

## D4.5 A smartphone app for personalized driving behavioural feedback.

*Interview with Yves Vanrompay*

Assisting drivers during and after the trip, that is what i-DREAMS does. As part of the post-trip coaching of the drivers a smartphone app for feedback has been developed where the driver receives feedback about important safety variables once a trip has been completed. Based on the safety driver performance of the individual, goals are offered to the driver and tips and tricks are available to achieve those goals. A driver can measure his/her individual performance in relation to other fellow drivers. The Android smartphone app, its realization and functionalities, are the subject of this deliverable. Furthermore, although not originally planned, an iOS version of the app was developed. This was not within the scope of this deliverable, but of course, we will definitely talk about it in this interview.

**Hello Yves, thank you for taking the time to talk to me. Today we focus on D4.5 describing the i-DREAMS smartphone app. What can you tell me about this app?**

*Yves: “To clearly explain the role of the app, I think we should first see how the app fits into the i-DREAMS platform. In the i-DREAMS platform we distinguish different components: input components, output components and processing/backend components. The app has a very specific role in this framework.”*

**Ok, that requires a bit more explanation I’m afraid. Let me start first with the input components? What are they exactly?**

*Yves: “As the name says, they input the platform with data that is collected. The first input component is the on-vehicle system containing the sensors that collect real-time data for real-time interventions. Trip events detected by this on-vehicle system, such as speeding, collision avoidance or tailgating, are sent to the backend system to be processed into driver metrics and scores. The second input component is the app that collects data from the smartphone sensors during a trip. We integrated a software development kit (SDK) from our partner OSeven PC into our app to collect data on handheld mobile phone use during driving. OSeven also provides a service to derive speed limits, from which the backend system can derive speeding events. The third component is the backend system developed by Hasselt University to process the data collected by the on-vehicle system and the OSeven SDK in order to calculate driver metrics and scores.”*

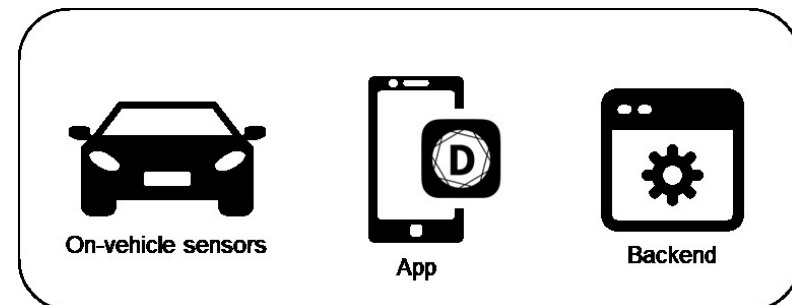


Figure 1: Input components of the i-DREAMS platform



**And the same question, but then for the output components. Can you elaborate on them as well?**

Yves: “Sure. The first output component was explained in deliverable interview D4.4, namely the intervention device that visualizes the real-time interventions and is used for driver identification. The app is the second output component that shows scores, trips and several gamification features (post-trip). And the web dashboard is the third output component. This tool is mainly interesting for companies and can be used by driver coaches and managers to analyse the behavioural evolution of the drivers. Via this dashboard the gamification features can also be managed.”

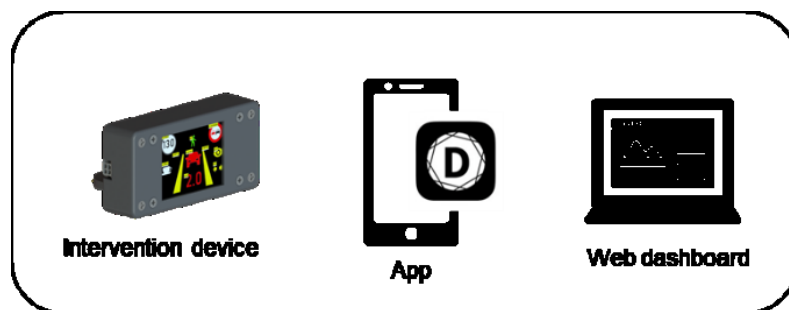


Figure 2: Output components of the i-DREAMS platform

**What are gamification features?**

Yves: “Well, those are specific game-like features in the app that help drivers to stay motivated to keep their driving performances at a high level. We included several of those features in the app. Coping tips and pros & cons for example are information elements that help drivers to improve their driving behaviour. The leaderboard is also such a gamification feature that shows a ranking of the driving performances, based on the aggregated safety score of each participant. This way drivers can compete with each other. And of course, there are also the goals and the badges. Goals are challenges that a driver can take up. After completing a goal, a new goal can be taken up. When a set of goals has been completed, drivers earn badges (bronze, silver, gold or platinum) as a reward.”

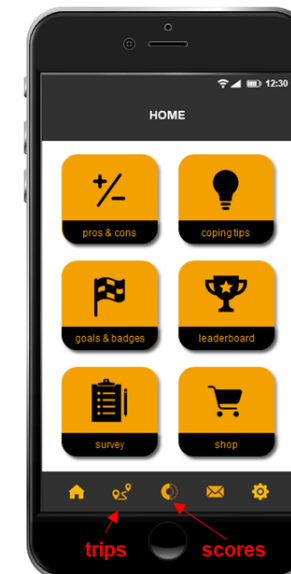


Figure 3: Impression of the home-screen of the i-DREAMS app containing the different features available



**And besides those gamification features, you also offer other app functionalities?**

Yves: “Yes, absolutely. Important functionalities we offer are the trips and the scores. Trips are logged and listed. In the app, each trip can be clicked. In that case a map opens that visualizes that trip, showing the GPS trace and the risk events that happened during the trip. Detailed information of each risk event can be consulted often accompanied with a video fragment, made with a dashcam, which is part of the on-vehicle system.

Scores are provided at different levels. Remember the logic model of change from deliverable interview 7.1 (see Figure 4 below). Well, we offer scores at the level of ‘Safety Promoting Goals (SPG’s)’ and ‘Performance Objectives (PO’s)’. The SPG score is then an aggregated score, based on the relevant PO’s. We also offer trip scores and an overall safety score (used in the leaderboard). Besides that, there are a few other features as well, but if you are interested you can check the deliverable for more details about that.”

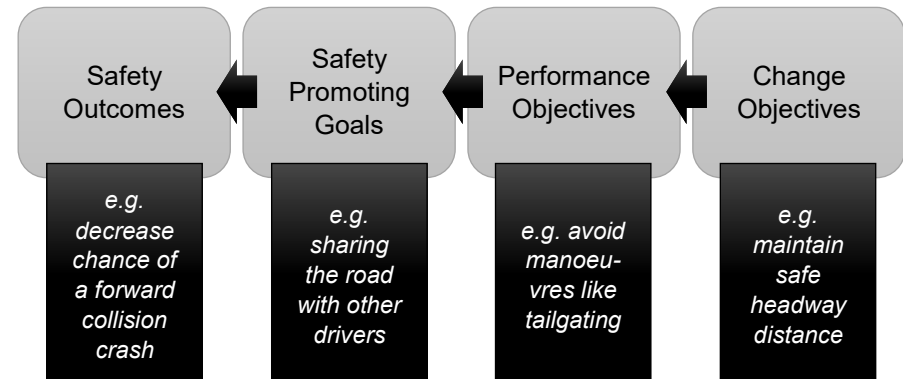


Figure 4: Illustration of how the logic model of change is applied in i-DREAMS

**OK, that is clear! So, we covered the input and output components in the i-DREAMS platform, but you also mentioned processing/backend components. What about them?**

Yves: “There we distinguish between the data processor and the intervention framework. The data processor receives data from the i-DREAMS on-vehicle system and the app, processes and stores it. It exposes an API to the i-DREAMS post-intervention framework which can get the necessary data from it. Each time new trip data is available, the post-trip intervention backend gets notified and can synchronize this trip data. The post-intervention framework thus contains trip information and a database with scores for all relevant performance objectives, which it generates from the data obtained from the i-DREAMS data processor. It also contains all logic to manage, process and expose the trip data and the gamification features to the output components.”



**You probably expected me to ask this, but what is an API?**

Yves: *“(Laughs) Yes, I did expect that a little bit. An API is a mechanism that enables two software components to communicate with each other and exchange data using a set of definitions and protocols. In this case the API allows the i-DREAMS post-intervention framework to communicate with the data processor, and also the output components (web dashboard, smartphone apps) to exchange data with the i-DREAMS post-intervention backend.”*

**And how was all of this developed?**

Yves: *“The i-DREAMS app was realized using an agile (Scrum) development methodology, in which functionalities are described in stories, that are selected and grouped in sprints of 2 weeks. Each sprint represents an iteration in the development process. In this way, development was efficient, flexible and traceable. The i-DREAMS app was developed in the programming language Kotlin, which is a state-of-the-art language (bundled in Android Studio) and is used by the majority of Android app developers. As already mentioned before, we used an API to let the app communicate with the backend. A REST API to be exact. REST uses http-methods to retrieve and post data between a client device and a server. The HTTP protocol allows REST APIs to let software on one device talk to software on another device (or on the same device), even if they use different operating systems and architectures.”*

**What elements did you take into account while developing the app?**

Yves: *“While developing the app, there were many elements we took into account. I will try to give some examples. Of course, the recording of data by the app requires a lot from the device’s battery. A lot of effort went into optimizing the O7SDK to achieve the optimum balance between recording accuracy and battery consumption. Furthermore, an algorithm was developed and integrated in the app to detect handheld smartphone use. And we had to make sure that the communication between the app and the on-vehicle system ran smoothly. Due to the need for recording trips in the background without any user involvement, users needed to perform several configurations on their smartphone for the app to record successfully which may vary among manufacturers and operating system levels. To that end, a device setup app screen where users can see with one look if all necessary Android permissions have been granted was developed. Open Street Map was integrated in the app to visualize trips and events ... If you want, I can go very deeply into these examples, but that might become a bit too technical perhaps.”*



Deliverable 4.5 is part of WP4:  
**Technical implementation**

[Download the report here](#)

**That brings me to my last question. Somewhere down the line, it was decided to also develop an iOS version of the app, although that was not originally the plan. Why did you decide on this and what was the main difference between developing an iOS app and developing an Android app?**

*Yves: "The most important reason was to boost recruitment of participants in our field trials, since a lot of people use iPhones. Development in Swift (a powerful and intuitive programming language) for iOS is completely different from Android with little to no re-use of code since the Apple and Google ecosystems are independent of each other. Getting iOS apps like i-DREAMS, which have to run in the background on the smartphone and require specific app permissions for recording trips, published on the App Store can be challenging, but in the end, it went quite well."*

Yves, thanks a lot for talking to me about this. Again, I learned a lot.

Edith Donders

i-DREAMS DisCom Manager

## i-DREAMER in the spotlight



**YVES  
VANROMPAY**

*Graduated as PhD in Computer Science in 2011*

*Employed at the Transportation Research Institute of Hasselt University since 2015*

*Passionate about travelling, astronomy and history*

*Tasks in i-DREAMS: Team lead i-DREAMS post-trip intervention backend, web-based dashboard and smartphone apps (Android and iOS)*

