated by the AIDE partners as basic HMI documents.

Improving the quality of life in the Community:
The increase of new information society technologies (nomad devices, phone, email) shows that the great potential for enhancing the mobility and quality of life is identified by the European citizen. An increasing amount of time is spent in vehicles and new telematics services and in-vehicle information applications are transforming the vehicle from merely a means for transportation to a place for work and leisure.
As information and mobility represent key values of the quality of life, it is necessary to address the well-known safety risks associated with the in-vehicle use of these systems and solve the potential conflict between information, mobility and road safety. Furthermore, an increase of in-car functionality will also take place in the field of active safety and driver assistance systems. AIDE is active on the field of integration of functionality for the user via the HMI (SP3) and develops further evaluation methodology that helps to ensure the quality of products throughout the development process (SP2).

ANNEX A Results of Subproject 1

No.	Self-descriptive title of the result
1	Parameters and indicators of behavioural adaptation to ADAS/IVIS for inclusion in DVE model for preliminary design of AIDE system
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Pietro Carlo Cacciabue
Position	Researcher, Head of Human Factors Sector
Organisation	Joint Research Centre (JRC)
E-mail	Pietro.cacciabue@jrc.it

TYPE OF RESULT / STATUS OF RESULT
Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	X
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
This report consists of a review of the driver behaviour variables and parameters aimed to be used for the Driver – Vehicle – Environment (DVE) model, specifically addressing the issue of behavioural adaptation to the use of Advanced Driver Assistance Systems (ADAS) and In-Vehicle Information systems (IVIS) and reflecting the most important behavioural indicators.

Planned or potential exploitation:
Design of in-vehicle systems through the inclusion of parameters and indicators of Behavioural Adaptation.

Socio-economic impact:
Impact on design processes and driver behaviour analyses, so that a common approach can be found for the inclusion of users in design and development cycles.

AIDE partner(s) exploiting the result:
KITE, JRC, ICCS, CIDAUT, CERTH, INRETS, LIU, UNILEEDS, VTI.

No.	Self-descriptive title of the result
2	Final DVE model structure
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Fabio Tango
Position	Researcher
Organisation	Centro Ricerche Fiat (CRF)
E-mail	Fabio.tango@crf.it

TYPE OF RESULT / STATUS OF RESULT

Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	X
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: Final formulation of driver-vehicle-environment model to be implemented in subproject 1 simulation tool. The cognitive / behavioural driver's model is developed following a Machine Learning approach; in particular, some parameters such as task demand, distraction and user's intentions are investigated, Indicators of behavioural adaptation to ADAS/IVIS (above all the latter) are also explored, by means of distraction parameter.
Planned or potential exploitation: Modelling driver behaviour for different purposes and applications, specifically for warning or assisting the users in their driving task.
Socio-economic impact: Impact on systems design by considering driver-vehicle-environment interactions and relationships. Possible impact at acceptability level: systems can be more supportive and effective in helping the driver
AIDE partner(s) exploiting the result: KITE, CIDAUT, INRETS, CRF, UNIMORE, RENAULT, PSA.

No.	Self-descriptive title of the result
3	Literature review of behavioural effects
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Farida Saad
Position	Researcher
Organisation	INRETS
E-mail	saad@inrets.fr

TYPE OF RESULT / STATUS OF RESULT

Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	X
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Literature review aimed at identifying the main types of problems that arise in the study of the behavioural adaptation induced by the use of different driver support systems.

Planned or potential exploitation:
Driver behaviour studies.

Socio-economic impact:
Impact on design of new systems by taking into account driver behaviour and driver needs and capabilities.

AIDE partner(s) exploiting the result:
JRC, ICCS, CIDAUT, PSA, TNO, REGIENOV, CERTH, INRETS, LIU, UNILEEDS, VTI.

No.	Self-descriptive title of the result
4	Measurement of the long-term effects of ADAS
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Estelle CHIN
Position	Cognitive ergonomics researcher
Organisation	PSA Peugeot Citroën
E-mail	estelle.chin@mpsa.com

TYPE OF RESULT / STATUS OF RESULT

Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:

There are 2 exploitable results in the deliverable :

1- Long-term behavioural effects of Citroen LDWS, speed limiter/conventional cruise control and Intelligent Speed Adaptation

2- Methods to evaluate long-term effects of ADAS

Planned or potential exploitation:

1- Results will be taken into account to optimize the development of the next version of LDWS, speed limiter and cruise control (functionality, HMI, user manual) to favour efficient and safe learning and use and avoid any misuse/abuse of ADAS

2- The different methods used to evaluate long-term effects of ADAS will be used in the internal procedure of HMI evaluation

Socio-economic impact:

Efficient use of ADAS increases their acceptability and favours the deployment of ADAS contributing to increase safety and mobility.

AIDE partner(s) exploiting the result:

JRC, ICCS, CIDAUT, PSA, TNO, REGIENOV, CERTH, INRETS, LIU, UNILEEDS, VTI.

No.	Self-descriptive title of the result
5	Investigation of learning and appropriation phase of ADAS and adaptive ADAS
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Estelle CHIN
Position	Cognitive ergonomics researcher
Organisation	PSA Peugeot Citroën
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TYPE OF RESULT / STATUS OF RESULT

Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	x
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:

There are 3 exploitable results in the deliverable :

3- Learn to drive with ACC
4- Learn to drive with speed limiter/conventional cruise control (French OEMs ADAS)
5- Acceptability of adaptive ADAS (frontal collision system)

Planned or potential exploitation:

3- Results will be taken into account in the design and the development of future ACC and to define relevant information in the user manual to favour efficient and safe use
4- Results will be taken into account to optimize the development of the next version of speed limiter and cruise control (functionality, HMI, user manual) to favour efficient and safe learning and use
5- Results will be taken into account in the design of ADAS (e.g. warnings) adapted to drivers' driving style (sport like or family-like drivers)

Socio-economic impact:

Efficient learning of ADAS increases their acceptability and use, and favours the deployment of ADAS contributing to increase safety and mobility.

AIDE partner(s) exploiting the result:
PSA and the AIDE partner(s) having generated the result, and therefore owning (equal shares of) it.

No.	Self-descriptive title of the result
6	Computer simulation of Driver-Vehicle-Environment - SSDRIVE
SP	**1**

CONTACT PERSON FOR THIS RESULT

Name	Nadia Cacciabue
Position	Project Manager
Organisation	KITE Solutions snc
E-mail	info@kitesolutions.it

TYPE OF RESULT / STATUS OF RESULT

Please tick one category only:

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:

SSDrive is a tool able to implement the DVE model in a software environment, allowing to simulate driver's behaviour in answer to the variation of parameters which describe the Environment, Driver's conditions and Vehicle's dynamics.
SSDrive has been developed in two software versions which allow the final user to operate on the setup of the characteristics of Driver, Vehicle and Environment with different level of detail.
The first version has been developed focusing on the Driver model characteristics and the interaction with IVIS devices; that is, driver's conditions can be set up by the final user by setting the parameters linked to driving attitude (ATT), experience (EXP), visibility and traffic density (VIS, DOT) and presence of activated IVIS in the passenger area. These parameters influence the driving behaviour and in particular:

- Speed, accelerations and steering angle;
- Task Demand (driver's cognitive workload in tackling driving tasks);
- DIStraction (driver's distraction level from the main driving task, caused by the presence/absence of activated IVIS).

Rules and parameters which describe driver's status, Vehicle's dynamics and Environmental conditions can be completely set up with different values. This application is developed in Matlab/Simulink, then it allows end-users to introduce other rules and parameters which describe, for instance, new conditions of the Environment or the simulated activation of an ADAS and its effects on the driving behaviour.

The second version is a stand alone application which is able to simulate the Environment and Vehicle

dynamics model in greater detail . In the Environment it has been implemented a simulation of hurdles on the path and the answer of the driving behaviour according to the hurdle's dynamics. For instance, it is possible to simulate traffic jams and car following conditions.
Driver's conditions can be simulated by modifying the above mentioned Experience and Driving Attitude parameters and it is possible to measure effects on Driver's behaviour through the evaluation of the speed, acceleration, steering angle, time to collision, headway.
This version allows to modifying only the parameters of Driver, Vehicle and Environment defined by the DVE model and it cannot be reprogrammed by the end user link the other version. This application was developed in C++ programming language.
In D 1.3.4 the user manual and instruction on how to install and utilise the software tool are given.
The theoretical background and description of architecture are found in subproject 1 deliverables D 1.1.3/4/5 and D 1.3.3

Planned or potential exploitation:
Software tools developed from the original DVE instrument will be sold or otherwise made available to interested third parties. The instruments will need an adaptation to the specific user needs and purposes.
In addition, the assessment of procedures for HMI evaluation could be expanded with the inclusion of simulation of DVE interaction for the design of interfaces. This action would require the support of a process for standardisation within ISO.

Areas of possible applications of SSDrive could be divided according to:
- AIDE-core applications based on AIDE subproject 1 aims defined in the technical annex and possibly provided by the SSDrive at the end of the project;
- Non-AIDE core applications going towards the direction of possible DVE simulator's improvement.

In reference to AIDE-core applications:
- SSDrive simulator could be seen as a tool for the evaluation and prediction of IVIS' impact on driver's behaviour, instead of assessing human subjects, e.g. test on equipped cars or driving simulator (cost effective activities).
- IVIS: evaluation of the impact on driver's behaviour and error propensity of IVIS' design changes, cost-value analysis, etc.. It should be possible to link the DVE to an IVIS system in order to validate the effectiveness of the system by measuring the simulated-driver response to the virtual environment. It should be possible to reproduce the IVIS effects on Driver, Vehicle and Environment in order to observe these effects on driver's behaviour and to assess the efficacy of the ADAS and IVIS systems.
    - DVE as tool to support the design and testing, in virtual conditions, of the impact of IVIS devices on different Environment, Driver state and Vehicle conditions.
    - DVE as a tool to evaluate the impact on driver's behaviour and error propensity of multiple IVIS activation.

SSDrive could be also considered as a tool supporting OEMs in the early stage of IVIS's development, in order to evaluate driving behaviour and error propensity due to a particular configuration of the IVIS reproduced in the DVE simulator through the DIS parameter.

In reference to non AIDE-core applications:
- the SSDrive could be used as an emulator of driver's behaviour in a simulated traffic environment, e.g. by modeling vehicles' behaviour of "surrounding traffic" in driving simulators, or in micro simulations of traffic (e.g. for road design).
- Road and traffic simulation are implemented to allow the evaluation of the impact on driver's behaviour and error propensity in different driving conditions.

Socio-economic impact:
It is our opinion that the DVE simulation tool (SSDRIVE) is a good tool for the evaluation of behaviour and safety implications of DVE interactions. This tool should lead to enable easier and more effective design processes and ultimately safer in-vehicle HMI. Standardisation of the DVE models will enable good comparisons and improved quality of evaluations, and thus will make HMI evaluation studies comparable to a greater extent.
SSDrive can have different applications aimed not just to assess existing functionalities, but also to develop alternative and new ones, reducing time, risks and costs of tests on users.

For instance, it can be useful to: - Industrial partners (both supplier and OEM) for a quicker and more flexible assessment of an IVIS since the early stage of design phase; - Industrial partners who have already developed one or more IVIS; - Who want to evaluate the impact on the driving behaviour by reproducing different instrumental combinations.
AIDE partner(s) exploiting the result: KITE will own the source code of SSDRIVE. All AIDE partners will have free use of the tool in its basic configuration.

ANNEX B Results of Subproject 2

No.	Self-descriptive title of the result
1	The Visual Demand Measurement Tool
SP	**2**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The work in this task differs somewhat from the other tasks in AIDE WP 2.2 where the focus has been on the development of metrics and methods. Here the focus has been on actual technical development of the analysis tool, however; a range of suggested metrics has also been presented. This selection is based on previous results in related projects. An overview of some of the work performed on visual behaviour including descriptions of metrics can also be found in a review conducted within the AIDE project by Johansson et al (2004).

Planned or potential exploitation:
The Visual Demand Measurement (VDM) tool is currently being used within Volvo Technology and can be used by all AIDE partners. Interest has been expressed also from institutes and companies outside AIDE.

Socio-economic impact:
As the primary source of information in driving is visual and many accidents can be attributed to visual distraction the measurement of visual behaviour is imperative. The importance of the measurement of the visual demand of IVIS/ADAS through eye-glance behaviour (e.g. glance frequency, average glance duration, total glance duration, total task time) is, for example, reflected in the European Statement of Principles on Human Machine Interface for IVIS (EC, 1998), as well as in the ISO 15007 eye-glance measurement standards and the AAM document (2003). Up until now measurement of glance behaviour has been very tedious, and therefore surrogate measures are often sought. An alternative to seeking surrogate measures is to make glance measurement fast, easy-to-use, reliable, and inexpensive. This approach has recently shown that glance-based measures can now be automatically calculated either in real-time or offline in seconds (Victor, 2001, in press). The basic idea of the VDM tool is that it would cope with interchangeable eye tracker senor data collected in different environments (field, simulator or in simple desktop driving task). Data from the sensor would then be analysed off-line in VDM tool for basic analysis (more elaborate analysis should be conducted using a traditional statistical program). A non-professional user should be able to perform the analysis with help from the VDM tool. Further details on the "science behind" VDM tool can be found in the review by Johansson et al (2005)

AIDE partner(s) exploiting the result:
VTEC, BMW, TNO, CTAG PSA VTT VTI REGIENOV PSA

No.	Self-descriptive title of the result
2	Development and validation of existing subjective tools and methods for the evaluation of driver mental workload
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Annie Pauzié Estelle Chin
Position	Research Director Cognitive ergonomics researcher
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	X
Guidelines, methodologies, technical drawings	X
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Functionality, purpose, innovation etc.
The development of a tool to evaluate driver mental workload, the Driving Activity Load Index (DALI) has been conducted and tested in real road experiment. The DALI is a revised version of the NASA-TLX, adapted to the context of the driving task. Indeed, mental workload while running a task is closely linked to the specificity of the context, and the tool to evaluate this human cognitive aspect has to fit with the characteristics of this context.
The goal was to develop a tool as robust and as easy to apply as possible, in order to evaluate in an efficient and quick way several conditions, and to be able to compare them. As a matter of fact, evaluation of mental workload do not produce absolute value, but relative values comparing the load induced for the driver by diversified contexts.
The innovation is that the project AIDE allowed to test the validity of this tool in real road situations, for 4 types of context varying by the level of load for the driver. This experiment conducted by INRETS allowed to confirm the usefulness of this tool, and the fact that the comparison pair wise, used by the NASA-TLX computation was not necessary.
In summary three questionnaires have been designed to evaluate driver mental workload: PSA-TLX, DALI and BMDMW. Results show their sensitivity, but their validity has still to be proven. Nevertheless, the potential of the questionnaires is interesting as this method presents high level of diagnosticity, contrary to

behavioural indicators.

Planned or potential exploitation:
In order to make driver mental workload evaluation easy and not costly in terms of time and money, a DALI tool kit has been developed. This process was not included in the AIDE contract, but it is the next step of exploitation INRETS intends to conduct after the successful tests conducted in the framework of the AIDE project. So, in addition to the existing paper tool kit, the software tool kit will allow to: enter directly data from the driver into the computer, run the statistical analysis and produce the resulting graphs with just “one clik” under excel application. Once the DALI tool kit will be finalised, it will be available on internet for free. The questionnaires will be used in internal procedure of HMI evaluation by PSA, INRETS and BMW

Socio-economic impact:
Usually, in the studies investigating Information and Communication Technology safety and usability, evaluation of the driver’ mental workload is made using NASA-TLX, whereas this tool has been developed by the NASA for evaluation of pilots ‘mental workload. Because the DALI is more adapted to the driving task, and take into account the main factors involved in the potential load for the driver, it should support in a more efficient way the design process of ICT by producing data usable for the specification of the HMI, allowing for example to distinguish between auditory and visual load, or to identifying that there is a timing interference with the main driving task when using the system. So, it can be expected that if designers have more adapted tool to support their design, they will develop safer and more useable systems for the users’ population.

AIDE partner(s) exploiting the result:
INRETS is the only partner at the origin of the DALI, and, as a public scientific body, will put this tool for free at the disposal of any other partners. PSA CTAG KITE BAST VTEC

No.	Self-descriptive title of the result
3	Taxonomy of IVIS/ADAS applications
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Angelos AMDITIS
Position	Research Director for ITS
Organisation	Institute of Communications and Computer Systems
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	X
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Review and taxonomy of IVIS/ADAS applications consist of applications available in the market, prototypes, state of the art or under development. In addition reviews of HMI components and methods for evaluation tests are also included in the survey and taxonomy performed.

The survey and taxonomy is a reasoned analysis of the IVIS (In Vehicle Information System) and ADAS (Advanced Driver Assistance System) applications in order to organise them in several categories. In accordance with the information available, each application is classified on the basis of whether the system:

- is available on the market;
- exists in the form of prototype;
- is realised or realisable (future application);

In addition, the following items are surveyed:

- Which system requirements have to be changed to allow its use in existing conditions;
- What are the criticality and the advantages of the system in terms of safety, usability and acceptability;
- Which are the requirements to the evaluation procedures/tools derived both from the specific features and the various steps of the design process (requirements with regard to validity, reliability and practicability).

A final outcome of this is the identification of a group of applications or prototypes to be used in future tasks.

Planned or potential exploitation:
As an academic research & educational institute ICCS uses this result to extend its expertise for in vehicle information and advanced driver assistance systems research and teaching.
ICCS will exploit this AIDE result in the following ways:

- Conferences targeted at academic and trade audiences will utilize dissemination of the result and raise public awareness.
- Articles in magazines will target non academic audiences.

Moreover, the expertise gained will be exploited in follow up European research projects in the sector. The latter will be targeted so that projects developed can benefit the Hellenic Department for Transport.

Socio-economic impact:
Useful tool for the R&D of new safety applications and for the analysis and evaluation of existing ones through between other things Field Operational Tests.

AIDE partner(s) exploiting the result:
ICCS, BMW, BOSCH

No.	Self-descriptive title of the result
4	Modular subjective instrument to evaluate usability and other aspects of ADAS and / or IVIS systems
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Elisabetta Nodari
Position	Senior researcher in User Interaction and Product Perception Group - Product ergonomics Dept.
Organisation	Centro Ricerche FIAT
E-mail	elisabetta.nodari@crf.it

TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	X
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
An electronic instrument (based on Excel software) to collect subjective evaluation of ADAS and/ or IVIS systems was developed and applied in different contexts. This instrument allows to evaluate the following aspects:usability, aesthetics, impact on driving, willingness to have the system . The instrument has a modular structure, divided in different sub-dimensions to be evaluated, which can be applied totally or only partially, accordingly to specific analysed systems.

Planned or potential exploitation:
The instrument is planned to be used in all future testing phases of ADAS and IVIS on board systems tested by CRF.

Socio-economic impact:
Expected impact is on increasing road safety by the introduction of an efficient tool to the usability process

AIDE partner(s) exploiting the result:
CRF is the major owner of these results. Contributing partners are: TNO, BMW, VTEC CIDAUT INRETS KITE UNIMOD CTAG VTT VTI TNO PSA

No.	Self-descriptive title of the result
5	**Development and Refinement of Evaluation Tools and Methods: Tactile Detection Task and Peripheral Detection Task**
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Emma Johannson Natasha Merat
Position	 Senior Research Fellow
Organisation	Volvo Technology Dept 6310 Human Factors, Safety Group Institute for Transport Studies University of Leeds
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Peripheral Detection Task and Tactile Detection Task
Three experiments were conducted at Volvo Technology, PSA and Leeds University, which were designed to examine the suitability of a series of detection tasks for the safety assessment of IVIS and ADAS. The basis for this work is the Peripheral Detection Task method. However, the visual stimuli used traditionally in this task were altered in some experiments, prompting the use of the term Detection task for all experiments. The following alternative set ups were assessed:

1. Detection task with the visual LED placed in from of the driver instead of in the periphery,
2. Auditory detection task – an auditory version of the PDT where visual stimuli was been replaced by auditory stimuli such as 'beeps' or burst of white noise were investigated,
3. Different set ups of a so called Tactile Detection Task – a tactile version of the PDT, where visual stimuli are replaced by vibrotactile stimulators were looked at.

Based on earlier findings, described in the AIDE State of Art report 2.2.1 (Johansson, et al, 2005) and the results from the current three experiments, it is recommended that the tactile detection task can be used for assessing the safety of an IVIS whilst driving. The recommendation of this task is partly based on the fact that, currently, IVIS and ADAS rely least on the tactile/haptic modality. It can be assumed therefore that this is the least 'overloaded' modality and that any impairment in performance in the detection task will be due to a competition for general (rather than modality specific) resources. (contact: Emma Johansson)
Planned or potential exploitation: Software and hardware for PDT and TDT can be sold or otherwise made available to interested third parties. A process for standardisation of PDT has been launched within ISO WG8. Basically the PDT was, is and will be used by AIDE partners in evaluation experiments.
Socio-economic impact: Since it is our opinion that the detection task is a good tool for very efficient (i.e. time and cost saving) evaluation of workload and safety effects of HMI, wider use of PDT in Europe and elsewhere should lead to safer in-vehicle HMI. Standardisation of the PDT method will serves to guarantee the quality of evaluations performed, and will make HMI evaluation studies comparable to a greater extent. When used with common sense the PDT is a valuable for assessing workload while performing task and therefore will contribute to traffic safety research
AIDE partner(s) exploiting the result: VTEC, BMW, TNO, ULEEDS, BAST

No.	Self-descriptive title of the result
6	**Development and Refinement of Evaluation Tools and Methods: Enhanced Occlusion Test**
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Roland Schindhelm
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:

Enhanced Occlusion Technique
The Enhanced Occlusion Technique (EOT) was developed by BASt in AIDE T2.2.2-Occlusion Method Development, which was a subtask of T2.2.2 “Visual demand measurement tool development”. The task provides first experimental experiences on the application and suitability of the EOT derived from laboratory tests.
The EOT is based on the original occlusion technique using occlusion goggles. Contrary to the original occlusion technique the EOT uses an additional continuous sensomotor tracking task, which the subjects performes additionally to the IVIS task under occlusion conditions. The subject receives feedback of the tracking deviation via acoustic signals.
Similar to the original occlusion technique EOT can be used for the evaluation of IVIS tasks in early stages of HMI development. In comparison with the original occlusion technique, EOT presents a better simulation of real driving task and driver workload. The test results showed that the EOT conditions resulted in an improved sensitivity of metrics presented by the occlusion technique for the assessment of IVIS tasks.

Planned or potential exploitation:
BASt offers laboratory tests including EOT to external customers. The EOT results will be used by BASt for HMI evaluation at BASt and for further development of occlusion method and indicators.

Socio-economic impact: EOT provides a sensitive, easy applicable technique to evaluate HMI tasks. Developers and designers of HMI tasks can use it in early stages of the development to improve HMI design regarding safety.
AIDE partner(s) exploiting the result: Bast, BMW, FORD

No.	Self-descriptive title of the result
7	**Development and Refinement of Evaluation Tools and Methods: Lane Change Test in Driving Simulation**
SP	**2**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
LaneChangeTask implemented in driving simulator
The LaneChangeTask (LCT) is a specific experimental setting to evaluate in-vehicle HMI. The task is currently standardized as a work item in ISO WG8. The LCT allows to measure performance degradation of a primary driving-like task (lane change) while simultaneously performing a secondary task under evaluation. The LCT that is currently available as a software for standard PCs has been integrated into a standard driving simulator setting (here BMW driving simulator). This allows BMW to use the task with mock-ups and compare results from the LCT with results from standard driving simulator experiments. The basic research question within AIDE showed that the LCT is scaleable over different experimental set-ups. The results have been forwarded to ISO and other partners. (contact: Klaus Bengler, klaus-josef.bengler@bmw.de)

Planned or potential exploitation:
LCT-DSim is used within the BMW development process as a tool to evaluate the suitability of HMI (integrated and 3rd party mobile devices) for use while driving.
The knowledge on driving simulator implementation can be shared with other driving simulators.

Socio-economic impact:
The application of the LCT-DSim allows to integrate a standard evaluation tool into the internal HMI tool chain. This leads to a more efficient evaluation which provides early feedback for HMI developers.

AIDE partner(s) exploiting the result:
BMW VTEC FORD PSA DC CTAG

No.	Self-descriptive title of the result
8	Review of existing techniques and metrics for IVIS and ADAS assessment
SP	**2**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The result is reported in AIDE D2.2.1. It gives an overview of existing techniques and metrics which are relevant to the off-line assessment of driver workload and distraction during use of IVIS and ADAS. It provides researchers and HMI developers with the background behind the techniques and metrics. Also, the actual metrics are defined along with presentations of e.g. projects and specific experiments where the metrics have been applied. Each section also provides the reader with issues to further consider in future development within the field.

Planned or potential exploitation:

The results will be used by BASt for planning experiments in the HMI lab and for further development of experimental methods and indicators.

Socio-economic impact:
AIDE partner(s) exploiting the result: VTEC, BAST, CRF BMW PSA TNO VTI CTAG

No.	Self-descriptive title of the result
9	**Quantitative relationships for accident risk effects estimates**
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Wiel Janssen
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Development of quantitative relationships to be used for estimating aggregate accident risk effects from behavioural evaluation studies.

Planned or potential exploitation:
Within AIDE an attempt was made to estimate accident risk effects on the basis of behavioural measurements. Although this attempt is based on experimental results from the literature and far from perfect yet, it can provide a first rough estimate of effects changes in driving behaviour may have on accidents.

Socio-economic impact:
A rough estimate of the relation between changes in driving behaviour and accidents is of importance to assess the effect of systems on accidents.

AIDE partner(s) exploiting the result:
VTI, ULEEDS

No.	Self-descriptive title of the result
10	**Trade-off between driver state and behaviour with respect to effects on accident risk**
SP	2

CONTACT PERSON FOR THIS RESULT

Name	Wiel Janssen
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Deriving functional relations for quantifying the trade-offs between driver behavior and driver state with respect to their effects on accident risk

Planned or potential exploitation:
A first attempt was made to quantify these trade-offs and this attempt can be used for further exploration.

Socio-economic impact:
There is a number of difficult applied theoretical issues that remain unresolved because of a lack of interest in difficult work. This is one of them and further exploration of this is needed to close the gap between driving behaviour and accidents.

AIDE partner(s) exploiting the result:
TNO

No.	Self-descriptive title of the result
11	**AIDE evaluation methodology ('AIDE Cookbook')**
SP	**2**

CONTACT PERSON FOR THIS RESULT

Name	Wiel Janssen, Andreas Keinath and Elisabetta Nordari
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The work of subproject 2 was dedicated to develop a generic, industrially applicable, methodology for the evaluation of vehicle human-machine interfaces with respect to safety. The cookbook describes this method. Definition of the methodology (scenarios, level of developed system to be evaluated, subjective and/ or objective parameters to be evaluate, sample size, experimental design...) to perform in a effective and efficient way the user's evaluation of ADAS and / or IVIS systems. This was applied finally in the final exploitation of the AIDE demonstrators.
AIDE has generated a test protocol for the evaluation of ADAS and IVIS systems in real traffic conditions considering experimental subjects. In particular, 3 test protocols have been defined corresponding to the 3 AIDE prototypes (city-car, luxury car and truck), all of them sharing a common evaluation structure (method, tools and protocol) but different in system functionalities and interface.

Planned or potential exploitation:
The cookbook provides a number of steps necessary to be made for setting up, conducting and analysing an experiment on hmi evaluation. This can be applied immediately and where applicable will be used e.g. by TNO and CRF in all future testing phases of ADAS and IVIS on board systems.

Socio-economic impact: The methodology describes a number of steps necessary for evaluating systems but more importantly describes a number of measurements to evaluate the impact of those systems on safety. This test protocol can decrease the costs of the final validations of this kind of systems since the time to market can be reduced. Moreover, this protocol could help to focus the attention in the important aspects when testing the prototypes with real drivers. Expected indirect impact is on increasing road safety: customer needs are brought into the system design cycle.
AIDE partner(s) exploiting the result: All AIDE partners

No.	Self-descriptive title of the result
12	**Experimental results (evaluations)**
SP	**2**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	x
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	x
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: In subproject 2 the prototypes were evaluated. The results are the data of these evaluations (3 prototypes) and the reports on the evaluations within the AIDE project.
Planned or potential exploitation: The results of the evaluation can be used to improve the developed systems and the analysed results might be publishable in international journals or on conferences also as recommendations for HMI evaluators.
Socio-economic impact: The results of the evaluation can be used to improve the systems which should lead to better management of information presented to the driver. It is expected that a better management of information leads to decreased workload and increased traffic safety. These results could be applied in future developments and thus, the timetable can vary accordingly.
AIDE partner(s) exploiting the result: All AIDE partners

ANNEX C Results of Subproject 3

No.	Self-descriptive title of the result
1	Drivers characteristics module
SP	**3**

CONTACT PERSON FOR THIS RESULT

Name	Evangelos Bekiaris
Position	Research Director
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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	√
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The driver characteristics module personalises the warning and/or information provision media, timing and intensity according to driver's profile, explicit and implicit preferences. For this reason, it identifies static, semi-dynamic and dynamic parameters, to be monitored and considered when providing a warning. Static and semi-dynamic parameters will be imported by the driver him/herself (once for the static and at the start of each journey for the semi-dynamic), while the dynamic ones are recorded by the system (user preferences, e.g. average demand of services and user driving behaviour, e.g. TTC).

Planned or potential exploitation:
We will exploit the developed algorithms and s/w through publications ourselves and commercialise results through one of the Institute relevant spin-offs.

Socio-economic impact: If the result is exploited as described above, what is the expected impact on the European society and economy? Increased road safety? Increased mobility of European citizens? Increased competitiveness of European vehicles (improved performance, lower price etc.) on the global market? Please try to be more specific than just repeating one or more of these general statements, and make sure it is clear why this result will have the impact you describe. We have measured the users' acceptance of ADAS, when applying the DCM concept in own tests, reaching on average 26% higher. Thus, the impact expected is a wider acceptance of ADAS warnings, a wider use and ultimately, a subsequent road safety enhancement.
AIDE partner(s) exploiting the result: CERTH/HIT

No.	Self-descriptive title of the result
2	AIDE system logical and functional architecture
SP	3

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify): Specification of system architecture	X

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The AIDE architecture is a description of a logical and functional structure realizing an adaptive integrated in-vehicle HMI. It contains the important components and their tasks and responsibilities and as well their dependencies. The architecture contains various architecture principles and design decisions. In addition to that, the AIDE architecture defines a prioritization mechanism in order to get a basis for the management and coordination of the input/output events.
It also defines the relevant interfaces specifying the semantic content and the communication flow.

Planned or potential exploitation:
The AIDE architecture is the basis for a harmonised interoperability between applications and components responsible for management and coordination of input and output events. The demand for this architecture explicitly grows when not a priori know applications are additionally added during the lifetime of the vehicle. This especially applies e.g. for intgeration of applications hosted on nomadic devices. Thus this result may be exploited within cooperations between OEM, supplier and nomadic device manufacturers.

Socio-economic impact:
The usage of the AIDE architecture ensures a safe and integrated management of all input and output events, where OEM specific HMI strategies may be supported by the usage of OEM specific management rules. The specified architecture is the basis for fast and efficient cooperations between OEM, suppliers and nomadic device manufacturers with the aim of designing safe future interaction systems within vehicles, despite a growing number of applications within future vehicles.

AIDE partner(s) exploiting the result:
Bosch, CRF, ERTICO, ICCS, Motorola, Nuance, PSA, VTEC, VTT, SEAT

No.	Self-descriptive title of the result
3	ICA Module
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	x
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The intelligent management of the communication flow is defined by the ICA module which on the basis of the different conditions manages the provision of all type of information coming from the different applications. The Interaction and Communication Assistant (ICA) is the system responsible for the centralised management of information and adaptive interface functions, able to manage the information data flowing on the basis of the traffic and environment assessment, as well as of the level of activity of the driver in the primary and secondary tasks.

Planned or potential exploitation:
The ICA module is planned to become available in next generation of vehicles starting with luxury cars.

Socio-economic impact:
Expected impact is on increasing road safety.

AIDE partner(s) exploiting the result:
The responsible partner for the logic of the ICA is CRF, the ICA logic has been then developed (SW code) in 3 versions for a Truck (ICCS and VTEC), for a city car (DIBE and SEAT) and for a luxury car (DIBE and CRF).

No.	Self-descriptive title of the result
4	HMI virtual prototypes
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	x
Prototype/demonstrator available for testing	x
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of results:
A virtual prototype showing a particular HMI concept for an instrument cluster has been designed and developed by USTUTT and CRF in the course of the AIDE project. The interactive HMI concept utilizes either a real haptic barrel key or a standard mouse as input device and shows the central screen layout and a potential screen design for the luxury car demonstrator. The virtual prototype is based on Macromedia Director and is available as standalone version as well as integrated in a driving simulator environment.

An already available truck cockpit mockup, connected to a driving simulator platform, was set up with AIDE HMI hardware and software, thus enabling rapid prototyping of AIDE HMI solutions. Parts of this setup was then transferred to the VTEC truck demonstrator, but some functionality remains in the mockup.

A PC demonstrator of the Nuance Speech Component developed in the course of the AIDE project. The PC demonstrator illustrates how the Nuance Speech Component can be used for Voice Activated Dialing (by number of from the address), SMS reading and music selection by voice for MP3 files. The demonstrator is PC based and a GUI mimicking the look & feel of a car HMI, plus a set of utilities to simulate phone address books and incoming SMS.

REGIENOV has developed a platform built on top of a driving simulator to evaluate several AIDE concepts related to adaptivity in distraction.

SEAT has used a virtual prototype to implement the final HMI concept. This prototype which is based on a Macromedia Flash simulation can run a software that simulates the different “graphical user interface” (GUI). Using this tool SEAT can make early evaluations of the GUI concepts. The usability and acceptance of the colors, sizes, icons and the management concept can be validated. Those simulations can be seen in a table screen as well as in the car displays.

CTAG developed a PC-Based Simulation Tool to perform previous evaluations of ADAS warning strategies, that allows the experimenter to put the participants in context during focus group sessions or individual evaluations, thanks to the capability to easily configure and show the driving situation (cars behaviours, ADAS involved, HMI and warning modalities, scenarios, etc.).

Planned or potential exploitation:
The HMI virtual prototypes can be used to demonstrate the AIDE HMI interaction concept at exhibitions and lab demonstrations. The USTUTT/CRF prototype has also been fully integrated in the driving simulator at the University of Stuttgart and can be used for demonstration purposes.

The VTEC prototype will be used for dissemination of AIDE concepts and results inside and outside Volvo. Volvo will also be able to continue building on this virtual prototype in future HMI projects.

NUANCE’s PC demonstrator will be used to demonstrate the Nuance Speech Components to potential Nuance customers who may be interested in integrated it in their cars.

REGIENOV’s virtual prototype developed through the AIDE project has been intensively re-used (after providing successful results) in order to evaluate new safety-oriented applications and strategies.

SEAT’s HMI virtual prototypes can be used as an evaluation platform for a new HMI concept. It is used also to demonstrate the AIDE HMI interaction concept at exhibitions and lab demonstrations. SEAT’s GUI prototype is also available at the AIDE web site.

CTAG’s PC-based Simulation Tool will be used to perform quick evaluations of HMI and warning strategies for ADAS in other studies related with conflict situations and adaptivity.

Socio-economic impact:
By using the virtual prototypes as a dissemination tool, effectiveness of AIDE concepts can be demonstrated to decision makers e.g. within OEM companies, increasing the probability that AIDE solutions will reach market, and rapid prototyping as in quicker and cheaper HMI development allows for better and safer HMI at lower cost.

AIDE partner(s) exploiting the result:
USTUTT, CRF, VTEC, NUANCE, REGIENOV, SEAT, CTAG

No.	Self-descriptive title of the result
5	DVE modules on Real Time in Vehicle Platform
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The DVE module Real Time platform collects data from all on-board sensors and other application modules. These data are synchronously amassed inside a container (pool of data). By synchronous aggregation of data is meant that the contents of the pool should as closely as possible relate to one time instant. That is, it should contain input data as measurements of one moment of driving, in real time.
The following sensor data get captured:

- Vehicle Dynamics;
- Driver's Actions;
- Lane Information;
- Detected Targets;
- Driver's profile specifications

all received through a CAN bus.

Moreover, depending on the vehicle,

- faceLAB eye data;
- Cockpit activities (CAA)

can be received either via a CAN or a TCP/IP channel.

Map and gyro information are collected by ADASRP application, which runs on the same computer as the one on which DVE platform is running, by a mechanism of shared memory (InterProcess Communication, IPC).

Driver's degradation state is obtained by establishing a bidirectional Ethernet communication between DVE platform and drivers' state degradation application: the platform provides the application with all necessary input, for that the later will output a diagnosis of the driver's state.
Planned or potential exploitation: As an academic research & educational institute ICCS uses this result to extend its expertise for in vehicle information and advanced driver assistance systems research and teaching. ICCS will exploit this AIDE result in the following ways: • Conferences targeted at academic and trade audiences will utilize dissemination of the result and raise public awareness. • Articles in magazines will target non academic audiences. Moreover, the expertise gained will be exploited in follow up European research projects in the sector. The latter will be targeted so that projects developed can benefit the Hellenic Department for Transport.
Socio-economic impact: The real time platform is enhancing road safety by acting as a perception server for a set of driver-vehicle-environment assessment units.
AIDE partner(s) exploiting the result: ICCS, VTEC, CRF, SEAT

No.	Self-descriptive title of the result
6	Traffic and Environment Risk Assessment module
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Traffic and Environment Risk Assessment (so-called here after TERA) is a software library tailored for adaptive HMI solutions. TERA library consist of the following components:

- A risk estimator component: calculation of the level of risk that is related to traffic and environmental conditions (Risk of Collision, Risk of Road Exit, Risk of Lane Exit, Environment Risk, etc.). The risk is based on the vehicle dynamics, the environment conditions, the road ahead and the other road users (e.g. Moving objects), but not the current activity of the driver;
- An intention predictor: a decision component that predicts the intention of the "AIDE-vehicle" driver related to the possible maneuvering (e.g. straight motion, drifting, lane change to the left, lane change to the right, etc.). The output is accompanied with a level of confidence for the decision.

The library assumes input from the vehicle communication bus and surrounds sensors' output.

Planned or potential exploitation:
As an academic research & educational institute ICCS uses this result to extend its expertise for in vehicle information and advanced driver assistance systems research and teaching.
ICCS will exploit this AIDE result in the following ways:

- Conferences targeted at academic and trade audiences will utilize dissemination of the result and raise public awareness.
- Articles in magazines will target non academic audiences.

Moreover, the expertise gained will be exploited in follow up European research projects in the sector. The latter will be targeted so that projects developed can benefit the Hellenic Department for Transport.

Socio-economic impact: The Traffic and Environment Risk Assessment module is enhancing road safety by assessing the vehicle's surrounding environmental and traffic conditions.
AIDE partner(s) exploiting the result: ICCS

No.	Self-descriptive title of the result
7	S/W Prototype of a Driver Availability Module
SP	3

CONTACT PERSON FOR THIS RESULT

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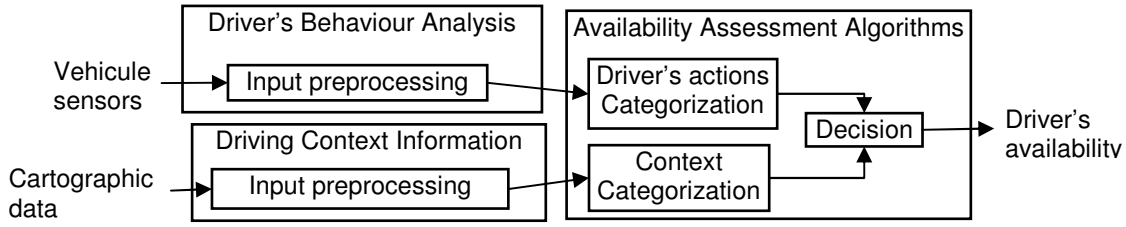
URL	http://www.inrets.fr/

TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

The Driver Availability Estimator (DAE) module aims to assess the driver's "level of Availability / Unavailability" to receive and process information, according to the requirements of the primary driving task (depending on the nature of the road infrastructure, the goal followed at this time, the current driving actions carried out, the event occurrences, and so on). *Availability* is a user centred concept defined to "translate" the Driving Demand problem in specific terms of "on-board information management" question. Synthetically, if the driving demand is high, driver's attention must be focused on the driving task and – consequently – he/she is unavailable to perform another task. On the contrary, the driver can be considered as potentially available, when the driving demand is low. The module calculate in parallel two diagnostics, one based on driver's behaviour and one on cartographic information and merge them to elaborate the final one.



Once developed, DAE prototype will be at AIDE partners' disposal, for the whole duration of the project, for

implementation on AIDE Demonstrators and end users test in real driving conditions.

Planned or potential exploitation: As an academic research institute INRETS uses this result to extend its expertise for advanced driver assistance systems research. INRETS will exploit this AIDE result in the following ways: • Conferences targeted at academic and trade audiences will utilize dissemination of the result and raise public awareness. • Articles in magazines will target non academic audiences. Moreover, This module will be use to researches within national and international projects to adapt in–vehicle applications to the driver. We will continue to work on this module to integrate different inputs like object detection, lane detection.
Socio-economic impact: The Driving Availability Estimator module is enhancing road safety by taking into account the driving situation and the driver's actions to manage the HMI.
AIDE partner(s) exploiting the result: INRETS

No.	Self-descriptive title of the result
8	Speech I/O Software Device for in-car operation of phone or media player
SP	**3**

CONTACT PERSON FOR THIS RESULT

Name	Christophe Couvreur
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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The Speech I/O software device designed and implemented by Nuance allows hands-free voice operation of various in-vehicle systems (cell phone including SMS handling, Media Player, Fleet Management system, etc). It relies on state-of-the-art speech recognition and speech synthesis for input and output, respectively. Speech recognition and speech synthesis are combined in complete task-oriented I/O dialogs within the Speech I/O software device.
The Speech I/O software device takes the form of portable software code, readily applicable to current automotive embedded platforms.
The Speech I/O software device is developed in English and Italian within AIDE, but the technology and methodology is generic and be localized directly to other European languages.

Planned or potential exploitation:
The Speech I/O software device will be sold to car manufacturers or tier-1 equipment manufacturer by Nuance. The Speech I/O software will also be used and extended within Nuance for further development of Automotive voice-enabled HMI's toward natural speech dialogs and hands-free voice control of in-car navigation systems.

Socio-economic impact: Distraction caused by operation of cellphones and media players in cars is a well-know road safety issue. By enabling in-car hands-free and eyes-free operation of these devices via speech control, the Nuance Speech I/O component will increase road safety.
AIDE partner(s) exploiting the result: NUANCE. The SW is available to other partners within the AIDE project, as per the AIDE consortium agreement. Three partners (CRF, VTEC, Seat) are using the Nuance SW in their car demonstrators.

No.	Self-descriptive title of the result
9	Architecture and data flow for integrated HMI system implementation
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	X
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: - Architecture description - Details of dataflow between the different parts
Planned or potential exploitation: - The system description can be used as basis for future development of integrated HMI system
Socio-economic impact:
AIDE partner(s) exploiting the result: *The results have been produced by the whole subproject 3 consortium.*

No.	Self-descriptive title of the result
10	Adaptation and Warning strategies
SP	**3**

CONTACT PERSON FOR THIS RESULT

Name	Julien Roland
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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	X
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: In the report "AIDE-REGIENOV-IR-WP3.4-R1-V1-Warning Strategies User Evaluations", AIDE delivers results related to adaptive warning strategies (e.g. in case of distraction and multiple warnings) for which an important impact on safety is expected. These results are based on human factors evaluations carried out by REGIENOV and CTAG on advanced driving simulators, and are relevant for researchers, engineers and evaluators that are active in the domain of in-car HMI – and could serve as input towards future HMI guidelines and standards.
Planned or potential exploitation: Generation of new or updated standards/guidelines. This will be carried out in concerned groups (e.g. ISO), in some cases involving AIDE partners.
Socio-economic impact: Will contribute to improve efficiency of warnings and / or assistance systems, as well as better acceptability, and thus more widespread use of these safety related technologies.
AIDE partner(s) exploiting the result: All AIDE partners.

No.	Self-descriptive title of the result
11	Proof of Concept: Implementation of AIDE system in protoype vehicles
SP	**3**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	x
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Four vehicles: One "test car", developed by PSA, and the following three "demonstrator vehicles":
- CRF Luxury car
- SEAT city car
- VTEC truck

In the three demonstrator vehicles, full implementations of integrated and adaptive HMI according to AIDE use cases and specifications have been made. The purpose of the demonstrators has been to demonstrate and prove the AIDE HMI concepts, as well as proving the general feasibility of implementation of the AIDE functional and logical architecture. With the PSA test car, there has been no main focus on HMI. Instead, the test car has been used to successfully prove the feasibility of implementing the AIDE logical and functional architecture in a real production vehicle physical architecture. A description of all four vehicles and technical verification/feasibility tests performed is given in AIDE deliverable D3.5.2. A description of the final HMI solutions is given in AIDE deliverable D3.4.4.

Planned or potential exploitation:
Within the project lifetime, the demonstrators have been successfully used for results dissemination, both within the involved partner companies, within the project consortium, and also externally. This will to some extent continue beyond the end of the project, at least at the demonstrator developing partner companies. In coming years, the results on technical feasibility of the AIDE concepts and architecture, as well as the detailed descriptions of the specific design decisions made in the AIDE HMI implementations, can and will be used as a basis for product development decisions. This is true at least for OEMs, and potentially so also for automotive suppliers.

Socio-economic impact:
This result proves the feasibility of the modular and scalable architecture proposed by AIDE for implementation of integrated HMI. Usage of modular architectures, especially if standardised, has the potential of lowering costs of HMI system development for European OEMs. Further, since this proof of feasibility may allow OEMs to develop and manufacture adaptive and integrated HMI, there is good potential for 1) improved usability of European in-vehicle HMI, improving competitiveness of European vehicles, as well as 2) improved safety of European in-vehicle HMI which would have benefits both in terms of competitiveness but also of course in terms of improved road safety.

AIDE partner(s) exploiting the result:
Specifically, for internal dissemination and direct basis for company HMI and system development: CRF, SEAT, VTEC, PSA. No clear statements from other partners, but at least OEM and automotive supplier partners are expected to be able to successfully exploit this result.

No.	Self-descriptive title of the result
12	Cockpit Activity Assessment module
SP	**3**

CONTACT PERSON FOR THIS RESULT

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E-mail	[1]matti.kutila@vtt.fi [2]gustav.markkula@volvo.com

TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	X
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The Cockpit Activity Assessment (CAA) module is implemented with Simulink/MATLAB and can be utilized to detect the driver's secondary task activity. The main output parameters of the module are 1) Eyes-off-road, 2) Visual time sharing, and 3) Cognitive distraction. Also, a parameter quantifying the amount of attention given by the driver to the mirrors is output, and can be used in e.g. driver intent estimation. In addition to the Simulink/MATLAB module, a Microsoft Windows application is available for rapid classifier adaptation to various vehicle types and models.

Planned or potential exploitation:
VTT: The exploitation will be two fold. As a public body, VTT is not intended to commercialize the software modules. Firstly, the parts of the algorithm owned by VTT will be further utilised in the upcoming national and international level assignments and projects. So far, for example Toyota has shown increasing interests concerning the methodology of detecting driver state. Secondly, VTT is also executing driver behaviour and ADAS impact analysis in some European funded activities (e.g. PReVENT-Preval) where the module could be a useful tool.

Volvo: The work on the CAA has further advanced Volvo Technology's competence within real-time driver activity assessment, and the new insights gained are likely to influence coming research and/or product development work directly (e.g. by means of reusing software code) or indirectly (e.g. by means of reapplying approaches found to be beneficial).

Socio-economic impact: Secondary tasks (e.g. using handheld devices, watching video players, etc.) are an increasing problem in today's traffic. Monitoring secondary driver activity, and adapting the systems in the vehicles and their user interfaces to the driver's state of attention definitely has a great potential for improving traffic safety in European vehicles. Moreover, similar activities are already on-going in Japan and U.S.A. Thus the CAA module development work allows the European automotive sector to be competitive in their knowledge and technology concerning smart HMI-adaptation according to the driver's behaviour.
AIDE partner(s) exploiting the result: The AIDE partner(s) having generated the result, and therefore owning (equal shares of) it. VTT Technical Research Centre of Finland Volvo Technology Corporation

No.	Self-descriptive title of the result
13	Nomadic device gateway and applications
SP	**3**

CONTACT PERSON FOR THIS RESULT

Name	Kimmo Kauvo
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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	X
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
The software library for Microsoft Windows Mobile 5.0 was developed. The library was implemented as a compact dynamic link library (.dll) that can be imported into any Windows Mobile 5.0 or 6.0 Smartphones or Pocket PCs with a little effort. The library carries out the following functionalities:

- Handle the backlight state (on or completely off).
- Get the phone manufacturer and model.
- Get the phone owner name
- Get all current tasks of the smartphone
- Get main battery remaining power
- Get all appointments on the desired day
- Get all contacts
- Change profile ("silent", "meeting", "normal")

Planned or potential exploitation:
As a result of the nomadic device development work an invention report about the profile changing functionality when reduced driver's vigilance level is detected, was written. The invention report describes potential use of the library in order to decrease distraction due to a mobile phone.
The invention announcement will be used as a marketing material and currently the exploitation opportunities are right now under discussion.

Socio-economic impact: Secondary tasks (e.g. using handheld devices, watching video players, etc.) are an increasing problem in today's traffic. The library enables safe and more comfort adaptation of the nomadic device to the vehicle environment.
AIDE partner(s) exploiting the result: The AIDE partner(s) having generated the result, and therefore owning (equal shares of) it. VTT Technical Research Centre of Finland, Motorola ICCS

No.	Self-descriptive title of the result
14	A European Nomadic Devices Forum exploring a number of issues related to Nomadic Devices use by drivers
SP	**3**

CONTACT PERSON FOR THIS RESULT

Name	Paul Kompfner[(1)] Angelos Amditis[(2)]
Position	[(1)]Project Manager [(2)]ITS Research Director
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TYPE OF RESULT / STATUS OF RESULT
TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify): Stakeholders Forum	X

In the below tables, please describe in words the result and its exploitation/impact. First, a number of mandatory fields are listed. For these you are required to enter text. Then, a number of "recommended" fields are listed. If you have input to these, you are more than welcome to supply it.

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result:
Functionality, purpose, innovation etc.
The Nomadic Device Forum constitutes a multi-sector working group aiming at:
- Safe, effective and user-friendly nomadic device integration and use in vehicles.
- New business opportunities related to the in-vehicle use of nomadic devices

To achieve these objectives, the Forum is assigned with the following tasks:
- Act as a European consensus platform to reach cross-sector agreement on issues relating to nomadic device safety, technical harmonisation, in-vehicle integration and their safe use
- Act as a bridge between the research projects on nomadic device issues and also between Europe and the rest of the world
- Provide advice to the EC on nomadic device issues
- Identify requirements for new work items, handled e.g. by of sub-working groups of the Forum, research initiatives, standardisation bodies etc.

Planned or potential exploitation:
The Nomadic Device Forum will continue its operation as a Working Group under the umbrella of the *e*Safety Forum.
The main work items of the Nomadic Devices Forum and its sub-working groups, identified up to now are:

- Further discuss a MoU on implementation of the European Statement of Principles (ESoP) on human machine interface for safe and efficient in-vehicle information and communication systems.
- Promoting the creation of commonly accepted gateways for in-vehicle integration of nomadic devices, in terms of mechanical mounting, electrical connection and device-vehicle information exchange.
- Identifying business opportunities specifically in the areas of public-private services (e.g. eCall, speed advice, traffic information, cooperative systems).

As mentioned above, the Nomadic Devices Forum may identify new work items. So from this point of view the NDF is directly exploitable and can directly support the future transparent, safe and efficient integration of NDs within vehicles interior.

Timetable for exploitation:
The attendees at the most recent workshop of the AIDE Nomadic Devices Forum (Brussels, 24 October 2007), agreed on the need for the Nomadic Device Forum to continue following the end of the AIDE project, perhaps as a working group of the *e*Safety Forum. The organizing committee of the Nomadic Devices Forum has already drafted the Terms of Reference for the continuation of the Nomadic Device Forum as an *e*Safety Forum working group.
Thus, the Nomadic Devices Forum is planned to continue its operation as a Working Group under the umbrella of the *e*Safety Forum, immediately after the end of the project. So from this point of view the NDF has an immediate exploitation possibility.

Socio-economic impact:
The use of "Nomadic Devices" (or NDs), or portable and aftermarket devices used in the vehicle by a driver for support, assistance, communication or entertainment, is increasingly common. As in-car use of mobile phones, handheld computers, portable navigators and personal music players grows rapidly, there are concerns that this must not lead to driver distraction and increased safety risk. The lack of standards for device "docking" in the vehicle, and for safe installation and use, imply added costs, inconvenience and perhaps risks for the user.
The Nomadic Devices Forum has been established by AIDE IP with the aim to address these challenges and to bring together representatives of the key stakeholders involved, thus the exploitation of the Nomadic Device Forum activities beyond AIDE is expected to have an impact on increased road safety, and increased mobility for citizens.
During the last three years the Forum has organized a number of workshops and meetings to discuss important issues around nomadic devices and their use within the vehicle, addressing the most important use cases, the potential requirements for and main characteristics of a common "Nomadic Device Gateway", related business aspects and HMI issues including the awareness and take-up of the European Statement of Principles on In-vehicle HMI, the "ESoP".
The expected impacts of the main work items of the Nomadic Devices Forum and its sub-working groups, identified up to now are:

- Increase road safety by motivating a MoU on implementation of the European Statement of Principles (ESoP) on human machine interface for safe in-vehicle information and communication systems signed by all stakeholders targeted by the ESOP.
- Increase mobility of citizens by motivating a MoU on implementation of the European Statement of Principles (ESoP) on human machine interface for efficient in-vehicle information and communication systems by all stakeholders (esp. Nomadic Devices Providers)
- Establishing and structuring the dialog on the creation of commonly accepted gateways for in-vehicle integration of nomadic devices, in terms of mechanical mounting, electrical connection and device-vehicle information exchange.
- Increase competitiveness of European vehicles (and Nomadic Devices) on the global market by identifying business opportunities specifically in the areas of public-private services (e.g. eCall, speed advice, traffic information, cooperative systems).

As mentioned above, the Nomadic Devices Forum may identify new work items.

AIDE partner(s) exploiting the result:
The AIDE partner(s) having generated the result, and therefore owning (equal shares of) it.
ERTICO, ICCS, VTEC, All AIDE Partners

ANNEX D Results of Subproject 4

No.	Self-descriptive title of the result
1	Review of existing HMI design guidelines and standards.
SP	**4**

CONTACT PERSON FOR THIS RESULT

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E-mail	Schindhelm@bast.de

TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: This document gives an overview of all relevant design guidelines and standards for researchers and HMI developers. It provides the reader with a short summary of each guideline and is useful as a recommendation for HMI development. It is also valuable as a database, for a quick update of knowledge within an HMI development or within a researcher's team.
Planned or potential exploitation: The results have been / will be used in connection with ESoP HMI development, in which BASt is involved.
Socio-economic impact: The report will contribute ongoing activities by the dissemination of design guidelines for in-vehicle HMI and thus improve road safety internally and externally.
AIDE partner(s) exploiting the result: BASt; BMW; Bosch; ERTICO; JRC

No.	Self-descriptive title of the result
2	Recommendation for HMI Guidelines and Standards
SP	**4**

CONTACT PERSON FOR THIS RESULT

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TYPE OF RESULT / STATUS OF RESULT

Scientific and/or Technical knowledge (Basic research)	
Guidelines, methodologies, technical drawings	x
Software code	
Database, Data Source	
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	
Results of demonstration trials available	
Other (please specify):	

DESCRIPTION AND EXPLOITATION / IMPACT – MANDATORY FIELDS

Short description of result: This report presents a collection of recommendations to experts active in the field of guidelines and standards relevant to HMI development of IVIS and ADAS. The recommendations are based on findings and results that have been achieved in the subprojects of the AIDE IP. The report describes activities performed to present these results to institutions involved in standardization, discuss recommendations on standard and guidelines and how to use them for the future work of international standardization bodies, i.e. a joint workshop conducted together with ISO WG8, activities within the eSafety WG on ESOP, exchange and discussions within the AIDE forums. The report is intended to be a recommendation and helpful input but does not put any obligation to the recipient
Planned or potential exploitation: The results have been / will be used in connection with ESoP HMI development.
Socio-economic impact: Contributions to human factors standardization on an international level
AIDE partner(s) exploiting the result: BASt; BMW; Bosch; OPEL, Renault, VTEC, CERTH/HIT