

MeBeSafe News

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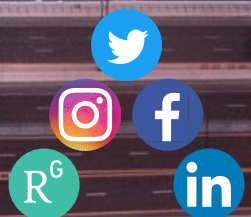
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Making a connection

to the people passing by

When you've designed something new, you naturally want to talk to people and see how they react. But if you built it on a motorway, you can't just stop drivers and have a chat. MeBeSafe has found a way to connect with them.

You are cruising down the lane of the good old motorway. A catchy tune is played on the radio, and you are not fully alert to everything around you. So when you take the exit from the fast road, you might not remember or be able to slow down enough. But in this case, something unusual happens. Lights illuminate on the sides of the road and start moving towards you. You have just witnessed the MeBeSafe InfraDriver Nudge – nudging you to slow down.

"The nudge is made to slow down the people who need it – when they need it" Milou van Mierlo from Heijmans explains. *"Driving 120 km/h on the motorway is not a problem – but driving even a little under 120 km/h on an exit is, and then you will get nudged."*

The moving lights act upon you to form an illusion that you are going faster than you actually are. This illusion solution is the result of a long pre-study with a lot of evaluations led by ika at RWTH Aachen, and it has now been installed on a real road after testing in ika's driving simulator.

"Heijmans has built lights into a lot of roads before, so it was up to us to get the nudge to the real world" Milou states. *"The project is measuring the quantitative effect, but we also have to know what people think of it."*

Talking to the people is an essential part in evaluating how well something worked, so that needlessly had to be done. But the nudge is put up on a motorway exit, and you can't just stand there with a coffee booth expecting people to stop in the middle of traffic and talk about their experience.

Neither could you put up a QR-code with a link to a survey, believing people to scan it when they drive past. Both alternatives could actually promote risky behaviour, and MeBeSafe is about making traffic safer.

"We had to find another way to get in touch with the people, and the journey began already when selecting where we should place the nudge" Milou exclaims.

Speeding is common on far too many motorway-exits, simply because it so easy to

get speed blind. This means that there's an abundance of alternative places where a nudge like this could have been built. Several factors were taken into account when selecting the location, whereas the main factor was that the road exit showed potentially dangerous traffic situations.

For example, drivers being surprised by the narrowing curvature of the exit. The exit that was finally selected is however a bit different from the others. It is located in the outskirts of a large Dutch city, where a lot of people live. But the area is primarily residential, and no shopping malls or other public services are available nearby.

"This is not an exit that everybody takes. The people going there are very likely to live in the area – in fact, it is more or less the only way for them to get home." Milou clarifies. *"So not only will most people taking the exit be local residents – but most of the residents have also taken the exit."*

As the nudge is only visible when you are speeding, not everyone will have seen it. But some will, and some might have seen it

"I think it makes you more aware of "driving" and driving less on autopilot. I saw cars brake in front of me. It seems that people slow down more."

– Respondent

"The communities all have their own communication channels we could use, and the city had a local digital panel that they opened up for us. And of course, we could send out surveys to people within the postal code zone" Milou tells, *"So we actually got to hear from the exact persons we wanted!"*

The results from the surveys are being analysed at the moment, but the indications are positive. People seem to appreciate it. At the same time, other partners are evaluating the effect on traffic safety. So if the nudge is appreciated by people as well as having an effect on road safety –

it may well be used at other dangerous exits across the world. And by choosing a test location where the right people could be targeted better, MeBeSafe's research can progress more efficiently. Milou van Mierlo is enthusiastic.

"Only a traffic sign does not seem sufficient. Speed cameras seem excessive. I think the light system would be a good alternative."

– Respondent

"It is really nice to hear what people say. You put it out there for people and then you get their feedback. They are the ones you built it for, so they are the ones who matter in the end"



The InfraDriver Nudge

is developed by ika at RWTH Aachen, ISAC at RWTH Aachen, Heijmans and the BMW Group

The nudge aims to reduce speed for car drivers when necessary. It is made by a row of lamps on either side of a road. When a driver goes too fast, the lamps will either light up in one position or in a sequence to make it look like they are moving towards the driver and the driver will think they are going faster than they are.

What is good driving - REALLY?

The quest of comparing driving in different situations

We all want to be better drivers, but what is actually better? Lots of apps are supposed to measure how you drive and give you a score – but that score might not capture the whole truth. MeBeSafe is investigating how this could be improved.

Imagine yourself cruising along a highway in the middle of July. The sun warms the back of your head as the asphalt softly rattles beneath you. Now picture yourself driving in the middle of nowhere, right on a snowy mountaintop. Blizzards roar while the tyres screech in desperate pursuit of finding grip. There's honestly not much similarity between the two situations.

As a skilled driver, you are totally aware that you must behave in completely different ways. You would expect that your driving-app – measuring how well you drive – understands the difference and takes it into account as well.

Many of these apps claim to track the way you drive – and that's also what they do to a high degree. But as the market for driving apps has grown, there has not yet been enough research to understand the whole picture. Few apps specify what they measure when you drive or how they convert it into a score. Anders af Wählberg is a MeBeSafe researcher from Cranfield University who has been looking into this type of issue for years.

"I only managed to get my hands on an app algorithm one single time. The score-calculation looked complicated, and at a first glance you might be impressed by the complexity."

"But more complexity is not necessarily good. I dug into the code for a few weeks and it doesn't really seem to be based on the previous evidence we've found."

Anders means that many apps have not yet been able to base everything on scientific evidence. Instead, they seem to have set up limits and weights for certain behaviour based on personal judgements. This is certainly not surprising, as it is immensely hard for anyone to judge what is good or bad driving. But this oversimplification – or overcomplication depending on how you view it – might not be an ideal solution.

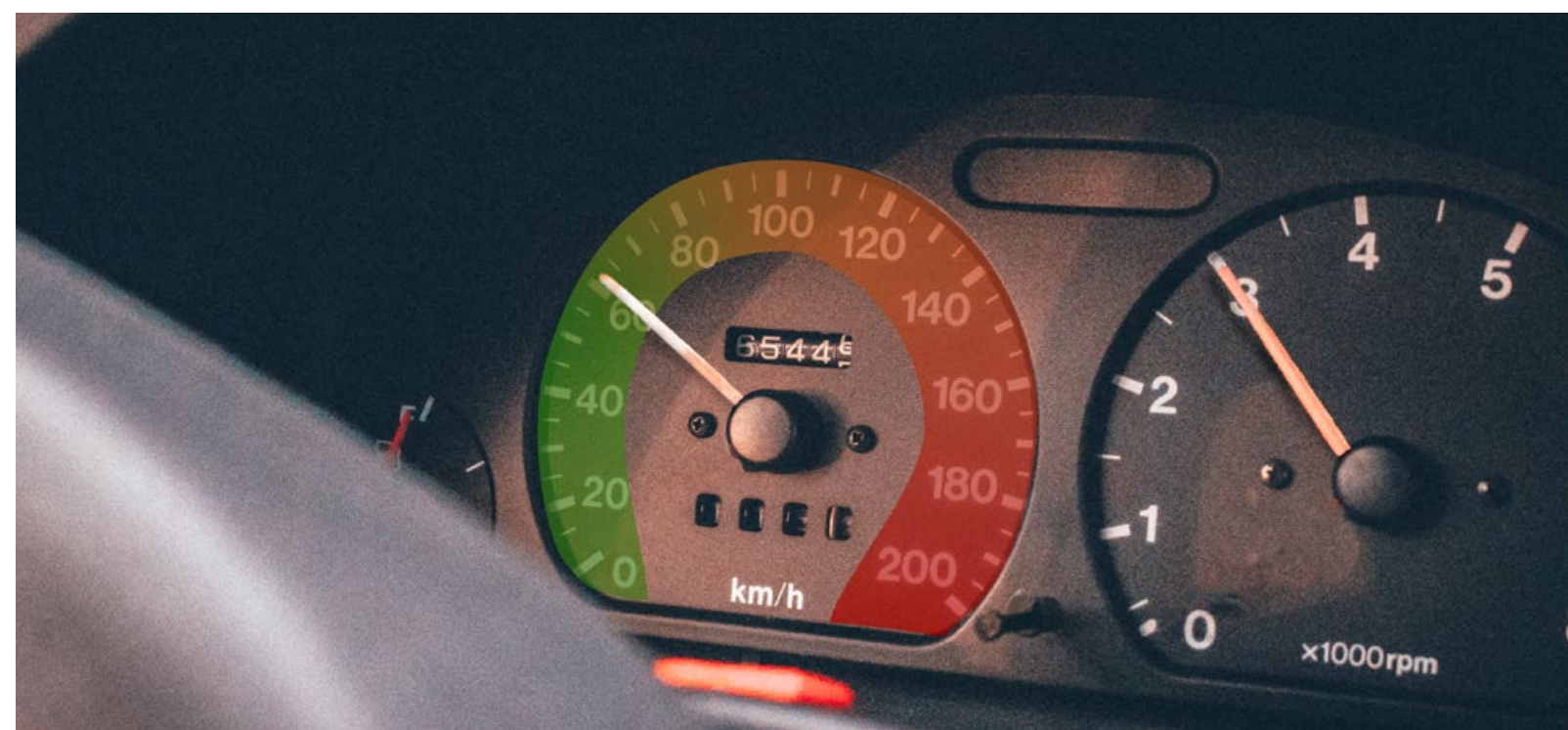
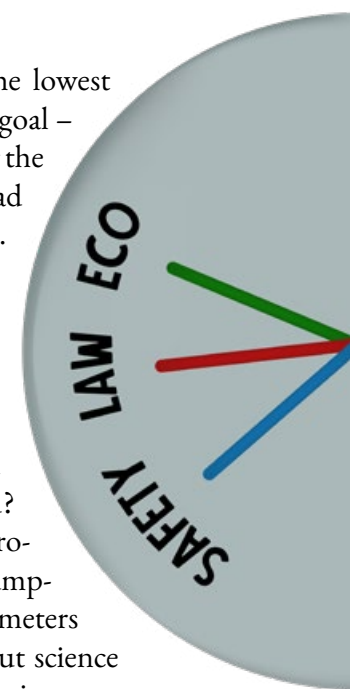
"Some apps will for example give you some kind of penalty if you speed, and that could sound reasonable. But what they actually say by that, is that there is no risk of an accident if you drive at the speed limit or below – but a large risk if you are above. Research does not say that. The risk of an accident is dependent on the speed – but not the amount of speed above some kind of limit." Anders decrees.

If a driving app should work perfectly, it should treat behaviour more as a continuum than something with fixed limits. Driving at 79 on an 80-road could not always be considered 'better'. Likewise, driving at 120 on

the 80-road must be considered to be 'worse' than driving at 81. There should be a more floating scale if we are to capture the reality. But not only does such an app have to be more flexible in measuring, it also has to choose what is the best behaviour.

Should high levels of safety or the lowest fuel consumption be the ultimate goal – or perhaps that of always following the traffic rules? These three might lead to three different optimal speeds. And when you take more than one type of behaviour into account, such as speed, acceleration and turning radius, you are about to enter the mad box. How much is a fairly good acceleration worth compared to a fairly bad speed? When you want to have a compromise between safety and fuel consumption for a number of different parameters – it is very easy to just forget about science and set up some seemingly good limits.

And still, the most complex issue has yet to come. Let's head back to the summer highway and the snowy mountaintop. An app should be not only able to understand the current situation but also judge what type of behaviour is most appropriate in that context.



"Shell is developing a new app for truck drivers within MeBeSafe. And for truckers, the context becomes ever more important. For instance, one app used today could give awful scores when you were driving in the city compared to driving on the highway. But the truckers already know if they drove in the city or on the highway. They want to know how well they did in that environment" Anders states.

"One app today gives different scores depending on where you drive. But the truckers already know if they drove in the city or on the highway. They want to know how well they did in that environment" – Anders af Wåhlberg

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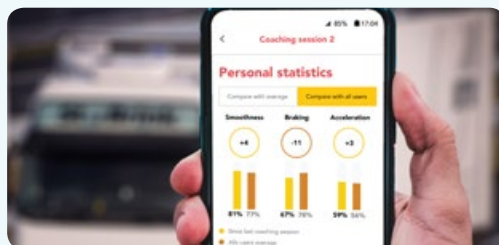
This is something MeBeSafe intend to change. The pursuit is anything but trivial, but it is necessary if an app should avoid falling into the pit of arbitrary selected values.

To reach this goal, the general connections between different environmental factors and safety-risks need to be defined.

In order to do that, real driving data has to be analysed. A lot of real driving data. Not only do we need data on a driver driving at 60 km/h, accelerating 1.5 m/s², turning their wheels in a curve with a radius of 10 m, with an ambient temperature at 12°C, 1.5 mm of rain falling per hour and 15 cars/min passing on the road.

We need driving data for each scenario at each location. This is a huge task for anyone. But it is something that we are willing to aim for to cover all aspects of driving.

"We of course have ideas on how to do this with the things we have. But the results would be even more complete if others would share their data sets from previous studies. There are a lot of large data sets that would be invaluable to do this analysis." Anders states. *"In an ideal world, if we get all the data that we need we could make an app that makes total sense. That way a trucker could look at their app and say 'Ah, I did better last week, not because I drove on the highway but because I was better.' And that is what really matters in the end."*



The Coaching App

is developed by Shell, Cranfield University, Cygnify, Virtual Vehicle, SWOV, the BMW Group and Volvo Cars.

The coaching app aims to help truckers improve their driving by peer-to-peer coaching. Data on driving behaviour is collected by the app and shared with nobody else than the driver.

The app will suggest a time when two peers should meet and coach each other, based on an analysis of the data. It will give suggestions on what they could discuss at that coaching session.

LIVE FROM THE NETHERLANDS Status Update of MeBeSafe field trials

MeBeSafe field trials are well under way. The nudges and measures are being tested in real-life situations and a lot of data is being gathered. Are they effective and how many lives can they in-fact save?

The team got together for a thorough status update at the 5th General Assembly hosted by TNO in Helmond, the Netherlands.

First up from the team was Olaf Op den Camp, safety researcher at TNO, who shared the latest news of the In-Vehicle Nudge, which aims to increase attention of car drivers approaching bike intersection. The user-testing had fared well, and they are now in the middle of analysing the drivers' gaze direction with the help of Cygnify. Moreover, they are talking with FCA in Italy about the delivery of a car in which TNO will implement the Cygnify cyclist prediction model. At the time of the meeting, when Covid-19 had just begun its tour of Europe, he reassured that the car would come alone.

Olaf shared further news of the Cyclist Nudge in the Netherlands, which aims to have cyclists who are approaching intersections become more aware of the surroundings. They have received data on the trajectories of cyclists passing the nudge and are now planning how to do the analysis together with SVOW. These outcomes are intended to be compared with the Cyclist Nudge in Sweden, as their designs are the same. The possible differences may provide valuable insight as the implementations are made in different scenarios.



Olaf Op den Camp



Pontus Wallgren



Anna-Lena Köhler



Saskia de Craen



Johann Ziegler

Similarly, human factors researcher **Pontus Wallgren** from Chalmers University of Technology shared news of the Cyclist Nudge in Sweden. It is not used for bike-bike intersections, but instead implemented to reduce the speed of cyclists approaching dangerous intersections with cars. The quantitative data of the study is currently being analysed to make sense of the huge amount of collected datapoints. Variable factors such as nearby cars, weather and cyclist flow are taken into account. Once a data model for the analysis is created, data from an upcoming second location will supposedly be a breeze to analyse.

Anna-Lena Köhler, specialist in driver behaviour at ika at RWTH Aachen gave an update about the field test of the InfraDriver Nudge. When necessary, the nudge aims to have car-drivers adapt a suitable speed and trajectory. The quantitative part of the field test is based on several thousands of cars passing by the installed nudge at a sharp-curved highway-exit in Eindhoven, the Netherlands. The team has completed testing different configurations of lights and movement patterns and are continuing to test more configurations. The data is now being analyzed to determine which configurations are the most effective.

Saskia de Craen, senior researcher at Shell, expressed her delight in having the latest version of their coaching app DriveMate up and running. This measure is not a nudge, but a basis for coaching. It provides truck drivers a private insight into their personal driving style and occasionally suggests meeting a colleague for a peer-to-peer coaching session. The app is currently being used by several selected drivers and are about to be introduced to more drivers in Norway and the United Kingdom.

Pär Gustavsson, active safety analyst at Volvo Cars, reported on their measure which aims to encourage drowsy drivers to take a break by giving them an incentive to do so. User-testing is currently well underway. The present iteration is assessing the effectiveness of giving away vouchers eligible at a variety of shops, such as furniture or clothing stores, if the driver agrees to take a break when they are found to be drowsy.

Furthermore, Pär shared some new visuals of the current design of the adaptive cruise control (ACC) nudge, which aims to increase the use of ACC among car drivers.

The design is soft to the eye and resembles circles moving around in an unorderly fashion. As the ACC-use increase, so will too the order among the circles. They will eventually slow down into a halt and form an orderly shape – appealing to our attraction to beautiful things. User-testing is currently running and will lead to insights on how to polish the nudge design towards increased effectiveness.

But the measures themselves are not the entirety of the project. There is also the safety impact analysis, which builds upon the data from all of the MeBeSafe measures. The result will be an estimate of how many lives the measures can save if they were implemented across Europe. Johann Ziegler from VUFO spoke of the progress they had made so far. Literature reviews are ongoing, and they are now discussing which European databases and statistics they will use to compare and extrapolate data from. It will result in the so-called transfer function which will be used to understand the impact on traffic related accidents.

In the end, this will lead to the verdict of the MeBeSafe project. Elaborate nudges and sturdy apps are nothing worth if they cannot make the world a little bit better. And hopefully a great number of saved lives will stand as a legacy of the project.



is developed by ika and ISAC at
RWTH Aachen, Heijmans
and the BMW Group



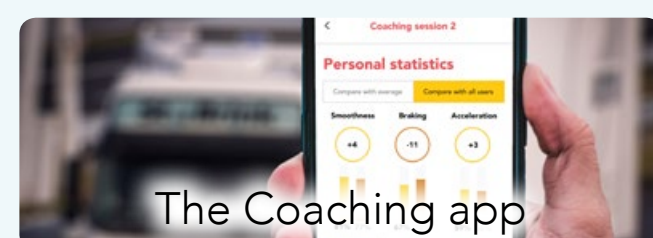
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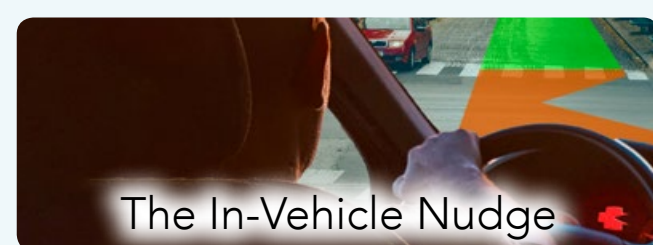
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Cygnify, BMW Group, Offis and Virtual Vehicle

MAY THE PEERS BE WITH YOU

When meeting a friend can be the ultimate learning experience

Coaching. Normally the subject means that a coaching expert comes to guide you on something they are not really familiar with. Is there another way to do it?

For a long time, coaching has been a popular way in getting people to improve. Employers like to try it out as an easy way to perfect imperfections at the firm. This has naturally spawned an abundance of work for professional coaches, who are mainly trained in doing the pep-talk and not necessarily possessing work-specific expertise.

According to the classic definition, it's actually beneficial for coaches to be totally oblivious to the subject their so called coachee is working with. In this way, it is easier for them to help employees gain insights by themselves. But this method does not suit everyone. Some people prefer more hands-on tips on how to improve.

A lot of companies therefore use a manager from within the company to do the coaching instead. The idea is good, but for some people it could turn out to be a bad move. The psychologist Anders af Wählberg from Cranfield University is well aware of how people react to different stimuli, and he is skeptical.

"A boss does not necessarily have any first-hand experience of what you do and might not even have the same background. And if they coach you, it means that the boss is scolding you on how to behave. 'Do that, now get yourself together!' This leads to a very unequal relationship." Anders af Wählberg explains.

Yet another alternative is professional education of some kind. In MeBeSafe, the coaching is focused on traffic safety – and mainly aimed at truck drivers. Truckers are true professionals, really knowing the road and how to drive. Could some kind of traffic education work for them? Educators can talk to people, as they know a lot about their subject. Anders af Wählberg however has a different opinion.

"There is a huge amount of studies on this, and they all say the same thing. Traditional traffic safety educations for the average driver do not work! They do not make traffic safer. If you educate people or not – it does not matter."

This is the research Anders has found and there may of course be situations when education works perfectly fine. But with such a strong literature review from a partner, MeBeSafe decided to try another route, without coach-pros, bosses or traffic educators. Suddenly, another alternative dawned upon the project. Who knew the struggles of a trucker better than a trucker?

"Peer-to-peer coaching could be the thing, although it's rarely used officially" Anders proclaims. "But if you think of it, it is actually used in real life all the time. When a new worker comes to a factory, how do they learn to use the engines? Well, there's already a bunch of fellows there who know the grit – and they'll show the newbie how to do it."

So MeBeSafe took the novel route of using the ancient practice of learning from your fellows – and adapted it into a modern and standardized setting. In getting coached by a peer, you are talking to an equal with similar experience. And to make it even more equal, MeBeSafe decided that the peers should coach each other at the same time. But this is actually not trivial for truckers.



"Normally you'll meet your colleagues every day" Anders explains "But for truckers, the situation is very different. They are driving away all the time and rarely get to meet. So we have to make them come together and talk!"

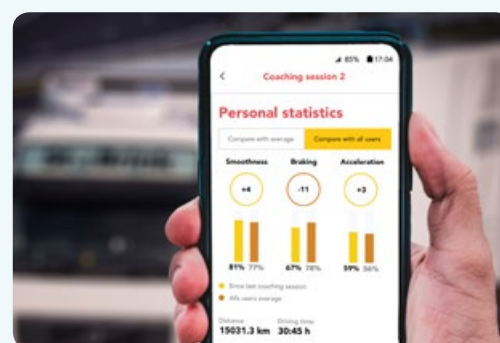
MeBeSafe therefore had to help the truckers plan when and how they could meet in person. This could be achieved by a planning device, reminding you when it is time to meet up. From the very beginning it was decided the measure would be app based, and indeed, a mobile app seem like an ideal solution.

And if you make a mobile app to help drivers meet – wouldn't it make sense to guide them in what they could talk about as well? So MeBeSafe set out to create the app in such a way that it collects data on how you drive, and then suggests relevant topics you might discuss – with the help of some good reading material. This way, the coaching could be based on actual data and good insights.

But as important as it may sound, the data on your driving and the suggested topics are just a bonus. They can help if you don't know what to talk about – as a trigger to get the conversation started. But if the drivers find it more important to talk about other topics than the provided ones, they can of course do it. They are the ones knowing their situation. They don't have to show their data to their peer if they do not want to, and don't even have to meet if they are not interested.

"We want to empower the drivers. If you have a hired coach, they come and tell you what to talk about, and then you have less influence over the interaction. But when you are together with an equal peer you can control the discussion and influence what you talk about. We don't know what they talk about at the meetings and don't want to!" Anders cheerfully exclaims.

The first concept of the app is up and running, but there are still more tweaks to be made on the data side. Drivers are trucking around in vastly different environments, and a comparison against the average might not be fair if this is not taken into account. MeBeSafe is hard at work making the information as close to reality as possible. But in many ways, the most important step is already taken. The app gives something to the truckers that they have lacked for so long, despite the fact that almost everybody else has it. Real life contact with their colleagues. And that is a deed on its own.



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Nudging cyclists EN-MASSE

Traffic is often most dangerous when a lot of people meet at once. But not when it comes to Dutch biking. Dutch cyclists should instead be nudged to get more aware when they're seemingly more alone.

Biking in the Netherlands is a phenomenon of its own. More people bike than in any other country on earth, and the society is fully built to embrace it. In the bigger cities, cyclist jams are as common as car jams are around the world. This of course provides a wholly different traffic situation than in many other parts of the world.

Intersections between cars and bikes are dangerous places in most countries. This also holds for the Netherlands, though bikes have been largely separated from each other. This separation has made traffic safer. Biking lanes may still cross car roads, but these intersections have been improved by traffic lights or changes to the layout of the biking lanes. This system has so far seemed to work really well. MeBeSafe is helping drivers to spot cyclists by introducing a nudge in the car. However, interaction between cars and cyclists are not the only exposure to difficult traffic situations for cyclists.

In the Netherlands, another intersection has instead sailed up as a priority; namely

that between bikes and other bikes. Because these will naturally still have to cross their respective ways. An example of such a dangerous spot could be a T-crossing, where endless streams of bikes search to weave themselves together. You could think that a lot of traffic would mean a lot of accidents, but large flow is actually not the issue. The researcher Esra van Dam from TNO explains.

"When it's rush hour, some T-crossings are really busy. Bike after bike comes along. But there's so many people that you can't do exactly what you want. You might have to ride at another speed than the one you would prefer. And then you have to become more aware of the surroundings."

MeBeSafe aim to make traffic safer by nudging. This means that nudges should be employed where they have the largest effect. But this also means that a nudge to help cyclists get more aware would not really be necessary in the times of Dutch high traf-

fic. When bikes constantly come along, you know that you can't just turn or speed into other people. When the traffic is calm on the other hand, you will not be as aware of your surroundings, as you don't see others all the time. But a really empty biking lane is still not the most dangerous spot.

"If the T-crossing is rarely visited by anyone, you might not be likely to run into somebody when you get there" Esra explains. *"But busy intersections between the rush hours are somewhat in-between. There are still many people coming, but they are not so many that you always see one turning into your lane from the side when you enter the intersection. Especially not when the view is blocked. And that's dangerous, because somebody might actually be very close, and you don't expect them."*

In the Netherlands, you are to give way to the cyclist that is turning out into your lane, if they are coming from the right. This holds no matter if the view is blocked or not. MeBeSafe is determined to help the forward-going bikers when they are approaching seemingly free intersections, to make them aware that they may not in fact be alone. The prospect is to nudge them to get more aware and to have safer approach towards the intersection. This will give them the opportunity to see if anybody is

coming from the other direction, about to turn into their lane in front of them. If somebody does, they would already be running at a lower speed, which makes it easier to brake if that's necessary.

"We decided to nudge the biker going forward" Esra explains. *"They are the ones who should give way - but they might not see the cyclists coming from the right. Consequently, they may not reduce speed."*

This problem of bikes meeting bikes is actually rather similar to how intersections between cars and bikes work. In these intersections, there are also a lot of people, but not so many that there's a constant line of them that you can see all the time and become aware of the upcoming situation.

Both cars and bikes can approach the intersection without seeing the other in time. This issue has already been investigated in MeBeSafe, both from the car driver's and the cyclist's point of view.

"The Swedes looked at helping cyclists to slow down before crossing a car road, while we were investigating another problem on how to help cyclists merge together. So for this case, we could actually borrow the Swedish solution – and just move it to the Dutch context of bikes meeting bikes" Esra describes.

This cyclist nudge is based on flat transversal stripes across the road that are getting closer and closer together before an intersection, to provide a visual illusion of going faster than you actually are. It was shown to have a good effect in the Swedish pre-study, and is now evaluated even further by Chalmers University of Technology in the Swedish context. The Dutch context is about to get the same treatment.

"The nudge has been up on this really busy intersection, and we measured how people behaved before and after" Esra informs. *"But science being the way it is, we must wait for the results to be finished."*

But what is to be expected? Well nobody knows as of yet. Results are being analysed and are expected to be finished rather soon. There is a strong probability that the nudge will not always work on the masses of cyclists passing by, but this actually is to be expected. Esra is cautiously optimistic.

"The nudge may of course not work all the time. You might not even see the nudge when there's a lot of bikes going over it. But that's not the point. That's not when it needs to work or even when it should work." Esra proclaims. *"But when you're alone and approach an intersection where people might turn out in front of you from a blocked intersection, in that very moment, then we might have some effect. That's what we're all working for."*



The Cyclist nudge

is developed by Chalmers University of Technology and researched by Chalmers/ SAFER, TNO and SWOV.

The cyclist nudge aims to reduce cyclist speed when necessary. It is made by completely flat stripes running across a biking lane. The stripes are getting closer and closer together.

This will create an illusion that you are going faster than you actually are, which will make it more likely that you slow down. MeBeSafe found the nudge to work even when it was not noticed at all.



Nudging with privacy

How to measure, ask and coach someone without knowing who they are.

During this decade, the importance of one's right to privacy has taken the centre stage. Face-recognition and machine-learning continue to develop, social media and data leaks made headlines and the implementation of regulations such as GDPR initially made companies feel like they can run, but never hide. How is MeBeSafe faring?

Researchers are often trusted with sensitive personal data which is highly important to anonymize. MeBeSafe is no exception. The nudges and measures address the behaviour of individuals, so it is *no kidding, Sherlock* that data derived from individuals is needed for us to investigate further.

In Gothenburg, Sweden, the Cyclist nudge – aiming to slow cyclists down when approaching statistically dangerous bike-car intersections, which was developed by Chalmers University – is currently being analysed from a quantitative perspective in order to indicate the effectiveness over time.

This requires huge amounts of data which is collected from locations where the nudge is installed. In order to discern a change in the cyclist's speed, it is necessary to know the speed from several moments before the nudge until the time the cyclists interact with it.

This could be done by video analysis, which means that the cyclists would need to be recorded. From a privacy perspective, that would also mean that each and every one of the cyclists would want to be asked beforehand so they can give their consent or not. That is of course not possible, but MeBeSafe manages to solve this anyway for the benefit of everyone involved. Instead of using image processing technology that relies on human interaction, Chalmers is using a system that processes motion activity to datapoints immediately, and it does this offline and at-location. Consequently, the data collected and transferred to MeBeSafe is not images of people, but merely the datapoints of each moving object and the respective speed-trajectory.

"If we had collected video material, it would have required a lot of paperwork! But as data is anonymized directly, we can begin collecting data both very rapidly and without infringing on anyone's privacy." Pontus Wallgren, researcher at Chalmers University, states.

This way it's possible to collect large sets of data, which you can use to deduce or indicate whether or not something is working. However, to get a deeper understanding of the results and be able to change the desired outcome, you need to know why and how something works. Hence, you have to ask the individuals you've measured, but how do you contact them if you don't know who passed by the nudge?

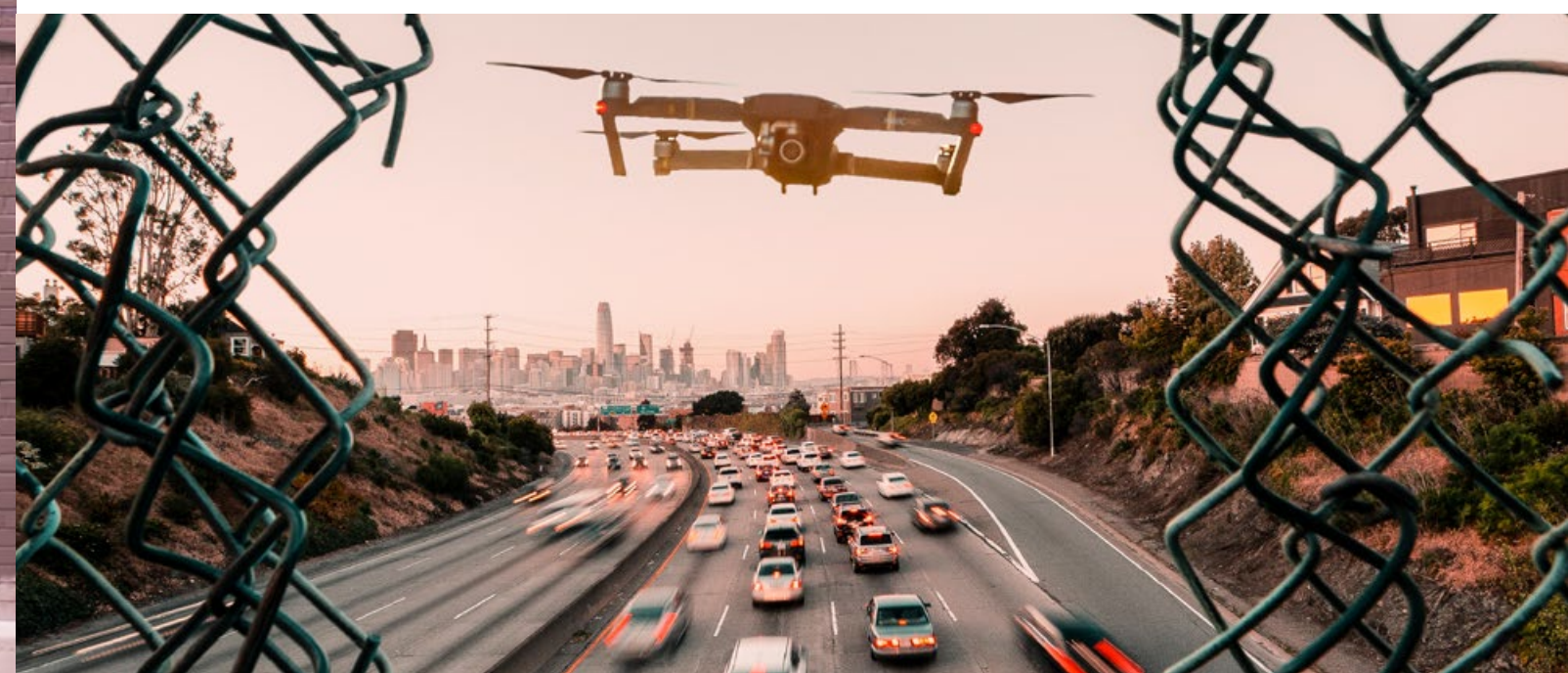
Since a nudge normally is designed to not require an active thinking process, you wouldn't want to attract their attention in proximity to the nudge. It could possibly skew their normal behaviour, and that would be counter-intuitive for the research! So how can they share their thoughts and reasoning?

In the city of Eindhoven, the Netherlands, this matter was solved for the InfraDriver Nudge, a measure led by ika of RWTH Aachen University – aiming to slow down individual car drivers where appropriate – by cleverly thinking several steps ahead. Milou van Mierlo from Heijmans explains:

"We conducted a resident survey with a good recruitment strategy I may say. When we selected a road exit to install our nudge, we considered who would actually take that specific exit. We selected an exit so that if you come from the north, the drivers would most likely be residents of three specific neighbourhoods. We're now quite certain that everyone who lives in these neighbourhoods and drive the car is likely to take that exit quite often."

This means that the choice of location for the nudge instalment, can facilitate how effectively you collect feedback from a specific group of people. Naturally, it was one of several factors in the selection process; the main factor being the road exit showed potentially dangerous traffic situations. For example, drivers being surprised by the narrow curvature of the exit. Then again, factoring in how to collect user feedback has made it easier to come in contact with people who have experienced the nudge.

"That's the benefit of the location we chose. Knowing this, we distributed a resident survey via Eindhoven citizen panels, with which the city can reach people based on the area they live. Additionally, we knew that neighbourhoods have a committee, so I visited one meeting of every committee and explained a little bit of the project and distributed the anonymous survey via them." Milou van Mierlo asserts.



It is obvious that privacy is important when assessing how a solution works, but can privacy on its own affect how well the solution works? The measure in MeBeSafe that puts privacy at its core is the coaching app Drive-

"Most driving apps focus heavily on somebody else monitoring you. But neither drivers or managers really like that"

– Saskia de Craen

know what they can improve. The researchers can't determine who is who on an individual basis. This is the case not only out of belief for someone's right to stay anonymous, but because the coaching app probably wouldn't work that well otherwise, as expressed by Saskia de Craen from Shell:

"There are countless apps for measuring driving behaviour. However, most of them focus

heavily on someone else monitoring you. Drivers don't like that, and even managers don't really like that, because they have to talk to a driver not performing so well then, and those are of course not the easiest conversations. Based on our scientific research, we have concluded that coaching might be more effective if it is up to the drivers themselves if they want to share their personal data with anyone else. We call this 'Empowering the driver'."

It is significant to know, in the context of privacy, that the coaching app is supported by so-called offline coaching; face-to-face between peers. Only if the driver chooses to take part, they will eventually share something with their peer, but it is still up to them to decide if they want to share and what they want to share.

It's all about creating a familiar and protected environment. To allow the drivers to decide whether they share their private data or not is very important in creating that environment, in much the same way that people during everyday conversations share what they are comfortable with based on who they are talking to during a specific circumstance.

You may however ponder if this anonymization in some way could be harming research if we as researchers can't tell who's doing what? The short answer is that it depends on the end goal. Knowing who is doing what is probably not the end goal. It is however a common means to get to some other end goal, such as better performance in one or several aspects.

The end goal for the coaching app is to have the truck drivers ride more safely. It is not important to know which individual is driving how. Instead it is important to ask the question what would empower all of these drivers and increase their likelihood to become even better drivers. Instead of manager monitoring, the app answers with self-reflection, peer-to-peer coaching and high user-privacy. This is the novel concept of the coaching app.

Amidst the rising concern for privacy-rights, is the coaching app re-introducing an essential idea of how people prefer to be treated? That is yet to be determined, but so far, the reactions from truck drivers are very positive and their commitment has exceeded MeBeSafe's expectations.

In the future decade, we can expect privacy to take on an even more central role. And with that we can expect the demand for personal privacy – or simply people wanting to be approached based on consent and fairness – to become an even higher priority. How will future services and products adapt? What kind of research needs to be done in the scientific world? How will it be conducted? Would it even be embraced in practice?

We don't know. What we do know however, is that whoever the research may involve, that it is possible to measure cyclists, ask car drivers and coach truck drivers without knowing who they are in person. We don't know, and in order to make traffic safer, we don't have to.



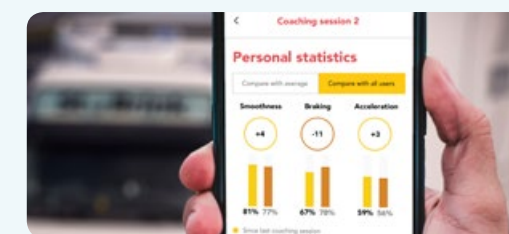
The Cyclist nudge

is developed by Chalmers University of Technology and researched by Chalmers/SAFER, TNO and SWOV.



The InfraDriver Nudge

is developed by ika at RWTH Aachen, ISAC at RWTH Aachen, Heijmans and the BMW Group



The Coaching App

is developed by Shell, Cranfield University, Cygnify, Virtual Vehicle, SWOV, the BMW Group and Volvo Cars.



Getting cyclists together with nudging

It is tricky to turn onto a road that's already full of people. Everyone just travels on, while you cannot find any space. On a Dutch biking lane, you would actually have priority over those going forward, but it does not always work as intended. Could nudging do the job?

You've likely experienced it more than once. Waiting in a long traffic line, simply because you need to turn into a road where there's a lot of traffic. This is usually a problem for cars, but in the Netherlands, the same thing happens for bikes as well, especially during rush hour. This has unfortunately led to a lot of cyclists crashing into each other in intersections. MeBeSafe wants to reduce this risk with the aid of some nudging.

"We wanted to do something to help turning cyclists merge together smooth and safe" Martin Nabavi Niaki from SWOV declares.

"More specifically, we wanted through-going cyclists to keep to the left so that turning cyclists could use the right side"

For this specific scenario, imagine a T-crossing where two one-directional biking lanes meet. This layout is actually very similar to the effect of a motorway-entrance, where traffic is going in one direction and cars are entering from one side. When a car is about to enter such a road, it is certainly good manners to help them join in. Talking about Dutch cyclists coming from the right, they actually have legal priority over those going forward. Unfortunately, it does not always work as intended. Martin explains what MeBeSafe decided to do.

"To solve this issue of unsafe merging, researchers from SWOV got together to brainstorm on how to solve the issue with nudging. The result was two different nudges that could be used".

One of these nudges consists of a slanted line from the right side of the road, coming in with an angle to create a new and less busy lane to the right. This new lane would be reserved for cyclists entering from the side. The other nudge is a dashed centre-line in the middle of the one-way cycle path – not entirely unlike a motorway with two lanes going in the same direction. Both nudges are designed to make through-going cyclists move to the left so that the right turning cyclists could merge more safely, and the effect was tested by a representative group of people.

"We had an indoor testing facility made by TU Delft for a cycling study, where cyclists could go around in a one-way oval lane, or take a shortcut through the loop" Martin describes, *"We observed the cyclists and measured their behaviour at the intersections with and without nudge"*

The nudges may seem very simple, but the results were positive. Cyclists were shown to change their behaviour because of the centre-line, which was manifested by a change in their trajectories, speeds and risk of collisions in the intersections.

The simple dashed line seemed to be interpreted as two forward-going lanes, where many cyclists switched over to the left-hand side, leaving space for those about to turn into the lane from the right side.

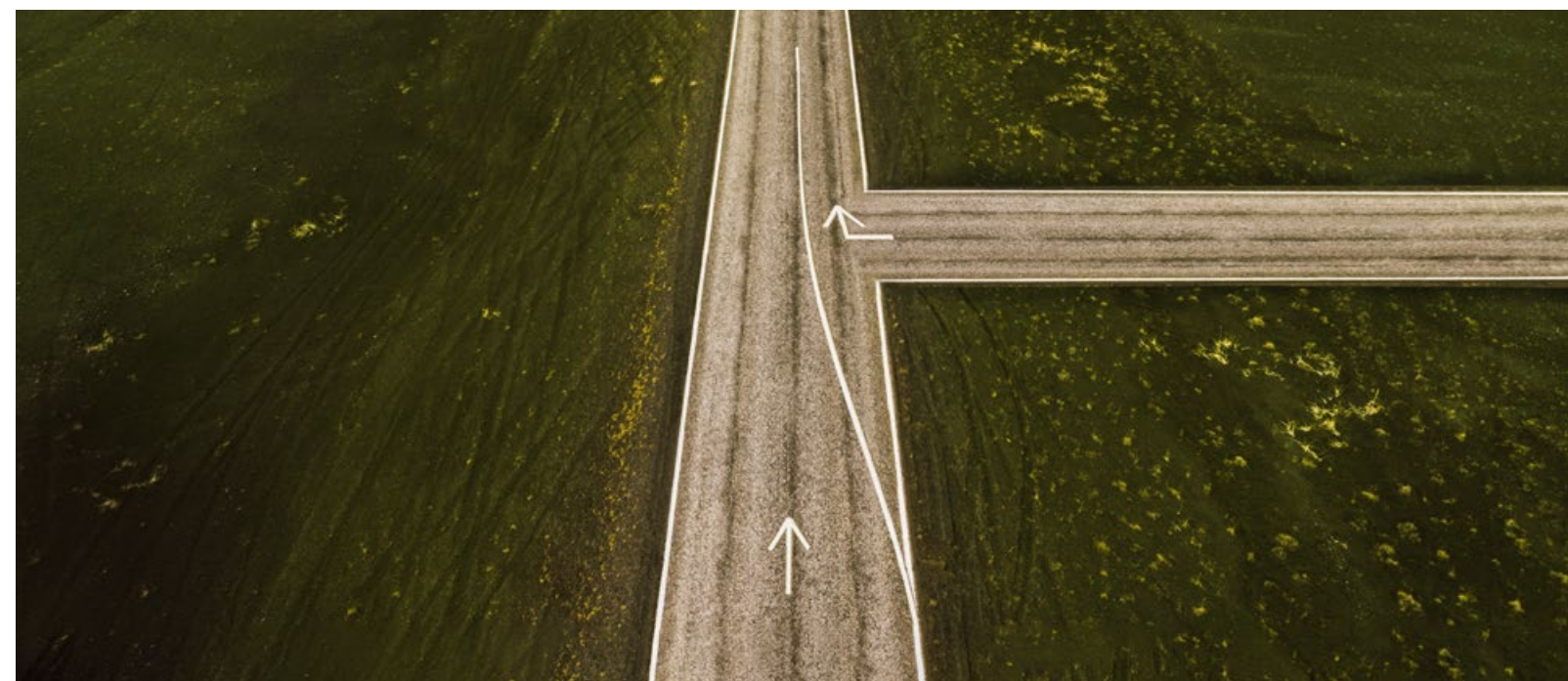
"We have a clear effect from the line" Martin explains, *"Many more trajectories are swaying to the left-hand side, and the risk of collisions between cyclists have decreased"*

It is worth noting that some cyclists still biked on the line or swayed over the line, even though many of them were directed to the left. A possible reason could be that cyclists generally experience a large degree of freedom in biking, and adjust to the traffic when it is necessary.

"If you would put up the lines for cars, they would be fully divided into two lanes. Cars normally don't drive on the centre of a line, but the cyclists did" Martin describes.

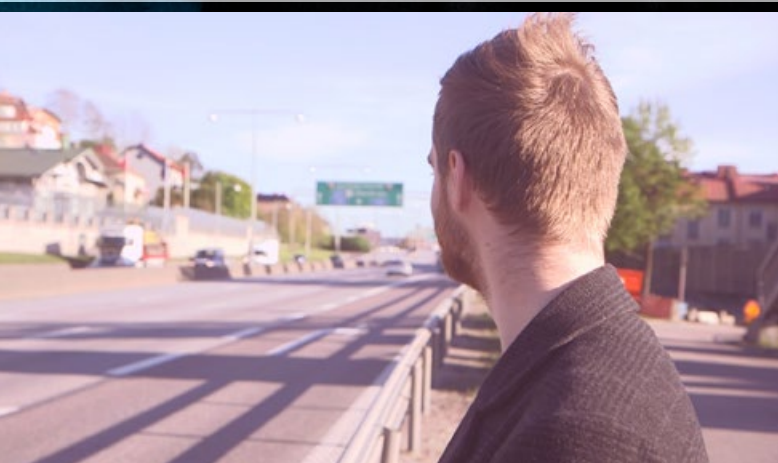
The nudge is different from using two lanes in the same direction, as the division occurs just before an intersection and ends a bit afterwards. It is only there to help people merge. But it is not only one-way roads that could be tackled, Martin expects it to work even for intersections of bikes going in both directions – as long as it is clear which direction is which.

The nudges are very subtle, and build upon the knowledge we already know and the symbols we already react to. It seems that very small measures could give a large effect. And that is a main goal of nudging.



MEBESAFE MOVIE IN THE MAKING

MeBeSafe is well on the way making an infotainment movie about the project and what nudging is in general. Get your first sneak peek of the contents here!



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THE PEOPLE OF MEBESAFE



MeBeSafe would be nothing without all the wonderful people behind it, devoting their work and soul to get the best possible results. Read what some of them have to say, and see the full interviews on our website or social media.

I love video analysis. Just having access to video data and seeing how nudges are actually affecting cyclist trajectories – it's really interesting! I'm analysing how cyclists are affected by implementing a centre line where two cycling facilities intersect.

Small changes matter. Just implementing a centre line into a cycling facility may not seem a lot, but it can actually really improve safety.



MARTIN NABAVI NIAKI
SWOV

There is one thing that really speaks out for me in the project. It's probably the researcher and the statistics person in me talking now... To some people it might seem very boring.

But if you're analysing your data, simulate the results and send out the questionnaires – everything that you have collected in a project... You're doing some really complicated statistics, and then... suddenly you see a significant effect!



ANNA-LENA KÖHLER
ika, RWTH Aachen

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