Design for Calibrated Trust

A step towards increasing acceptance of autonomous vehicles

In the past decade nearly $1.5 Billion has been spent on the research and development of autonomous vehicles. The promise of autonomous vehicles is not only an upgrade on our current vehicles but a new meaning to mobility. However, there exist certain barriers in realizing this future. Arguably, the most prominent barrier to autonomous vehicles is building trust between the users and the autonomous vehicle. The current project uses calibrated trust as a lense to develop a toolkit for Autonomous Technology Development Teams for building appropriate trust.

What is Calibrated Trust?

Assumptions   **Capabilities**   **Expectations**

Maintaining the active balance between a designers assumptions, vehicles capabilities and user expectations

Understanding the Challenge

"Driving is not just a dynamic control task but also a social phenomena and requires interaction between all round users involved to ensure the flow of traffic and to guarantee the safety of others....The challenge is to treat the problem not as a rigid dynamics problem but that of a social being"

-Rasuli & Tsotsos (2019)

The statement by Rasuli and Tsotsos accurately capture the challenge of designing an autonomous vehicle. We are not designing a vehicle but an actor in a social setting. To explore the meaning of this statement, interviews were conducted with experts in the field of *trust in automation, vulnerable road users, responsible technology and autonomous vehicles*. The key conclusions that were gathered, form the basis of the calibrated trust toolkit:

Socio-technical approach to design: Designing for a social setting cannot be achieved by a solutionism approach (The ideology that technology can solve all challenges/problems). A more realistic and meaningful approach is a socio-technical approach to design. The difference between both these methods of designing lies in the acceptance that the user and the autonomous vehicle need to work together. Failure by either of them will lead to unwanted consequences.

Communication: Trust is built on information and experiences. In this regard communication plays an important role. Within the scope of the project communication can be seen as three channels: *Communication within the internal stakeholders of the company, communication between the company and the end user, communication between the autonomous vehicle and the end user*. All three communication channels must align in creating a proper understanding of the autonomous vehicle for the end user.
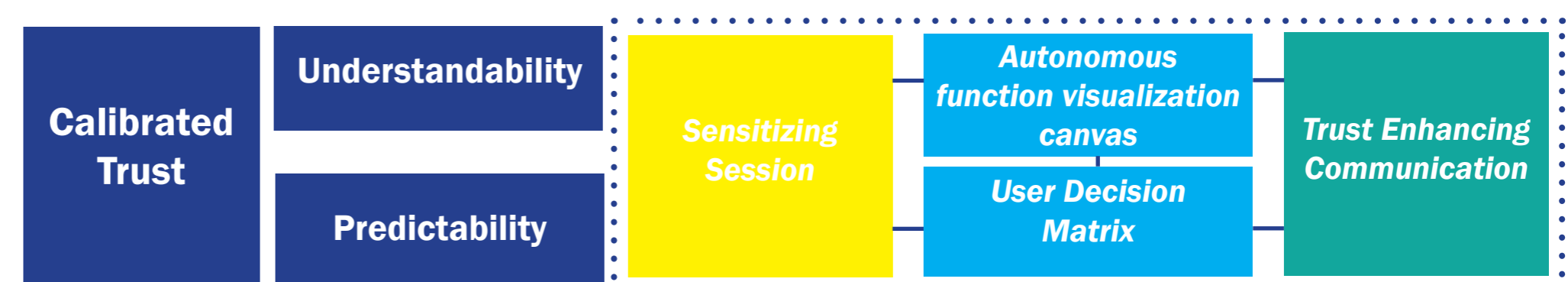
Calibrated Trust Toolkit

The calibrated trust toolkit consists of four parts that combined together, to facilitate designing for calibration of trust. The four parts are:

Sensitizing session: A session during the planning phase that allows for the design and development team to create a common understanding of trust and the factors influencing them. This is followed by creating a trust goal that is in line with the design direction.

Autonomous Function Visualizer: A human centered visualization canvas that allows developers to break down individual autonomous functions into technology, context of use and user behavior. This creates a more holistic understanding of the autonomous, easy communication across various functions and the ability to capture iterations performed on the autonomous function throughout the development process.

User Decision Matrix: The user decision matrix is used in the detail design process to design HMI and eHMI systems. The basis of the matrix is based on how we make decisions, and what role the context of use plays in the making decisions. The user decision matrix allows for exploring the role of context when using an autonomous function.

Trust Enhancing Communication (TEC): TEC is a set of principles and requirements that are created for communicating with stakeholders within the product development process

The relationship between components of calibrated trust (understandability & Predictability) and the various parts of the toolkit

Sensitizing Session   **Autonomous Function Visualization Canvas**   **User Decision Matrix**   **Trust Enhancing Communication**

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