

# UNDER-ESTIMATED FACTORS IN THE ADOPTION OF SELF-DRIVING CARS

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## ABSTRACT

Automated vehicle acceptance is needed to improve road safety, reduce congestion, reduce pollution and to meet a number of higher-level goals. To date, little is known about the factors that actually influence drivers' acceptance or rejection of Self-Driving technology. Acceptance is critical to the widespread uptake of Self-Driving vehicles. This article focuses on the factors that have been underestimated in the adoption of Self-Driving cars. The article is organized as follows: in Section 1 the Introduction is given, in Section 2 Adoption models are presented, in Section 3 Social relationships, subjective norms, impact of cultural milieus are presented, in Section 4 The indirect impact of social media is presented, in Section 5 The interaction between social media, subjective norms and self-efficacy is presented, in Section 6 Future objectives are presented, Conclusions are given in Section 7.

## KEY WORDS

automated vehicle, road safety, adoption, self-driving cars, under-estimated factors

## CLASSIFICATION

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## INTRODUCTION

Automated vehicle acceptance is needed to improve road safety, reduce congestion, reduce pollution, and meet a number of higher-level objectives. To date, little is known about the factors that actually influence drivers' acceptance or rejection of self-driving technology.

Economic and technological developments in the 5<sup>th</sup> generation wireless network further cloud the degree of confidence in these innovations. Acceptance is critical to the widespread adoption of self-driving vehicles. This paper focuses on the factors that have been under-appreciated as having an impact on the adoption of Self-Driving Cars. Theories of adoption, the perception of self-efficacy, mass media, the way information is accessed, and the impact of the social environment are underestimated.

Through experiencing the efficient operation of Self-Driving Cars, the personalizing effect of the social norms system, and appropriate mass communication channels, we can increase the widespread use of Self-Driving Cars.

Investigating the human-specific factors behind the intention to use Self-Driving Cars has become the basis for several models.

Who, when, why and for what reason would use self-driving technology will be of great importance in the future. Given that the respondents in previous studies currently have minimal personal experience of self-driving, the results rely mainly on the results of responses that the respondent imagines or is currently thinking about.

The article is organized as follows: in Section 1 the Introduction is given, in Section 2 Adoption models are presented, in Section 3 Social relationships, subjective norms, impact of cultural milieus are presented, in Section 4 The indirect impact of social media is presented, in Section 5 The interaction between social media, subjective norms and self-efficacy is presented, in Section 6 Future objectives are presented, Conclusions are given in Section 7.

## ADOPTION MODELS

According to the Technology Acceptance Model, the main factors influencing intention to use are "perceived usefulness" and "ease of use". The question of utility is complex, what is useful for society, the economy, the environment, is not necessarily useful for all users, i.e. it may not pay off in the present life. Utility in this sense varies from one individual to another.

The "simplicity of use" can be better defined in technical terms. The easier it will be to access a self-driving car through an app, and the easier it is to operate, the more attractive it will be for the user. However, we should not forget the generational and infrastructural differences in this respect.

In addition, research has also identified a number of variables – trust, perceived security risk, personality factors, social norms – that influence the intention to use.

The Automated Vehicle Adoption model summarises the mental process that most users go through in 4 steps. The first level of the 4-stage model of automated vehicle acceptance is based on positive and negative attitudes, i.e., the attitudes, behaviours, and mental attitudes towards self-driving.

The second level is the decision phase, where the choice to accept or reject self-driving cars is made.

At the third level, the practical implementation takes place, i.e., personal experience is gained, and at the fourth level, the criteria of 7 acceptance classes are considered based on the model.

At the micro level, they mainly measure socio-demographic, personality, and travel behaviour variables. At the micro level, they list the variables of AVs on individuals, which consist of asset-specific, normative, and affective factors.

At the meso-level, they classify into separate classes those factors that are exposed to AVs and already have personal experience, vehicle domain-specific characteristics – performance, safety, efficiency, service – and separate factors with symbolic meaning and moral values. In total, the model classifies 28 acceptance factors into 7 classes.

This alone shows how difficult it is to predict who will ultimately decide to use self-driving cars and on what basis.

The factors that are under-appreciated in terms of self-driving adoption and based on existing models include self-evaluation, the effects of communication and innovation, and the way information is accessed [1, 2].

## **SOCIAL RELATIONSHIPS, SUBJECTIVE NORMS, IMPACT OF CULTURAL MILIEUS**

An individual's behavioural intention is influenced by several factors. According to Bandura's Social Cognitive Theory, the immediate physical environment, peer relationships, cultural milieu, social norms and values, and the influence of peers determine how we think about the world and ourselves [3-5].

A 2016 study examined the acceptance of self-driving cars after reading idealised and realistic representations. Before taking the test, which consisted of 24 items, participants were randomly assigned to read short stories that contained realistic or idealistic descriptions of a friend's experience of using a self-driving car for the first six months.

Reading the idealised portrayal resulted in greater acceptance of Self-Driving Cars. The question then arises as to what is the most effective way of gaining acceptance of self-driving: gaining the trust of a good friend through experience or promoting the increasing range of cars and the expansion of driving features in trade publications.

I wonder on what basis and facts the next generation will choose self-driving, and what are the main factors that drive current drivers to adopt self-driving.

## **THE INDIRECT IMPACT OF SOCIAL MEDIA**

According to Social Cognitive Theory, media is one of the most influential environmental influences. Self-esteem is most influenced by a sense of self-efficacy and subjective norms; behaviour is most influenced by trust in technology and the intention to use self-driving vehicles. Today, trust in technology and vehicle use are most influenced by mass media. Mass media includes broadcasts, movies, video games, audio recording, reproduction, internet, blogs, RSS-news feeds, podcasts, mobile media, and print media [6].

In a 2016 survey by Fraedrich and Lenz, 57 % of respondents said they were generally interested in autonomous driving and 78 % of them obtained information on the topic mainly through mass media [7]. Social media such as Facebook, Twitter or WeChat influence the willingness of the public to operate Self-Driving Cars.

Kohl et al. concluded, based on an analysis of 642 033 tweets, that communication strategies need to be rethought due to the bias of pros and cons. Overestimating the benefits leads to misuse and then disappointment, while overestimating the risks leads to resistance. People were found to be more accepting after they had used prototypes, but increased safety features led to

an experience of loss of control [8-11]. The positive or negative bias broadcast by mass media plays a large role in consumers' perceptions of self-driving cars and in their behavioural fluctuations. In the case of new emerging technology, there is no personal experience, so the media plays a greater role in product purchase preferences.

The mass media also has a significant impact on consumer confidence in self-driving cars and helps to promote understanding of innovative technologies. The media play a key role in reducing uncertainty about new products by providing information in an understandable form. Otherwise, consumers will doubt whether they can learn to use self-driving cars. The opinions of others – family, friends, colleagues, etc. – will also influence consumer behaviour. Subjective norms have a strong and positive impact on perceived usefulness and attitudes towards use.

## **THE INTERACTION BETWEEN SOCIAL MEDIA, SUBJECTIVE NORMS AND SELF-EFFICACY**

Subjective norms change evaluations and affect behaviour, and this can change their trust in the product [12]. Mass media have an impact on subjective norms. Norms are beliefs, about the behaviour of others and their evaluation of it, which influence our judgements and opinions. Mass media also affect self-efficacy. Self-efficacy [13] can be defined as an individual's beliefs about his or her ability to perform in a way that influences the events that shape his or her life. Individuals with a high sense of self-efficacy treat difficult, complex tasks as a challenge, while a low sense of self-efficacy tends to lead to an avoidance attitude.

A sense of self-efficacy comes from a variety of sources, the most important being practical experience, but it can also be developed through other vicarious experiences and learning. If we see the example of others like us, our own personal sense of self-efficacy may increase or decrease as a result of success or failure as a result of persistent work.

Therefore, if the mass media portray the use of self-driving cars in a positive light, and the user's judgement and evaluation of it is positive, it has the potential to influence behaviour. Behaviour can be reinforced by a sense of self-efficacy, the practical personal or others' positive experience of being able to use a Self-Driving Car effectively and not failing in this experience.

The impressions of the passengers of a self-driving shuttle were investigated in an interview study at the EUREF (Europeanises Energieforum) campus in Berlin-Schöneberg by 30 users. The research confirmed that the participants had idealised expectations of the technological capabilities of the automated shuttle, which may have been fostered by the media.

Less than a quarter of respondents would prefer an external control room or an on-board cabin attendant to unattended automation. A US study found that men showed a greater willingness to hand over control of driving. Women and greater conscientiousness were associated with greater anxiety about AV, while prior knowledge about AV helps reduce anxiety about self-driving. Emotional stability and openness to experience were positive predictors of willingness to accept AV, while conscientiousness had a negative effect. And extroversion was negatively associated with willingness to transfer leadership [6-9]. Subjective norms have a strong and positive effect on perceived usefulness and attitude towards use [14, 15].

Subjective norms change evaluation and behaviour, and this can change trust in the product [16, 17]. The opinions of family, friends and colleagues influence the consumer's opinion. Mass media, subjective norms, and self-efficacy combine to influence consumer trust and behavioural intentions. Information through Facebook, Twitter, chat and other social media, as well as peer influences and the experience of being able to challenge the use of self-driving cars, i.e., to experience the impact of a major event in one's life, combine to influence the future use of AVs [18-24].

## FUTURE OBJECTIVES

Based on the research so far, the prototypical future user is a less conscientious, introverted male with prior knowledge of AV. He or she is informed through social media (e.g. Facebook, Twitter, WeChat) and believes that self-driving vehicles are easy to use. He is emotionally stable, open to new experiences, has family members, friends and colleagues who find or use self-driving vehicles useful, and has heard idealised stories about self-driving vehicles.

## CONCLUSIONS

The study focuses on the factors that have been underestimated in the adoption of Self-Driving Cars. In the future, companies wishing to promote Self-Driving Cars should use social media to describe self-driving in a way that is as clear and simple as possible. Information should be communicated mainly through Facebook, Twitter, WeChat, YouTube. Self-management should be linked to emotional stability and openness. Women should be given the opportunity to be cautious and understand the benefits of giving up driving. The controllability of vehicles should also be communicated. In order to increase self-efficacy, the user should experience the simplicity of use and understand why it is useful in their lives. The use should be linked to a community experience, a community of community, because of the impact of social norms, and personal experience should be enabled through open days, test tracks, test drives.

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