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Does projection into use improve trust and exploration? An example with a cruise control system

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ABSTRACT

We know that the systems which are trusted by the users are more often used, especially in a risky situation where they need to delegate control, but we still ignore largely the factors which improve trust in the systems. Our issue here was to explore whether the way we present the system to the users will have an effect on their confidence in it.

In this study, we had nine subjects using for the first time a cruise control system on open road; before, we present the system to them in three different ways: (i) a function-oriented written presentation (G1), (ii) a use-oriented written presentation, "augmented" with difficult situations (G2) and (iii) a use-oriented film presentation (3). They evaluate their trust in the system on scales before the whole experiment, after the presentation and after the real use. At the end, they also have self-confrontation interviews, where they see the video of their driving and describe their activity, strategies and feelings. We then develop quantitative and qualitative analysis of trust, linked with specific situations of action.

Our results indicate that the presentation of instructions lowers the evaluation of trust (and of efficiency) that conductors have a priori; they had constructed an a priori representation of a CCS that is rather idealistic, and realised, after reading the instructions, and above all after having watched a film, that its use is not so obvious as they had previously thought There is thenceforth a drop in trust that nevertheless goes up again after use of the system during driving We remark, from qualitative analyses of use experience of the regulator in real driving conditions, that this drop in trust in the system does not inhibit subjects in their use, and in particular, for subjects who have watched a film of projection into use They know more of the functions of the system in driving conditions, they produce less distorted reconstruction of the functioning, and they have a deeper level of understanding of the system.

1. Introduction

1.1. Delegation of control and trust need

The use of a new technological tool, whether it is a question of human–machine- or human–human-mediated cooperation, leads to transformation of human activity, often in the direction of a modification of the control and the initiative of the activity by the user. Mastery of the situation and of the power to act can thus diminish; and this loss of control, i.e. delegated to another human or machine, may be compensated for by the trust that it is acceptable. It may be very uncomfortable to delegate the control of an activity to a tool or to a person that one does not trust. People tend to seek emotional comfort and well-being, and in a risky situation which can generate fear for instance, they will need to interact with an object or a person that they trust, to reduce this feeling of fear and to reinstall emotional comfort. We define this notion of emotional comfort and discomfort (Cahour, 2008) as a global feeling, which is dynamically constructed through the affective states (trust, fear, surprise, etc.) lived by a user during a specific activity, and which involves the body and the mind. It is important to consider the comfort/discomfort of the users, besides their efficiency and performance, for the ergonomic evaluation and design, since the effective use of new tools depends on both (El Jaafari et al., 2008). Lheureux et al. (2004) find that, among users of the cruise control systems, the two most frequently cited motives, for owning such a system are "comfort" (around 40%) and "not having to worry about police checks" (around 35%), which is, according to us, a typical issue of emotional comfort too.

In a risk situation (such as that of driving a car) and in environments whose evolution is uncertain, human beings are potentially

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threatened and rendered fragile; they thus need to consider that the tools that they use are reliable and efficient, and that they can predict their behaviour, otherwise they could involve taking personal risks, of accident for instance.

Trust (and distrust, which is its inseparable opposite) has been studied in relation to control of dynamic systems (Amalberti, 1996; Muir, 1994; Rajaonah et al., 2003), often within interpersonal frameworks (Rempel et al., 1985; Josang et al., 2005). Muir and Morais (1996) have shown that the use of an automatic system increases as a function of the trust that is accorded to it and a new system for assisting driving, which modifies the control of the activity of changing gear, seems to be particularly susceptible to depending on this sentiment of trust. Rajaonah et al. (2003) have in any case shown that the less drivers have trust in a regulator, the more they prefer to deactivate it.

One of the functions of trust is to reduce complexity and uncertainty (Muir, 1994). since one of the characteristics of a complex system is that the interactions between components are unpredictable, when one reduces complexity by making one element in the environment reliable and predictable (trustable), it allows the subject to limit the perceived risk.

1.2. Trust as an affective feeling

(Dis)trust is defined here as a sentiment[1] resulting from knowledge, beliefs, emotions and other elements derived from lived or transmitted experience, which generates positive or negative expectations concerning the reactions of a system and the interaction with it (whether it is a question of another human being, an organisation or a technology). Assumed predictability and reliability are at the heart of this sentiment, which implies that the other will not put one in a risky or threatening situation. The subject can thus delegate control to such a system because he knows how it functions and can anticipate its reactions that he knows will not present risk to himself. We emphasise here the fact that (dis)trust is a sentiment and not a simple intellectual representation, constructed upon rational bases. According to us, it is an affective state, since one gives one's trust a little like one gives one's friendship, that is to say, not only on the basis of diverse indications and prior beliefs, but also on the basis of personal dispositions (which can, besides, vary according to context and mood) and shared relational experience, without always having a clear and exhaustive representation of the reasons that make one attribute or not a feeling of trust (this being just as valid for a system as for a human being). Also trust/distrust has a bodily component and is often associated with release and tension, and with a level of personal control and vigilance; people who trust the system (or person) they interact with, relax their attention and vigilance, whereas they are tense and much more in a controlling position when feeling distrust. Certain authors maintain that trust results from efforts that human beings make to overcome their fears, that it is not a rational reaction faced with uncertainty, but rather a reaction faced with the fear generated by such uncertainty (Gléonnec, 2004). Uncertainty and absence of control over a situation would thus be unbearable, and trust would be a need to limit frightening uncertainty. As defined by influent authors in psychology of emotion (Scherer et al., 2005; Lazarus, 1991; Frijda, 1986), affective feelings are generated by an "appraisal" by the subject of the situation/object relatively to his psychological comfort (or well-being). The subject in a situation that he evaluates as risky and uncertain feels emotionally uncomfortable and needs to feel trust for the object he wants to delegate control to.

[1] It is rarely the case in the studies about trust and use of automatic systems cited before, where trust is considered, in a more traditional cognitive view, as a set of beliefs.

We can summarise our representation of trust by saying that, in an actual relation of risk and control delegation with an object, the emotional comfort of the subjects (which is the central motivation for using an assistance system) depends on their level of trust or distrust in the object. When they feel it as reliable (no risky for themselves) and predictable, it then reduces complexity and uncertainty and increases the emotional comfort.

1.3. Trust and presentation of a cruise control system

The device studied here concerns the initial taking into use of a cruise control system within real driving. Driving is a risky activity that takes place within a complex and an evolving situation, and what is at stake for drivers is to delegate part of their activities (Malaterre and Saad, 1986), i.e. the management of speed, to a new system that they discover. Through his actions and perceptions, the driver tries to understand the system, its reactions and limits, and what he can expect from it. With the cruise control system, the role of the driver changes with respect to control. Instead of acting directly, the driver therefore becomes a supervisor (Scardigli, 1996), notably in ensuring transitions when the system arrives at the limits of its domain of action (for instance when the traffic is heavy, the system is often disconnected with short and non-conscious brakes). The way in which the conductor is informed in advance about these modifications (see the list of scenarios in Section 2.1) then becomes the main aspect at stake. Such understanding and anticipation is initially constructed through the presentation of the system made to the driver. It is thus important to detail how the means of presenting the system, to try to make it understandable and predictable, will influence trust and use.

It has become classical to distinguish the logic of functioning from the logic of use (Richard, 1983). In the function-oriented logic, one begins from the system and actions on it, towards their consequences, what its manipulation leads to as a modification of the environment and for the subject ("if one does this, one gets that"). In the use-oriented logic, one begins from the intentions of the user, his needs in terms of actions on the environment ("if one wants this, one does that"). This second logic appears to be more appropriate for presenting information to the automobile driver, who is above all guided by intentions of actions and looking for means to carry them out. Sarter et al. (1997) also stress that a training based on experience is preferable to a learning focused on the knowledge of the model of system functioning. The remaining question concerns the modes of communication by which this information should be presented: either the classical mode of written instructions or else the audiovisual mode that reproduces the driving environment and the visual context in which actions are performed.

1.4. Hypothesis

We begin from the observation that current written instruction booklets are most often insufficient as accompanying measures for taking charge of cruise control systems. We thus seek to determine what could be the impact of a new integrated approach, called 'projection into use', involving the use of a film to immerge the user into the principal evolutions of the driving situations with which he will be confronted.

The objective of this experimentation is thus to test a new means of accompanying the taking control of an assistance for driving, within the general hypothesis that, prior to an initial trying out of the system, the projection into use using a film will allow:

- Improvement of the degree of the subjective feeling of trust in the system (identified from evaluation scales and