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Not fearless, but self-enhanced: The effects of anxiety on the willingness to use autonomous cars depend on individual levels of self-enhancement

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ABSTRACT

The aim of our study is to examine how positive cognitive evaluations, anxiety-related affects, and the interplay between these two factors influence the willingness to use autonomous cars. We argue that the negative effect of anxiety as well as the interplay of positive evaluations and anxiety within the technology adoption process are contingent on a so far neglected facet of individual motivations, which plays a major role when dealing with anxiety towards unknown, yet status-laden, objects: self-enhancement. By employing a vignette-based online survey, we examined how people assess different levels of autonomous cars. Our results show that positive evaluations of benefits increase, whereas anxiety-related feelings decrease individual willingness to use autonomous cars; moreover, the positive effect of benefit evaluations diminished with increasing levels of anxiety. More importantly, self-enhancement emerged as a pivotal variable in this context: First, the negative effect of anxiety decreased with increasing levels of self-enhancement. Second, the attenuating effect of anxiety on the effects of positive evaluations was less pronounced with increasing levels of self-enhancement. Especially for people with low levels of self-enhancement motivation anxiety-related feelings (e.g., via strengthening self-efficacy beliefs) should be reduced. Moreover, self-enhancement values should be triggered when promoting autonomous cars.

1. Introduction

Autonomous cars is an eminent convergence between two technological fields (i.e., informatics and engineering), which is able to transform individual mobility. However, so far, psychological determinants, which might explain the intention to adopt (e.g., use) this technological innovation, are rare. Research on the adoption of new technologies suggests that the perceived characteristics of the technology itself (e.g., benefits) predict adoption intentions (e.g., use) (Arts et al., 2011; Currall et al., 2006; Junquera et al., 2016). For example, research on electric vehicles has shown that higher levels of financial benefit perceptions lead to higher adoption intentions (Egbue and Long, 2012). Interestingly, characteristics of a technology do not only refer to cognitive evaluations like benefit perceptions but also to affective reactions (e.g., anxiety) (Venkatesh, 2000; Venkatesh and Bala, 2008). For instance, research on computer-based technology has shown that higher levels of anxiety reduce the intention to use the technology (Meuter et al., 2003). Thus, cognitive as well as affective phenomena shape an individual's proneness towards new technologies. More precisely, current evidence suggests that cognitive evaluations of a technology in terms of benefits are positively, and anxiety-related phenomena are negatively related to the intention to adopt autonomous cars.

These cognitive and affective phenomena do not operate independently from each other. Affective responses influence cognitive processes and hence the evaluation of an object (e.g., benefits) (Edwards, 1990). For example, research on nanotechnology has shown that the relationship between the knowledge about the technology and the support for it is stronger when negative emotions towards the technology were low (vs. high) (Lee et al., 2005). Within this cognition affect relationship, "the Affect Processing Principle suggests that positive affect provides a 'go' sign and negative affect a 'stop' sign" as behavioral feedback towards the evaluated object (Clore and Huntsinger, 2009, p. 40). Hence, anxiety as avoidance-oriented negative affect might inherently (cf. Carver, 2004) hamper the relationship between positive cognitive evaluations of an object (e.g., perceived benefits) and the tendency to approach it (e.g., use). Therefore, we assume that the relationship between positive cognitive evaluations towards autonomous cars in terms of benefits on the willingness to use them might be hampered (i.e., moderated) due to a "stop" sign based on the behavioral affect system (i.e., anxiety).

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Taking the current state of research one step further we argue that within this interplay of object-specific cognitive and affective responses another variable should be considered which is not directly related to the specific evaluated object but has been shown to determine coping strategies regarding negative affect (e.g., anxiety): self-enhancement (Tsai et al., 2015). This person-related variable can represent an individual's desire to demonstrate normative competence in a social context and to dominate other people (Schwartz et al., 2012). Especially individuals with high levels (vs. low levels) of self-enhancement do seek tasks which (a) offer the possibility to demonstrate one's ability in a social context and or (b) are related to status (Schwartz, 2010; Schwartz et al., 2012) in order to pursue their goal of self-enhancement. Because using an autonomous car is a public act (i.e., social context) and because autonomous cars in the proximal future have higher purchase costs than conventional cars, which in turn are related to increased status perceptions (Griskevicius et al., 2010), we argue that the effect of anxiety on the willingness to use an autonomous car will be less pronounced for individuals with high (vs. low) levels of self-enhancement. Thus, high levels of self-enhancement might result in reduced influence of anxiety regarding autonomous cars because an individual's desire to show his abilities to impress others and maintain prestige let them to overcome the effects of anxiety.

Moreover, we argue that this mitigation of the effect of anxiety by means of self-enhancement generalizes to the interaction effects of anxiety, too. We argue that the mitigating effect of anxiety on the effects of positive cognitive evaluations is also reduced by increased levels of individual self-enhancement.

To sum up, previous research has indicated that positive evaluations in terms of benefits and negative affective reactions (e.g., anxiety) towards a technology influence the willingness to adopt it. Moreover, it was shown that anxiety-related feelings do not merely decrease technology adoption intentions per se but also attenuate the effects of positive cognitive evaluations of a technology. Thus, the aim of our research is to examine how autonomous-car-related factors such as benefit perceptions and anxiety influence the willingness to use them. Moreover, we want to examine how anxiety influences the effect of benefit perceptions on the intention to use autonomous cars. Additionally, we want to examine, whether the interplay between anxiety and benefit perceptions on the willingness to use autonomous cars are contingent on person-related factors (i.e., individual levels of self-enhancement).

In order to test our assumptions, we conducted a quantitative approach based survey based on a representative sample in terms of sex, age, and education. Since we concentrated our analysis on individual values, which vary between age cohorts (Robinson, 2013), educational background (Steinmetz et al., 2009), and biological sexes (Schwartz, 2010) it seems necessary to use a sample that is not biased in terms of these variables. Data analyses were based on manifest multiple regressions.

If we are able to detect the hypothesized effects we will provide insights for implementation strategies of autonomous cars. Particularly, politicians or decision makers in car companies can tailor their communication strategies in media campaigns accordingly. For example, if feelings of anxiety diminish the effect of benefit perceptions on adoption intentions, automakers should highlight the safety of autonomous cars. Moreover, if we confirm that high levels of self-enhancement motivation decrease the negative effects of anxiety on the positive benefit and willingness to use relationship, media campaigns should particularly trying to emphasize to this motivations.

2. Theoretical background

2.1. The influence of benefit perceptions on technology adoption

In innovation adoption literature, the perceived characteristics of a technology have been found to influence adoption intentions towards it (Arts et al., 2011; Spiess et al., 2015). As a result, characteristics can manifest themselves as benefits associated with the use of the technology (Lee, 2009; Prasanna and Huggins, 2016). According to its etymological meaning, benefit perceptions were found to positively influence the adoption behavior of technologies (Currall et al., 2006; Henson et al., 2008; Lee, 2009). This pattern remains consistent across a variety of technologies. For example, research on nano, (Currall et al., 2006) food, (Henson et al., 2008), automotive, (Plötz et al., 2014), or internet-based (Lee, 2009) technology indicates that higher levels of benefit perceptions entail higher usage intentions.

Interestingly, benefits are not unidimensional; rather, they can evolve from different perceptions derived from the capabilities of the technology. For example, in the automotive realm, past research has revealed that economic (e.g., cost minimization through less consumption) and time benefit perceptions (e.g., faster charging times of plug-in batteries) are valid predictors of usage intentions (Graham-Rowe et al., 2012; Kent, 2014; Plötz et al., 2014; Sang and Bekhet, 2015; Türnau, 2015). In the case of autonomous vehicles, it is assumed that they will improve traffic flow and thus reduce travel time (i.e., time benefit) (Roncoli et al., 2015). Furthermore, due to their faster reaction time in comparison to humans (Young and Stanton, 2007), it is assumed that they will also reduce accidents (i.e., safety benefits) (Waldrop, 2015).

To summarize, past research has revealed that benefit perceptions positively influence the intention to adopt technological innovations in the automotive industry (Egbue and Long, 2012). In particular, economic and time benefit perceptions have been found to increase the likelihood of adoption. As a new factor, owing to the capabilities of autonomous cars (e.g., self-braking ability), the reduction of accidents can be perceived as an additional benefit (i.e., safety) associated with autonomous cars. Hence, we argue that higher levels of economic, time, and safety benefit perceptions lead to a higher intention to use autonomous cars.

H1. Higher levels of benefit perceptions lead to a greater willingness to use autonomous cars.

2.2. The influence of negative affective reactions on technology adoption

In addition to cognitive evaluations in terms of benefit perceptions, characteristics associated with a technology can be perceived as affect (Cazan et al., 2016; Martínez-Torres et al., 2015; Wood and Moreau, 2006). Relying on the “affect-as-information” theory (cf. Clore and Huntsinger, 2009; Loewenstein et al., 2001; Slovic et al., 2004), the affect conveyed serves as feedback on how to react towards the object (i.e., technology) evaluated. Thereby, negative affect (e.g., anxiety) can imply feedback that reduces the intention to approach an object (see: Welpe et al., 2012). This reduced intention, in particular, holds for avoidance-behavior-oriented affect, such as anxiety (Carver, 2004; Spörrle et al., 2008), which in the case of behavior towards technology leads to lower adoption intentions (Gelbrich and Sattler, 2014). This negative pattern was found to exist across a broad range of technologies. For example, it was found to reduce adoption intentions for self-serving technologies (Gelbrich and Sattler, 2014), Radio Frequency Identification (RFID) (Pramatari and Theotokis, 2009) or near-field communication technology (Chen and Chang, 2013). When focusing on automotive technology (e.g., electric vehicles), anxiety, again, was found to negatively influence adoption processes towards the technology (Franke and Krems, 2013; Plötz et al., 2014). For example, Plötz et al. (2014) have shown that higher levels of range anxiety perceptions of electric vehicles reduce the likelihood of adopting them. Therefore, in line with previous research on technology in general and automotive technology in particular, we posit that anxiety will negatively influence the willingness to use autonomous cars.