# The relevant human factors challenges for interaction with drivers and users

Technology, Cars

**The relevant human factors challenges for interaction with drivers/users would be following**

- One of the main challenges would be rapid onboarding which refers to people experiencing great difficulty reestablishing the driving context. Automation often fails on encountering unexpected situations which leaves the driver with a really short amount of time to respond. Research has shown that driving onboarding times grow quickly with the increased level of automation combined with complex situations.

- Prolonged use of automation while in platooning mode might lead to deterioration of skills. Casner found that cognitive skills deteriorate quite quickly in the absence of practice. Fortunately, it was also found that 'hands on' skills are remarkably resistant to forgetting but since cognitive skills are first required to decide what manual operations are needed, it is imperative for the driver to be in sync with his/her cognitive skills.

- In some situations, the driver does not counter check the automation system status and blindly trusts the decisions taken by the automation system. This is termed as overreliance. Poor judgment and distraction are the two main causes of accidents. Overreliance can exacerbate these problems.

- The way an automation system controls a vehicle is different from a human. Automation systems have a limited working range due to sensor limitations and regulations. For instance, the lead driver in the platoon when asked to take control might not reclaim control due to

not fully understanding the functional capabilities of the ACC (as radars in ACC have a limited range).

- Behavioral Adaptation – In one of his researches, Rajaonah asserted that a lower perceived risk and lower workload is manifested by drivers (who often use ACC) than those who don't use this automation system quite often. In another research by Hoedemaeker, it was shown that higher speeds are adopted by those drivers who use ACC. This phenomenon can be explained with the Risk Homeostasis Theory which states that people at any moment of time compare the amount of risk they perceive with their target level of risk and will adjust their behaviour in an attempt to eliminate any discrepancies between the two.

- The purpose of the automation systems is to help drivers with tasks that are dangerous, complex or time consuming. In mundane driving situations, automation aids in mitigating mental workload but in emergency cases when unexpected situation arises, the mental workload can shoot up rapidly.

**Design guidelines to address the relevant human factors challenges for interaction with drivers/users would be following**

- Due to the diversity of activities a driver could find himself in, different ambient conditions, and possible driver states, the vehicle can monitor the driver, assess her or his readiness and ability to control the vehicle safely, and adjust the behavior of the ADAS accordingly. Sensing systems can be used that can already detect driver focus, are already in use and are available in current vehicles.

- To address the issue of Behavioural Adaptation, new training methods can be adopted by authorities. Drivers should be taught about the functional limitations of the automation systems. They should be trained to make them comfortable with the technology. This would also help them to put trust in the technology and would also aid in cases of emergency when they would need to take the control back from the automation system. The training process can also be modified in order for drivers to become more competent in mode conflict resolution and computer skills. The problem of overreliance can also be mitigated by extensive training as once the driver knows the limits of the automation system, he/she can know how much trust to place in the automation system and thus when the warning sign is displayed, the driver can act accordingly.

- To make sure that the driver does not feel out of the loop and to minimize mode errors, the synergy between the automation system and the human should not just be deactivations and activations. Driver should be kept in the loop at all times which would also help them understand the system better. This would in turn help the driver to react to any emergency scenario swiftly and rapidly. Thus, this can also aid in addressing the issue of rapid onboarding.

- To reduce driver's mental workload, an adaptive automation system can be used which would be able to filter the information as the per the situation requirements. Different situations can be variations in driving conditions such as traffic density and drivers population which includes age, experience and gender.