Say goodbye to speeding tickets

The importance of user experience for the acceptance of ISA systems

Part of the
'Automotive trends: Intelligent driving assistants'
white paper series

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Got a speeding ticket recently? It may have been your last one. Your next new vehicle will come with an intelligent speed assistant (ISA) built in as standard. It can prevent you from speeding based on the General Safety Regulation[1]. However, the user experience (UX) of ISAs is to some extent up to the manufacturer — this may lead to different experiences depending on the car brand. We'd like to avoid this variation and inconvenience. So, here's Luxoft's guide on what a friendly, easy-to-use and unobtrusive ISA that fulfills all regulations and norms could look like.

Luxoft's vision of a UX concept for ISA

Assistance systems in vehicles can be designed in many ways. A successful assistance system should fulfill its task in a user-friendly and unobtrusive manner, but it requires skill and practice to model such a system behavior. In this white paper, we present Luxoft's vision of a good UX for an ISA system.

Why an ISA is needed

Why do drivers need an assistant to help them adhere to speed limits? We already have the speedometer, right? Well, sometimes a speedometer just doesn't cut it. Let's look at why.

Vision Zero — for safer roads

The European Commission is at the forefront on the fight for safer roads with their "Strategic action plan on road safety" and "EU road safety policy framework 2021-2030". A noble goal laid out in those road safety plans is reaching zero road deaths by 2050 (Vision Zero).

Collisions caused by exceeding the speed limits are a major contributor to the total traffic casualty toll. This is why, in June 2021, the European Union announced its regulation (EU) 2021/1958, defining procedures and technical requirements specifically for intelligent speed assistance systems. With this ISA-specific regulation, the EU hopes to cut down the number of traffic deaths. A study of the European Transport Safety Council (ETSC) suggests that ISA systems could reduce speed-related collisions by 30% and associated fatalities by 20%.

Like in the old days — but more modern

We need to bring back the feeling of velocity in more than one way. The needle — or the digits — of the speedometer is not enough. Drivers have to 'sense' when they are driving too fast. Not by re-introducing the rattle and rumble of ancient times, but through innovation. This is the domain of user experience. Let us explain why it is crucial.

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[1] Specifically, the Commission Delegated Regulation (EU) 2021/1958 of 23 June 2021 (supplementing Regulation (EU) 2019/2144 of the European Parliament and of the Council)

No hard feelings

Modern cars are comfortable and luxurious. In fact, they create a driving experience that decouples drivers from the actual driving conditions. In earlier years, you could usually tell your speed by the sounds and rattling of the car ("When the rear-view mirror begins to vibrate, I'm too fast for the city center"). However, modern cars — especially electric vehicles, where the familiar acoustic feedback of a combustion engine is missing — provide a uniform driving feeling: No matter if you are snailing through a traffic-calmed city center or cannonballing on a highway or the German autobahn, you're just not able to feel how fast you are anymore. So, it's easy to exceed speed limits without intent.

Even cruise control and its younger sibling, adaptive cruise control (ACC), is not a solution: Drivers have to activate them deliberately, and they often just forget or simply don't bother.

The same is true for other feedback, like when an icon appears in the instrument cluster to signal a warning or malfunction. If users cannot interpret the icon's meaning immediately, they might just ignore it. Of course, people could and should simply check the manual, which by the way is often available in electronic form in the infotainment system of the car. But, let's be honest, no one does that. The first impulse that many drivers have is to call a friend who can tell them what to do and if all is fine.

Apps and other kinds of assistants on the market also try to provide help for that gap by making use of image recognition and artificial intelligence. For example, Apple's Visual Look Up can tell you the meaning and importance of a dashboard icon by simply analyzing a picture of it.

But the appearance of these helpers also points to a drawback of the systems: Users are pushed too hard; they feel out of their depth with modern user interfaces (UIs) and may feel distracted instead of supported. Their minds begin to wander: What does that strange feedback mean? What's going on now? What does this icon tell me? — instead of concentrating on the traffic.

If users do not understand a feature and how it works, they will deactivate it, thus increasing their risk of getting involved in an accident. An intelligent always-on system, like an ISA, can circumvent this.

Helpful systems

At Luxoft, we create and design systems in a way that they become trustworthy assistants people like to use.

With a trustworthy assistant by their side, users feel more self-confident. Using the systems to increase safety just feels good.

So, what's the secret sauce of a good system, one that will be accepted by users? The answer is: Trust. Users must trust the system. To gain that trust, it's important that the system and its functionality is transparent and understandable right from the very first use.

How to create a trustworthy assistant

To create a trustworthy assistant — one that the driver will rely on — a lot of collaboration between multiple disciplines is needed. Why? Let's have a quick look at Aarron Walter's hierarchy of user needs:
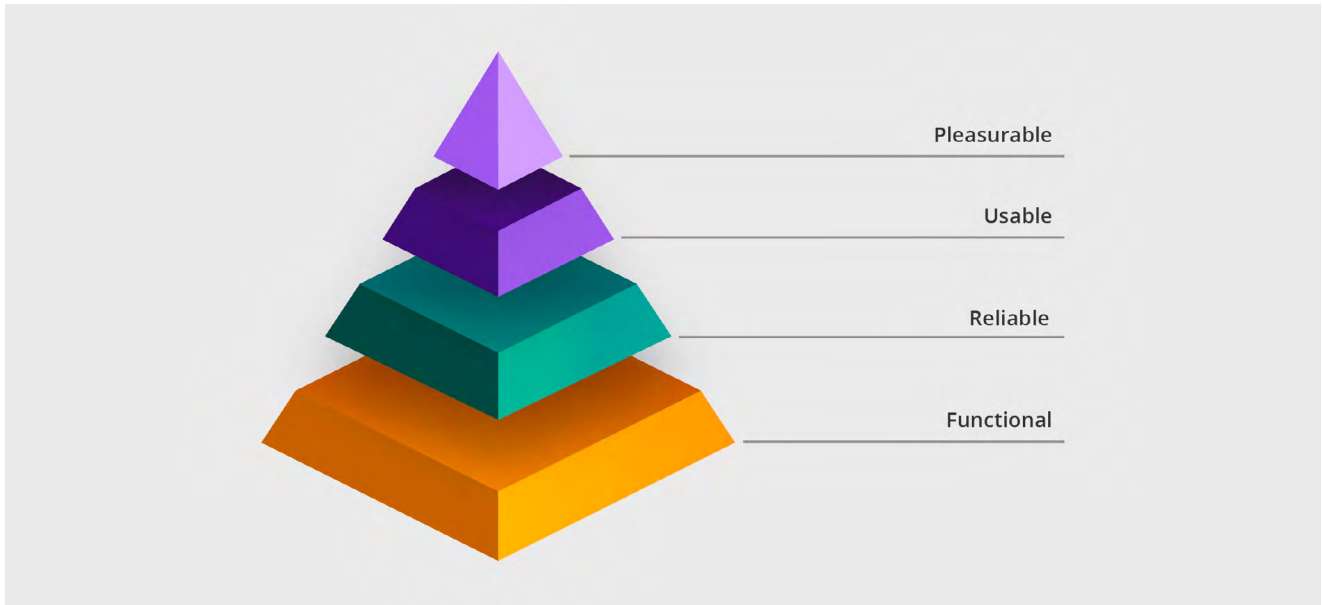

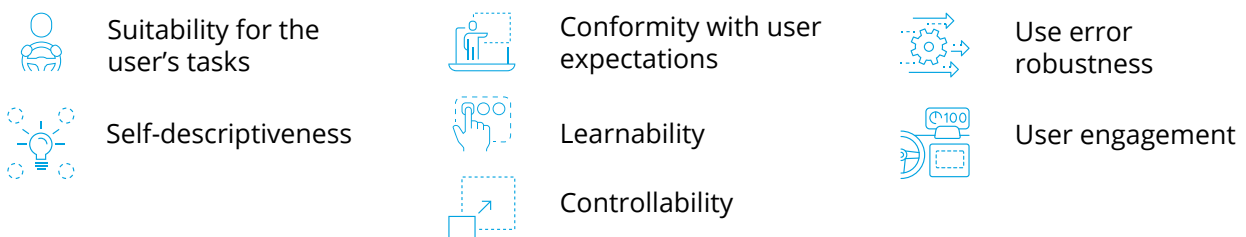*Figure 1: Aarron Walter's hierarchy of user needs*

Walter's theory is based on the idea that a product needs to be functional, reliable and usable first, before it can become pleasurable, due to the hierarchical, bottom-up structure. Based on the complexity of the assistants we are designing, several disciplines need to work hand in hand. Within Luxoft, we are capable of supporting with all of these aspects from the bottom to the top.

Here are some examples of what our experts can support you with: The **autonomous domain** is able to support with expertise when it comes to algorithms, sensors and cameras. **Automotive Advisory** checks regulations and liability issues. **System Test and Validation** ensures reliability and compliance with norms. **User Experience Design** ensures simplicity and ease of use.

The common goal is to design systems that feel so simple and familiar that users just love to use them and never think of turning them off.

UXD in particular deals with the interface toward the driver and — with all that new technology and assistance — can act as a differentiator for people who like to use such assistants.

An intelligent interface that supports the driver has to tick some boxes when it comes to interaction principles according to the ISO 9241-110:2020:

Suitability for the user's tasks

Self-descriptiveness

Controllability

Conformity with user expectations

Learnability

Use error robustness

User engagement

To fulfill these principles during the product life cycle, the system may need to get adapted from time to time, based on the experiences drivers have with such systems in general and dedicated brands in particular. This is because typical private users treat themselves to a new car only every couple of years. When entering their new car for the first time, these users might feel like getting catapulted into the future and need much more information about the multitude of new gadgets and assistants than drivers already used to a similar system.

Experienced loyal drivers on the other hand — sticking to their beloved brand for decades — may quickly become familiar with their new car. As a result, some of the info provided to them may not be needed anymore after the first couple of days — this information could even become annoying if it continues to pop up.

Different expectations, different system behavior

Not everything technology can do is intuitive to use. In some cases, users may have an incomplete mental model about a dedicated feature. Therefore, we need to support users — especially when it comes to the very first interactions with new technology. Luckily, a well-designed system can be learned easily.

We need to provide information and explanations to users according to their current needs. These needs may differ from user to user (e.g., it makes a difference if you are a truck driver and change your truck every day or if you are a private user driving the same car each and every day for a couple of years). What supports the user in one case may be too much, or even annoying, in the other.
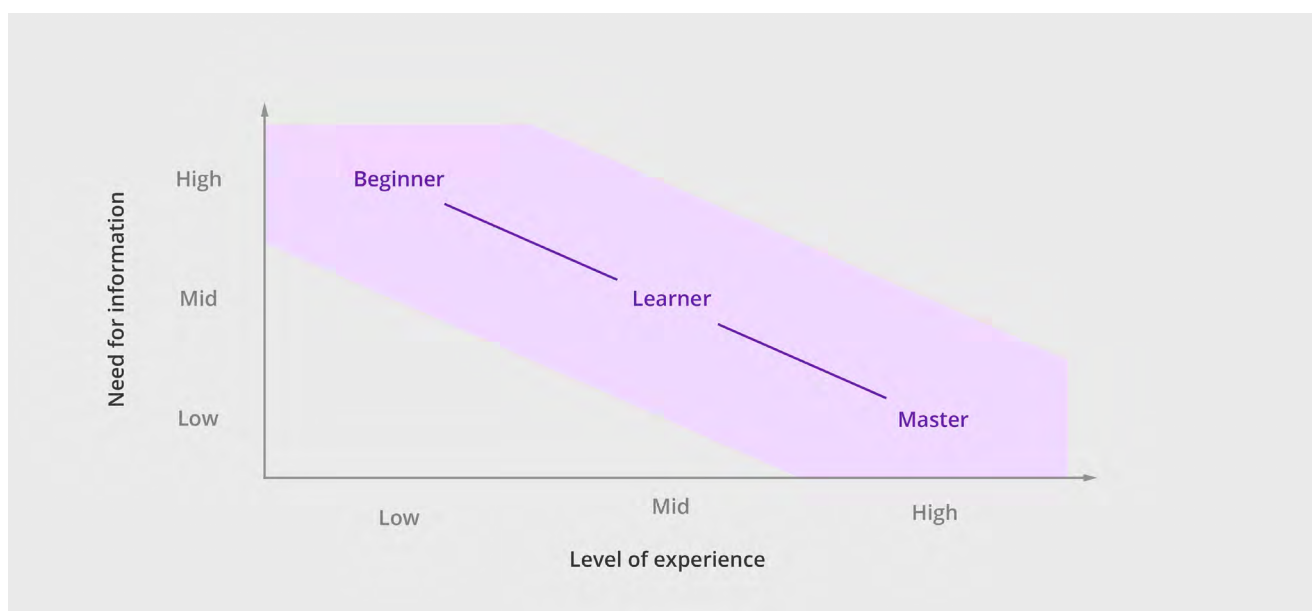

Figure 2: Relation between experience and need for information

As Figure 2 shows, experience and needed support are reciprocal: The less experience you have, the more information you need, and vice versa.

Good systems can be personalized according to the drivers' needs over time. Nowadays, technologies like artificial intelligence and over-the-air updates even allow the customization of the driver interface based on the foundations of the norms and standards.

A closer look

Let's look at a more concrete example and the process steps of creating a concept.

Step 1: Analysis and preparation

Before actually designing the interface for the scenario of an ISA, it is important to understand the requirements laid out in the relevant regulations. What is mandatory? What is not allowed? Where are the degrees of freedom to improve the user experience?

In the case of ISAs, three types of warnings are defined:

a) Visual and cascading acoustic warning

b) Visual and cascading haptic warning

c) Haptic warning only

In particular, the haptic warning and how to consider it properly needs attention. According to the standard, the haptic warning shall be noticeable by the driver and provided directly or indirectly through the accelerator control if several conditions apply. This shall be achieved by increasing the restoring force of the accelerator control.

Step 2: User flows

Next, these complex requirements are translated into a user flow to get an understanding about the relevant inputs and outputs for the user.

Step 3: Wireframing

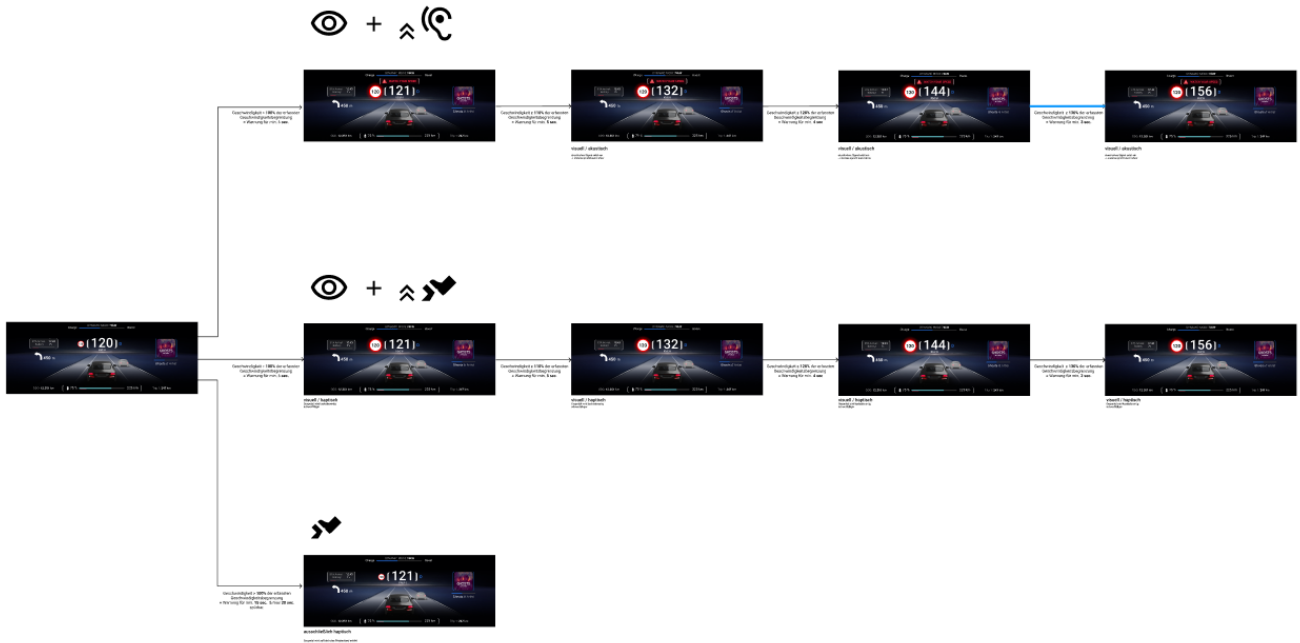### ISA system based on EU regulation R1958

Figure 3: ISA – First wireframing

While creating such an initial user flow, our UX designer already starts thinking about how to design a solution to represent all of the cases and information toward the driver in a way that is intuitive, easy to learn, non-distracting and not annoying. While doing that, considering the proper information architecture and adequate representation is a must.

Functional details — when to present which UI element, for how long, and in which size, color and position — are sketched out and specified, creating an easy handover to the implementation team already in mind.

Step 4: User feedback

Let's elaborate on the new possibility of providing only haptic feedback to the user.

Checking with some experienced drivers in internal interviews, it turned out that haptic-only feedback is a smart way to provide the feedback, as it is nonobtrusive. But there were also concerns raised that the increased resistance of the accelerator pedal may be perceived as a malfunction, especially considering that the vehicle is new to the drivers. They might start to feel insecure about their new car or truck due to this "unknown" behavior.

Step 5: Final concept

Getting back to our preliminary considerations about the users' needs for information along the level of experience, we enrich our concept to support the first-time user experience with haptic feedback of the ISA. How do we do that? Based on available data — like the connected user profile, driver ID card, driver monitoring or other data — we know exactly who is currently steering the car and we know if that person is new to the car or has already driven it for several hundred kilometers. Based on this data, we can decide if the pure haptic feedback is already enough, or if some explanatory information could be supportive.

If a new driver is behind the wheel, we can support the haptic feedback with a simple message in the instrument cluster to let the driver know that everything is working properly.

Figure 4: Visual user support for haptic feedback (beginner mode)

Such an additional message will only be shown during the first couple of weeks and kilometers to support the learnability of the interface.

This approach can help drivers with getting onboarded and gaining trust in the system. When more experienced, drivers will not need this additional information anymore — they will have learned the meaning of the rigidity in the acceleration pedal (a proper mental model is in place and as a result the overall UX has improved).

To sum up, norms and standards may define a reliable basis of how to implement assistant systems like ISAs or automated driving assistant systems (ADAS), but for a compelling and satisfying UX, more expertise is needed. Our UXD team can provide additional value by tailoring the solution according to users' needs with the support of our comprehensive automotive domain experts — we provide holistic solutions considering the hierarchy of user needs.

Together for better UX concepts — and safer driving

UX designers need to consider the regulations, find the degrees of freedom and use them to maximize the user experience so that users feel safe and well taken care of.

Is your UX design ready for fastidious users?

Does it meet all regulations?

Let's find out: Meet with our UX design experts for an in-depth analysis of your product or concept. Just **contact us** for a first evaluation.

There's more to explore

To learn more about ISAs and the ISA-related regulations, read the first part of this white paper series: "**What you should know about intelligent speed assistance**". Modern UX concepts make use of AI and therefore are subject to an upcoming European regulation, commonly known as the 'AI act'. Read all about the proposed regulation and its stipulations in the second part "**The new AI Act and its repercussions for automakers**". To get familiar with the various kinds of feedback of digital assistants in cars, we highly recommend reading the third white paper "**See it, hear it, feel it: How driving assistants grab your attention**", which is a good basis for understanding the concept presented here.
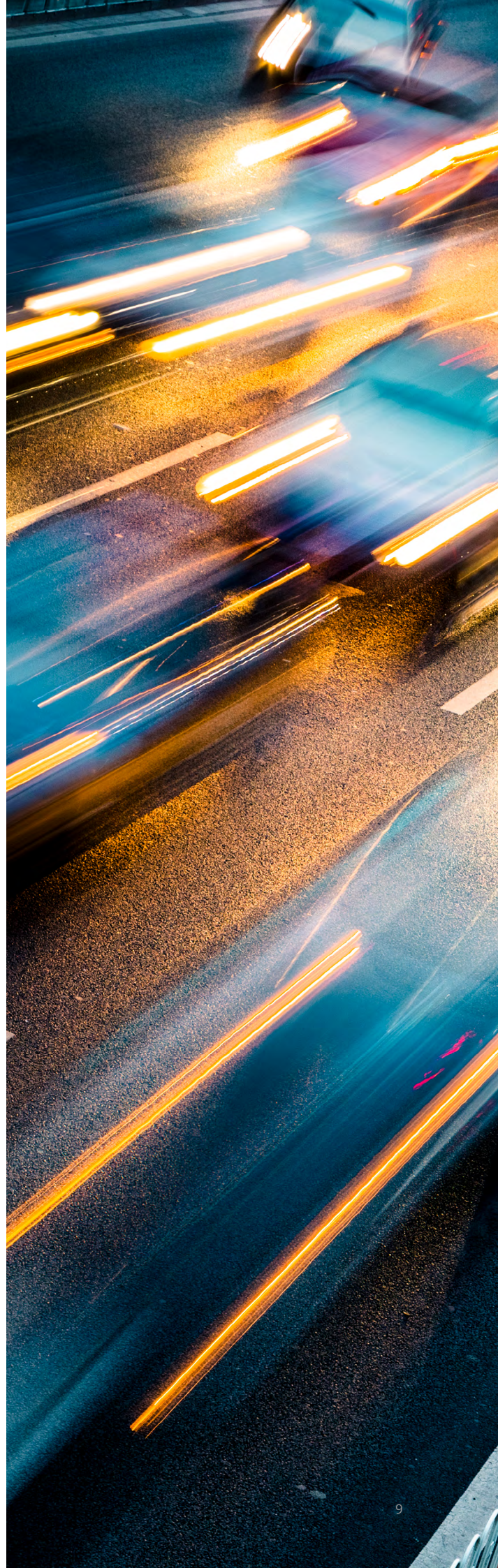
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About Luxoft

Luxoft, a DXC Technology Company, is a trusted partner in global digital transformation and a leader in delivering competitive advantage in the software-defined world. We engineer and deliver innovative services and products that shape the future of industries by leveraging our extensive partnership network and deep industry-specific expertise.

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