

D5.1 Organization of the driving simulator and on-road trial experiments in i-DREAMS.

Assisting drivers to drive as safely as possible ... that is the main goal of i-DREAMS. How safe a driver is driving, is reflected in his position in the Safety Tolerance Zone (STZ). That position is determined by taking into account the driver's mental state (e.g. How alert am I?), the driving context (e.g. What are the speed limits, weather conditions...?) and the performed driving behaviour (e.g. Lane positioning, headway). By constantly monitoring these elements in real-time and assessing the danger in real-time, in-car interventions are provided to the driver to assist him/her in staying ahead of danger. There are 3 phases in the STZ that determine what type of interventions are provided: (1) the normal driving phase where no interventions are required, (2) the danger phase where risk is imminent and the driver is informed of potential dangers, and (3) the avoidable accident phase where the system issues concrete warnings to avoid a collision. Besides in-vehicle interventions during the trip, post-trip interventions will further educate drivers about their specific safe and unsafe driving performances.

The i-DREAMS platform that is needed to realize these ambitions requires a lot of research, development and testing. In that respect, this deliverable has two main purposes. The first one is to identify best practice when planning and implementing simulator and field trials by evaluating previous experiences from other studies. The second one is to create a 'roadmap' for successful implementation, taking into account possible technology implementations, insurance, legal and ethical issues involved.

One of the ambitions of the report was to identify best practices. I read that you used the FESTA handbook to determine best practices from previous studies. Can you elaborate a bit on this handbook?

GRAHAM HANCOX: *"Well, FESTA stands for 'Field operation tEST support Action'. The aim of this handbook is to create a common methodology for field operations trials (FOT's) across Europe. We used the information from this handbook to create two i-DREAMS checklists to be used by all partners, to make sure they operate in-line with the FESTA handbook. We created one checklist for planning and one for implementation. These checklists are actually an important part of this deliverable. They act as useful reminders of the level of work required to effectively plan and run the large-scale field trials and simulator studies. They are crucial as reference documents to ensure efficient planning and implementation."*



In your opinion, how challenging do you believe is the organization of the simulator studies and the field trials?

GRAHAM HANCOX: *“The largest challenge in any FOT is the time effort and costs associated with running them. You have to know that in i-DREAMS we deal with a highly complex FOT to operate smoothly due to the scale we are dealing with. That scale will be a huge challenge! We are testing in 4 different transport types (car, bus, truck, rail) across 5 different countries (Belgium, Germany, Portugal, Greece and the UK). A significant amount of forethought and planning is obviously crucial.”*

What is it exactly that you are testing in these trials?

GRAHAM HANCOX: *“It is not easy to summarize that briefly. Numerous research questions, formulated in different tasks of work packages 3, 5, 6 and 7 are being investigated in the trials. These questions are about the Safety Tolerance Zone – how to define it, what the relevant interventions are per STZ phase, but they are also about what scenarios to use, what experimental protocols, what data handling strategies to implement. Numerous questions are about the recruitment of participants – what strategy to use, what inclusion and exclusion criteria to define, how to follow up on recruitment progress, participation and drop-out, but also questions about user experience and acceptability are addressed. Furthermore, several questions about effectiveness of interventions are looked into, taking into account task complexity and coping capacity of the driver. I am sure I left out a lot of elements in this brief summary. If you want to have a detailed overview about this, I can refer you to section 3 of the report.”*

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Can you explain to us what the trials will look like? What is the plan? What will you do in each country and how many participants will be involved exactly?

GRAHAM HANCOX: *“In each country we will focus on specific modes. First, we will organize simulator trials to ensure the i-DREAMS platform can detect different phases of the STZ model and to gain initial user acceptance/feedback on the technology we use. The goal is to test 110 participants in simulators, 15 car drivers in Germany, 15 in Greece, 20 truck drivers in Belgium, 30 bus drivers in Portugal and 20 for rail in the UK. In a second step we plan to organize field pilots: 5 car pilots in Germany, 5 in Greece and 5 in the UK. Five truck pilots in Belgium, 5 bus pilots in Portugal and 5 rail pilots in the UK, all in a one-month period. Then of course we start the biggest challenge, being the main field trials. Since we have a limited budget and therefore finite amount of equipment, we will organize them in two groups, back-to-back with a changeover period for the equipment. Each group of drivers will participate for 18 weeks. During the first 4 weeks, no intervention is planned. In the next 4 weeks will foresee in-vehicle interventions. In the 4 weeks after that we will add post-trip feedback via the smartphone and in the last 6 weeks we will add gamification features to that. We aim for a total of 265 cars (50 in Belgium, 65 in Germany, 65 in Greece and 85 in the UK). 75 buses (all in Portugal), 125 trucks (75 in Belgium, 50 in Portugal) and 50 rail drivers (all in the UK).”*



What were the most important steps that were undertaken when organizing the simulator trials?

GRAHAM HANCOX: *“Well, there were some technical challenges, but we also had to tackle matters related to resource planning and experimental design. Firstly, of course, we needed to have simulators. DSS has built two new driving simulators specifically for the i-DREAMS project: one car simulator and one bus/truck simulator. The mock-ups of both simulators were built as realistically as possible, but in such a way that it allowed for easy assembling and disassembling, since the simulator trials take place in multiple countries. And then of course a lot of thought went to determining what we wanted and could measure and evaluate, how we would do that, what interventions we wanted to test, what technology to use ... It was a very big puzzle, but we managed to put all the pieces of the puzzle together.”*

I can imagine that for organizing the field trials, that puzzle is even more complex. What element will be crucial to guarantee a smooth process?

GRAHAM HANCOX: *“Besides the experimental protocol, ethical and legal issues, insurance issues, I believe the installation effort will be essential. As already mentioned before, field trials will be organized in two waves to guarantee efficient use of budget to buy equipment. The number of installations is based on the principle of ‘one vehicle – one driver’, but of course we leave open the possibility for the participation of multiple drivers using the same vehicle. For example, if multiple drivers from one family all want to participate using the same family car, we will definitely go for that. The*

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necessary technical solutions are in place to facilitate that. And that can of course also be the case for other modes: multiple drivers that drive the same truck or bus ... We are more than happy to accommodate that, since the installation effort will be considerable. There is a large number of vehicles to be installed and de-installed. The staff that takes care of this will need to have the necessary technical expertise, moreover, specific certification to do that, is required. Since one of the smart cameras that we use, Mobileye, requires input signals from the vehicles’ CANbus, we expect a few challenges there too. Mobileye requires specific signals to support its headway monitoring, collision avoidance and lane departure warning capability. In modern cars, most of these signals (turn indicator activation, brake light activation, vehicle speed and activation of wipers) are digitally available on the CANbus. In older vehicles, some of these signals are missing and analogue signals have to be found in the vehicle (requiring the removal of vehicle parts, soldering of cables, additional installation and wiring). Of course, we try to avoid this as much as possible by focusing on specific car brands and models in the recruitment phase, but still, we cannot eliminate it completely. And then there is also the robustness of the technology. Everything has been tested and re-tested, but you never know when Murphy is lurking around the corner.”



Deliverable 5.1 is part of WP5:
4-stage, 5-country experiment

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How aware is everybody involved of all these challenges?

GRAHAM HANCOX: *“The iDREAMS team is of course very aware. Each partner involved appoints the right staff that is able to handle all these challenging aspects. Moreover, we make sure we have specific internal communication strategies in place to ensure cross sharing of lessons learnt as equipment is fitted. We also foresee a separate process for communicating equipment failures and another for updating each other on progress. Besides keeping all the team members in the loop, there is of course also the communication with participants. We worked out a standard strategy to communicate with participants on a routine basis to inform them on what is to come and in the case of adverse events. We standardized that strategy across trial sites and transport types.”*

From what you are telling me, I understand that very exciting and interesting challenges lay ahead. I wish you all good luck

Edith Donders

i-DREAMS DisCom manager

Researcher in the spotlight



**GRAHAM
HANCOX**

Graduated as ergonomics / human factors specialist

Employed at Loughborough University since 2013

Passionate about martial arts, health and fitness and horror films

Tasks in i-DREAMS: Leading Task 5.1 to ensure smooth communication between partners for the trials. Organising and running the UK road trials among many other things

