Designing cooperative interaction of automated vehicles with other road users in mixed traffic environments

# interACT D7.3 Proceedings of the interACT Final Event

| | |
|---|---|
| Work package | WP7: Dissemination and Exploitation |
| Task(s) | Task 7.3: Dissemination of foreground and events |
| Authors | **Pantelis Kanellopoulos – ICCS** |
| Dissemination level | Public (PU) |
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# Revision and history chart

| Version | Date | Main author | Summary of changes |
|---|---|---|---|
| 0.1 | 06/05/2020 | Pantelis Kanellopoulos (ICCS) | Table of Content |
| 0.2 | 07/07/2020 | Pantelis Kanellopoulos (ICCS) | Initial Draft |
| 0.3 | 09/09/2020 | Pantelis Kanellopoulos (ICCS) | Final Draft |
| 0.4 | 14/09/2020 | Niki Georgiou (ICCS) | Comments |
| 0.5 | 25/09/2020 | Markus Böhm (BMW) | Peer Review |
| 0.6 | 28/09/2020 | Pantelis Kanellopoulos (ICCS) | Comments incorporated |
| 1.0 | 29/09/2020 | Marc Wilbrink, Axel Wodtke (DLR) | Final Version |



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# List of abbreviations and acronyms

| Abbreviation | Meaning |
|---|---|
| AV | Automated Vehicle |
| DLR | Deutsches Zentrum für Luft- und Raumfahrt |
| D7.3 | Deliverable 7.3 Proceeding of the interACT Final Event |
| EC | European Commission |
| EU | European Union |
| GA | Grant Agreement |
| GDPR | General Data Protection Regulation |
| HMI | Human Machine Interaction |
| ICCS | Institute of Communication and Computer Systems |
| INEA | Innovation and Networks Executive Agency |
| Tx.y | Task x.y |
| WPx | Work Package x |



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# Executive Summary

The current deliverable constitutes a detailed report of the activities made within Task 7.3 "**Dissemination of foreground and events"** in regards to the organisation of interACT Virtual Final Event that took place on the 18th and 19th June of 2020. These activities include the agenda creation, the invitations sent to potential attendees, the digital promotional materials created, the announcements made via social media for raising the visibility of the event and additional work performed around the final event. Nevertheless, it should be mentioned that the interACT consortium had already planned a physical event that would have been held on April 1st of 2020 and preparatory activities towards its realization had been made. Particularly, the venue's location was selected to be in Fürstenfeldbruck area *(Bavaria)* close to BMW test tract in Maisach. The physical conference as well as the exhibition would have taken place in Fürstenfeldbruck and the demonstration of interACT test cars would have been made in Maisach.

After the COVID-19 outbreak the interACT consortium had to cancel the physical event and after receiving an extension on project's lifecycle due to the unpredictable impact of the pandemic the event was turned to a virtual one. However, within this deliverable only the activities made for organizing and realizing the virtual event of the project, are described.

Lastly, D7.3 includes the reports from the presentations given by the interACT partners during the online event for ensuring that readers have an overview about the presented results of the project.



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# 1. Introduction

## 1.1 Purpose and Scope

This document describes the actions made within **Task 7.3 Dissemination of foreground and events** in regards to the organisation of interACT Final Event. Its scope is to present the tools and channels used to communicate the event, the programme of the event, the speakers and a summary *(report)* of the presentations made.

## 1.2 Intended Readership

**Table 1: Intended readership**

| Intended Audience | Reason for interest in reading |
|---|---|
| **European Commission** | As the funding authority to assess the effort made towards the realization of the interACT Final Event and to receive a report regarding the activities undertaken by the consortium as well as the discussions and presentations made. This deliverable constitutes an official report to INEA / EC as foreseen in the GA. |
| **Project Partners** | To be informed about the actions made before the event, to document the discussions and presentations made during the event and overall the effort spent for its realisation. |
| **Stakeholders**<br>*(Vehicle manufactures, OEMs, end users, road authorities, decision makers and public authorities, scientific and research community, etc. )* | To share knowledge acquired from the research activities of the project, to be informed about the interACT produced results and the presentation made during the final event. Moreover, to be informed about the project in general and its vision. |
| **Representatives of organizations** involved in EU funded projects under the similar topic | To share knowledge, best practices, lessons learnt, vision related to the project's topic and expand the project's network and overall raise its visibility in a wider audience |
| **Anyone interested** | To be informed about the project, its scope, its results as well as the discussion and presentations made during the Final Event |

## 1.3 Structure of the Deliverable

The deliverable is comprised of seven chapters and one annex. The **first chapter** describes the scope of the deliverable, the audience that is addressed to and its structure. The **second chapter** delineates the activities made towards organising the event which include the agenda creation, the invitations sent to



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potential attendees, the digital promotional materials created, the announcements made via social media for raising the visibility of the event and so on. The **third chapter** lists the speakers of the interACT Virtual Events and gives a brief information of their bios. In the **fourth chapter** the reader can have an overview on Day 1 and Day 2 of the online event which includes a short summary of each day as well as highlights. The **fifth chapter** includes the reports from the presentations given by the interACT partners during the online event and the **sixth** provides measurement of the performance of the event. Lastly, the **seventh chapter** concludes this document. The **Annex I** include a depiction of the email sent to the attendees of the virtual event and project's newsletter subscribers in order to inform them that videos from the event, the presentations made and the results of the project were available online at the interACT website.



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# 2. Preliminary Activities

The interACT partners put a lot of effort in order to successfully organize the Virtual Final Event of the project, raise its visibility and invite potentials attendees. This chapter describes all the tools and channels used as well as the activities made for achieving the above.

## 2.1 Official Invitation

The content of the invitation was drafted by ICCS and reviewed by DLR. The design and the overall creation of the official e-invitation was made by ICCS. It was circulated to the consortium via email for inviting and communicating the **interACT Virtual Final Event** within project partners' contacts and network. The invitation, as shown in Figure 1, included the following details:

- Link for registering to the event *(Eventbrite);*
- Link to the Agenda and the social media accounts of the project;
- The acknowledgement text;
- The EU emblem and the project partners' logos.

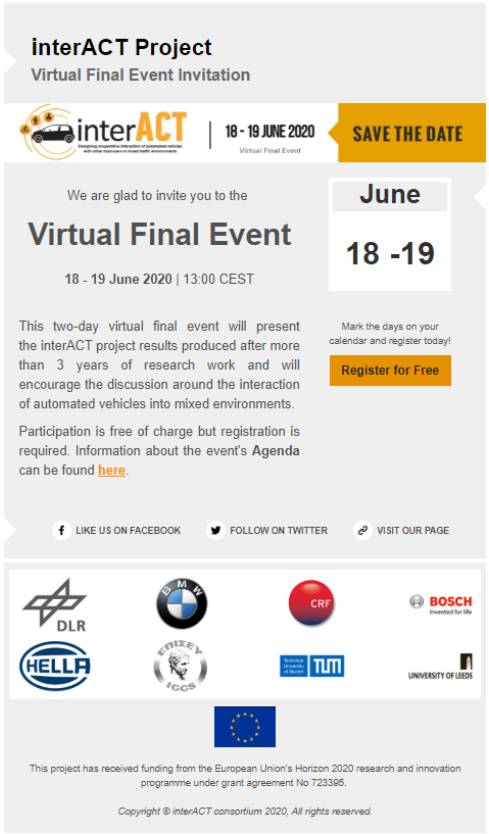


**Figure 1: Official invitation of the interACT Virtual Final Event (electronic form)**



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**Table 2: Content of the Official electronic invitation**

| **Invitation's content** |
|---|
| We are glad to invite you to the<br><br>Virtual Final Event<br><br>18 - 19 June 2020 \| 13:00 CEST<br><br>This two-day virtual final event will present the interACT project results produced after more than 3 years of research work and will encourage the discussion around the interaction of automated vehicles into mixed environments.<br><br>Participation is free of charge but registration is required. Information about the event's Agenda can be found **here**<br><br>(https://www.interact-roadautomation.eu/wp-content/uploads/interACT_Agenda_FE_Final-version.pdf). |

## 2.2 Connection Details Email

After collecting the registrations made via **Eventbrite** the Communication and Dissemination team of the interACT project contacted the registrants for providing them the connection details for each day of the event. The email included:

- Useful information to the attendees;
- Contact details with the interACT Communication and Dissemination team for any queries;
- Button with the connection details for Day 1 (GoTo webinar link);
- Button with the Connection details for Day 2 (GoTo webinar link);
- Social media of the project;
- Acknowledgement text;
- EU emblem;
- Partners' logo.



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**Figure 2: Connection Details Email**

**Table 3: Content of Connection Detail Email**

| **Content of Connection Details email** |
|---|
| Dear interACT friend,<br><br>We are contacting with you because you have registered to attend the interACT Virtual Final Event to be held on the 18th and 19th of June 2020.<br><br>With this email we provide you the connection details of the event. Please note, you will need a different link for each of the 2 days.<br><br>Useful Information:<br><br>You will not be seen or heard by the other attendees or the organisers. All questions will have to be provided online, using the Questions box. We will endeavour to answer a few questions during the webinar, but please note that due to the large number of registrations, and limited time, we cannot answer all questions. These will be addressed after the webinar, and shared online, on the interACT website. |



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| Content of Connection Details email (continue) |
|---|
| Please read the instructions that follow carefully.<br><br>DAY 1 - JUNE 18th 2020<br><br>For attending Day 1 (June 18th) please click on the button below. You will be redirected to the online tool that we use for broadcasting this event. Please fill in your name and email and then click on the register button.<br><br>That's it! Enrollment has been completed and you are attending the first day of the interACT Virtual Final Event!<br><br>[GoTo Webinar Link - https://register.gotowebinar.com/register/4738379852393415181]<br><br>DAY 2 - JUNE 19th 2020<br><br>For attending Day 2 (June 19th) please click on the button below. You will be redirected to the online tool that we use for broadcasting this event. Please fill in your name and email and then click on the register button.<br><br>That's it! Enrollment has been completed and you are attending the second day of the interACT Virtual Final Event!<br><br>[GoTo Webinar Link - https://register.gotowebinar.com/register/1255349116947863821] |

## 2.3 Follow up email to registrants for Day 2

After the successful completion of **Day 1** *(18th June 2020)* of the event the Communication and Dissemination team *(ICCS)* sent a follow up email on the 19th of June 2020 before the beginning of Day 2 to registrants in order to thank them about their attendance during the first day. Within this context to remind them the connection details of the second day.

**Table 4: Content of follow up email to registrants for Day 2**

| Content of follow up email to registrants for Day 2 |
|---|
| Dear interACT friend,<br><br>We would like to warmly thank you for attending the 1st Day of the interACT Virtual Final Event. Today, Day 2 of the Event, it will take place at 13:00 CEST. You can attend it at the link below:<br><br>https://register.gotowebinar.com/register/1255349116947863821<br><br>Should you have any questions please feel free to contact us.<br><br>Kind regards,<br><br>The interACT communication and dissemination team |



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## 2.4 Registration via Eventbrite

The interACT communication and dissemination team, ICCS, employed the Eventbrite platform for the creation of a dedicated page of the interACT Final Event in order to promote and share it. Eventbrite is a self-service ticketing platform that allows anyone to create, find, share and/or attend events.

With creation of the **interACT Virtual Final Event** page at the Eventbrite platform anyone interested around the project and the event could be informed about it *(i.e. date, time, agenda)* and register by filling in the related fields. The registration period spanned 17 days and after its end all registrants were contacted in order to send them the connection details as already described in section **2.2 Connection Details Email** of the current document. It should be stressed that all information collected were treated according to the principles of General Data Protection Regulation (GDPR)[1].

The link where the interACT Virtual Final Event could be found at Eventbrite platform was the one that follows:

https://www.eventbrite.co.uk/e/interact-virtual-final-event-tickets-107198573820

The number of registrants as well as other statistics regarding the performance of the interACT event are presented in Chapter 6 “Performance Measurement” of the current deliverable

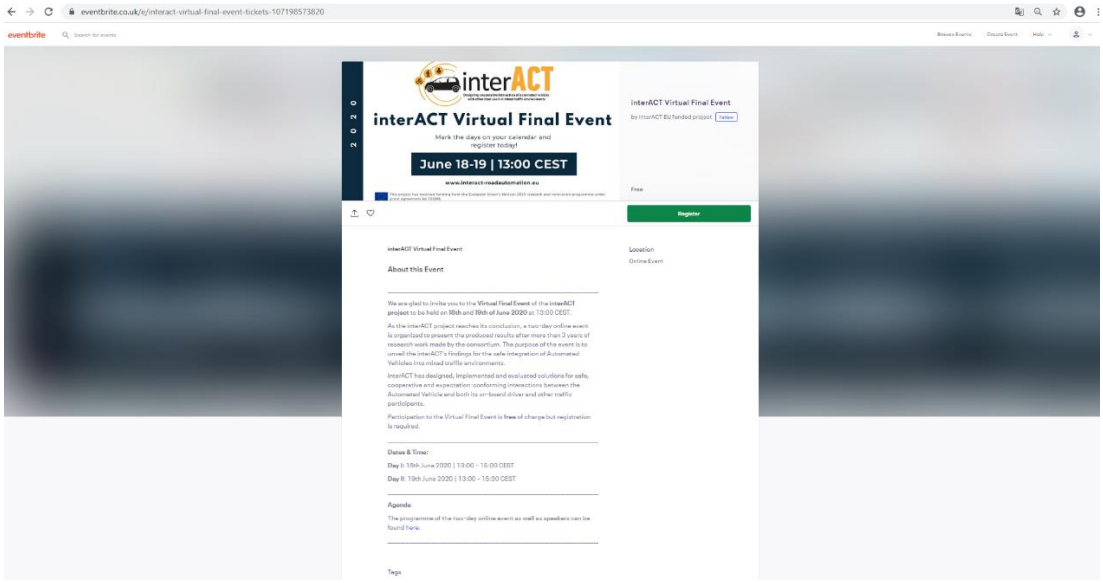


**Figure 3: Eventbrite registration page for the interACT Virtual Final Event**

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016R0679



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**Table 5: Content of the Eventbrite registration page for the interACT Virtual Final Event**

| Content of the Eventbrite registration page |
|---|
| We are glad to invite you to the Virtual Final Event of the interACT project to be held on 18th and 19th of June 2020 at 13:00 CEST. |
| As the interACT project reaches its conclusion, a two-day online event is organized to present the produced results after more than 3 years of research work made by the consortium. The purpose of the event is to unveil the interACT's findings for the safe integration of Automated Vehicles into mixed traffic environments. |
| interACT has designed, implemented and evaluated solutions for safe, cooperative and expectation-conforming interactions between the Automated Vehicle and both its on-board driver and other traffic participants. |
| Participation to the Virtual Final Event is free of charge but registration is required. |
| **Dates & Time:** |
| Day I: 18th June 2020 \| 13:00 – 15:00 CEST |
| Day II: 19th June 2020 \| 13:00 – 15:30 CEST |
| **Agenda** |
| The programme of the two-day online event as well as speakers can be found here. |

## 2.5 Promotional Materials

As the event took place virtually, only digital materials were created for the promotion of the event. Within this context the following digital materials were created for assisting the consortium in raising its visibility via various tools and channels used.

- SAVE THE DATE image for the slideshow of the interACT's website;
- Header image for the Eventbrite page;
- SAVE THE DATE banner for the official electronic invitation and the connection details email;
- Power Point template for the speakers' presentations of the Virtual Final Event

### 2.5.1 SAVE THE DATE - interACT Website slideshow

The website of the project is one of the main online communication channels of interACT. For this reason, it was of utmost importance to advertise the online event via this channel to provide its visitors a clear and immediate preview of the most important information (i.e. online event, date and time). Anyone interested about this event could click on this slideshow image and get redirected to a page within the project's website which included in detail all important information such as Agenda, registration link and so on. The dedicated page at the website regarding the event is available at:



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https://www.interact-roadautomation.eu/interact-virtual-final-event-save-the-date/


**Figure 4: SAVE THE DATE slideshow picture (interACT website)**

### 2.5.2 Header image - Eventbrite Page

As already mentioned in section **2.4 Registration via Eventbrite** of the current document, the communication and dissemination team of the project created a dedicated page of the Virtual Final Event at the Eventbrite platform. For achieving the optimum visual result, a header image was created for serving the scope of this action. The image included information about the dates that the online event took place, time, the URL of the interACT website, the project's logo, EU emblem and the required acknowledgement text.


**Figure 5: Header Image – Eventbrite Page**



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### 2.5.3 SAVE THE DATE Banner – Official invitation & Connection Details email

A SAVE THE DATE banner was created for the official invitation of the Virtual Final Event and it was also used in the Connection Detail email that was sent to the registrants.


**Figure 6: SAVE THE DATE banner**

### 2.5.4 Power Point template – Speakers' presentations

A power point template was created for the presentation that the Virtual Final Event speakers made within the context of having a consistent visual representation of the project.


**Figure 7: PowerPoint Template for Speakers' presentations**

## 2.6 Social Media Announcements

As social media are significant tools for communicating with wide audience, the interACT consortium used them for making announcements about the event and further raise its visibility. Before the realization of the online event 5 posts were made on interACT social media accounts in order to announce:

- Save the date of the event's realization;
- Invite potential attendees *(registration and agenda included)*;
- Announce the key note speaker, Mr. Tom Alkim;
- Call to action with Register now post *(Eventbrite link included*);
- Last call invitation to potential attendees to register few hours before the realization of Day 1 of the event.



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### 2.6.1 interACT Twitter Account


**Figure 8: Save the date & Keynote speaker announcements on interACT Twitter Account**

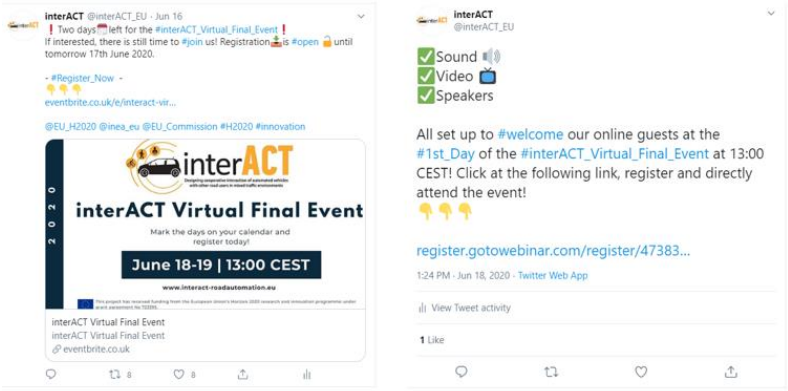


**Figure 9: Register Now & Last call invitation posts on interACT Twitter Account**

### 2.6.2 interACT Facebook Page

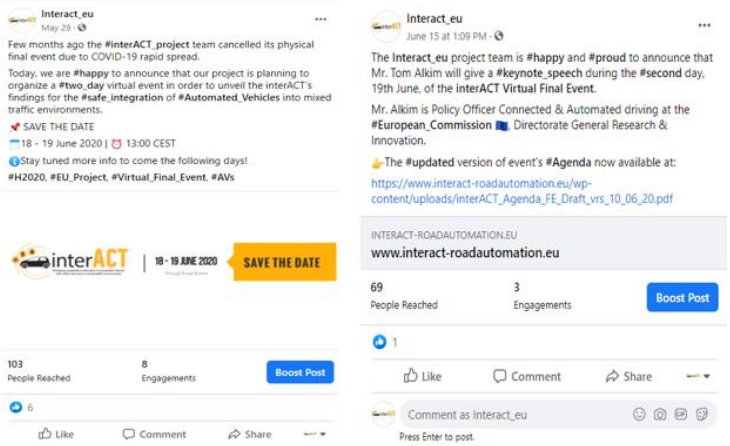


**Figure 10: Save the Date & Keynote Speaker announcement on interACT Facebook Page**



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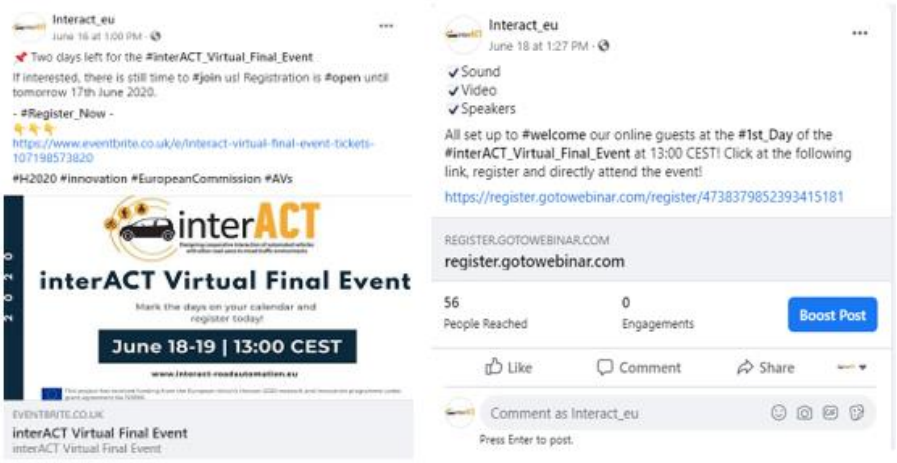


**Figure 11: Register now & Last call invitation post on interACT Facebook Page**

## 2.7 interACT Website – Final Event Section

As the interACT project was coming to its end, the interACT consortium had organized its Final Event on 1st April 2020 to be held in Munich Germany. In light of COVID-19 breakout and related containment measures, the interACT project team decided to turn the physical interACT Final Event into a Virtual one as to secure all participants' safety and health. Within this context, the consortium organized a two-day online event on the 18th and 19th of June and determined to include at project's website a dedicated section on the Final Event where all presentations made, the recording of the online event (Day 1 and Day 2 videos) as well as speakers' short bios. With the scope of providing an overview to the interACT stakeholders the Key Results of the project were also included. The Final Event section is located at the menu bar of the interACT website and it is consisted of three subsections which namely are:

- **Overview;**
- **Key Results;**
- **Virtual Final Event.**

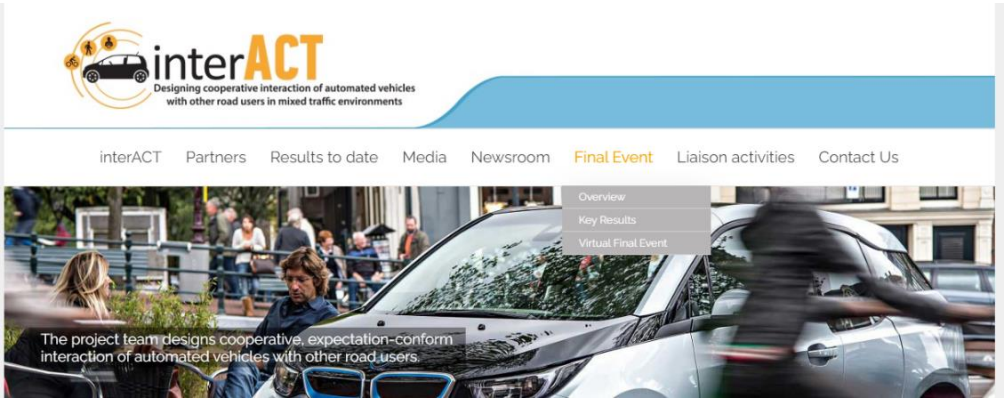


**Figure 12: Final Event Section at interACT website**



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The Overview section provides a short description about the event, the reason why this event took place virtually, a brief overview of the interACT produced results, short summary per day of the event and highlights (photos). The Key Results section includes a detailed description of the key results produced by the research work made throughout the interACT lifecycle. It includes three main categories the Introduction, Key results and Impact. The core category is the Key Results and it is consisted of:

- Human-human interaction in real traffic
- Intention recognition
- Planning the automation – the Cooperation and Communication Unit
- HMI design and component development
- Demonstrator integration
- Evaluation Methodology and Results

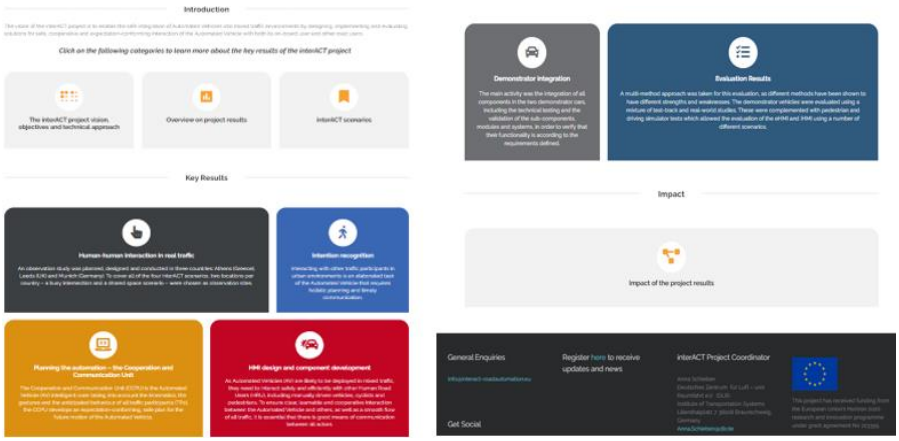


**Figure 13: Key Results Section**

Lastly, the Virtual Final Event subsection includes the recorded videos from Day 1 and Day 2 of the online event, the Agenda, speakers' bios and all the PowerPoint presentations made by speakers per each day.

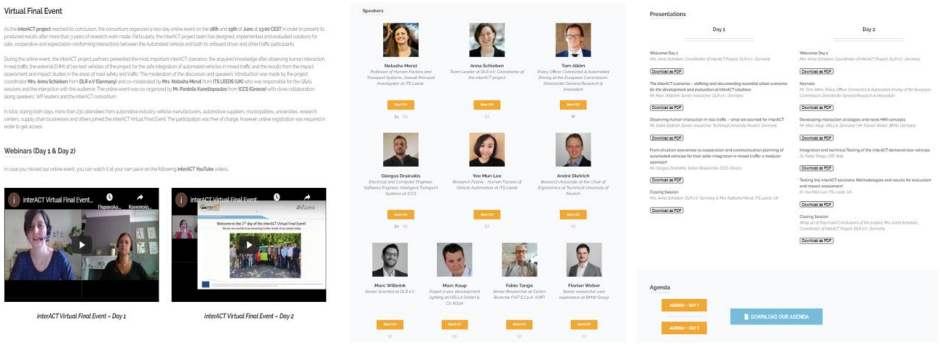


**Figure 14: Virtual Event section (Introduction, Webinars, Speakers, Presentations, Agenda)**



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# 3. Speaker & Bios

The current chapter presents the speakers who participated at the virtual event along with a short bio in order to give to the reader a better view on their expertise and the research that they made during the interACT lifecycle and topics they elaborated during the Virtual Final Event.

## 3.1 Anna Schieben (DLR e.V., Germany)

**Anna Schieben** - *Team Leader at DLR e.V, Coordinator of the interACT project*

Anna Schieben received her diploma degree in Psychology at the Technical University of Braunschweig in 2005. Since then, she works at the Institute of Transportation System at DLR, now as Senior Scientist. Her main fields of expertise are Human Factors and the design of Human-Machine Interaction strategies for automated vehicles. At DLR she is leading a team of seven researchers on Human-Machine interaction. Anna Schieben was involved as a researcher and WP leader in several national and European projects in this area such as interactIVe, AdaptIVe and CityMobil. Since 2017 she is acting as the coordinator of the H2020 project interACT. To increase the awareness for Human Factors research needs and user-centric design for automated vehicles she is actively participating in several network activities such as the US-Japan-EU Trilateral working group on Human Factors for automated vehicles, the EC STRIA activities of Human Factors and the Human Factors group in the EU project ARCADE.

## 3.2 Natasha Merat (ITS Leeds, UK)

**Natasha Merat** - *Professor of Human Factors and Transport Systems, Overall Principal Investigator at ITS Leeds.*

Professor Merat is an experimental psychologist and research group leader of the Human Factors and Safety Group, @ITS Leeds. Her main research interests are in understanding the interaction of road users with new technologies. She applies this interest to studying factors such as driver distraction and driver impairment, and she is an expert in studying the human factors implications of highly automated vehicles. She is PI to a number of key UK and European Projects on automated vehicles, such as InterACT, HumanDrive, and L3PILOT. Professor Merat is co-chair of the Transportation Research Board (TRB) sub-committee on Human Factors in Road Vehicle Automation; task member of the tri-lateral working group on human factors of automation; and advisory board member of Veoneer (a spin-off of Autoliv Inc.), and Zenzic (formerly Meridian Mobility Technology): an initiative set up by the UK Government and industry to accelerate the research and



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development of CAVs. Professor Merat is also a member of ISO WG8/TC22, where discussions are currently taking place about external messages of Automated Vehicles and internal Driver Monitoring.

## 3.3 Tom Alkim (European Commission)

**Tom Alkim** - *Policy Officer Connected & Automated Driving at the European Commission, Directorate General Research & Innovation*

**Tom Alkim** is Policy Officer Connected & Automated Driving at the European Commission, Directorate General Research & Innovation. He has over 20 years of experience in the field of ITS, C-ITS and Automated Driving and was a constant factor for the Dutch Ministry of Infrastructure and Water Management at Rijkswaterstaat, the National road operator. He was part of the core team that was responsible for the Declaration of Amsterdam and the European Truck Platooning Challenge during the Dutch EU presidency in 2016.

Tom Alkim is now working with the European Commission on advancing Connected & Automated Driving in a responsible manner to deliver societal benefits. In this capacity he was co-organiser of the Second European Conference on Connected & Automated Driving. He is co-chair of the Working Group on Cooperation and Coordination of R&I in the EU CCAM (Connected, Cooperative and Automated Mobility) Single Platform for Open Road Testing. He is also involved in an expert group to advise the European Commission on specific ethical issues raised by automated driving.

## 3.4 Marc Wilbrink (DLR e.V., Germany)

**Marc Wilbrink** - *Senior Scientist at DLR e.V.*

Marc Wilbrink is a senior scientist at the Institute of Transportation Systems of the German Aerospace Center (DLR). Mr. Wilbrink studies psychology at the university of Brunswig and is currently writing his PHD. Mr. Wilbrink was involved in several EU funded project like InteractIVe, CityMobil2, AdaptIVe, ADAS&ME and interACT. His current research interests are in the fields of automated driving functions, interaction design for automated vehicles (eHMI) and driver state adaptive interaction strategies.

## 3.5 Yee Mun Lee (ITS Leeds, UK)

**Yee Mun Lee** - *Research Fellow, Human Factors of Vehicle Automation at ITS Leeds*



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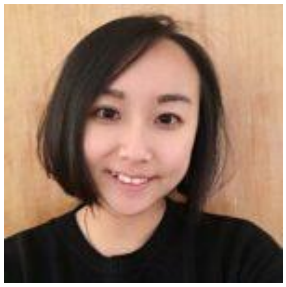

Dr. Lee is a Research Fellow at the Institute for Transport Studies, University of Leeds. She obtained her PhD in Cognitive Aspects of Driving from the University of Nottingham Malaysia, and has nine years of research experience in road users' cognition. She currently leads the evaluation and impact assessment work package within interACT. Her main research interests are in investigating the interaction between AV, other road users and the on-board drivers. In addition, Dr Lee is also currently involved in the L3Pilot research project.

### 3.6 Giorgos Drainakis (ICCS, Greece)

**Giorgos Drainakis** - *Electrical and Computer Engineer, Software Engineer, Intelligent Transport Systems at ICCS*

Giorgos Drainakis received his Diploma Degree in Electrical & Computer Engineering from National Technical University of Athens (NTUA) in 2012 and his MSc in Wireless & Optical Communications from University College London (UCL) in 2013. He has 4 years of experience as software engineer, with various projects on embedded systems, mobile telecoms, logistics & industrial production. He currently works as Software Engineer at the Institute of Communication and Computer Systems (ICCS). His main research interests are: Wireless Comms, Mathematical Modelling, C++, Windows Apps, Agile Development.

*interACT mainly involvement in: CCPU development (WP3), Situation Awareness development (WP2), Integration of CCPU in CRF*

### 3.7 André Dietrich (TUM, Germany)

**Andre Dietrich** - *Research Associate at the Chair of Ergonomics at Technical University of Munich*

André Dietrich is a research associate and PhD student at the Chair of Ergonomics at the Technical University of Munich. He graduated in Aerospace Engineering with emphases on aviation and flight propulsion in 2015 at the TUM. His research focuses on interaction between automated vehicles and pedestrians with an emphasis on the effects of visual communication. In the European Project interACT he lead work package 2" Psychological Models on Human Interaction & Intention Recognition Algorithms

### 3.8 Marc Kaup (HELLA, Germany)

**Marc Kaup** - *Expert in pre-development lighting at HELLA GmbH & Co. KGaA*



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**Marc Kaup** studied Mechanical Engineering with focus on polymer technologies at the University of Paderborn/Germany. Since 2011 he is employee of the automotive supplier HELLA in R&D for vehicle lighting. As a technical project manager he is responsible, inter alia, for the visual communication of Automated Vehicles with other traffic participants. Marc took the lead of interACT's Work Package 4 – Suitable HMI for successful human-vehicle interaction.

## 3.9 Florian Weber (BMW Group, Germany)

**Florian Weber** - *Senior researcher user experience at BMW Group*

**Florian Weber** is a senior researcher at BMW. He has a background in psychology and nearly 10 years of experience in different domains of automotive user experience and user research, leading various research and development projects. In Interact he lead the development of the human-vehicle interaction concepts within InterACT's WP 4. His current research Interests are focused on interaction between humans and artificial intelligence including the interaction between humans and automated vehicles.

## 3.10 Fabio Tango (Centro Ricerche FIAT S.C.p.A., Italy)

**Fabio Tango** - *Senior Researcher at Centro Ricerche FIAT S.C.p.A*

Graduated in Physics in 1995 from University of Turin and PhD in Computer Science in 2008 from University of Turin. His experience is on driver modelling and states classification, human-automation interaction, data-fusion techniques, arbitration and sharing control strategies. His main research interest is focused on using AI techniques in highly autonomous vehicles. He has been Technical Manager of HOLIDES and AUTOMATE projects; currently working on interACT, PRYSTINE and L3-Pilot projects.



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# 4. Virtual Event (Day 1 & Day 2)

The interACT consortium organized a two-day online event on the **18th** and **19th of June** at 13:00 CEST in order to present the project's results after more than 3 years of research work. During the online event, the interACT project partners presented the most important interACT scenarios; the acquired knowledge after observing human interaction in real traffic; the external Human Machine Interaction *(eHMI)* of two test vehicles of the project for the safe integration of automated vehicles in mixed traffic and the results from the impact assessment and impact studies in the areas of road safety and traffic. The moderation of the discussion and speakers' introduction was made by the project coordinator **Mrs. Anna Schieben** from DLR e.V *(Germany)* and co-moderated by **Mrs. Natasha Merat** from ITS LEEDS *(UK)* who was responsible for the Q&As sessions and the interaction with the audience. The online event was broadcasted via the GoTo Webinar tool and it was co-organized by **Mr. Pantelis Kanellopoulos** from ICCS *(Greece)* with close collaboration along speakers, WP leaders and the interACT consortium.

## 4.1 Day 1 of the Virtual Event (18th June 2020)

### 4.1.1 Summary of Day 1

At the beginning of Day 1, **Mrs. Anna Schieben** welcomed the audience *(online attendees*) and briefly presented the interACT project and its vision. Later on, **Mr. Marc Wilbrink** *(DLR eV, Germany)* took the floor where he presented the interACT scenarios. A Q&As session followed where the co-moderator **Mrs. Natasha Merat** *(ITS Leeds, UK)* addressed audience's queries to **Mr. Wilbrink.** The presentations continued with one entitled *"Observing human interaction in real traffic – what we learned for interACT"* made by **Mr. Andre Dietrich** *(Technical University of Munich, Germany).* Several questions were raised by the audience and answered during the respective Q&As session. The last presentation of Day 1 was made by **Mr. Giorgos Drainakis** *(ICCS)* with the title *"From situation awareness to cooperation and communication planning of automated vehicles for their safer integration in mixed traffic: a modular approach".* After the end of **Mr. Drainakis'** speech, **Mrs. Natasha Merat** (co-moderator of the event) *asked* the speaker all questions received. It should be stressed that throughout all presentations the audience had the opportunity to send their questions via the question box of the **GoTo Webinar** tool. The first day of the event was wrapped up by **Mrs. Anna Schieben** *(DLR e.V., Germany)* and **Mrs. Natasha Merat** *(ITS Leeds, UK).*



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### 4.1.2 Agenda of Day 1

The full agenda of Day 1 is presented in the table below.

| Time | Topic |
|---|---|
| **Opening session** | |
| 13:00-13:10 | **Welcome**<br>*Mrs. Anna Schieben, Coordinator of interACT Project, DLR e.V., Germany* |
| 13:10-13:20 | **"interACT – the vision of automated vehicles in mixed traffic"**<br>*Mrs. Anna Schieben, Coordinator of interACT Project, DLR e.V., Germany* |
| 13:20-14:50<br>**The basis for the interACT developments:**<br>**Defining scenarios, observing real traffic & programming the vehicle automation**<br>*Moderators: Mrs. Anna Schieben, DLR e.V. Germany \| Mrs. Natasha Merat, ITS Leeds, UK* | |
| 13:20-13:40 | **"The interACT scenarios – defining and documenting essential urban scenarios for the development and evaluation of interACT solutions"**<br>*Mr. Marc Wilbrink, Senior researcher, DLR e.V., Germany* |
| 13:40-13:50 | Q&As |
| 13:50-14:10 | **"Observing human interaction in real traffic – what we learned for interACT"**<br>*Mr. André Dietrich, Senior researcher, Technical University Munich, Germany* |
| 14:10-14:20 | Q&As |
| 14:20-14:40 | **"From situation awareness to cooperation and communication planning of automated vehicles for their safer integration in mixed traffic: a modular approach"**<br>*Mr. Giorgos Drainakis, Senior Researcher, ICCS, Greece* |
| 14:40-14:50 | Q&As |
| **Closing session** | |
| 14:50-15:00 | **Wrap up of Day I and preview of Day II**<br>*Mrs. Anna Schieben, DLR e.V. Germany \| Mrs. Natasha Merat, ITS Leeds, UK* |

### 4.1.3 Presentations of Day 1

The presentations made during the first day of the event are available online at the project's website at the section "Final Event", subsection Virtual Final Event under the title "Presentations". For reader's ease the presentations are listed below along with the respective link so they can be directly visited as well as downloaded.



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Table 6: List of Day 1 Presentations

| Speaker | Presentation | URL |
|---|---|---|
| **Mrs. Anna Schieben**, *Coordinator of interACT Project, DLR e.V., Germany* | **Welcome Day 1** | https://www.interact-roadautomation.eu/wp-content/uploads/Anna-Schieben_Welcome_Day-1.pdf |
| **Mr. Marc Wilbrink**, *Senior researcher, DLR e.V., Germany* | **The interACT scenarios – defining and documenting essential urban scenarios for the development and evaluation of interACT solutions** | https://www.interact-roadautomation.eu/wp-content/uploads/Marc-Willbrink-Day-1.pdf |
| **Mr. André Dietrich,** *Senior researcher, Technical University Munich, Germany* | **Observing human interaction in real traffic – what we learned for interACT** | https://www.interact-roadautomation.eu/wp-content/uploads/Andre-Dietrich_Day-1.pdf |
| **Mr. Giorgos Drainakis,** *Senior Researcher, ICCS, Greece* | **From situation awareness to cooperation and communication planning of automated vehicles for their safer integration in mixed traffic: a modular approach** | https://www.interact-roadautomation.eu/wp-content/uploads/Giorgos-Drainakis_Day-1.pdf |
| **Mrs. Anna Schieben,** *DLR e.V. Germany* **Mrs. Natasha Merat,** *ITS Leeds, UK* | **Closing Session** | https://www.interact-roadautomation.eu/wp-content/uploads/Wrap-Up-Day-1-Anna-Schieben.pdf |



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### 4.1.4 Highlights from Day 1


**Figure 15: The moderators of the interACT Virtual Final Event, Mrs Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) while welcoming the audience**

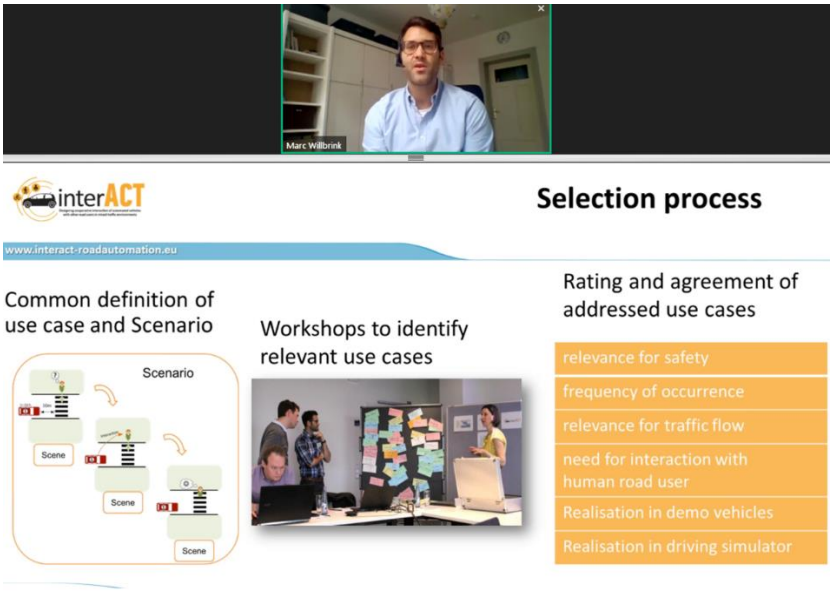


**Figure 16: Mr. Marc Wilbrink (DLR e.V., Germany) while presenting "The interACT scenarios – defining and documenting essential urban scenarios for the development and evaluation of interACT solutions"**



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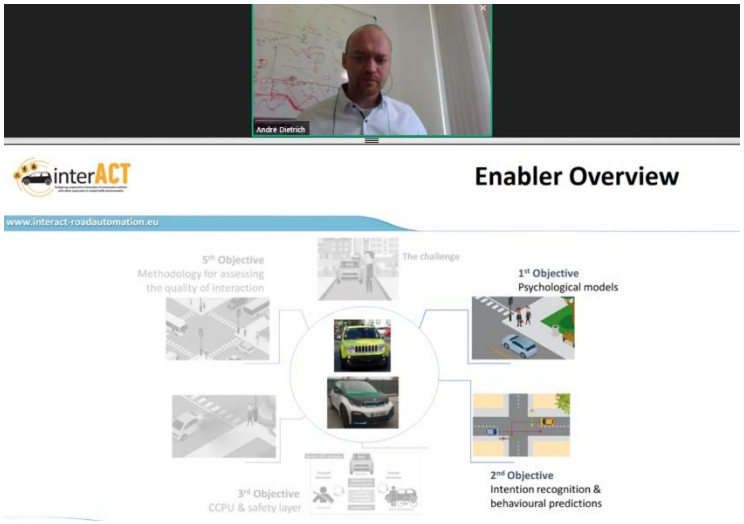


**Figure 17: Mr. Andre Dietrich (Technical University of Munich, Germany) while presenting "Observing human interaction in real traffic – what we learned for interACT"**

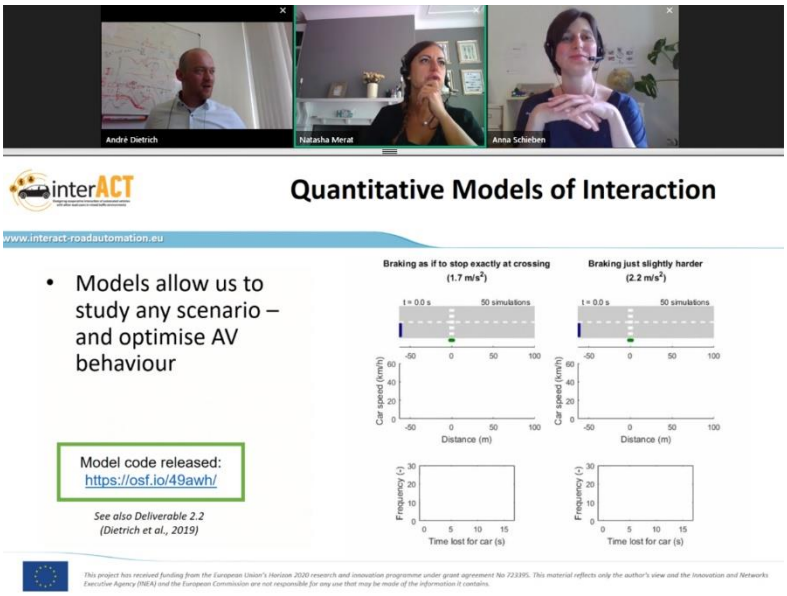


**Figure 18: Q&A session moderated by Mrs. Anna Schieben (DLR e.V, Germany) and Mrs. Natasha Merat (ITS Leeds, UK) after Mr. Andre Dietrich (Technical University of Munich, Germany) presentation**



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**Figure 19: Mr. Giorgos Drainakis (ICCS, Greece) presenting "From situation awareness to cooperation and communication planning of automated vehicles for their safer integration in mixed traffic: a modular approach"**

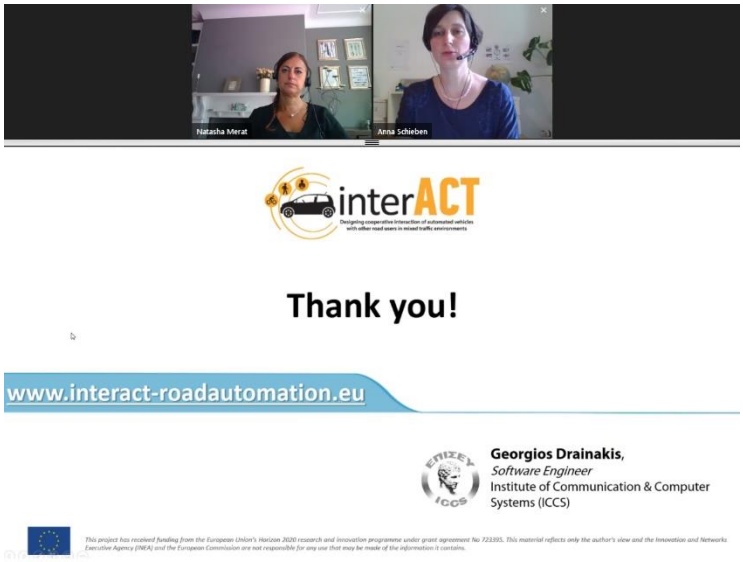


**Figure 20: Q&A session moderated by Mrs. Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) after Mr. Giorgos Drainakis (ICCS, Greece) presentation**



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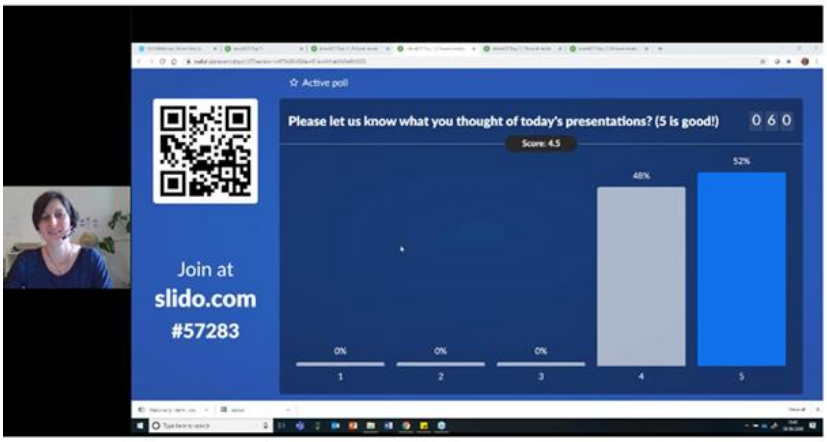


**Figure 21: Mrs. Anna Schieben (DLR e.V., Germany) wrapping up Day 1 of the online event**

## 4.2 Day 2 of the Virtual Event (19th June 2020)

### 4.2.1 Summary of Day 2

At the beginning of Day 2, **Mrs. Anna Schieben** (DLR eV, Germany) welcomed the audience (online attendees) and made a summary of Day 1. The first presentation of Day 2 was given by our keynote speaker **Mr. Tom Alkim**, Policy Officer Connected & Automated driving at the European Commission, Directorate General Research & Innovation. Our consortium was very honoured as **Mr. Tom Alkim** accepted the invitation of the interACT project team to participate to our Virtual Final Event and present the EU perspective on Connected, Cooperative and Automated Mobility *(CCAM).* A Q&As session followed where the co-moderator **Mrs. Natasha Merat** *(ITS Leeds, UK)* addressed audience's queries to our keynote speaker. Later on, **Mr. Marc Kaup** and **Mr. Florian Weber** took the floor to present *"Developing interaction strategies and novel HMI concepts"*. A Q&As session followed where the co-moderator **Mrs. Natasha Merat** *(ITS Leeds, UK)* addressed questions from the audience to the speakers.

**Dr. Fabio Tango** *(CRF, Italy),* continued the presentation session and talked about *"Integration and technical Testing of the interACT demonstrator vehicles"*. A Q&As session followed where the co-moderator **Mrs. Natasha Merat** *(ITS Leeds, UK)* addressed audience's queries to Dr. Tango. The last presentation for Day 2 was made by **Dr. Yee Mun Lee** *(ITS Leeds, UK)* and it was entitled *"Testing the interACT solutions: Methodologies and results for evaluation and impact assessment"*. Throughout the 35'min presentation of **Dr. Lee** the audience was sending questions regarding the studies discussed and **Mrs. Natasha Merat** *(ITS Leeds, UK)* addressed to the speaker all queries raised. It should be stressed that throughout all presentations the audience had the opportunity to send their questions via the question box of the **GoTo Webinar** tool. At the end of Day 2, **Mrs. Anna Schieben** together with the co-moderator **Mrs. Natasha Merat** made a short evaluation using the online tool **slido.com** by asking the



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audience about their view around the presented results and overall the event. The two-day event was closed by **Mrs. Anna Schieben** presenting the conclusions of the interACT project.

### 4.2.2 Agenda of Day 2

| Time | Topic |
|---|---|
| **Opening session** | |
| 13:00-13:05 | **Welcome**<br>*Mrs. Anna Schieben, Coordinator of interACT Project, DLR e.V., Germany* |
| 13:05-13:15 | **"interACT – the vision of automated vehicles in mixed traffic"**<br>(Summary of Day I)<br>*Mrs. Anna Schieben, Coordinator of interACT Project, DLR e.V., Germany* |
| 13:15-13:35 | **Keynote**<br>*Mr. Tom Alkim, Policy Officer Connected & Automated driving at the European Commission, Directorate General Research & Innovation* |
| 13:35-15:40<br>**The implementation and evaluation of the interACT research:**<br>**Developing the Human-Machine interaction, implementing the demonstrator vehicles and evaluating the interACT solutions**<br>*Moderators: Mrs. Anna Schieben, DLR e.V. Germany \| Mrs. Natasha Merat, ITS Leeds, UK* | |
| 13:35-14:05 | **"Developing interaction strategies and novel HMI concepts"**<br>*Mr. Marc Kaup, HELLA, Germany \| Mr. Florian Weber, BMW, Germany* |
| 14:05 –14:15 | Q&As |
| 14:15-14:35 | **"Integration and technical Testing of the interACT demonstrator vehicles"**<br>*Dr. Fabio Tango, CRF, Italy* |
| 14:35-14:45 | Q&As |
| 14:45-15:20 | **"Testing the interACT solutions: Methodologies and results for evaluation and impact assessment**<br>*Dr. Yee Mun Lee, ITS Leeds, UK* |
| 15:20-15:30 | Q&As |
| **Closing session** | |
| 15:30-15:40 | **Wrap up of Day II and Conclusions of the project**<br>*Mrs. Anna Schieben, Coordinator of interACT Project, DLR e.V., Germany* |



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### 4.2.3 Presentations of Day 2

The presentations made during the second day of the event are available online at the project's website at the section "Final Event", subsection Virtual Final Event under the title "Presentations". For reader's ease the presentations are listed below along with the respective link so they can be directly visited as well as downloaded.

**Table 7: List of Day 2 Presentations**

| Speaker | Presentation | URL |
|---|---|---|
| **Mrs. Anna Schieben**, *Coordinator of interACT Project, DLR e.V., Germany* | **Welcome Day 2** | https://www.interact-roadautomation.eu/wp-content/uploads/Anna-Schieben_Welcome_Day-2.pdf |
| **Mr .Tom Alkim,** *Policy Officer Connected & Automated driving at the European Commission, Directorate General Research & Innovation* | **Keynote** | https://www.interact-roadautomation.eu/wp-content/uploads/interACT-Final-Event-EU-perspective-on-CCAM.pdf |
| **Mr. Marc Kaup,** *HELLA, Germany* **Mr. Florian Weber,** *BMW Group, Germany* | **Developing interaction strategies and novel HMI concepts** | https://www.interact-roadautomation.eu/wp-content/uploads/Marc-Kaup-Day-2.pdf |
| **Dr. Fabio Tango,** *Centro Ricerche FIAT S.C.p.A, Italy* | **Integration and technical Testing of the interACT demonstrator vehicles** | https://www.interact-roadautomation.eu/wp-content/uploads/Fabio-Tango_Day-2.pdf |
| **Dr. Yee Mun Lee,** *ITS Leeds, UK* | **Testing the interACT solutions: Methodologies and results for evaluation and impact assessment** | https://www.interact-roadautomation.eu/wp-content/uploads/23062020_interACT-Final-Event-YMLee-Final-Presentation.pdf |
| **Mrs. Anna Schieben,** *Coordinator of interACT Project, DLR e.V., Germany* | **Closing Session -** Wrap up of Day II and Conclusions of the project | https://www.interact-roadautomation.eu/wp-content/uploads/Anna-Schieben-_Wrap-Up_Day-2.pdf |



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### 4.2.4 Highlights from Day 2

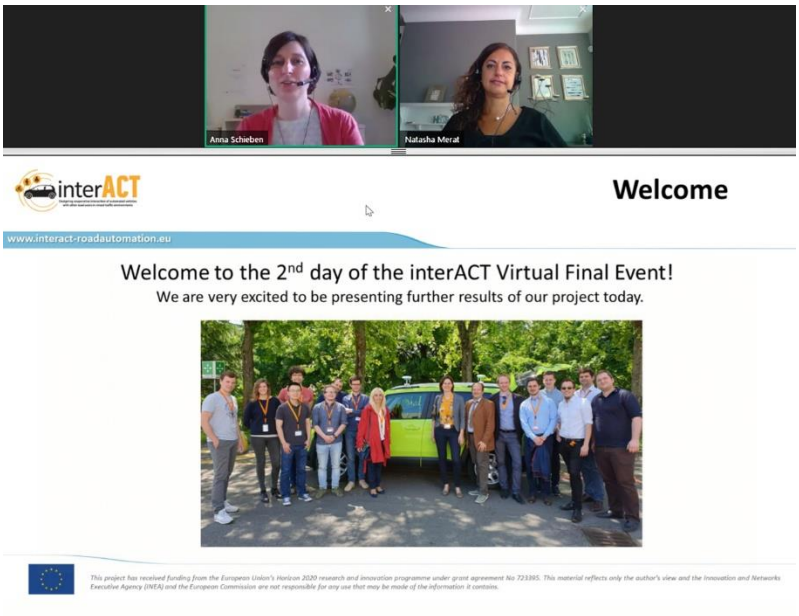


**Figure 22: Mrs. Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) while opening Day 2 of the interACT Virtual Final Event**

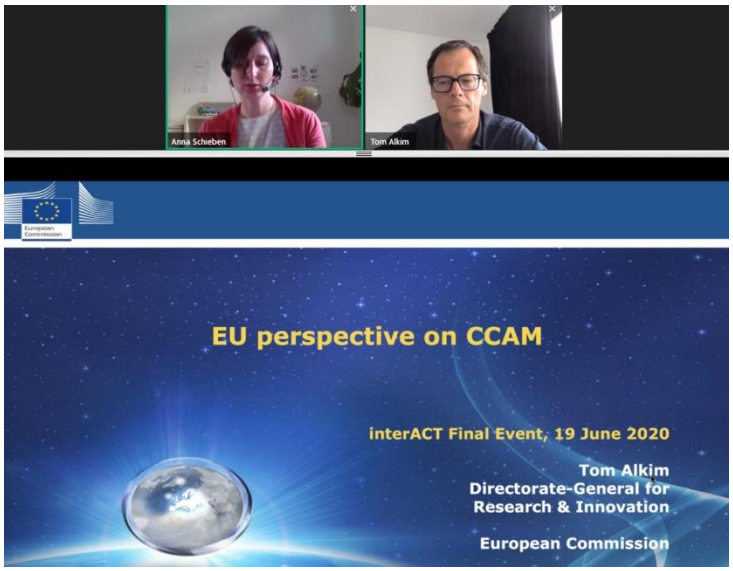


**Figure 23: Keynote speaker, Mr. Tom Alkim, Policy Officer Connected & Automated driving at the European Commission, Directorate General Research & innovation while presenting the EU perspective on CCAM**



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**Figure 24: Mr. Marc Kaup (Hella, Germany) and Mr. Florian Weber (BMW Group, Germany) presenting "Developing interaction strategies and novel HMI concepts"**

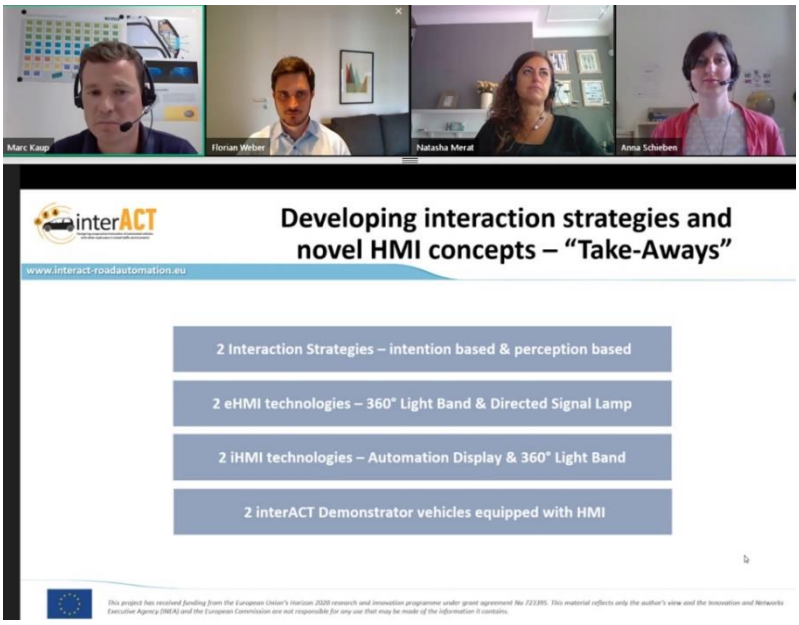


**Figure 25: Q&A session moderated by Mrs. Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) after Mr. Marc Kaup (Hella, Germany) and Mr. Florian Weber (BMW Group, Germany) presentation**



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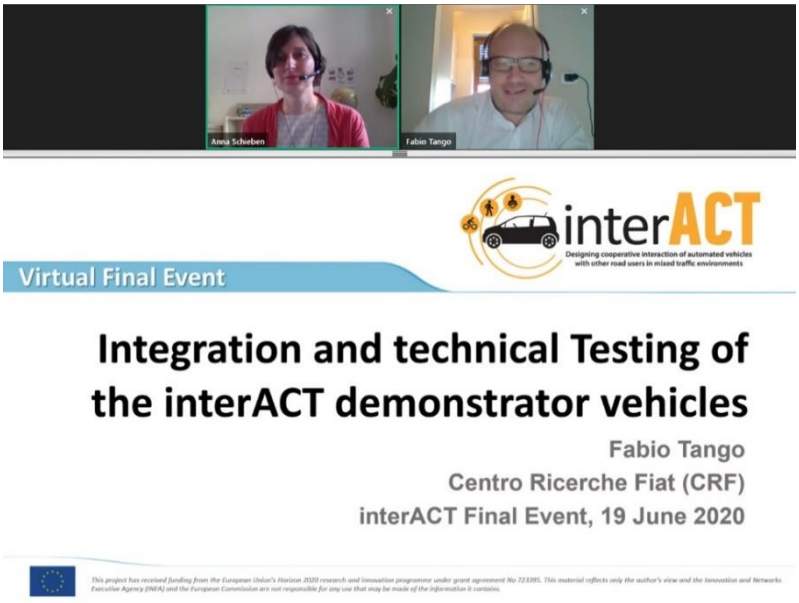


**Figure 26: Dr. Fabio Tango (CRF, Italy) while presenting "Integration and technical Testing of the interACT demonstrator vehicles"**


**Figure 27: Q&A session moderated Mrs. Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) after Dr. Fabio Tango (CRF, Italy) presentation**



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**Figure 28: Dr. Yee Mun Lee (ITS Leeds, UK) while presenting " Testing the interACT solutions: Methodologies and results for evaluation and impact assessment"**


**Figure 29: Q&A session moderated Mrs. Anna Schieben (DLR e.V., Germany) and Mrs. Natasha Merat (ITS Leeds, UK) after Dr. Yee Mun Lee (ITS Leeds, UK) presentation**



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# 5. Presentations report

This section constitutes a detailed report on presentations and discussions made throughout the interACT Virtual Final Event. For reader's ease, the current section presents the core messages *(summary)* per presentation. The availability of webinar videos *(Day 1 & Day 2)* as well as the PowerPoint presentations on project's website and in combination with the provided summaries allows to the reader to have a complete view and understanding of the talks made during the interACT Virtual Final Event.

## 5.1 Opening Session (Day 1)

### 5.1.1 Welcome | Anna Schieben (DLR e.V.), Germany | Natasha Merat (ITS Leeds), UK

**Mrs. Anna Schieben** (DLR) the interACT project coordinator welcomed the attendees to the interACT Virtual Final Event and introduced to them the topics that will be discussed during the webinar. Mrs. **Natasha Merat** (ITS LEEDS), took the floor as co-moderator of this online event and conducted a poll using the online tool named **slido.com** for interacting with the audience. At first, she welcomed the attendees and asked them to get involved by answering the following questions.

- **What type of organization do you represent (e.g. Research/Industry/ Government etc.)?**

  The dominant answer was **research and industry** while other answers were received such as SME, start-up, European Commission, OEM etc.,

- **Which country are you calling from?**

  The dominant answer was **Germany** and mainly countries across Europe while participants from US, Canada and Asia also attended the webinar.

- **What is your main field of expertise? (human factors, design, sales, sensors, etc.)**

  With dominant answer **Human Factors** and responses from many other fields such as HMI, psychology, Systems Engineers, data science and many more.

### 5.1.2 interACT – the vision of automated vehicles in mixed traffic | Anna Schieben (DLR e.V.), Germany

Mrs. Anna Schieben (DLR) introduced the project to the audience and presented the interACT project facts. Later on, she described the challenges that the interACT project addressed and which are:

- Safe integration of Automated Vehicles *(SAE level 3 and above)* into complex, mixed traffic environments;



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- Solutions for expectation-conforming interaction of Automated Vehicles (AV) with other road users and on-board users;
- Increase in user acceptance and ease-of use by appropriate AV design;
- Increase the overall safety and reliability of AVs in mixed traffic environments.

The session was wrapped up with a brief presentation of the 5 defined objectives which namely are: Psychological models; Intention recognition & behavioural predictions; Cooperation and Communication Planning Unit *(CCPU)* & safety layer; Novel HMI elements; Methodology for assessing the quality of interaction.

## 5.2 The basis for the interACT developments: Defining scenarios, observing real traffic & programming the vehicle automation (Day 1)

### 5.2.1 The interACT scenarios – defining and documenting essential urban scenarios for the development and evaluation of interACT solutions | Marc Wilbrink (DLR e.V.), Germany

Mr. Marc Wilbrink was responsible for WP1 within which the scenarios were created and chosen. He talked about the challenges and divided his presentation into **three parts** a) Taxonomy; b) interACT scenarios and selection criteria; c) Format of standardized use case and scenario description. **Taxonomy** is important because all partners have background in different disciplines and experience in different projects. This leads to the problem that all partners used the same words but meant different things. As a result, the consortium decided to use a taxonomy that should be the same for everyone. The project did not invent one but used an existing one from Ulbrich et al. In his presentation, **Mr. Wilbrink** defined at first what is a scene which persists only several seconds and is a snapshot of the environment including

- Scenery *(Lane network, stationary elements, traffic lights, obstacles);*
- Dynamic elements *(cars, road users);*
- All included agents.

A scenario spends over several time and is a sequence of different scenes connected by actions and events. Moreover, it includes goals of the agents and spans a certain amount of time. In other words, different scenes are all built together in one scenario. A use case includes several scenarios. The taxonomy set the basis for the selection of scenarios with the Common definition of use case and scenario and conducted several workshops to identify relevant use cases. The interACT project team ended up to 4 must have use cases

- React to crossing non-motorised TP at crossings without traffic lights;
- React to an ambiguous situation at an unsignallised intersection;
- React to non-motorised TP at a parking space;



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- React to vehicles at a parking space.

The last point was the format of describing and selecting the scenarios and use cases which were made by using such templates. The definition of the interACT use cases and scenarios can be found in the **Deliverable D1.1 – Definition of interACT use cases and scenarios**

### 5.2.2 Observing human interaction in real traffic – what we learned for interACT | André Dietrich (TUM), Germany

The WP2 leader of the interACT project on Human interaction and modelling, **Mr. Andre Dietrich** explained how we understand human interaction in real traffic conditions as well as the key messages we learnt for the interACT project and how we further proceeded. In this talk, the first and the second objectives of the project were explicated i.e. the **Psychological models** and the **Intention recognition and behavioural prediction** respectively. He highlighted that the **key objectives** were to observe interaction in urban human traffic encounters in order to understand how human interact amongst each other and to learn how automated vehicles should do this. Therefore, the interACT project team examined how to model observed behaviour in order to derive recommendations for automated vehicles and to predict the behaviour of traffic participants.

The idea of interaction was based in several types of behaviours between two or more traffic participants but at the end seven bubbles of behaviours were used as presented in the publication of **Mr. Gustav Markkula**. Moreover, implicit and explicit communication was defined. With the aforementioned definitions, the observation of traffic started and generated knowledge on how traffic works. The observations were realized with the methods of video, ground based LiDAR, Questionnaires and Manual Observation. The results can be found in the deliverables D2.1 and D2.2

With the gathered information a glimpse of findings is:

- Occurrence and necessity of interactions highly depends on the situation and a variety of other influences, such as traffic density, time of day and specific traffic conditions;
- Explicit communication *(e.g. gesturing, flashing lights etc.)* happens rarely - most potential interaction-demanding situations are resolved before they actually arise, mostly by adjusting kinematic motion;
- Cooperation, communication and thus interaction between human road users takes place at low speeds, usually below 20 km/h;
- At higher speeds conflict avoidance is predominant – pedestrians use large enough inter-vehicle gaps to cross without expecting the second vehicle to adapt;
- Self-reports ≠ reality: some pedestrians reported to use some sort of visual information from the driver – even when the driver could not have been physically perceived.

All the above were high level findings but the biggest problems observed were within one location, different starting positions lead to different interactions. Moreover, infrastructure *(e.g. road layout,*



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*points of interests)* influences traffic encounters and resulting interactions while comparing locations consistently is complicated, especially with different observers on the ground. In order to deal with these problem, **Mr. Dietrich** mentioned that the interACT project team used sequence diagrams and counted how often something happened. Virtual reality experiments were made with simulators in order to investigate the effects of implicit and explicit communication of vehicles. Visualizing the acquired data allowed us to understand decision making processes and basically allowed to model these processes and identify optimal AV strategies to maximize efficiency. Models allowed us to study any scenario and optimize AV behaviour. As a bottom line, we understood how people use information from traffic and allowed to AVs to accurate predict how the other traffic participant will behave. The detection with head orientation estimation and the detection of hand waving gesture was developed within the interACT project.

### 5.2.3 From situation awareness to cooperation and communication planning of automated vehicles for their safer integration in mixed traffic: a modular approach | Giorgos Drainakis (ICCS), Greece

Last presentation for Day 1 was given by **Mr. Giorgos Drainakis** who was responsible for WP3 and presented aspects of the development of the Cooperation and Communication Planning Unit *(CCPU)* which is the main intelligence for the Automated Vehicle. The CCPU namely is the brain of the interACT system which communicates with the other modules and its main task is to orchestrate the interaction between all participants including the passengers of the AVs. The basic thing that needs to be consider is that we are talking about a time-critical application and we need to ensure safety in every action and above that to make sure that the motion is something that is easy for the other participants to follow. The main task of the CCPU is to gather *(and synchronize)* traffic environment information *(collected by sensors)* and predicted behaviours, identify current traffic situation, develop a future safe plan for the AV and communicate the plan to all involved traffic actors. Support modules that are essential for CCPU are the Map and internal communication system.

The **Perception Platform** is actually about what the sensors are useful for our system. The sensor network installed to the car provides raw data from the AV and the traffic environment. This raw data has been given by equipment installed at the car like laser scanners for detection, tracking and classification of static and dynamic objects; stereo video cameras and radar sensors and enhanced GPS system for localization. The main attributes that we need from the environment is object detection, classification, tracking. After all this raw data is gathered then we move on to the **Situation Awareness Platform** which is an intelligence layer that can identify the intentions both of the vehicle and the pedestrians. Another aspect that was used as a support module was enablers basically was digital data bases for the CCPU from where we can draw some elements that are helpful to identify some traffic scenarios and how to react with them. Based on the interACT use cases there were several scenarios generated and the task was to digitalize them so the machine can understand them. In our system we



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had two catalogues, the scenario catalogues that include any traffic conflict and the AV that has to deal with and the strategy catalogue the reaction according to the scenario. Moving on the core modules of the CCPU we can separate it into **three stages**:

- identification of the current traffic scenario and potential conflict;
- strategize a reaction plan and communicate it via HMI;
- plan execution via actuators/controllers and in parallel fail-safe mechanisms in case of emergencies.

The **Situation Matching Module** is responsible to understand any kind of raw data information from sensor or intelligence information from situational awareness platform and identify scenarios that basically are conflicts between the vehicle and other traffic participants. It has the ability to understand multiple scenarios in case of multiple traffic participants reacting. The output of the situation matching goes to the interaction planner which is basically the strategy planning of the CCPU and its main task is to classify the situation we currently are and strategize a plan according the situation. Mainly the output of this module is communication via HMI with other traffic participants (e-HMI) and also communication with internal participants *(passengers of the vehicle)* with i-HMI. The information of the interaction planner goes to the trajectory planning module *(which is the actuator of the CCPU)* and handles the control of the system. It has a twofold role in the CCPU it Generates the a-priory *(long-term)* path & the dynamic (short-term) trajectory of the AV and handles the vehicle's controllers. Lastly the safety layer module computes a fail-safe trajectory at all times and at the same time monitors the system and checks the actions of the car are safe and if not it intervenes and notifies the system. The most important fact of safety layer is to be real fast and accurate nearly real time. After extracting few preliminary results in testing to the lab *(via simulations)* then we moved on to the actual deployment onto the CRF demonstrator vehicle. The testing was as an agile process which included:

- Development (*add new features or updates);*
- Deployments in the car, using Docker technology;
- Live testing;
- Feedback and analysis.

Moving on into some conclusion, mainly we followed the four-test process design, implementation, lab testing and deployment.



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## 5.3 Closing Session (Day 1)

### 5.3.1 Wrap up of Day I and preview of Day II | Anna Schieben (DLR e.V.), Germany | Natasha Merat (ITS Leeds), UK

**Mrs. Anna Schieben** summed up the topics presented in Day 1 and gave a preview of Day 2 topics. **Mrs. Natasha Merat** made the following questions to the audience in order to learn more about what they believe after attending the first day of the interACT Virtual Final Event. The questions were:

- **Please let us know what you thought of today's presentations?**
  54% of participants answered 5 (good) and 46% replied 4.

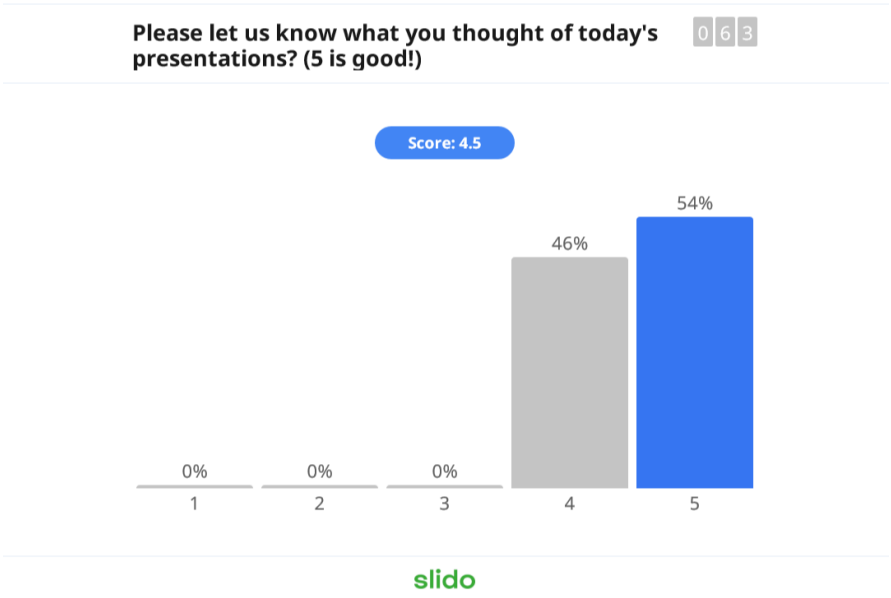


**Figure 30: Please let us know what you thought of today's presentations?**

- **What was the most interesting result from today?**

The dominant answer was eHMI while many other answers were given such as Evaluation methods, Safety etc.



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**Figure 31: What was the most interesting result from today?**

## 5.4 Opening Session (Day 2)

### 5.4.1 Welcome | Anna Schieben (DLR e.V.), Germany | Natasha Merat (ITS Leeds), UK

**Mrs. Anna Schieben** (DLR) the interACT project coordinator welcomed the audience and made a brief description of the topics that will be discussed during Day 2 of the virtual event. Later on, she gave a short summary of Day 1 and presented general project facts for those who were not able to attend it.

**Mrs. Natasha Merat** (ITS LEEDS), took the floor as co-moderator of this online event and conducted a Poll for the second day using the online tool named slido.com for interacting with the audience. At first she welcomed the attendees and asked them to get involved by answering the following questions.

- **In your opinion, how important is an additional external HMI component for communication between Automated Vehicles and other road users? (5 is very important)**
  The average score for this question was 3.6
- **Do you expect any positive from an external HMI component for the communication between AVs and other road users?**
  The 76% of the audience replied Yes, 13% answered No and 11% Don't know.

### 5.4.2 Keynote | Tom Alkim (European Commission)

**Mr. Tom Alkim,** the keynote speaker of the interACT Virtual Final Event, presented the EU perspective on CCAM. At first, he talked about the call on **Automated Road Transport** and gave a description on the topics that was focused on. Within this call the interACT project was included under the topic



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"Infrastructure, Connectivity & Cooperative Systems". There were eight H2020 Projects related to human centered design, consumer trust and acceptance of AVs which namely are: *ADAS&ME; AutoMate; BRAVE, interACT; TrustVehicle; VI-DAS; MEDIATOR; DriveToTheFuture*. Later on, Mr. Alkim talked about the **Connected Automated Driving** conference that was organized in April 2019 and the major issues discussed were:

- Safety Validation of Automated Vehicles;
- Ways to gain trust / societal and user acceptance of CAD systems;
- Ethical issues raised by CAD;
- Cybersecurity and data protection;
- Cooperation.

One important conclusion from that conference was that the hype of automated vehicles was passed - and realism is setting in. Compared to the first European Conference on Connected and Automated Driving there is a shift from more technological topics towards non-technology related aspects such as user centred design, ethical issues etc. Mr. Alkim explaining the Gartner Hype Cycle, starting from the year of 2010 – when it was the first time the topic of autonomous vehicle was discussed – it was expected to take more than 10 years to mainstream adoption. In 2016 the topic of the autonomous vehicle was at the top of inflated expectations. But in the past four years more realism has been observed because shifting from realism into practice also run into a lot of complications when driving in mixed traffic with AVs. The proposed European Partnership on Connected, Cooperative and Automated Mobility *(CCAM)* will likely start at the same time as the upcoming 7-year framework program, Horizon Europe, on January 1st of 2021. The expected positive impacts for the society will be on:

- safety;
- environment;
- inclusiveness;
- competitiveness for the European sector.

For this partnership, it is important that different sectors and stakeholders are involved and namely are: industry, public authorities and road operators, mobility and logistic services, representative bodies, regulatory bodies, research and they are all working together. In this context there are several thematic clusters *(7 clusters)* related to CCAM.

- large scale demonstration;
- in vehicle technologies;
- validation;
- integrating the vehicle in the transport system;
- key enabling technologies;



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- social aspects and user acceptance;
- research coordination.

In the last part of his presentation, Mr. Alkim talked about the **operational design domain** (ODD) framework in theory providing a visual representation of limited ODD and showed the difference between theory and the issues that appear in practice. As he mentioned, "*When things do not go as planned are often related to infrastructure elements, mixed traffic, and weather conditions"*.

Mr. Alkim stated that it is a joint task for all stakeholder to try to solve it in optimizing the ODD. However, all gaps cannot be disappeared but the transition of control from outside into ODD can be made. Looking the interact gaps to dealing with auto traffic, the behaviour of AVs - when it is inside ODD - do behave differently from human operated vehicle at the moment and in the end this should be more harmonized. There is still a long road in research to be made but **interACT project** made huge steps towards it.

## 5.5 The implementation and evaluation of the interACT research: Developing the Human-Machine interaction, implementing the demonstrator vehicles and evaluating the interACT solution (Day 2)

### 5.5.1 Developing interaction strategies and novel HMI concepts | Mr. Marc Kaup (HELLA) Germany | Mr. Florian Weber (BMW) Germany

The first part of the presentation was given by **Mr. Florian Weber** and mentioned that in real traffic conditions there are different interaction partners and interaction elements on a certain time basis and by observing them *(including audio observation studies*) the interACT team identified how this interaction actually evolves. He continued that according to a scenario, an Automated Vehicle is approaching an intersection and once turns right there is a pedestrian waiting at a curve and once tries to cross it. The AV stops and start communicates with pedestrian in order to cross the street. Once the pedestrian is passed, the AV starts moving slowly and accelerates again. Looking this perception signalling design then you can see the basic two element changed the real here design is basis that we do not communicate the intention of the AV but actually represents something like eye contact or similar things transmit perception of what the automated vehicle sees to the traffic participants outside of the vehicle. We actually transmit the perception of the AV and the decision intention of the AV to give the right of way to the pedestrian.

In the second part of this presentation, **Mr. Marc Kaup** took the floor and he talked about the visual channel used to transfer the message from the AV to human road users. This channel *(i.e. external HMI)* is a channel of choice to transfer the messages and light was the right medium to transfer messages from AVs to human road users. It is easy to explain to all road users and light signalling as it is already well known internationally to manual driven vehicles. Light has very important advantage as a sender



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of a signal so you identify the sender of signal because of light meeting surface of the car body. This one is very important point, fact and argument we used for our choices. Then we have to check which kind of technologies could be feasible to transfer the messages to solve our main use cases. The methods that we have chosen were two:

- **External HMI 1**: It is the 360° light band around the vehicle which covers a lot of use cases and it is visible from all sides of the vehicle. The visibility from all sides of the car is one of the main differences to the other technology *(eHMI 2)* that we chose.
- **External HMI 2:** It is a directed signal lamp that sends light signal to only one specific traffic participant. The idea behind which is an interesting technological approach to realize perception-based interaction strategies just to send signals to traffic participants to whom this message is addressed to and conveys the messages that the AV has detected the case referred to.

Specifically, the 360° light band *(eHMI1)* that was chosen is a solution that fits to the car body of the demonstrator vehicle. By this, one of the main goals that the project had was a fully integrated solution was reached. An aspect that should be examined by the interACT team which also raised a lot of technical questions was how this light band should be like and the light colour. The colour of choice was cyan / blue green / turquoise i.e. SAE cyan to be out of the green, blue restricted areas for vehicles and traffic lighting so its idea to get such a colour between these colours.

The external HMI 2 component is one of the main differences that we have with other similar projects. It is called directed signal. The idea that we implemented in the project is something like a projector with special liquid crystal display as an imaging device inside light sources and reflector for back illumination. A 320 channel to realize in a horizontal range of 70° to send light signal and coded messages to only one specific traffic participant. Moreover, the interACT team also demonstrated one very first prototype of this directed signal idea behind the windshield of the vehicle. There are other which are so called 360° light band for the internal use which is also possible to illuminate different colours and different segments in order to give the board user the hint if the object is detected and towards which direction.

### 5.5.2 Designing interaction of automated vehicles for mixed traffic environment: development, integration and evaluation of the interACT system | Dr. Fabio Tango (CRF), Italy

**Dr. Fabio Tango** presented the design and development of the interaction strategies of automated vehicles *(AVs)* for mixed traffic environment and related HMI solutions, as well as their integration in the interACT demonstrator vehicles and their evaluation. The focus was on the assessment of the strategies and external HMI solutions in the two demonstration cars, one **from BMW** and one **from CRF**. The context when we talk about interacting with AVs into a mixed traffic environment is the



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extension of the traditional two-way human-to-human cooperation into a three-way cooperation. The activities performed within WP3 were the definition of these interaction strategies from the direct observation of traffic participants in real world in three different countries *(UK, Greece and Germany)* and then the design of three external HMI *(eHMI)* solutions to be tested. The SW module with the implemented strategies and the eHMI proposals have been integrated in the two demonstrator cars, in WP5. In particular, the two demonstrations focus on different scenarios and use-cases: the CRF demo car considered mainly the integration of the CCPU and the perception platform, with a basic implementation of the eHMI; the BMW car considered mainly the integration of eHMI, with all the defined solutions. This means that evaluation *(carried out in WP6)* was different: for the CRF car (capable to move completely in autonomous way, but not allowed to do so in real world), it was made on private test track; for the BMW car, it was made in real traffic, using the at Wizard of Oz technique (thus making possible the experimentation in urban scenario). **Dr. Tango** continued his presentation by giving the description per demonstrator car starting from the BMW one**.** Basis for prototype is a BMW i3s series car focusing on the interaction between the vehicle and other traffic participants. The vehicle is equipped with fully integrated eHMI components *(few details for main components were showcased)* and the legal authorities gave special permit for real world testing of the eHMI components. Basically, there are 2 components for eHMI the one for 360° intention and perception-based interaction and the other for perception-based interaction. "eHMI" components are controlled by the control panel which is a tablet that sends the command to the eHMI control. Then it forwards the specific command to the appropriate component of eHMI. The signal from the control panel to ECU is provided by WLAN communication. After that the DGPS system is used to monitor specific data of the vehicle such as position and velocity. In addition, there are two cameras to monitor the surrounding during the demo studies of technical testing. All the info collected together from the control unit are sent to the PC to log all data for the evaluation and for the technical testing. If the validation is successful in testing process, then the component is integrated inside the vehicle. After that there is a second phase the of system verification which we test and validate the entire system including all components before the vehicle is ready.

Dr. Tango completed the demonstration cars' description with the **CRF car.** The basis for the CRF prototype is a "Jeep Renegade" series car. The CRF demonstrator is focusing on the interaction between **the vehicle and other traffic participants in parking scenarios**. The vehicle is equipped with the following components and fully integrated with **i)** the Perception Platform, **ii)** the Cooperation and Communication Platform Unit (CCPU) developed by the interACT consortium, **iii)** a basic implementation of the eHMI. This demonstrator car has been tested in private FCA test-track in 2 different areas, one test area with **pedestrian**s and one with the **vehicle**. Few details regarding the main components of the CRF demonstrator were explicated. The **perception platform** (*part of the module of the CCPU)* is on a **PC base** while the trajectory planning (*the control motion of the vehicle)* is implemented on **dSpace MicroAutobox 2** because the process should be really fast in real time.



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The **evaluation process** was made on the CRF private test-track, emulating a parking area, with the following idea: the car can move autonomously in a parking area to search for a parking slot and, during this time the vehicle can interact with other traffic participants. In particular, in our case, the vehicle was moving straight on, interacting with a pedestrian that intended to cross the road ahead. The **main results** of this integration activities were two:

- interACT demonstrators ready for evaluation
- interACT solutions evaluated and demonstrated.

The **main results** of the assessment phase were:

- Pedestrians generally felt safe and comfortable interacting with the demonstrator in a test-track setting.
- Both eHMI solutions were generally well received, with high ratings of usability, acceptance and learnability for both.
- When the eHMI was absent, participants used vehicle kinematics to infer intention

The **lessons learnt / key points** that should be considered for future activities are about different aspects. First, there is a need for high-precision digital maps and position for trajectory planning, as well as for a 360° surrounding view for the detection of dynamic and static obstacles. There should also be a careful design to consider the integration of the sensorial system and eHMI components. In particular, the consequences of misleading eHMI are severe, and therefore the public should be educated about the risk of eHMI failures. More studies should be developed, to understand interactions in more complex scenarios *(e.g. More than one to one interactions)* and across different situations as well as to understand long-term effects and behavioural adaptation. The deliverables of the **interACT project D5.3, D6.2** and **D6.3** present in detail all the topics elaborated within the presentation of Dr. Fabio Tango.

### 5.5.3 Testing the interACT solutions: Methodologies and results for evaluation and impact assessment | Dr. Yee Mun Lee (ITS Leeds), UK

**Dr. Yee Mun Lee** talked about the methods and evaluation criteria used to evaluate and assessing the impact of the interACT solutions as well as some key findings of the project. There are three interACT solutions that Dr. Lee presented and namely are: the **Safety Layer** which is used to eliminate or reduce the severity of collisions and will only intervene if necessary; the **internal HMI** (iHMI) provides onboard users some information of whether other road users have detected by the AV; and the **external HMI** (eHMI) provides information to other road users that the AV is interacting with. Dr Lee discussed the **iterative process** on how we decide study designs and research questions, which has taken literature review into account, our use cases, traffic participants and the interACT solutions. Dr. Lee mentioned that 30 studies have been conducted by using different method and evaluation criteria. The methods



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used were: i) the **simulator**, ii) **test-track**, iii) **real-world**, iv) **quantitative modelling** and v) **questionnaire**. The **simulator** is controllable, cost effective, safe, repeatable and reliable whereas, the **real-world studies** have ecological validity and realism. In between, the **test track** has some controllability and people are also able to experience an AV on their selves. Moreover, some data were fed from the simulator and from the real world to the Quantitative models.

Dr. Lee continued by presenting the interACT solutions and started with the **Safety Layer**. She provided an illustration of the scenario at which the AV intended movement was to change lane and at the same time the car in front changes the lane. The AV detects the danger of collision and returns to its initial lane. In order to demonstrate the on-the-fly techniques for maneuver and trajectory planning work, several hundred realistic test scenarios have been created. These scenarios were modelled from real-world data, or artificially created. Later on, Dr. Lee talked about the next interACT solution, the **internal *HMI*** *(iHMI),* which provides information to the on-board driver about what the vehicle has detected outside the vehicle. The general impression from iHMI studies was that iHMI seem to be useful, satisfactory, understandable, and the vehicle movement was predictable. Lastly, the **eHMI** (the third interACT solution) has two types: a) the **Intention-Based eHMI** which was installed all around the vehicle. It transmits a Slow Pulsing Light Band in cyan and the message that convey to other traffic participant is *'I am giving way';* b) the Perception-Based eHMI which was a Directed Signal Light Band in cyan and conveys the message to other traffic participants *'I detected you'.*

Overall, some of the findings showed that pedestrians generally felt safe and comfortable interacting with the AV with an eHMI *(CRF demonstrator study).* Additionally, eHMIs were generally well-received, with high ratings of usability, acceptance and learnability *(from both pedestrians' and drivers' perspectives).* However, there were also some findings from the evaluation study on eHMI that showed some negative effects that crashes might occur when people decide to cross the road without evaluating when the vehicle is decelerating for them or not. The general impression was that 'If eHMI was present, participants relied on the eHMI to infer intention. However, when the eHMI was absent, they used vehicle kinematics to infer intention.

Concluding, the incorporation of the interACT safety layer proving that the vehicle never causes an accident. These fail-safe manoeuvres ensure the availability of safe actions even if vulnerable road users behave unexpectedly. So, in turn, we expect that the proposed safety layer will increase the comfort and trust of humans in AVs. The interACT project's observation studies in conventional traffic situations showed that explicit communication rarely happens, interactions are mainly resolved by implicit communication *(at least in our chosen sites).* However, more explicit communication was observed in parking scenarios. e.g. driver who used signal are more likely to take priority than drivers who do not. The interACT evaluation studies showed that participants are able to use kinematics information as a cue, without the need for eHMIs. However, eHMIs study can also induced earlier crossings, and shortened the interaction time, and therefore improved flow, if visibility and consistency of eHMI are ensured. Overall, there was a positive experience reported for eHMIs by participants. Dr. Lee



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highlighted that we need to be cognizant of the potential of new types of crashes and consequences of failure/miscommunication might be severe, and therefore public guidance around eHMI capability will be required. Thus, more studies required on the potential negative effects of eHMI. Lastly in terms of methodologies, more effects of eHMI seem to be found in simulator than Test track or Real-world studies.

### 5.5.4 interACT Wrap Up and conclusions | Mrs Anna Schieben, Germany

Mrs. Anna Schieben, in this last presentation of the interACT Virtual Final Event concluded the achievements of the project which are listed below:

- **Cross-cultural observations** and understanding for human-human interaction in mixed traffic resulting in **human interaction** models.
- **Improvement of intention recognition algorithms** to identify relevant interaction situations.
- Development of **Cooperation and Communication Planning Unit** and full integration in CRF vehicle.
- Newly developed **eHMI and HMI elements** and prototypical implementation in CRF and BMW demonstrators.
- **Evaluation** of project intermediate and final solutions with various evaluation methodologies such as Virtual Reality studies, simulator, test track and Wizard-of Oz
- **Road safety:** Safety layer implemented in CCPU that avoid collisions and higher perceived subjective safety by eHMI and vehicle movement design
- **User-acceptance** and **ease-of use** of Automated Vehicles: User needs considered in the whole design process; Evidence that eHMI could increase subjective acceptance and satisfaction in interaction with AVs
- **Validation procedures for Automated Vehicles**: Reviewed and new evaluations methods; Novel, on-the-fly techniques for manoeuvre and trajectory planning
- **Leadership of industry**: Higher TRL levels for several technical developments compared to the start of the project, e.g. eHMI components and CCPU.

After Mrs. Schieben completing the presentation of the interACT's achievements, Mrs. Natasha Merat via **slido.com** tool asked the online event's attendees a couple of questions:

- **Please let us know what you thought of today's presentations? (5 is good)**

  The average score from the attendees' responses was 4.4

- **What was the most interesting result from today?**

  There were several responses given by the audience such as test track studies, user evaluation, evaluation studies and so on but the one that the majority answered was "eHMI".



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# 6. Performance Measurement

The efforts made by the consortium during the preparation period of organizing and promoting the online event lead to the significant number of **230 registrations** via the Eventbrite platform. **One hundred and nighty four** (194) registrants out of the total **two-hundred and thirty** (230) were externals and the rest were members of the consortium or related to project partners. The external attendees were representatives from the field of the automotive industry, vehicle manufacturers, automotive suppliers, municipalities, universities, research centres, supply chain businesses and others individuals. The registrations were made for both days of the online event (Day 1 and Day 2) so the attendees could have the flexibility according to their schedule to join the event and the day and topic that they were interested to. The following chapters present in detail the analytics for each day of the event as extracted by the **GoTo webinar** tool.

## 6.1 Analytics of Day 1

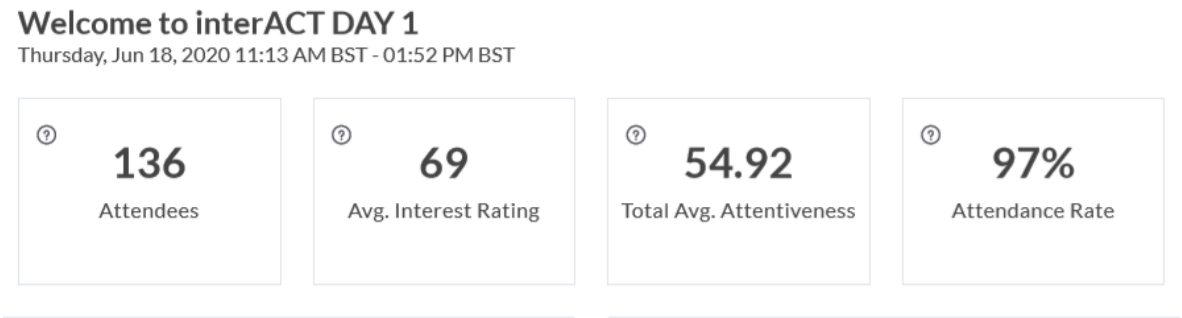


**Figure 32: Analytics of Day 1**

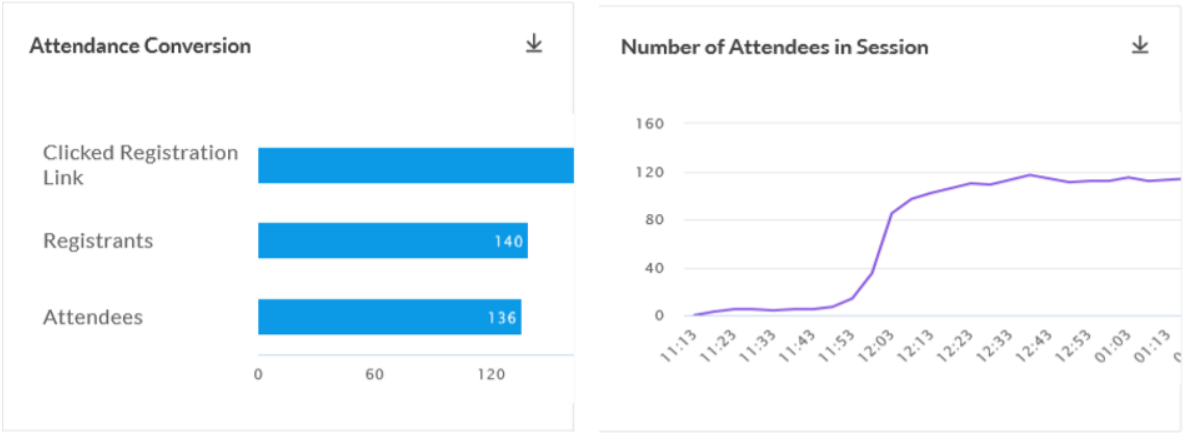


**Figure 33: Attendance conversion & Number of Attendees in Session - Day 1**



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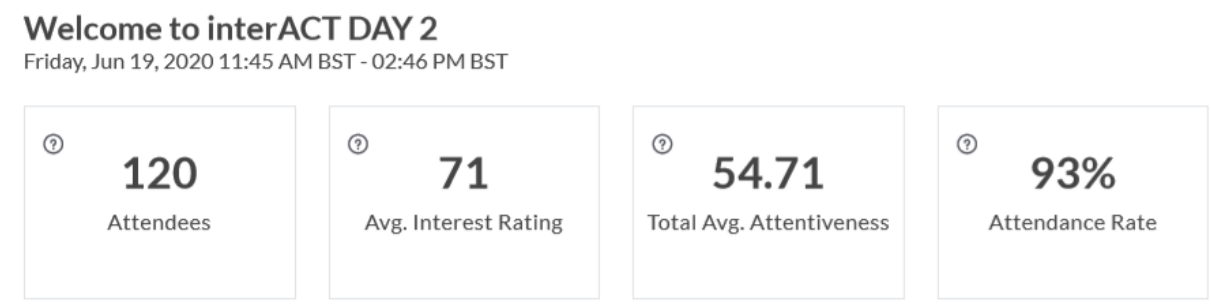


**Figure 34: Analytics of Day 2**

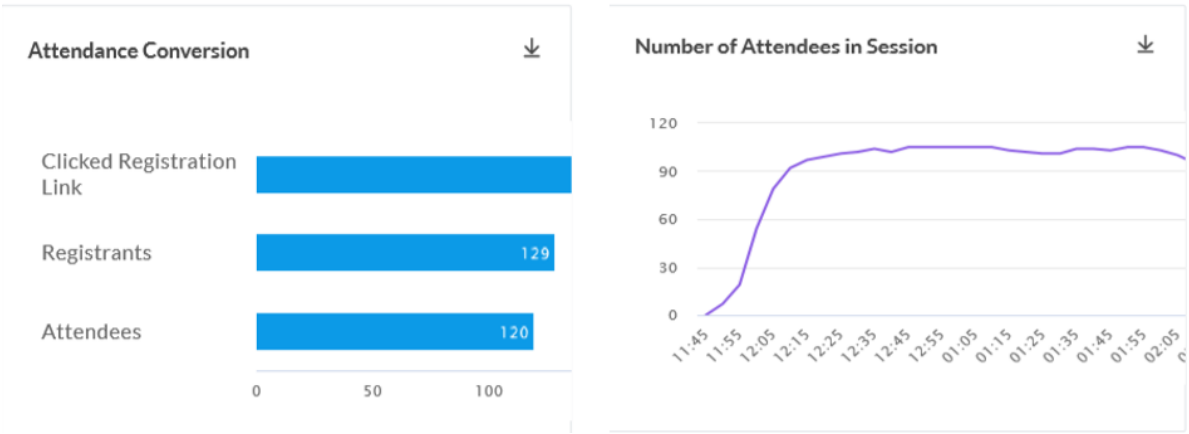


**Figure 35: Attendance conversion & Number of Attendees in Session – Day 2**



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# 7. Conclusions

This document outlined the activities that the interACT consortium made towards organizing the Final Event of the project for disseminating the project technical results and findings. The reader can find details on the preparative activities on promoting the event, the process of registering and the platform used, the programme of the event, speakers' bios and reports from their presentations. Lastly, the deliverable includes the performance measurement of this task by providing the statistics extracted from the GoTo webinar tool.



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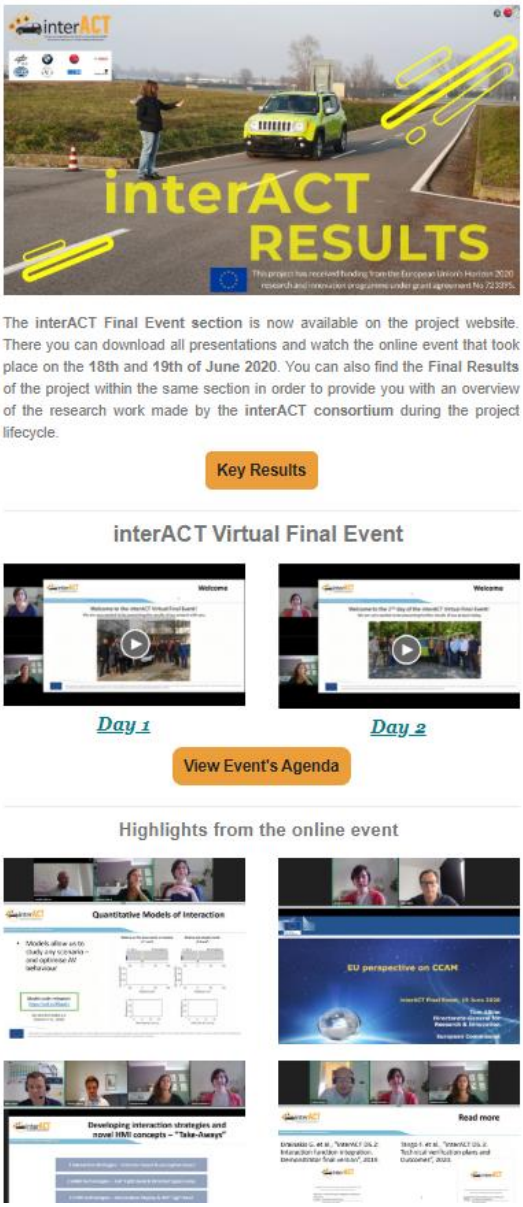
# Annex 1: interACT Final Results (email campaign)

The Final Event section was made publicly available in July 2020 and an email campaign was launched to communicate to the registrants of the interACT Virtual Final Event as well as the newsletter subscribers of the project the:

- interACT final results;
- the final event,
- the presentations and discussions made during the online event (videos available online).



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# Designing cooperative interaction of automated vehicles with other road users in mixed traffic environments