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A simple model for complex technology: introducing and testing a framework to understand acceptance of shared automated vehicles

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Shared automated vehicles (SAVs) may transform urban mobility but face strong public resistance. Existing acceptance research is fragmented and often relies on complex frameworks. We introduce a simplified shared automated vehicle acceptance (SAVA) model, identifying trust, utility and social comfort as core predictors of SAV acceptance. Using structural equation modelling, we tested whether these factors form a general acceptance factor (GAF) or operate as distinct but correlated predictors of intention to use. A 2 × 2 × 2 experimental design further assessed whether targeted informational interventions could increase trust, utility and social comfort. Monte Carlo-based power analyses indicated a minimum of 800 participants to detect small effects (Cohen's f = 0.20) with 80% power at α = 0.05; we recruited 1250 respondents after data cleaning, ensuring adequate power. Results show that trust, utility and social comfort are best modelled as distinct but correlated constructs, implying rather than establishing a GAF. Utility exerted the strongest effect. Experimental manipulations had no significant impact, suggesting stronger interventions are needed to shift acceptance. The SAVA model provides a parsimonious, testable framework explaining intention to use SAVs. This recommended registered report advances theory and offers practical insights for policymakers and providers seeking to improve SAV acceptance.

1. Introduction

Automated vehicles (AVs) could provide great benefits to cities and transport infrastructure [1–3]. While they may improve safety, reduce emissions, and provide better and more inclusive public transport, the technology also brings its own potential issues such as cybersecurity and moral issues [4]. This may be exacerbated in a development phase with imperfect vehicle technology, which is reflected in a marked public resistance towards AV introduction [5–7]. Shared AVs (SAVs) is a sub-set of AVs that may bring about its own advantages and barriers to adoption. SAVs refer to self-driving vehicles used for shared or pooled transport. They differ from privately owned AVs in that they are typically operated as part of a public or semi-public transport service. These SAVs can be multiple sizes, from small pods to full-scale buses. However, they are mostly referred to as large SUVs or vans carrying 6–10 passengers. The term 'automated' typically refers to a system that has some automation, while the more general 'autonomous' suggests a fully automated system. Current AVs and SAVs have a range of automated functions, but none of them are yet fully autonomous.

Ridesharing allows for an more efficacious and optimized transport solutions. However, the very social situation may be a deterrence by itself, as this is a more intimate form of transport [8–10]. To create an SAV service that best caters to the public's desires, we need social science to accompany the advent of self-driving technologies. There may be psychological obstacles for wide adoption, such as tech-distrust, social barriers of sharing and a low perceived usefulness [11,12]. Lack of user acceptance of AVs is the most prominent barrier to its widespread success [13]. It seems that several unanswered questions remain about key issues in user acceptance of SAVs. Still, there is a paucity of research using sound theoretical foundation, with just a quarter of all studies on SAV acceptance using a theory at all [14].

While understudied, acceptance of AVs has received recent attention. However, the theoretical frameworks used are vast and complex [15,16]. Furthermore, most of them focus on privately owned cars, rather than SAVs introduced to the public transport sector [16,17]. The social nature of sharing AVs may introduce a novel factor to consider for potential riders. This field remains understudied [9,14]. We want to address this research gap by suggesting a new framework based on the current research. This new framework will include the key concepts for predicting SAV acceptance, named the 'shared automated vehicle acceptance' (SAVA) model. We want to test this new framework to see whether a shorter survey could adequately explain intentions to use SAVs. We test experimental manipulations to see whether changes in these key factors can lead to increased willingness to use SAVs. First, we will present a literature review justifying our novel approach.

1.1. Automated vehicle acceptance models

While still a young field, the psychological research into user acceptance of new technologies has received wide attention. The unified theory of acceptance and use of technology (UTAUT) is a key framework for understanding technology uptake developed during the past two decades [18–20]. This theory builds on previous research into behaviour (i.e. theory of planned behaviour) and technology adoption (i.e. technology acceptance model (TAM)), and is, as the name suggests, an attempt to develop a unified framework [18,21,22]. The UTAUT has seen widespread use and modification, leading some to suggest that the main tenets of the theory remain somewhat untested [15]. They say that a more faithful use of the core dimensions performance expectancy, effort expectancy, social influence and facilitating conditions, would yield better results for efforts using the UTAUT. However, with a recent synthesis of extensions adding further predictors and moderators, the framework remains vast and complex [15].

Other recent efforts have tried to combine the UTAUT and AV acceptance research into novel models [16,17]. The multi-level model on automated vehicle acceptance (MAVA) and the UTAUT-4AV are both extensive and presented as models needing further validation and specification to each relevant case. The MAVA is geared towards privately owned cars, rather than shared public transport vehicles. The UTAUT-4AV is more tailored towards automated shuttles and can explain more than 90% of the variance in intention to use. This is unusually large for psychological research, almost perfectly predicting the outcome variable. UTAUT models typically predict between 50% and 70% of this variance [15,17]. Recent efforts suggests that there may be room to apply Occam's razor to reduce the number of included factors while retaining a good amount of explanatory power [23,24]. This may be because most of the population still have limited experience with AVs, making the perception of AVs more parsimonious and general. Such a simplification could yield more practically oriented

models that are easily applied in experiments, field tests and longitudinal research. It remains an open question how well a simplified model can account for SAV acceptance, and which constructs are most essential to include. Additionally, it may be important to track whether, and for how long, the single factor remains the best conceptualization, given that people's experience with AV technology will grow in coming years.

We suggest a simplified SAVA model consisting of merely three predictors of AV acceptance: trust, utility and social comfort. These three factors are conceptualized as constituents of the general acceptance factor. This removes the need for including socio-demographic information, the effects of which often disappear when sociopsychological measures are introduced [16,25]. The model thus does not imply a set of moderating factors like its more complex predecessors. A simple and effective model may help increase the hitherto low share of research conducted that includes theoretical frameworks by lowering the bar and streamlining the approach [14]. This could also help to align research approaches with each other, as it clearly delineates the application to shared mobility as opposed to privately owned cars. Last, this model clearly communicates to stakeholders what the most important focal points for acceptance are. Like contemporary frameworks, it focuses on the most fundamental concepts for user acceptance of AVs [26]. While these three predictors have been found to be the most efficacious in predicting intention to use SAVs, research remains to cement their value in application, independence and sufficiency [27,28].

The SAVA model was developed with the explicit goal of parsimony, retaining only the most efficacious predictors of SAV acceptance. We propose reducing a wide range of antecedents found in prior models such as MAVA, UTAUT and UTAUT-4AV into three core constructs, namely trust, utility and social comfort. The SAVA offers a more streamlined framework that is easier to apply in early-stage deployment studies, public surveys and experimental interventions. This simplification, however, comes with trade-offs. Established constructs like effort expectancy, facilitating conditions and social influence are omitted from SAVA in favour of clarity and manageability, even though they are known to hold predictive value in some cases. However, research has found that the more complex models often include predictors that are superfluous in explaining intentions to use [15,17,23,29–31]. The complexity of UTAUT and similar frameworks has been criticized for being overly complex and plunging the field of technology acceptance into a state of chaos [32,33]. By including more than 40 relationships in a framework explaining technology use behaviour, the UTAUT is criticized for being an uncoordinated patchwork of theories rather than a streamlined model for explaining behaviour efficiently [32]. Although heavily cited, as few as 10% employ the UTAUT constructs in their intended context [34]. These issues may stem from its overly complex nature and more parsimonious models are suggested as a possible solution exactly because they are easier to employ correctly [35,36]. Discarding predictors that have been shown to be efficacious predictors should only be done for good reasons. We believe the reasons are plentiful in this case, although we acknowledge the limit it puts on the model's comprehensiveness. As such, we do not position SAVA as a full substitute for models like UTAUT, but as a focused instrument to probe public response to SAVs under uncertainty, especially when brevity and construct clarity are paramount. In the following, we will present the elements of our proposed parsimonious SAVA-model.

1.2. Trust

The first cornerstone of our SAVA-model is the factor trust. Much evidence has accumulated showing the importance of trust in automation as important predictors of future use [16,28,37–39]. Trust is conceptualized broadly. As systems become more sophisticated, users' trust of systems will increasingly be akin to the trust towards other people [40]. Research have long found that there are only small differences between concepts of trust across different types of relationships, including towards machines or automations [41]. We therefore suggest that there are only minor nuances between these conceptualizations. Recently, a new measurement model of trust in automation was proposed, based on previous foundational models [38,39,42]. These are based on three dimensions: ability, integrity and benevolence [42], performance, process and purpose [39], or competence/reliability, understandability/predictability and intention of developers [38]. These three different conceptualizations share considerable overlap, but the latest iteration also point to people's familiarity with the technology and their propensity to trust as important for explaining trust in automation. In summary, formation of trust in AVs seem to be governed by how well and reliably AVs perform their intended task, whether it performs rational and predictable actions, and whether the service is delivered by trusted organizations.

Trust is often closely tied to safety in AV acceptance research. Safety can be tied to the first pillar of trust in AVs: ability, performance or competence. Improved safety is one of the key benefits promoted for automating road transport [43,44]. Trust, along with safety, is conceptualized as fundamental for AV acceptance in contemporary frameworks [11,45]. Conversely, safety concerns and trust issues may discourage future use of AVs [46]. Trust predicts safety ratings, utility, comfort perceptions, as well as intention to use [37,47–49]. This points to high interconnectivity between the concepts.

Transport authorities must carefully consider strategies for building trust when introducing SAV services to enhance public acceptability. The reviewed research highlights key factors that may influence trust in this context. Notably, some pilot programmes have inadvertently reduced trust and willingness to use, probably owing to perceptions of technological immaturity [25,50,51]. Perceptions of ability and reliability are central to fostering early trust in SAVs. Understandability or predictability of AVs may be of importance for other road users as well as passengers, and will help increase acceptance for both groups [52]. Last, the purpose and intention of developers is key, as has been documented in high trust societies such as Norway [8]. To empirically test these ideas, we will conduct an experiment to assess whether and how improvements in competence/reliability, understandability/predictability and developers' intention affect trust evaluations. Providing targeted information about SAV capabilities could be a key path towards improved SAV acceptance.

We define trust as the relational belief that the SAVs will behave benevolently, competently and predictably in traffic. This is in line with recent applications of trust in AVs and SAVs [37,38]. We do not include social trust in our concept of trust. Because trust has seldom been included in research based on the UTAUT there is somewhat scarce evidence for how it relates to utility and similar constructs [15,29]. However, trust and utility have been found to correlate on numerous occasions [23,29,53–55]. However, their contribution to AV acceptance has never been fully superfluous, and most associations fall in the medium to large effect size range. There is also a good reason to keep them conceptually distinct as they represent different psychological mechanisms, relational and instrumental, and research traditions.

1.3. Utility

The second component of the SAVA-model is utility. Our conceptualization of utility mostly derives from the TAM's 'perceived usefulness' [22]. This dimension closely relates to the UTAUT concept of 'performance expectancy' [18] and the 'perceived benefits' concept [16,56]. Performance expectancy has been found to be one of the strongest predictors of behavioural intention to use SAVs [17,27,28,57–59]. Compatibility from diffusion of innovation technology is also similar to utility and can outperform UTAUT predictor 'performance expectancy' [27,60]. The redundancy between compatibility and performance expectancy was noted by the authors [27]. Perceived value of a service has long been seen as important for customers' choice of one product over another [61]. In a real user setting with SAVs, utility was also found as critically important for continued user intention of the service [62].

Developers of SAV services often highlight their potential utility gain, both in terms of improved service coverage, efficiency, safety, travel cost and reduced emissions [63,64]. Social benefits such as improved availability of public transport could also be achieved. Less affluent neighbourhoods, even in welfare states such as Norway, have comparably lower public transport access than more affluent neighbourhoods [65]. Travel time is consistently an important predictor of willingness to use SAVs [66,67]. Delays are a great barrier to using SAVs, perhaps even more than the presence of strangers [68]. Ease of use, travel time and trip cost is often found to be important for people's intention to use [11,44,46,66,69,70]. The somewhat ubiquitous nature underscores the importance of the utility-construct, and it is placed as the second most fundamental step towards AV acceptance after trust in a recent hierarchy [26,45,71]. We therefore aim to test how improvements in perceived utility affect acceptance of SAV's.

We define utility as the instrumental expectation that using the SAV will improve one's travel goal attainment relative to alternatives with regards to usefulness, mobility opportunities and a reduced reliance on private cars. At its core, utility seeks to capture whether participants feel that the addition of a SAV service would be a valuable addition to their everyday travel needs. It is similar to the original concepts of perceived usefulness and performance expectancy, but adapted to the transport context [20,22]. It does not include ease of use items or issues of predictability in travel flow, as the latter is more aptly included in predictability under trust. Our utility concept aligns with a focus on the added value of the service. As previously noted, utility and trust have been found to correlate. This is also reasonable to assume, as it becomes more difficult to derive utility from a distrusted

service. However, we argue that the two are conceptually different and should constitute independent and significant predictors of SAV acceptance. The final factor of our proposed model examines the relatively underexplored social dynamics of SAVs.

1.4. Social comfort

Sharing AVs is key to achieving the benefits of automation in future transport systems. The lack of research on issues in ridesharing using AVs has been noted, and this may hamper the successful introduction of SAVs [9,72]. Sharing makes AVs less popular, and those who are less comfortable interacting with strangers are less likely to want to use SAVs [8,73]. Social comfort is found to be a key predictor of public transport use [74]. Travellers may be concerned with sharing rides with strangers because of security and privacy concerns, as well as a lack of social trust [75]. Privacy regarding location data is also considered an issue when the service can drive you all the way to your doorstep [76]. Discriminatory attitudes reduce ridesharing satisfaction and may be a significant hurdle for people to use SAVs at all [77]. Such attitudes are similar to other models of intergroup prejudice such as social dominance orientation, and can be considered relatively stable individual differences that predict a host of attitudes [8,77,78]. Comfort with sharing has been found to be one of the important predictors of willingness to use SAVs [23,27,79]. Including a set of items to capture people's perception of the social situation within SAVs thus seems pertinent. A willingness to pay extra for a 'privacy premium' in SAVs has been documented, especially among younger riders [73,80].

However, perceptions of AVs appear to differ depending on whether they are privately owned or shared as part of a public transport service. While private AVs are often framed as extensions of personal space, SAVs fall in between regular public transport such as buses and the private sphere of the car. For instance, the way a service is presented, whether as a large, bus-like vehicle or a smaller, car-like vehicle, can shape expectations of privacy and social interaction, highlighting differences in how the social environment is perceived [73]. Despite its potential significance, the role of the social situation in SAV acceptance remains understudied. It has been pointed out that because of the design of SAVs, that is between the private car and larger buses, it requires a new set of norms for how to share. People have developed and engrained norms about sharing a bus, but a shuttle (6–10 passengers) or a SUV (2–4 passengers) may require development of a new culture of sharing [81]. More experimental research is needed to determine how service design can accommodate diverse social preferences and emerging norms. To address this gap, we will experimentally test the role of perceptions of SAVs' in SAV acceptance.

We define social comfort as an affective-interpersonal appraisal of the social situation inside the SAV: whether the vehicle feels safe, pleasant and normatively acceptable to share with strangers. In this way, it is dissimilar from the concept of social norms that seeks to investigate how respondents believe others think about using SAVs. This understanding is rooted in research on ridesharing and public transport as well as intergroup dynamics from social psychology. Social comfort includes the ease with which participants socialize with others and perceptions about the intimacy in smaller vehicles, as well as thoughts about prejudice. It is similar but different to the traditionally measured hedonic motivation, as our concept is more aimed at comfort with the social situation in particular [20]. Few have tested social comfort in AV acceptance models. Comfort in a SAV and trust have been found to correlate and hedonic motivation may correlate with utility [47,53,82]. Although these constructs may correlate to some degree, we believe that social comfort is conceptually different to both utility and trust. This is supported by previous research suggesting that they constitute different factors [23].

1.5. Norwegian case and attitudes

There have been many SAV pilots in Europe and Norway in recent years [83]. Norwegian pilots have been conducted in several cities with Navya or EasyMile shuttles, as well as more traditional Toyota vehicles. These early pilots were often characterized by small shuttle-like vehicles (6–10 passengers), low speeds (max 15 km h^{-1}) and limited routes. In 2025, there are two prominent deployments, one large bus in Stavanger and a robo-taxi like SAV service in Oslo. These operate close to Society of Automotive Engineers (SAE) level 4, but with a human operator as per early 2025. Recent investigations suggest that there are only small changes in people's perceptions of an SAV service operating in their neighbourhood, even though these shuttles have been found to operate sub-optimally in several settings [25,50,51]. There was even a tendency towards a decline in trust and optimism about

the service. Further Norwegian studies suggest that people fail to find that SAVs may improve their mobility [84]. This could be a case of status quo bias or unwillingness to change the current travel behaviour without a real incentive [85]. The Norwegian society is characterized by trust in the government, and this trusting behaviour is further impacting beliefs about the SAVs [8]. Indeed, others find high intention to use SAVs in the future [86]. There thus seems to be an ambivalence in the Norwegian public, but they convene on trust and usefulness as important factors along with trusting the introduction to be handled with control.

1.6. Research questions

This study has two primary aims. First, we seek to test a simplified measurement model for the SAVA model. Specifically, we investigate whether trust, utility and social comfort represent distinct but correlated predictors, or if they can be considered components of an overarching general acceptance factor (GAF). By examining both a second-order factor model and a more parsimonious model where these predictors directly influence intention to use SAVs, we aim to determine the most accurate representation of acceptance.

Second, we aim to experimentally assess whether trust, utility and social comfort can be influenced through targeted manipulations. This allows us to explore the extent to which these factors are malleable and how interventions may enhance acceptance of SAVs. Understanding whether these components can be shaped through experimental conditions provides insight into how policy measures or clear communication could foster public trust and willingness to adopt shared automated mobility solutions.

The conceptual model for the study is shown in figure 1.

This approach allows us first to validate a streamlined model of SAV acceptance. Second, we will see whether the model can measure whether targeted interventions can effectively shape key acceptance factors. This will ultimately lead to easier access to theoretically sound measurement of SAV acceptance and improved implementation strategies for automated mobility solutions.

1.7. Study design

To ensure transparency and clarity regarding our research approach, the study's core questions, hypotheses, sampling plan and analysis strategies are summarized in table 1. This structured overview aligns with Peer Community In Registered Report's recommendations and explicitly links our research questions to hypotheses, planned statistical analyses and criteria for interpretation under different outcomes.

The template guides our methodological choices and clarifies the theoretical implications of possible study outcomes.

2. Material and methods

2.1. Ethics and open science

According to institutional procedures, this type of non-invasive, low-risk survey research does not require separate approval from any institutional ethics review board. The research was conducted in accordance with the guidelines of the National Research Ethics Committee of Norway [87]. The Norwegian Agency for Shared Services in Education and Research (Sikt) evaluated the proposed survey and confirmed that the collection and management of personal information was compliant with law (ref. no. 665388). R-code used in the project, as well as anonymized data, was shared using the platform of the Open Science Framework (OSF) (https://doi.org/10.17605/OSF.IO/RGCW4).

2.2. Analysis

We used structural equation modelling (SEM) analysis to test our conceptual model. The SEM analysis was performed in R using the *lavaan* package. This analytical approach was chosen as it closely fits the aims of the current research, namely testing a more parsimonious model of SAV acceptance. It flexibly allowed testing latent factors and their indicators, as well as effects between latent variables.

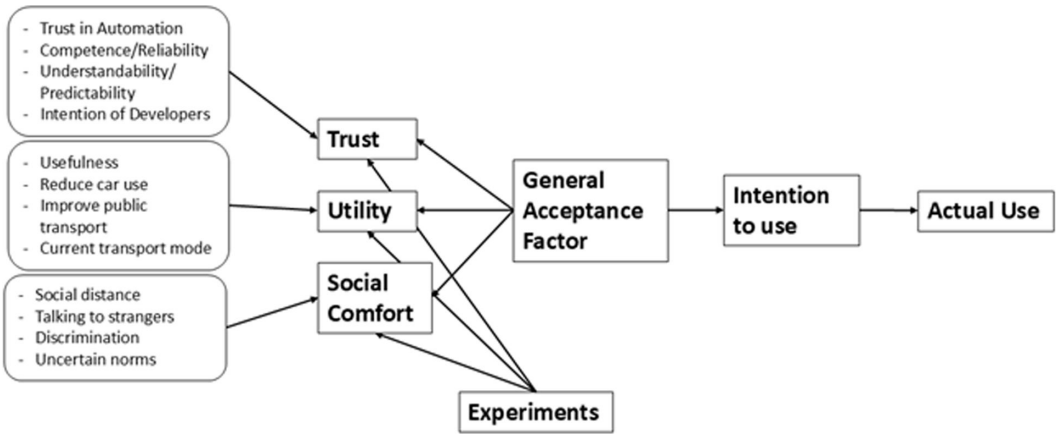


Figure 1. Conceptual model for the study, with experimental impact and causal chain.

For our four latent factors, trust, utility, social comfort and intention to use, we looked at how well the indicators constitute our latent factors. We also calculated Cronbach's alphas for the scales. Cronbach's alpha value typically increases with the length of the scale, and we suspected that our scales would have somewhat low alpha values because of this.

The SEM model fit was calculated using a maximum likelihood estimation. Multiple indicators were used to assess the fit of the SEM models: the comparative fit index (CFI), the Tucker–Lewis index (TLI) and the root mean square error of approximation (RMSEA) and the standardized root mean square residual (SRMR). Higher values of CFI and TLI, preferably above 0.90, along with lower values of RMSEA and SRMR, preferably below 0.08, indicate a better model fit [88]. These recommended cut-off values are based on analysis of continuous data. However, the Likert-format data in the present study can be regarded as ordered categorical data approximating a continuous distribution, but this measurement level should be considered when model fit measures are estimated (e.g. [89]). By considering multiple cut-off values for model fit we were able to make better decisions about our models.

We compared two models using these fit statistics. The first includes a GAF that is constituted by trust, utility and social comfort. The GAF then predicted intention to use. The second model only has an implied GAF, and that trust, utility and social comfort directly predicted intention to use. These three predictors will be allowed to correlate, as this is expected. We compared their fit using RMSEA, SRMR, CFI and TLI. If the models show similar fit, we kept the more parsimonious model without a second-order GAF. Otherwise, we promoted the best-fitting model.

Our model may suggest improvements through modification indices. These were considered for implementation if they were theoretically meaningful, particularly if our model showed sub-optimal fit. If model fit indices suggested removing indicators, we would do so. If an indicator had a substantial cross-loading, we would consider moving it if the cross-loading was substantial and it made conceptual sense. We would attempt to make an equal number of modifications to either model. If our suggested SEM models both showed unfavourable model fit, even after performing some suggested modifications, we would conclude that they are poor representations of the included indicators. If this were the case, we would resort to some exploratory analyses using factor analysis to find the best structure of our items. While we specify hypotheses for transparency and preregistration purposes, this study is exploratory in spirit and intended to inform future confirmatory research on SAV acceptance.

Considering our expected large sample size, we would be wary of striking a balance between type 1 and type 2 errors. We interpreted effect sizes as well as *p*-values to mitigate some of this increased type 1 error rate, instead of relying on *p*-values alone [90–92]. Cronbach's alpha levels are interpreted with their limitations in mind [93,94].

2.3. Monte Carlo simulation power analysis for structural equation modelling

To determine the required sample size for this study, we conducted a Monte Carlo simulation power analysis using SEM in R with the *lavaan* package. The goal was to ensure that all key model parameters could be detected with at least 90% statistical power at an alpha level of 0.05. In this analysis, we first specified a population model that reflects our theoretical assumptions. Based on assumptions from previous research and a pilot test (described later), we fixed factor loadings at 0.70, latent factor

Table 1. Study design template summarizing the study's core elements and outcomes. (CFI, comparative fit index; TLI, Tucker–Lewis index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.)

questions	hypothesis	sampling plan	analysis plan	rationale for deciding the sensitivity of the test for confirming or disconfirming the hypothesis	interpretation given different outcomes	theory that could be shown wrong by the outcomes	outcomes
do trust, utility and social comfort form distinct predictors or constitute a single general acceptance factor (GAF) in predicting intention to use SAVs?	trust, utility and social comfort form distinct but correlated predictors of intention to use SAVs	Monte Carlo simulation power analysis for structural equation modelling (SEM) determined a sample size of $n = 225$ participants required for 90% power at $\alpha = 0.05$	SEM using R (lavaan package) comparing two models: (i) second-order GAF predicting intention; (ii) direct effects model (distinct factors predicting intention)	factor loadings of 0.70, factor correlations at 0.50, and structural path coefficients of 0.3 were considered adequate for detecting practical effects	if model 1 (GAF) shows superior fit indices (CFI, TLI, RMSEA, SRMR), it indicates a parsimonious overarching acceptance factor. If model 2 is superior, it confirms trust, utility and social comfort as distinct but interrelated factors. Poor fit would suggest reconsideration of theoretical assumptions	models proposing overly complex or overly simplified frameworks of technology acceptance (e.g. extensive UTAUT/MAVA frameworks)	trust, utility and social comfort form distinct predictors. No evidence emerged for modelling a GAF in our data
can targeted informational manipulations improve trust, utility and social comfort in SAV acceptance?	informational manipulations specifically designed to address trust, utility or social comfort will significantly enhance these respective factors	$2 \times 2 \times 2$ between-subjects experimental design, Monte Carlo power analysis determined $n = 250$ per cell (total $n = 2000$) required for detecting small effects at Cohen's $f = 0.15$ with 90% power at $\alpha = 0.05$. A lower	three separate ANOVAs, each testing main effects of experimental manipulations on trust, utility and social comfort, respectively	effect sizes of Cohen's $f = 0.20$ is believed to be a realistic guess based on previous research using informational experiments in SAV settings. We will expect all three manipulations to show statistically	significant main effects confirm that targeted informational interventions are effective in improving the respective components of SAV acceptance. Non-significant effects would suggest informational	theories suggesting the immutability of attitudes towards SAVs, or that mere informational campaigns may be insufficient	targeted informational manipulations did not lead to substantial changes in trust, utility and social comfort. Although the change in trust emerged as significant, this effect was very small

(*Continued*.)

Table 1. (*Continued.*)

questions	hypothesis	sampling plan	analysis plan	rationale for deciding the sensitivity of the test for confirming or disconfirming the hypothesis	interpretation given different outcomes	theory that could be shown wrong by the outcomes	outcomes
		bound was determined for 80% power and Cohen's $f = 0.20$ at 800 participants in total		significant effects on their respective factors	interventions as designed are insufficient		

correlations set to 0.50, and structural path coefficients based on expected effect sizes of 0.3 for trust, utility and social comfort on intention, and 0.4 on intention to actual use [23,27]. Using this model, we simulated 1000 datasets at various sample sizes. For each dataset, we fitted our analysis model, which matches our hypothesized model structure, and recorded the proportion of simulations where each parameter was statistically significant ($p < 0.05$). By iterating across increasing sample sizes, we identified the minimum required sample size where all parameters achieved at least 90% power. This process resulted in a final sample size estimate of $n = 225$, indicating that 225 participants are required to reliably detect all specified effects in our model with high statistical power.

2.4. Monte Carlo simulation power analysis for analysis of variance

For the experimental manipulations, the primary dependent variables subjected to analysis were mean scores for trust, utility and social comfort derived from the respective survey scales. We performed separate 2 × 2 × 2 factorial analysis of variance (ANOVA) for each of these dependent variables, explicitly testing the main effects of each informational manipulation. To determine the required sample size, we conducted a Monte Carlo power analysis using R and the *pwr* package. The goal was to ensure that the main effects of manipulations on trust, utility and social comfort could be detected with at least 90% power at an alpha level of 0.05. In this analysis, we defined effect sizes that covered increasing needs for power: Cohen's $f = 0.25$ for trust (medium effect), 0.20 for utility (small-medium effect) and 0.15 for social comfort (small effect). These were approximate assumptions based on previous similar research showing trust and utility having the largest impact on intention to use, but also that online surveys may not be the best way to impact perceptions of SAVs [23,95]. A small effect would therefore be expected. Using varying effects sizes also gave the benefit of seeing how the proposed sample sizes varied, even though the smallest sample size would always be based on the smallest effect size. Using these parameters, we simulated 1000 datasets for various sample sizes per condition. For each simulated dataset, we fitted an ANOVA model testing only the main effects while ignoring interaction terms. The proportion of simulations in which each main effect was statistically significant ($p < 0.05$) was used to estimate statistical power. By iterating across increasing sample sizes, we identified the minimum required sample size per condition where all main effects achieved at least 90% power. This process resulted in a final sample size estimate of $n = 250$ per condition, indicating that a total of $n = 2000$ participants (eight conditions × 250 per condition) was required to reliably detect the main effects in our experimental design. This was an upper bound, given the small effect size and high power. Running the simulation with a more lenient 0.8 power and a small effect size of Cohen's $f = 0.2$, we got a suggestion of 100 participants per cell, giving $n = 800$.

2.5. Pilot test

A pilot study was conducted with 49 participants to evaluate the initial survey items and experimental manipulations. The text manipulations were accompanied by artificial intelligence (AI)-generated images depicting the SAVs. A full report can be found in the electronic supplementary material. Reliability analysis suggested acceptable internal consistency for trust, utility and intention-to-use scales, but poor reliability for social comfort. Confirmatory factor analysis revealed suboptimal model fit, prompting several modifications. The second item of the trust scale was amended to better reflect the intended underlying facet of predictability and to simplify the question to clearly capture one facet. We changed the last item from the trust scale in an effort to improve psychometric properties and better cover theoretical facets of trust in developers. For utility, we changed the phrasing of car dependence to be more general. This helps even respondents without access to cars to make a general judgement. We updated the wording of the last utility item to better reflect AV technology, rather than general transport. For social comfort, we replaced the poor-fitting last item of the scale 'I prefer that the vehicle has a driver on board', with a question designed to capture the novel social situation within small SAVs. Qualitative feedback highlighted concerns about the clarity of the stimuli and the salience of the experimental manipulation. Based on these findings, we refined the survey by replacing AI-generated images with a single picture of the latest Norwegian SAV pilot by Ruter. This was done to highlight the important text-only stimulus and strengthen the effect of the experimental manipulation. These changes aimed to improve the indicators' fit to the latent factors and the effectiveness of the experimental conditions.

2.6. Sampling strategies

For this study, there is a general-purpose model development focus. This means that we sought a general population sample. This does not necessarily have to be representative of any specific population as long as they do not differ in key aspects relating to SAV perceptions. We acquired 19 000 phone numbers from the credit checking company Bisnode. Of these 9000 are randomly sampled from Norwegians and 10 000 from people living in the Norwegian cities and communities of Ski, Kongsberg and Groruddalen. Ski and Kongsberg were chosen because they have had SAV pilots of different kinds in the years leading up to this data collection, while Groruddalen has a pilot in the early phases. This increased the likelihood that respondents had actual experience with these kinds of vehicles and facilitates longitudinal follow-up studies in the future. Our recruitment strategy drew participants from across the country, not just Oslo or pilot-heavy areas, to avoid regional clustering and ensure diversity of experience. Previous pilot exposure may differ meaningfully from future commercial deployments as well as geographically across the country, as the early pilots typically involve low speed (15 km h^{-1}), human operators and limited routing in certain areas of a city. This may shape perceptions of safety, reliability and comfort differently than higher-speed, fully automated services and may impact differently across geography. This contextual difference is important when interpreting the realism and transferability of participants' expectations and previous experience with AVs.

The short message service (SMS) invitation included a brief message (in Norwegian, translated below) identifying the sender as the Institute of Transport Economics and a secure link to the online survey:

> 'Would you like to help shape the future of transport? Take a short survey about future transport (approx. 10 min). The survey ensures data privacy and is part of a research project.
>
> Five gift cards of 1000 NOK will be raffled among participants.
>
> Take the survey here: [link]
>
> Read more here: [link]
>
> Best regards,
>
> Ole
>
> TØI'

In our recent experience, SMS-invitations of participants yield response rates varying from as low as 2% to a more stable 6–7%; 19 000 invites could thus yield 950 participants with a 5% response rate and 1330 with a 7% response rate. This would be acceptable given our power analysis. If the response rate dropped below this and we ended up lower than 800 responses, we planned to resort to other means of recruitment, such as word-of-mouth, social media or acquiring additional contacts—telephone numbers or otherwise. However, we planned to halt data collection if the response rate yielded more than 2500 responses as per our power analysis. To this end, we sent out invitations in heats of roughly 1000 SMS invites. Data collection commenced on 13 June 2025 and lasted until 27 June 2025.

We acknowledged the clear potential for selection bias in our SMS-based recruitment. This was especially important because of our low expected response rate. Individuals who are older, less familiar with technology, or more sceptical of unsolicited links may be under-represented in the sample. While our goal was not to obtain a strictly representative sample of the population, we aimed to capture sufficient diversity in demographic and experiential factors relevant to SAV acceptance. This may not necessarily suffer from the expected selection bias. To monitor potential bias, we collected basic demographic information and some mobility behaviour data to compare responders. Where necessary, we considered conducting subgroup analyses to explore differences in response patterns. These measures aimed to support the generalizability of the findings across key user groups, while acknowledging the practical trade-offs of our recruitment method.

2.7. Survey design

All study material was provided in Norwegian to participants and was translated to English in the manuscript for transparency. The full original language survey is available on the OSF repository. The authors have translated items from English to Norwegian and adapted where necessary. AI models have been used to improve the flow of the language in both English and Norwegian. For the survey, we opted to use the term 'self-driving (selvkjørende)' rather than automated/autonomous. While automated may be the correct term for most available services, 'self-driving' is more easily understood in Norwegian and suggest a general capability.

2.7.1. Experimental manipulations

We designed three experimental pieces of information. These were aimed at providing evidence of the suggested model's ability to track changes in people's perceptions, and to test whether informational content can impact the constituent factors trust, utility and social comfort. We provided all participants with some common information about the future service. Participants were randomly assigned to eight groups following a full factorial 2 × 2 × 2 design. This structure ensured that all combinations of experimental manipulations (trust, utility, social comfort) are systematically tested, allowing for isolation of each main effect. For example, group 8 received all three manipulations, providing insights into their cumulative effects, whereas group 2 received only the social comfort intervention, allowing isolation of this factor's independent impact. Group 1 received three control conditions. The six pieces of altered information are presented below in table 2 in a 2 × 2 × 2 set-up.

We wanted the text and images to be similar in length for control and experimental conditions. Essentially, we only wanted the information to differ on key aspects suggested by previous research to be detrimental to SAV acceptance.

For trust, this meant that the text focused on the three aspects suggested by Körber: competence/reliability, understandability/predictability and intention of developers [38]. We also adapted the information based on research conducted in Norway using similar frameworks, suggesting that trust in government and testing is key [8]. Furthermore, safety aspects are key to trust in AVs, which we also wanted to address.

For utility, we wanted to highlight the benefits of the service to potential customers. Including ticket fees, travel time and the benefit of flexible pick up/drop off points should maximize the perceived utility of the service to survey responders. Research suggests that some may be sensitive to the added travel time incurred by picking up co-riders along the route, so we wanted to address that point specifically [8].

Social comfort is dependent upon the purpose of the travel as well as the expectations of the traveller. Framing the vehicle as a car will induce thoughts of an intimate ride with strangers, while a small bus will relate the experience to regular public transport. This in-between-position is indeed identified as one of the key drivers of uncomfortable social experiences in SAVs [81]. Furthermore, the ability to report any uncomfortable events should put the more anxious riders at ease. Highlighting that the service will strive for a comfortable riding experience may also improve ratings of social comfort.

After participants were subjected to these three stimuli, they were asked to write a few words about their impression of the new service. This acted as a rumination prompt to enhance retention and understanding of the material presented. This was chosen rather than a manipulation check as a way to ensure respondents engage with the material [96].

The informational manipulations in this study were brief text-based prompts, rather than immersive interventions or personalized feedback. As such, we expected relatively modest effects on key metrics. For instance, the trust condition communicated that the vehicles were 'approved and considered safe' by authorities, which is a positively valanced, yet general statement. Stronger manipulations (e.g. presenting quantitative evidence of safety superiority or multimedia presentations) might yield larger effects. Our power analysis was therefore calibrated to detect small effects that are realistically achievable given the minimal nature of the intervention. This was also the reason why we wanted to maximize the difference between experimental and control conditions: to maximize the effect of a potentially weak manipulation method. While the experimental conditions include factual information (e.g. approval by authorities), the goal is not to fabricate trust-evidence but to test whether communicating existing trust-related credentials influences public perceptions. In this sense, the manipulation

Table 2. Information given to experimental and control conditions.

factor	control	experiment
shared information about the service	these are the self-driving vehicles Ruter is testing in Oslo in 2025. In the future, they might look different 	
trust experimental groups: 5, 6, 7, 8	such self-driving vehicles will provide transportation in urban areas. They are designed to offer travellers a modern travel experience	such self-driving vehicles have undergone thorough testing and adhere to traffic regulations. They have been approved by the authorities and are considered safe for road use
utility experimental groups: 3, 4, 7, 8	the service can be used for daily trips and provides an alternative way to get around. The vehicle will stop to pick up fellow passengers along the way	the service is intended to offer fast and efficient transport, potentially resulting in shorter travel times and affordable tickets. The vehicle can stop to pick you up wherever you prefer
social comfort experimental groups: 2, 4, 6, 8	these vehicles will be shared by multiple passengers and resemble cars. They could become an important part of public transportation, carrying several passengers at once. The seats may be oriented in the direction of travel or face one another. There will be no driver on board	these vehicles will be shared by multiple passengers and resemble small buses. They could become a significant component of public transportation, ensuring a comfortable experience for everyone on board. It will be easy to notify someone if you do not feel safe while riding

simulates a realistic deployment context where such information might be included in public messaging. However, we acknowledge that this design also partially reflects the availability of trust-relevant evidence, not only its framing. Interpretations of causal effects on trust should therefore consider both the informational content and the method of communication. This design reflects both practical constraints and the intention to test low-intensity communication strategies likely to be used in real-world deployment settings.

2.7.2. Socio demographics

Predictions of AV acceptance show that socio demographic information is of less importance in predicting SAV acceptance, as compared with sociopsychological variables. Therefore, we only collected rudimentary socio-demographic information:

(i) age (10 year intervals);
(ii) gender;
(iii) where do you live? (municipality/postal code?);

(iv) tech-savviness/familiarity:
  - I am among the first to adopt new technology;
  - I am well informed about developments in self-driving vehicles;
  - I am well acquainted with advanced driver-assistance systems in cars (adaptive cruise control/lane keeping assist);

(v) travel behaviour:
  - on how many days in a typical week do you use public transportation?
    - no days;
    - 1–2 days;
    - 3–4 days;
    - 5–6 days; or
    - 7 days;
  - how many hours do you usually spend commuting on an average day?
    - less than 30 min;
    - 31–60 mins;
    - 1–2 h; or
    - More than 2 h.

2.7.3. Shared automated vehicle acceptance

All items were measured on a five-point Likert scale ranging from 1 'totally disagree' to 5 'totally agree', with 3 representing a neutral response. This structure allows for expression of agreement, disagreement or neutrality without requiring additional options. There is an argument to be made that a sixth option ('don't know') in this context is conceptually equivalent to, and probably used as, a neutral answering option [97]. Potentially recoding the sixth option as a neutral midpoint may be equal to treating these answers as missing [98]. We therefore did not include a sixth option. Participants who skipped an item were treated as missing for that response. We aimed to keep a balance between positively and negatively phrased items. SAVA-items were presented in a randomized order for each participant.

2.7.3.1. Trust

Our measurement of trust was inspired by a multitude of investigations, but mostly building on recent developments in AV acceptance research [23,25,27,38,40,41]. We focused on the three concepts suggested by Körber: competence/reliability, understandability/predictability and intention of developers. We opted to include a general item as well as items to measure each of the three sub-components, with adjustments to the context and as a result of the pilot. These items closely resemble the ones used in other trust in automation studies [37,54]:

(i) I can trust such a vehicle;
(ii) I think these vehicles are reliable;
(iii) This vehicle is not sufficiently predictable in traffic; and
(iv) I believe the developers of such vehicles place great emphasis on passenger safety.

2.7.3.2. Utility

Many studies have investigated people's perception of the utility of AVs. Our conceptualization hails from the TAM, but relies on modern indicators [17,23,27,44]. These were chosen to most effectively capture variation in the latent construct of utility. We opted to include a general item for usefulness [22], in addition to car-reduction [64], availability improvement [27] and improved possibilities for personal mobility [17] as these are often cited potential benefits of SAVs. More than 80% of Norwegians have access to a car, justifying the general phrasing of the car use-item [99]. These were somewhat adjusted to the context and after pilot testing, particularly the second and fourth items:

(i) I believe this type of vehicle can be useful to me;
(ii) such vehicles are unlikely to reduce car use;
(iii) such vehicles can improve access to public transportation; and
(iv) I doubt that such vehicles can enhance my travel options.

2.7.3.3. Social comfort

The social aspect of sharing an automated ride has received little attention in research. There is also limited insight from previous ridesharing efforts. Our indicators were developed to capture some common concerns people report about SAVs [9,23,77,79]. These items were used in a similar survey by the authors [23]. We adapted the last item after the pilot because of poor reliability and to better reflect the status of the research:

(i) I think it is unfortunate that I have to sit so close to others;
(ii) I do not mind talking to strangers in such a vehicle;
(iii) women should avoid sharing these vehicles with unfamiliar men; and
(iv) I am unsure how I should behave around other passengers in such a vehicle.

2.7.3.4. Intention to use

Because of the low deployment and penetration of SAV services in society, intention to use is often the key dependent variable in surveys investigating acceptance of AVs. This construct is thought to be detrimental for actual use and has long traditions in social science. We used a scale previously used successfully in similar settings [23]. This approach used three items measured on a five-point Liker scale:

(i) I will start using this service once it becomes available;
(ii) I would try this service if it became available where I live; and
(iii) I will not use the service even if it becomes available.

To improve interpretability and inform future development of the measurement model, we included a single open-ended follow-up prompt for a randomly selected item from each participant's survey, asking 'why did you choose the rating above?'. This was implemented by assigning one reflective question per person. This qualitative data was only explorative and would be examined to improve interpretation of the survey items. Answers will be archived alongside the dataset to support future content validation and refinement of the SAVA constructs.

2.7.3.5. Actual use/familiarity

Actual users of SAV services are probably an elusive population to reach owing to the low deployment of SAVs in society. However, our targeting of areas where there have been piloted SAVs may increase our chances of reaching them. Ultimately, if approximately 225 respondents have user experience, we would be able to investigate main effects of our model to predict differences between populations that have or have no experience. Actual use was measured on a frequency scale using the following three items:

(i) have you seen a self-driving vehicle in traffic?
(ii) have you tried being a passenger in a self-driving vehicle? and
(iii) have you tried Ruter's self-driving vehicle in Groruddalen?

2.8. Data filtering and missing values

We chose some criteria to increase the quality of the data collected and exclude some responses. We excluded extreme values for time taken to complete the survey. Participants spending less than 2 min

or more than 1 h were excluded from analyses. Using less time than this is unlikely if any person were to answer the survey carefully. Likewise, using too long a time may suggest that they got distracted and may thus lose the coherence of the survey structure.

Participants who failed to answer any of the SAVA-items were excluded as they provide too little information for our analyses. We screened for invariant responses like selecting the same scale point across all SAVA items. Missing values were otherwise handled by the SEM estimation, using the full information maximum likelihood function in *lavaan* for both dependent and independent variables. We reported the number of cases excluded at each filtering step (e.g. timing, missing data, straight-lining), and all criteria and final sample counts may be documented in a supplementary flowchart or summary table. Participants excluded may be replaced by recruiting additional respondents if we fall below the minimum threshold of 800 participants. Previous similar research by the authors ended up excluding approximately 10% of the gross sample, which may be comparable with our current study, although these responses were eliminated mostly after a failed attention check [23]. We did not plan to conduct multivariate outlier analysis, as our primary goal is to test a structural model rather than estimate means or population-level prevalence.

The answers to our rumination prompt for the experimental manipulation may be explored. The content of people's responses may be analysed qualitatively or using a language model such as ChatGPT if the data is too vast. This use of AI has seen some success recently and may be helpful for qualitative analysis of large datasets [100].

2.9. Deviations from the registered protocol

Below we describe every departure from the preregistered procedures, the rationale for each change, and whether the decision was taken before data were inspected (i.e. prior to seeing outcome variables) or after the study had launched. The most significant change was switching data collection procedure from SMS to email. This was done owing to technical issues with SMS and low response rate before any data was inspected. The changes are presented in table 3.

All modifications were made prior to data inspection and in response to logistical issues unrelated to study outcomes. No analytic decisions were changed post hoc. Hence, the deviations have negligible impact on the confirmatory status of the preregistered hypotheses, while improving participant privacy and ensuring adequate sample size. The email addresses belonged to people who had been previously drawn as a general sample of the Norwegian population and should therefore not diverge from the SMS sample we originally intended to use in any significant way. However, there may be some sample selection biases emerging from them voluntarily signing up for future transport related studies.

3. Results

3.1. Data preparation and participant flow

We had 1361 completed responses downloaded from the survey server. That means that we had a 25% response rate to our email invitations. Thirty-three participants were removed because of incomplete data on the key SAVA-items. No participants were removed owing to straight-lining all SAVA-items. Seventy-three participants were removed owing to using less than 2 min or more than 1 h to complete the survey. We removed five respondents that did not report either male or female gender for our multivariate analysis purposes, as there is no established way to handle this. Thus 1250 participants were carried forward for analysis, meaning we excluded 8.2% of our completed cases.

In our data cleaning, we renamed columns to make them more readable. We recoded the eight groups into separate experimental and control groups. We also created a group for those who only experienced experimental conditions and those who only saw control vignettes. We recoded gender, 'hours of commute', 'public transport use' and exposure variables to have 0 as a null-point to ease multivariate interpretation. We reversed the necessary items (trust3, utility2, utility4, social comfort2 and intention3).

Table 3. Changes from the registered protocol with rationale and timing explained.

change	rationale	timing
removed postal-code and email questions from the main survey	to guarantee respondent anonymity and comply with institutional data-protection advice	after 17 responses were collected—prior to sending email invitations
minor wording tweaks in the survey (e.g. 'service' → 'vehicle', 'other passenger' → 'others')	to improve clarity; no change in meaning	before launch
added a fifth 'not relevant' category to the commute-time item; recoded as '0' in analyses	respondents reported not finding any suiting alternative in the existing options	after 17 responses were collected—prior to sending email invitations
updated the conceptual diagram in the manuscript	updated the measurements of the SAVA-factors so the figure matched the final item set; no analytical change	before analysis
re-phrased the SMS invitation text	to better motivate responses	after sending 1000 SMS invitations
recruitment procedure altered: sent 2000 SMS invitations, obtained 17 responses; switched to email after technical problems and very low response rates	SMS delivery failures and <1% response prompted a change. No outcome data had been examined when this decision was taken	after 1 week, but before looking at survey responses
obtained 5467 email addresses from two recent transport-survey projects (participants had consented to re-contact) and distributed an email invitation	to achieve the preregistered sample size in an ethically acceptable and practical way once SMS proved unviable	immediately after abandoning SMS, still before analysing data
drafted an email invitation consistent with the approved study description and SMS text	necessary because the channel changed from SMS to email: more descriptions were added	before email distribution
final sample size: 1361 completed surveys 1 week after the email launch (2 weeks after the initial SMS attempt)	achieved target power despite the recruitment adjustment	2 weeks after the first SMS was sent.

3.2. Achieved power

When data collection was halted, we had already surpassed our minimum required sample size by a comfortable margin. Although we could have attempted to continue recruitment, we were confident that the sample size would provide sufficient statistical power for our planned analyses. For the SEM analysis, a post hoc power test indicated that the model had near-perfect power (≈ 1.00) to detect a moderate degree of model misfit (RMSEA = 0.08) compared with a close-fit null (RMSEA = 0.05), given the sample size (n = 1250) and model complexity (d.f. = 98). This confirms that the SEM was well-powered to detect meaningful deviations from good model fit.

For the experimental tests, power depended strongly on how comparisons were structured. In the full-control versus full-experiment condition (group 1 versus group 8), group sizes were approximately 156 participants each. At this size, power to detect a small-to-medium effect (f = 0.15) was moderate (0.75) and rose to 0.81 for f = 0.16, which meets the conventional threshold for acceptable power. By contrast, power to detect a small effect (f = 0.10) was only 0.42, well below the standard 0.80 cut-off.

If comparisons are made using larger pooled groups, such as comparing all participants exposed to an experimental manipulation against those not exposed for each manipulation, this yields group sizes of $n \approx 625$, giving high power (≈ 0.94) to detect small effects (f = 0.10). However, the observed effects from the manipulations were very small: f = 0.048 (trust), f = 0.047 (utility) and f = 0.033 (social comfort). This yielded low statistical power (≈ 22–40%), indicating that while the study had sufficient sensitivity to detect meaningful effects, the manipulations produced effects too small to be reliably detected at the group level.

Table 4. Sociodemographic information and experience with AVs of our sample, $n = 1250$.

		n	%
gender	men	739	59
	women	511	41
age	under 19	0	0
	20–29	58	5
	30–39	137	11
	40-49	268	21
	50–59	342	27
	60–69	318	25
	70–79	112	9
	more than 80	15	1
hours of commute	not relevant	462	37
	less than 30 min	402	32
	31–60 min	146	12
	1–2 h	33	3
	more than 2 h	207	17
public transport use	no days	505	40
	1–2 days	385	31
	3–4 days	188	15
	5–6 days	153	12
	7 days	19	2
seen AV in traffic?	no/unsure	659	53
	yes, once	264	21
	yes, multiple times	327	26
tried AVs?	no/unsure	1116	89
	yes, once	89	7
	yes, multiple times	45	4

3.3. Sociodemographics of the sample

Table 4 displays descriptive statistics for key background variables, including gender, age, commuting habits and experience with AVs.

The sample had a slight majority identifying as men and most falling within the 40–69 age range. This is not atypical for surveys about technical subjects, where men typically are more likely to respond, but not overly skewed. Commute patterns varied. About one third reported not commuting, while another third commuted less than 30 min. Public transport usage was also diverse, with two in five reporting not using public transport, while a third used it 1–2 days per week. Regarding AV exposure, just over half had not seen an AV in traffic. Experience with AVs was limited, which is to be expected. However, 134 participants reported having tried being a passenger in a self-driving vehicle. These findings indicate that although AVs are increasingly present, direct user experience remains rare.

3.4. Descriptive statistics and scales

Table 5 presents descriptive statistics for the four key study constructs: trust, utility, social comfort and intention to use, based on data from 1250 participants. The table includes means, standard deviations, internal consistency (Cronbach's α), as well as skewness and kurtosis indicators.

All scales showed acceptable to excellent reliability. Although trust and social comfort scales could see marginal improvements if we removed the fourth and third item respectively, we retained

Table 5. Descriptive statistics of the study scales with reliability and skew statistics, $n = 1250$.

	mean	s.d.	Cronbach's α	skew	kurtosis
trust	3.30	0.53	0.89	−0.47	0.24
utility	3.26	0.37	0.86	−0.29	2.73
social comfort	2.96	0.60	0.74	0.11	0.14
intention	3.01	0.48	0.94	−0.47	1.17
tech savviness	3.26	0.91	0.73	−0.26	−0.45

them due to their theoretical relevance and minimal impact on scale quality. No other deletions improved reliability. The distributions were approximately normal, though utility and intention showed slight negative skew, and utility had a somewhat elevated kurtosis, indicating a moderately peaked distribution. Mean scores were around the midpoint of the scale, with trust and utility rated slightly higher than intention and social comfort. Histograms showing the distribution of the SAVA factors' constituting items are presented in the appendix.

3.5. Experiment analysis of variance

Figure 2 summarizes the different means of the three experimental manipulations on trust, utility and social comfort. Each construct was compared between a control condition and an experimental condition.

The means between experimental and control conditions are very similar, with small confidence intervals. The groups are similar in size. To evaluate the effectiveness of the experimental manipulations, separate one-way ANOVAs were conducted for each construct (trust, utility and social comfort), comparing participants in the experimental versus control conditions.

The manipulation targeting trust yielded a significant effect, $F_{1,1248} = 4.83$, $p = 0.028$, indicating that the trust-enhancing manipulation led to a small reliable increase in trust ratings. By contrast, the manipulation targeting utility did not produce a significant difference, $F_{1,1248} = 0.08$, $p = 0.781$, suggesting that perceived utility was not affected. The manipulation aimed at social comfort showed no significance, $F_{1,1248} = 3.33$, $p = 0.068$, indicating non-existent or very small effect that did not reach conventional significance thresholds. The eta squared effect sizes were 0.002 for trust, 0.002 for utility and 0.001 for social comfort, indicating very small effect sizes. Overall, these results suggest that the experimental manipulations had minimal effects, with only the trust intervention showing a small impact.

3.6. Structural equation modelling comparisons

To assess the structure and predictive pathways of SAV acceptance, we tested two SEM models using maximum likelihood estimation in the *lavaan* package in RStudio. These two models are presented in figure 3.

The first model specified trust, utility and social comfort as three correlated first-order latent variables predicting intention to use. This model showed good fit to the data: d.f. = 98, CFI = 0.973, TLI = 0.967, RMSEA = 0.054 (90% CI [0.049, 0.059]) and SRMR = 0.034.

The second model included a higher-order latent construct, the GAF. The GAF was defined by the three first-order latent variables trust, utility and social comfort. In the model, GAF was specified as the sole predictor of intention to use, capturing the shared variance among the three underlying first-order factors, rather than allowing the predictors to correlate. This model also showed good fit: d.f. = 100, CFI = 0.973, TLI = 0.967, RMSEA = 0.054 and SRMR = 0.034. All three constructs significantly loaded onto the GAF. The GAF significantly predicted intention ($\beta = 0.962$, $p < 0.001$).

A chi-square difference test revealed that the second GAF model had a significantly poorer fit than the first direct model, despite the fit indices being otherwise equal: $\Delta\chi^2_2 = 7.41$, $p = 0.025$. The models both performed almost equally satisfying on our key model fit indices. Based on this and the principle of parsimony, we retained the three-factor direct-effects model as the better-fitting structure.

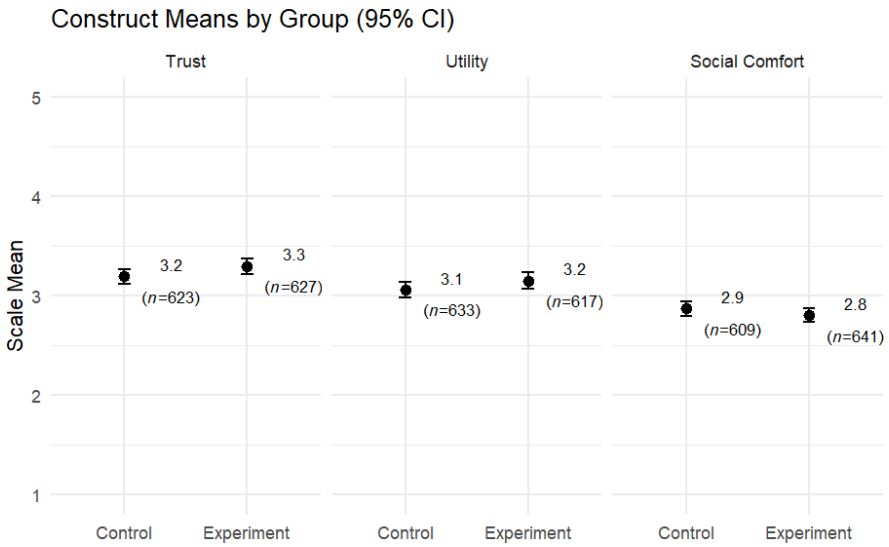
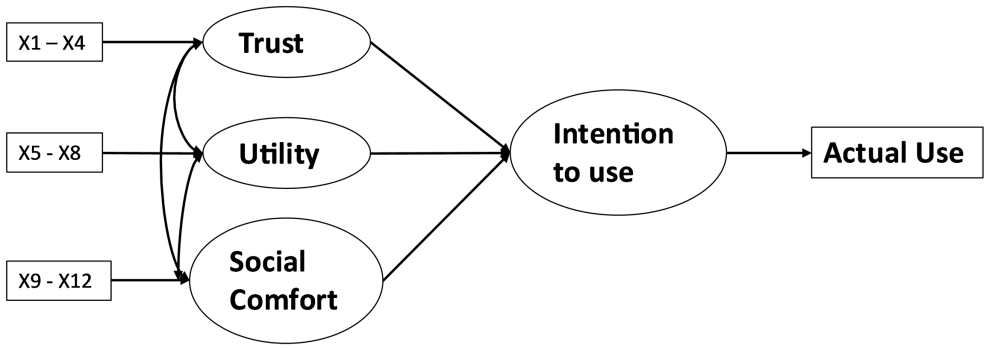


Figure 2. A plot illustrating the differences between control and experimental conditions for the three SAVA-constructs: trust, utility and social comfort. $n = 1250$. CI, confidence interval.

Model 1: Trust, utility, and social comfort directly predicts intention to use. The GAF is implied in the correlation between the three constructs.



Model 2: Trust, utility, and social comfort constitute a General Acceptance Factor that in turn predicts intention to use.

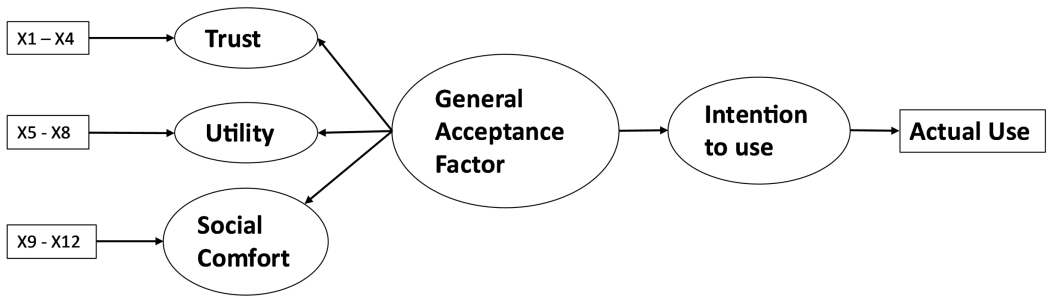


Figure 3. A path model overview of the two models being compared. The first implies a GAF in its correlation, while the second explicitly tests whether a GAF yields a better fit to data.

3.7. Structural equation modelling analysis and path model

This preferred direct model without the higher-order GAF is presented in figure 4 with model parameters.

Overall, the estimated model confirms that utility is the strongest unique predictor of intention, while trust also contributes positively. Social comfort was negatively associated with intention in the model, suggesting that less comfort is associated with less intention to use. The SAVA constructs also correlated significantly. This suggests that, while they are treated as separate, they still share

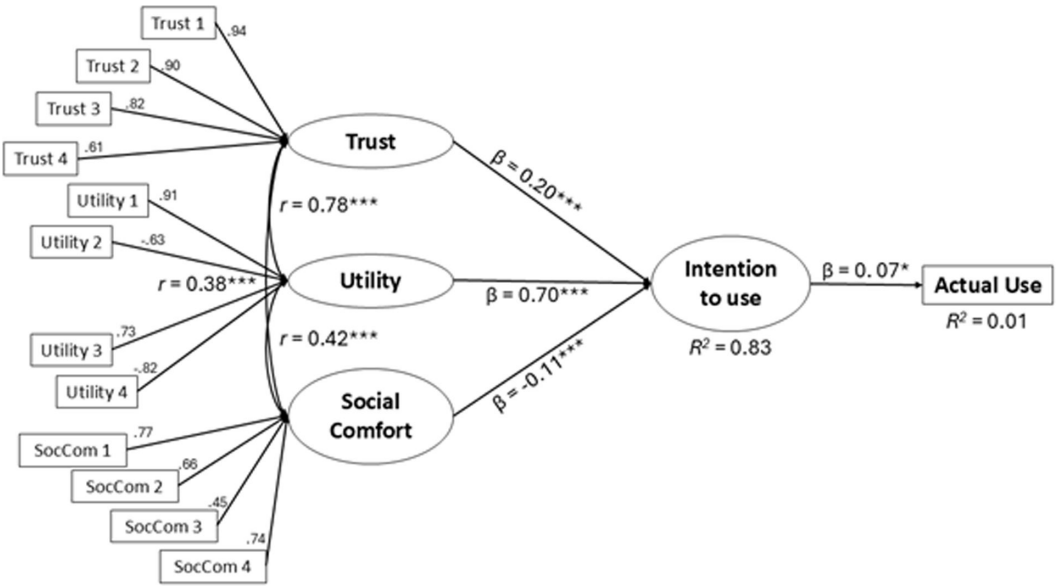


Figure 4. The path model for our preferred conceptual model, including item loadings, the size of the standardized path estimates and correlations. *$p < 0.05$. ***$p < 0.001$.

significant amounts of variation between them, particularly trust and utility. The latter indicates that trust relates to intention, though its unique effect weakens when controlling for utility. The factor loadings from the SEM analysis indicate that the latent constructs were generally well measured. All indicator loadings were statistically significant ($p < 0.001$), with most standardized loadings exceeding 0.70, suggesting strong associations between items and their respective latent variables. Trust and utility showed particularly strong internal consistency, with most loadings above 0.80. The social comfort factor had slightly lower loadings, especially for 'social comfort 3', indicating this item may contribute less reliably to the construct. This echoes the previous finding with a higher Cronbach's α if the item was deleted.

3.8. Exploratory analyses

This section includes exploratory analyses that were not explicitly described in the stage 1 registered report. They were included to further explore the relationships discovered in the data.

3.8.1. Full experimental effect

To explore the overall effect of the combined experimental manipulation, we conducted an exploratory one-way ANOVA comparing participants in the full control group (group 1) with those in the full experimental group (group 8). This grouping reflects the most extreme contrast in the experimental design, where participants either received no manipulation or all three manipulations. This comparison serves as a pragmatic test of the total manipulation effect on participants' intention to use SAVs. The difference in mean scores in intention to use between the two groups is shown in figure 5.

The analysis showed no significant difference in intention to use between the control and full experimental group, $F_{1,305} = 0.94$, $p = 0.332$. The eta squared was 0.003, indicating a very small effect size. This suggests that the combined manipulation across all three factors did not substantially alter participants' behavioural intention.

3.8.2. Factor structure

To explore the underlying structure of the 12 items used to measure trust, utility and social comfort, we conducted a principal component analysis (PCA) using varimax rotation. This analysis served as an exploratory follow-up to our confirmatory SEM models and helped assess whether a simpler factor

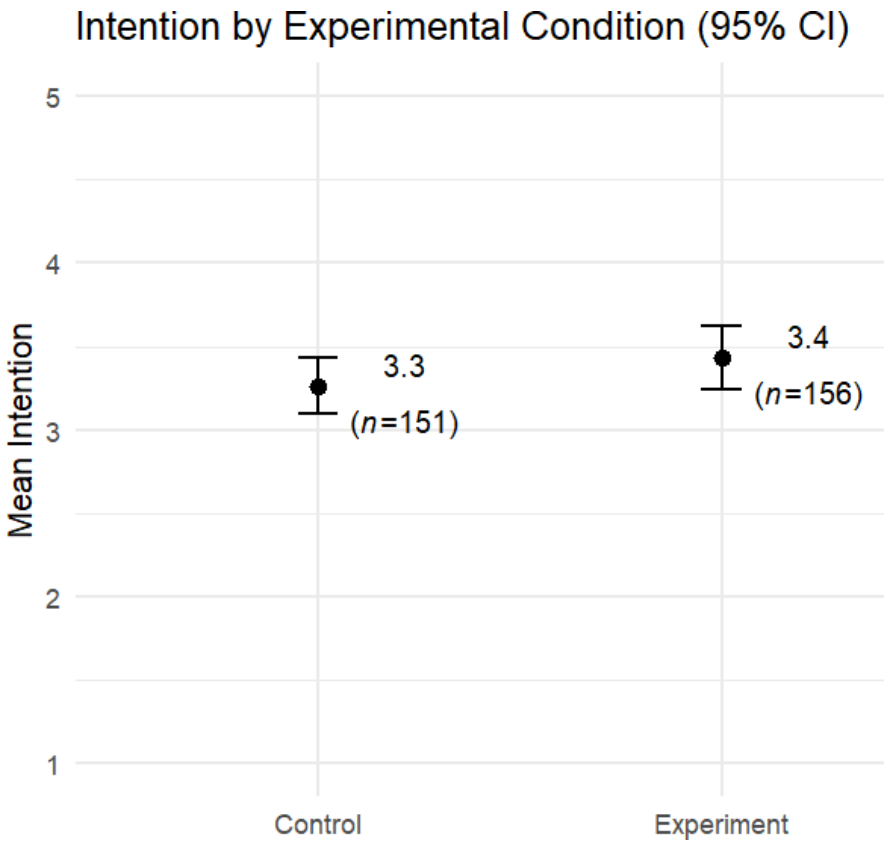


Figure 5. A plot illustrating the differences in intention to use between those who only saw control and experimental conditions. $n = 307$.

structure was empirically supported. The parallel analysis and scree plot in figure 6 indicate that two components had an eigenvalue exceeding those derived from simulated and resampled data.

This analysis suggests a simplified two-factor structure. Consistently, the varimax-rotated PCA revealed one dominant component (eigenvalue = 5.45), accounting for 45.5% of the total variance, with a second component explaining substantially less. All items loaded above the 0.30 threshold on the first component, with trust and utility items showing particularly strong loadings (e.g. trust1 = 0.84, utility1 = 0.83). Items from the social comfort scale had a smaller loading (e.g. soccom3 = –0.37), indicating that this construct may be less aligned with the GAF that emerged. The model fit for this two-factor solution was relatively poor, with an RMSR of 0.118. In some ways, these exploratory results challenge the SEM-analyses and suggest that there may be alternate ways of structuring the items, with both one- and two-factor solutions. However, given the poor fit and exploratory nature of the analyses, these factor solutions provide only limited support for alternate factor structures among the items. Parallel analysis has also been shown to be overly conservative when factor correlations are high, such as between trust and utility, and/or when each factor is defined by few items (see e.g. [101]).

3.8.3. Sociodemographic differences in shared automated vehicle acceptance factors

To examine whether demographic and behavioural characteristics were associated with user acceptance of SAVs, we conducted four exploratory linear regressions predicting the constructs of trust, utility and social comfort, as well as behavioural intention. These are presented in table 6.

All models explained only a small proportion of the variance in their respective outcomes. Still, some noteworthy patterns emerged. For trust, gender and tech savviness were significant positive predictors. The utility model similarly showed a positive relationship with tech savviness, and public transport use was also positively associated with utility perceptions. The social comfort model revealed a single significant predictor: age was negatively associated, suggesting that younger participants felt more at ease with the social aspects of SAV use. Having seen AVs and being more tech-savvy were the only significant predictors of intention to use. These are probably all interrelated constructs that

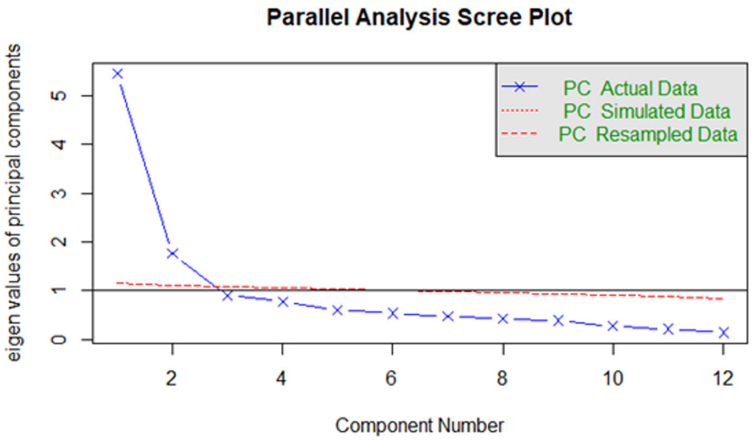


Figure 6. Parallel analysis and scree plot for the 12 SAVA-items in the survey, $n = 1250$. PC, principal component.

Table 6. Linear ordinary least squares (OLS) regression with standardized beta coefficients and *p*-values for each of the three SAVA factors and behavioural intention, $n = 1250$. (*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.)

	trust		utility		social comfort		intention to use	
predictors	*β*	*p*	*β*	*p*	*β*	*p*	*β*	*p*
age	0.06	0.053	−0.02	0.622	−0.12	<0.001***	0.04	0.182
gender[a]	0.06	0.041*	0.02	0.592	0.02	0.418	−0.01	0.632
seen AVs?	−0.05	0.099	−0.04	0.228	−0.02	0.436	−0.09	0.003**
public transport use	−0.04	0.184	0.07	0.015*	−0.01	0.746	0.04	0.168
hours commute	−0.05	0.091	−0.05	0.089	0.01	0.763	−0.03	0.323
tech savviness	0.13	<0.001***	0.09	0.007**	−0.02	0.525	0.22	<0.001***
adjusted R^2	0.015		0.011		0.011		0.045	

[a]0 = men, 1 = women.

work to push tech-interested people towards novel technologies, such as AVs. There was no issue of multicollinearity in our models. Neither gender nor age were significant in predicting behavioural intentions.

4. Discussion

This study set out to evaluate the SAVA model and to test whether concise informational cues could impact its three proposed components: trust, utility and social comfort. SEM showed that this parsimonious model is very well suited to model intentions to use SAVs. The three predictors were aptly constituted by their indicators, and the model predicted more than 80% of variance in behavioural intention. Although a second-order GAF also produced an acceptable fit, chi-square difference testing and the principle of parsimony argued against retaining this more complex alternative. Utility provided the strongest effect on intention, while trust and social comfort contributed smaller but reliable effects. The experimental manipulations consisted of brief text-based vignettes. Only trust increased owing to our experiments, but its effect size was very small and practically insignificant. While the proposed model seems very well suited for explaining and predicting SAV behaviour and intention, more work is needed to understand how to best influence the key perceptions of trust, utility and social comfort.

4.1. Constituting the shared automated vehicle acceptance model

The finding that trust, utility and social comfort each uniquely contributed to intention to use aligns with our aim of providing a more parsimonious model. Such a model could be of great use in practical settings where short-form surveys and user experience interviews are used. A shorter questionnaire enables easier deployment of a framework that is soundly grounded in theory. Some nuance may be lost in employing a simpler model, such as somewhat reduced explanatory precision compared to broader frameworks like UTAUT-4AV, which have demonstrated very high predictive power [17]. The model also omits a full measure of hedonic motivation or social norms, and is thus poorly situated to measure these factors. Nonetheless, the parsimony of the SAVA model offers clear advantages for applied contexts, where brevity and ease of use are often necessary trade-offs against maximal accuracy. Longitudinal studies could also look to use this model as a simple means of gaining comparable answers over time. Standardization on measurement could also give huge benefits across different applications of the technology and across contexts. The current paper could stipulate a way forward that unifies a scattered research field and provide a framework that is both easy to understand and empirically test. In an ever-changing field of research where technology is assumed to make great leaps in the coming years, we argue that it is important to be aware of how people's perceptions change along with it.

In line with previous findings, the results confirmed that trust, utility and social comfort explain substantial variance in acceptance [23,27,37,55,72]. Although construct means appeared to cluster around the midpoint of the scale, this should not be taken as evidence of neutrality. Item-level distributions showed substantial variation across the response scale, indicating that the midpoint reflects aggregation rather than indifference. Notably, the present results reaffirm that trust remains foundational for AV adoption, capturing perceptions of competence, predictability and developer intent [25,37,38,55]. Our conceptualization built on this tripartite framework and found support for its predictive relevance in the context of SAVs. The latter part, intention of developers, seems to be a little loosely tied to the other perceptions as measured by factor loadings. The scale showed good internal consistency in line with previous work using similar items, but these did not use intention of developers in their scale [54]. The overall results still support our conceptualization and measurement of trust. Tech-savviness and gender showed significant effects in predicting trust; suggesting that women are more likely to trust when the important technology interest is accounted for. Men have often been found to be more interested in technology and more optimistic, so controlling for this highlights the underlying structures [25,102]. No other background variables impacted trust, meaning it is largely determined by other factors. Trust remains an integral part of intentions to use and should be included in research wanting to predict and explain usage intentions and eventual behaviour. As such, it is well placed as the most fundamental part of the AV acceptance pyramid recently proposed [26]. The second layer of this pyramid is proposed to be 'efficiency'; a similar construct to our utility.

Utility was important for predicting intentions to use. This echoes the prominent role of performance expectancy in UTAUT-related studies and the TAM's perceived usefulness dimension [18,22]. Participants' belief that SAVs would improve their travel options and offer a viable alternative to private car use significantly predicted intention, consistent with the wealth of research that has used either TAM or UTAUT, both in SAV acceptance research and technology more broadly. Reducing car use seems to be less central to the construct than the other three items. Mere phrasing may have played a role; the other three items are framed as enhancing or improving something, while this item mentions reducing car use. Simply reversing items may also cause some psychometric artefacts [103]. However, the extraneous variation may simply originate from difference in consideration; whether SAVs could reduce car use could be considered as a potential benefit for society, but not necessarily a personal gain. The scale did show good internal consistency and constitutes a good measure of our intended construct of utility. Public transport users found a SAV service more useful, as did more tech-savvy respondents. Hours of commute did not play a role, neither did age or gender. Perhaps the service presented in the current study lacks characteristics to be considered a real improvement in most peoples' everyday mobility patterns. This exploratory regression analysis predicting utility scores largely suggests that other factors are important for value judgements.

Social comfort is the most novel and least studied construct in the current paper. It also emerged as an independent predictor in our SEM model. Its predictive validity supports arguments made by several papers arguing that interpersonal concerns are under-represented in current models [8,9,14,23,72,77]. The focus on discomfort with strangers, norms of interaction and safety inside the SAV appeared to capture a meaningful dimension of resistance. The poorest fitting item was the

sentiment that women should avoid sharing with unfamiliar men. Although Norway does have gendered issues in perceived security, they are world leading in gender equality [104,105]. These issues may be more important in other nations that are less equal. The only significant predictor of social comfort in our exploratory analysis was age, suggesting that older participants reported lower discomfort. The lack of gender effect suggests that women themselves do not rate the social situation as more deterring. Neither does being used to public transport impact these judgements. Although the scale scored low for internal consistency, it is acceptable for short scales. Our construct seeks to accommodate both feelings of personal space, being around strangers, prejudice and normative beliefs. Future research may help shed light on how to best consolidate social comfort, but we believe that the current study has laid the foundation for a diverse and precise measurement of the social issues regarding SAVs.

4.2. Comparing factor structures

The original UTAUT model and its adaptations have often struggled with theoretical overload and insufficient parsimony [15–17,32]. Our results support recent efforts to reduce dimensionality without sacrificing explanatory power [23,24]. However, the current paper does not lend credence to the notion of a unified GAF. We tested both a nested model with a higher-order GAF and ran PCA. We found scarce support for a single factor. While the higher-order GAF SEM showed acceptable fit, the better performance of the disaggregated model underscores the value of keeping trust, utility and social comfort conceptually and empirically distinct. The high correlations between the constructs suggest that they share a substantial amount of variance, but it seems that they are sufficiently distinct as to be conceptually kept apart. As this is, to our knowledge, the first study to compare these factors, there is little previous insights to glean from. However, the traditions for trust in automation and utility (or perceived usefulness and similar constructs) have distinct traditions [22,39]. It seems that our participants make distinct judgements of the SAVs' trustworthiness and their utility, although these judgements impact each other. This makes colloquial sense, as a completely untrustworthy service would be of very little value.

In our SEM analysis, utility emerged as the most efficacious predictor of behavioural intention. Trust and utility are highly correlated. This complex connection between them may be best handled by the more advanced SEM analysis. Regression analyses use simple arithmetic means and assumes low correlation between predictors. SEM accounts for measurement error by modelling latent constructs and thereby avoids conflating true variance with random noise. If the utility items were more internally consistent or less affected by random measurement error than the trust items, the SEM approach would naturally amplify their contribution. In our case, the choice of analysis method may have made a substantial difference. The more advanced modelling inherent in SEM gives a unique opportunity to account for this correlation. While trust would also be expected to relate strongly to intention, its unique contribution diminishes when controlling for utility. Future research should be wary of this when choosing statistical approaches for analysing their data. However, all three of our factors seem to independently contribute important variance to the predictions of intention.

Some previous research has also included both trust and usefulness. In SEM analyses, these have often found to be about equally efficacious [27,54,106]. However, these models also include several other factors that may influence the results. In other frameworks, trust is often either grouped with background factors and personality, or as a antecedent factor along with experience (i.e. [53]). There may be room for future research to investigate whether this approach, keeping trust at the more fundamental stage, could further clarify the simplified SAVA framework. While a meta-analysis suggests that trust and utility are about equally correlated to behavioural intention, their interconnectedness may complicate statistical analyses [107]. This may be solved by conceptually placing trust at the more fundamental levels of the 'pyramid of AV acceptance' [26]. Social comfort seems to be modestly, but reliably predictive of usage intentions. For this construct, it should be noted that these effects are at the group level. There may be people in this category for whom social comfort is of outmost importance. Previous research has suggested that people mostly are quite indifferent, while there are some who are at both extremes of the spectrum; some being delighted to share while others are discouraged [8,72]. The SEM model suggests a high degree of explained variance. This further suggests that the variance within each of the three SAVA-factors do contribute crucially to explaining SAV acceptance.

4.3. How to impact shared automated vehicle acceptance factors?

We did expect our vignette experiment to yield small but reliable results. However, this was not the case. Only one very small statistically significant effect on trust was uncovered. Nor was there any effect in the full control and full experimental groups as tested in exploratory analysis. These results show that public perceptions may not be very malleable. It may take more impactful interventions to improve intention to use through the SAVA-factors. A similar previous approach using illustrations along vignettes also failed to find any experimental effects, further emphasizing the inability to affect perceptions in this way [8]. Future studies should look to create more engaging interventions to test how to best improve acceptance. Several reports have noted positive effects of actual user experience with AVs [47,86,108], although some find more mixed effects owing to the technological immaturity of most available AV and SAV pilots [25,51,109]. Appropriate user testing and introduction may be key in succeeding with SAV deployment. Mere informational campaigns may not be sufficient and low-capability pilot testing may be harming user acceptance. Further research should continue to investigate the malleability of the SAVA factors as SAV services become increasingly available.

4.4. Strengths and limitations

The current study uses a stringent pre-registered approach adhering to open science principles. We have provided theoretical justification for a parsimonious SAVA model. This model shows great applicability in measuring usage intentions. We failed to find any practically significant effects of our vignette experiments. However, these null findings are still important as they provide clear avenues for future research.

Several caveats apply to our research. Recruitment via SMS and email probably under-represents digitally sceptical groups or groups who are less keen on answering online surveys. The sample was recruited as a general population sample, but respondents invited by email had already recently completed one transportation related survey. This two-step selection process may have further amplified sampling biases. Furthermore, already answering a survey about transport-related topics may induce a level of experience bias in our respondents. However, the previously completed survey was on a different topic: perceptions of transport policies for sustainable mobility. This may have made people more aware of transport research, but probably not to the point of impacting our results.

Our sample was slightly skewed towards male and older participants. Respondents were about the mid-point on intention to use and tech-savviness, which suggests that they probably were neither very optimistic nor pessimistic about the future of SAVs, suggesting that they were apt for our theory and model testing purposes. Differences in commuting times may be important to control for, as different contexts may yield very different ratings of possible utility for a SAV service. This, and similar measures of satisfaction with current mode of transport, is exactly the kind of consideration we sought to capture with our utility factor. Similarly, other questions regarding safety or risk perception may influence the efficacy and reliability of the trust factor. Because traffic safety and normal commute times vary with context, this may be important to include to improve external validity.

The cross-sectional design of our study precludes firm causal claims about the ordering of constructs. AV experience may, for example, impact SAVA-factors, instead of the other way around. The respondents' limited experience with SAVs may also be a cause for future investigation, as some have suggested that this may impact their answers in important ways [24]. Norway's characteristically high institutional trust and low inequality may limit generalizability to lower-trust societies. Future research should investigate whether and to what extent this impacts results.

In addition, mean values across SAVA-constructs tended to cluster around the midpoint of the scale. This overall central tendency limits the absolute variance available for explanatory modelling and highlights an important challenge for SAV acceptance research more broadly. Because most studies, including ours, rely on hypothetical scenarios of future services, respondents may struggle to take a clear stance and instead default to a neutral midpoint. This suggests that researchers should be cautious in interpreting neutral averages, as they may mask underlying heterogeneity in views while simultaneously constraining the explanatory power of acceptance models. However, we find that item-level distributions showed that this pattern reflects a mix of divergent responses rather than uniform neutrality, suggesting that our results were not overly impacted by this. The fact that the scales centred around the midpoint shows that the totality of items for each scale is well rounded without any heavy skew, rather than reflecting indifference to the survey questions. Future work should be weary of this and investigate ways of improving variance in responses to abstract concepts.

4.5. Future research directions

We encourage future research to test and apply the SAVA model in different cultural, technological and transport contexts. Further validation could involve longitudinal designs, field experiments or cross-national surveys to assess the model's robustness and predictive power. Researchers might also explore how the relative importance of trust, utility and social comfort shifts across user groups or over time, especially as exposure to AV technology increases.

5. Conclusions

A succinct SAVA model comprising trust, utility and social comfort was introduced and tested. Results suggest that it offers a robust yet tractable lens through which to understand public acceptance of SAVs. While perceived utility remains the primary driver of intention, trust exerts an indispensable secondary influence, and social discomfort can hinder uptake. Informational nudges alone appear insufficient to bolster usage intentions. The parsimonious model is a promising new avenue for practical, yet theoretically anchored, examinations of novel SAV technology in the coming years.

Ethics. The research was conducted in accordance with the guidelines of the National Research Ethics Committee of Norway. The Norwegian Agency for Shared Services in Education and Research (Sikt) evaluated the proposed survey and confirmed that the collection and management of personal information was compliant with law (ref. no. 665388).

Data accessibility. All data, materials and analysis scripts associated with this article are openly available on the Open Science Framework (OSF) [110].

The submission follows the strict procedure of a registered report and was granted level 6 of bias control: 613309490336.

Supplementary material is available online [111].

Declaration of AI use. Artificial intelligence (AI) was used solely for language editing to improve readability and clarity of the manuscript. No AI tools were employed for generating scientific content, analysis, interpretation of results or drawing conclusions. The authors take full responsibility for the integrity and accuracy of the work.

Authors' contributions. O.A.: conceptualization, formal analysis, funding acquisition, investigation, methodology, visualization, writing—original draft; P.U.: conceptualization, investigation, supervision, writing—review and editing; M.H.: conceptualization, funding acquisition, supervision, writing—review and editing.

All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

Conflict of interest declaration. We declare we have no competing interests.

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References

1. Hult R, Campos GR, Steinmetz E, Hammarstrand L, Falcone P, Wymeersch H. 2016 Coordination of cooperative autonomous vehicles: toward safer and more efficient road transportation. *IEEE Signal Process. Mag.* **33**, 74–84. (doi:10.1109/msp.2016.2602005)
2. Iclodean C, Cordos N, Varga BO. 2020 Autonomous shuttle bus for public transportation: a review. *Energies* **13**, 2917. (doi:10.3390/en13112917)
3. Othman K. 2022 Exploring the implications of autonomous vehicles: a comprehensive review. *Innov. Infrastruct. Solutions* **7**, 165. (doi:10.1007/s41062-022-00763-6)
4. Szűcs H, Hézer J. 2022 Road safety analysis of autonomous vehicles. *Period. Polytech. Transp. Eng.* **50**, 426–434. (doi:10.3311/pptr.19605)
5. Nordhoff S. 2024 Resistance towards autonomous vehicles (AVs). *Transp. Res. Interdiscip. Perspect.* **26**, 101117. (doi:10.1016/j.trip.2024.101117)
6. Pokorny P, Skender B, Bjørnskau T, Johnsson E. 2021 *Performance of automated shuttles at signalised intersections*. TØI. See https://www.toi.no/getfile.php?mmfileid=55332.
7. Pokorny P, Høye A. 2022 Descriptive analysis of reports on autonomous vehicle collisions in California: January 2021–June 2022. *Traffic Saf. Res.* **2**, 000011. (doi:10.55329/xydm4000)
8. Aasvik O, Hagenzieker M, Ulleberg P. 2025 'I trust Norway' – Investigating acceptance of shared autonomous shuttles using open and closed questions in short-form street interviews. *Transp. Res. Interdiscip. Perspect* **31**, 101414. (doi:10.1016/j.trip.2025.101414)
9. Sanguinetti A, Kurani K, Ferguson B. 2019 *Is it OK to get in a car with a stranger? Risks and benefits of ride-pooling in shared automated vehicles*. University of California. See https://escholarship.org/uc/item/1cb6n6r9.
10. Middleton S, Zhao J. 2019 Discriminatory attitudes between ridesharing passengers. *Transportation* **47**, 2391–2414. (doi:10.1007/s11116-019-10020-y)

11. Asgari H, Jin X. 2019 Incorporating attitudinal factors to examine adoption of and willingness to pay for autonomous vehicles. *Transp. Res. Rec.* **2673**, 418–429. (doi:10.1177/0361198119839987)
12. Cartenì A. 2020 The acceptability value of autonomous vehicles: a quantitative analysis of the willingness to pay for shared autonomous vehicles (SAVs) mobility services. *Transp. Res. Interdiscip. Perspect.* **8**, 100224. (doi:10.1016/j.trip.2020.100224)
13. Raj A, Kumar JA, Bansal P. 2020 A multicriteria decision making approach to study barriers to the adoption of autonomous vehicles. *Transp. Res. Part* **133**, 122–137. (doi:10.1016/j.tra.2020.01.013)
14. Greifenstein M. 2024 Factors influencing the user behaviour of shared autonomous vehicles (SAVs): a systematic literature review. *Transp. Res. Part F* **100**, 323–345. (doi:10.1016/j.trf.2023.10.027)
15. Blut M, Chong AYL, Tsigna Z, Venkatesh V. 2022 Meta-analysis of the unified theory of acceptance and use of technology (UTAUT): challenging its validity and charting a research agenda in the Red Ocean. *J. Assoc. Inf. Syst.* **23**, 13–95. (doi:10.17705/1jais.00719)
16. Nordhoff S, Kyriakidis M, van Arem B, Happee R. 2019 A multi-level model on automated vehicle acceptance (MAVA): a review-based study. *Theor. Issues Ergon. Sci.* **20**, 682–710. (doi:10.1080/1463922x.2019.1621406)
17. Bellet T, Banet A. 2023 UTAUT4-AV: An extension of the UTAUT model to study intention to use automated shuttles and the societal acceptance of different types of automated vehicles. *Transp. Res. Part F* **99**, 239–261. (doi:10.1016/j.trf.2023.10.007)
18. Davis VMD. 2003 User acceptance of information technology: toward a unified view. *MIS Q.* **27**, 425. (doi:10.2307/30036540)
19. Venkatesh V, Thong J, Xu X. 2016 Unified theory of acceptance and use of technology: a synthesis and the road ahead. *J. Assoc. Inf. Syst.* **17**, 328–376. (doi:10.17705/1jais.00428)
20. Thong X, Venkatesh. 2012 Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Q.* **36**, 157. (doi:10.2307/41410412)
21. Ajzen I. 1991 The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **50**, 179–211. (doi:10.1016/0749-5978)
22. Davis FD. 1986 *A technology acceptance model for empirically testing new end-user information systems*. Massachusetts Institute of Technology. See https://dspace.mit.edu/handle/1721.1/15192.
23. Aasvik O, Ulleberg P, Hagenzieker M. 2024 Simplifying acceptance: a general acceptance factor predicting intentions to use shared autonomous vehicles. *Transp. Res. Part F* **107**, 1125–1143. (doi:10.1016/j.trf.2024.10.025)
24. de Winter J, Nordhoff S. 2022 Acceptance of conditionally automated cars: just one factor? *Transp. Res. Interdiscip. Perspect.* **15**, 100645. (doi:10.1016/j.trip.2022.100645)
25. Aasvik O, Hagenzieker M, Ulleberg P, Bjørnskau T. 2025 How testing impacts willingness to use and share autonomous shuttles with strangers: the mediating effects of trust and optimism. *Int. J. Human–Computer Interact.* **41**, 3783–3798. (doi:10.1080/10447318.2024.2352220)
26. Nordhoff S. 2023 Towards the development of an instrument for the assessment of road user automated vehicle acceptance: a pyramid of user needs of automated vehicles. *arXiv* (doi:10.13140/RG.2.2.25055.02728)
27. Nordhoff S, Malmsten V, van Arem B, Liu P, Happee R. 2021 A structural equation modeling approach for the acceptance of driverless automated shuttles based on constructs from the unified theory of acceptance and use of technology and the diffusion of innovation theory. *Transp. Res. Part F* **78**, 58–73. (doi:10.1016/j.trf.2021.01.001)
28. Schwing M, Reit V, Selinka S, Kuhn M, Meyer-Waarden L. 2025 How consumer experience shapes the adoption of autonomous technologies: a longitudinal study with shared autonomous vehicles. *J. Consum. Behav.* **24**, 1133–1153. (doi:10.1002/cb.2471)
29. Jing P, Xu G, Chen Y, Shi Y, Zhan F. 2020 The determinants behind the acceptance of autonomous vehicles: a systematic review. *Sustainability* **12**, 1719. (doi:10.3390/su12051719)
30. Mir FA. 2025 An integrated autonomous vehicles acceptance model: theoretical development and results based on the UTAUT2 model. *Transp. Res. Part F* **112**, 290–304. (doi:10.1016/j.trf.2025.04.015)
31. Zhang T, Tao D, Qu X, Zhang X, Lin R, Zhang W. 2019 The roles of initial trust and perceived risk in public's acceptance of automated vehicles. *Transp. Res. Part C* **98**, 207–220. (doi:10.1016/j.trc.2018.11.018)
32. Bagozzi R. 2007 The legacy of the technology acceptance model and a proposal for a paradigm shift. *J. Assoc. Inf. Syst.* **8**, 244–254. (doi:10.17705/1jais.00122)
33. Benbasat I, Barki H. 2007 Quo vadis TAM? *J. Assoc. Inf. Syst.* **8**, 7. (doi:10.17705/1jais.00126)
34. Williams M, Rana N, Dwivedi Y, Lal B. 2011 Is UTAUT really used or just cited for the sake of it? A systematic review of citations of UTAUT's originating article. In *ECIS 2011 Proceedings*, p. 231. https://aisel.aisnet.org/ecis2011/231.
35. Li J. 2020 Blockchain technology adoption: examining the fundamental drivers. In *Proc. of the 2020 2nd Int. Conf. on Management Science and Industrial Engineering*, pp. 253–260. (doi:10.1145/3396743.3396750)
36. Smaldino PE. 2017 Models are stupid, and we need more of them. In *Computational models in social psychology* (eds R Vallacher, S Read, A Nowak), pp. 311–331. Psychology Press. (doi:10.4324/9781315173726-14)
37. Choi JK, Ji YG. 2015 Investigating the importance of trust on adopting an autonomous vehicle. *Int. J. Hum. Comput. Interact.* **31**, 692–702. (doi:10.1080/10447318.2015.1070549)
38. Körber M. 2019 Theoretical considerations and development of a questionnaire to measure trust in automation. In *Proc. of the 20th Congress of the Int. Ergonomics Association (IEA 2018),* vol. 823 (eds S Bagnara, R Tartaglia, S Albolino, T Alexander, Y Fujita), pp. 13–30. Cham, Switzerland: Springer International Publishing. (doi:10.1007/978-3-319-96074-6_2)
39. Lee JD, See KA. 2004 Trust in automation: designing for appropriate reliance. *Hum. Factors: J. Human Factors Ergonom. Soc.* **46**, 50–80. (doi:10.1518/hfes.46.1.50_30392)

40. Sheridan TB. 2019 Individual differences in attributes of trust in automation: measurement and application to system design. *Front. Psychol*. **10**, 1117. (doi:10.3389/fpsyg.2019.01117)
41. Jian JY, Bisantz AM, Drury CG. 2000 Foundations for an empirically determined scale of trust in automated systems. *Int. J. Cogn. Ergon*. **4**, 53–71. (doi:10.1207/s15327566ijce0401_04)
42. Mayer RC, Davis JH, Schoorman FD. 1995 An integrative model of organizational trust. *Acad. Manag. Rev*. **20**, 709–734. (doi:10.5465/amr.1995.9508080335)
43. Morando MM, Tian Q, Truong LT, Vu HL. 2018 Studying the safety impact of autonomous vehicles using simulation-based surrogate safety measures. *J. Adv. Transp*. **2018**, 1–11. (doi:10.1155/2018/6135183)
44. Rahimi A, Azimi G, Jin X. 2020 Examining human attitudes toward shared mobility options and autonomous vehicles. *Transp. Res. Part F* **72**, 133–154. (doi:10.1016/j.trf.2020.05.001)
45. Nordhoff S, Hagenzieker M, Wilbrink M, Oehl M. 2025 Development and validation of the automated vehicle acceptance questionnaire for pedestrians (AVAQ-P). *Trans. Res. Part F: Traffic Psychol. Behav.* **113**, 307–325. (doi:10.1016/j.trf.2025.04.016)
46. Etminani-Ghasrodashti R, Kermanshachi S, Rosenberger JM, Foss A. 2023 Exploring motivating factors and constraints of using and adoption of shared autonomous vehicles (SAVs). *Transp. Res. Interdiscip. Perspect*. **18**, 100794. (doi:10.1016/j.trip.2023.100794)
47. Paddeu D, Parkhurst G, Shergold I. 2020 Passenger comfort and trust on first-time use of a shared autonomous shuttle vehicle. *Transp. Res. Part C* **115**, 102604. (doi:10.1016/j.trc.2020.02.026)
48. Peng C *et al*. 2024 Conceptualising user comfort in automated driving: findings from an expert group workshop. *Transp. Res. Interdiscip. Perspect*. **24**, 101070. (doi:10.1016/j.trip.2024.101070)
49. Xu Z, Zhang K, Min H, Wang Z, Zhao X, Liu P. 2018 What drives people to accept automated vehicles? Findings from a field experiment. *Transp. Res. Part C* **95**, 320–334. (doi:10.1016/j.trc.2018.07.024)
50. Mirnig AG *et al*. 2022 External communication of automated shuttles: results, experiences, and lessons learned from three European long-term research projects. *Front. Robot. AI* **9**, 949135. (doi:10.3389/frobt.2022.949135)
51. Pokorny P, Bjørnskau T, Aasvik O. 2022 *Automated shuttles in a residential area—Video observations of interactions with other traffic participants in Ski—Hebekk (no. TØI-report 1917/2022)*. Oslo, Norway: TØI.
52. Berge SH, Hagenzieker M, Farah H, de Winter J. 2022 Do cyclists need HMIs in future automated traffic? An interview study. *Transp. Res. Part F* **84**, 33–52. (doi:10.1016/j.trf.2021.11.013)
53. Farmer D, Kim H, Lee J. 2024 The relationship between exposure to and trust in automated transport technologies and intention to use a shared autonomous vehicle. *Int. J. Human–Computer Interact.* **40**, 5897–5909. (doi:10.1080/10447318.2023.2247553)
54. Zhang T, Tao D, Qu X, Zhang X, Zeng J, Zhu H, Zhu H. 2020 Automated vehicle acceptance in China: social influence and initial trust are key determinants. *Transp. Res. Part C* **112**, 220–233. (doi:10.1016/j.trc.2020.01.027)
55. Zhang T, Zeng W, Zhang Y, Tao D, Li G, Qu X. 2021 What drives people to use automated vehicles? A meta-analytic review. *Accid. Anal. Prev*. **159**, 106270. (doi:10.1016/j.aap.2021.106270)
56. Raue M, D'Ambrosio LA, Ward C, Lee C, Jacquillat C, Coughlin JF. 2019 The influence of feelings while driving regular cars on the perception and acceptance of self-driving cars. *Risk Anal*. **39**, 358–374. (doi:10.1111/risa.13267)
57. Kaur K, Rampersad G. 2018 Trust in driverless cars: investigating key factors influencing the adoption of driverless cars. *J. Eng. Technol. Manag*. **48**, 87–96. (doi:10.1016/j.jengtecman.2018.04.006)
58. Madigan R, Louw T, Dziennus M, Graindorge T, Ortega E, Graindorge M, Merat N. 2016 Acceptance of automated road transport systems (ARTS): an adaptation of the UTAUT model. *Transp. Res. Procedia* **14**, 2217–2226. (doi:10.1016/j.trpro.2016.05.237)
59. Madigan R, Louw T, Wilbrink M, Schieben A, Merat N. 2017 What influences the decision to use automated public transport? Using UTAUT to understand public acceptance of automated road transport systems. *Transp. Res. Part F* **50**, 55–64. (doi:10.1016/j.trf.2017.07.007)
60. Rogers EM, Singhal A, Quinlan MM. 2019 Diffusion of innovations. In *An integrated approach to communication theory and research* (eds DW Stacks, MB Salwen, KC Eichhorn), pp. 415–434, 2nd edn. New York, USA: Routledge. (doi:10.4324/9780203710753-35)
61. Zeithaml VA. 1988 Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *J. Mark*. **52**, 2–22. (doi:10.1177/002224298805200302)
62. Guo J, Kang X, Susilo Y, Antoniou C, Pernestål A. 2025 Temporal patterns of user acceptance and recommendation of the automated buses. *Travel Behav. Soc*. **38**, 100909. (doi:10.1016/j.tbs.2024.100909)
63. Österle I, Ulrich C, Herwartz-Polster S, Sigle S, Weimer J, Conzelmann M, Fleck T, Zofka M. 2022 Benefits and costs of shared, modular automated vehicles for freight and passenger transport: the case of *U-Shift*. *Transp. Plan. Technol*. **45**, 203–225. (doi:10.1080/03081060.2022.2094930)
64. Shaheen S, Bouzaghrane MA. 2019 Mobility and energy impacts of shared automated vehicles: a review of recent literature. *Curr. Sustain. Energy Rep*. **6**, 193–200. (doi:10.1007/s40518-019-00135-2)
65. Lunke EB. 2022 Modal accessibility disparities and transport poverty in the Oslo region. *Transp. Res. Part D* **103**, 103171. (doi:10.1016/j.trd.2022.103171)
66. Hansen T, Sener IN. 2023 Strangers on this road we are on: a literature review of pooling in on-demand mobility services. *Transp. Res. Rec*. **2677**, 1368–1381. (doi:10.1177/03611981221123801)
67. Krueger R, Rashidi TH, Rose JM. 2016 Preferences for shared autonomous vehicles. *Transp. Res. Part C* **69**, 343–355. (doi:10.1016/j.trc.2016.06.015)

68. Lavieri PS, Bhat CR. 2019 Modeling individuals' willingness to share trips with strangers in an autonomous vehicle future. *Transp. Res. Part* **124**, 242–261. (doi:10.1016/j.tra.2019.03.009)
69. Schikofsky J, Dannewald T, Kowald M. 2020 Exploring motivational mechanisms behind the intention to adopt mobility as a service (MaaS): insights from Germany. *Transp. Res. Part A* **131**, 296–312. (doi:10.1016/j.tra.2019.09.022)
70. Xiao J, Goulias KG. 2022 Perceived usefulness and intentions to adopt autonomous vehicles. *Transp. Res. Part A* **161**, 170–185. (doi:10.1016/j.tra.2022.05.007)
71. Nordhoff S, de Winter J, Madigan R, Merat N, van Arem B, Happee R. 2018 User acceptance of automated shuttles in Berlin-Schöneberg: a questionnaire study. *Transp. Res. Part F* **58**, 843–854. (doi:10.1016/j.trf.2018.06.024)
72. Dolins S, Karlsson M, Strömberg H. 2023 AVs have a sharing problem: examining user acceptance of shared, autonomous public transport in Sweden. In *2023 IEEE 26th Int. Conf. on Intelligent Transportation Systems (ITSC), Bilbao, Spain*. (doi:10.1109/ITSC57777.2023.10421886)
73. Clayton W, Paddeu D, Parkhurst G, Parkin J. 2020 Autonomous vehicles: who will use them, and will they share? *Transp. Plan. Technol*. **43**, 343–364. (doi:10.1080/03081060.2020.1747200)
74. Currie G, Delbosc A, Mahmoud S. 2013 Factors influencing young peoples' perceptions of personal safety on public transport. *J. Public Transp*. **16**, 1–19. (doi:10.5038/2375-0901.16.1.1)
75. Sarriera JM, Álvarez GE, Blynn K, Alesbury A, Scully T, Zhao J. 2017 To share or not to share: investigating the social aspects of dynamic ridesharing. *Transp. Res. Rec.* **2605**, 109–117. (doi:10.3141/2605-11)
76. Gurumurthy KM, Kockelman KM. 2020 Modeling Americans' autonomous vehicle preferences: a focus on dynamic ride-sharing, privacy & long-distance mode choices. *Technol. Forecast. Soc. Chang*. **150**, 119792. (doi:10.1016/j.techfore.2019.119792)
77. Moody J, Middleton S, Zhao J. 2019 Rider-to-rider discriminatory attitudes and ridesharing behavior. *Transp. Res. Part F* **62**, 258–273. (doi:10.1016/j.trf.2019.01.003)
78. Kleppestø TH, Eftedal NH, Thomsen L. 2020 Social dominance orientation (SDO). In *Encyclopedia of evolutionary and psychological science* (eds T Shackelford, V Weekes-Shackelford), pp. 1–9. Cham, Switzerland: Springer. (doi:10.1007/978-3-319-16999-6_2602-1)
79. Patel RK, Etminani-Ghasrodashti R, Kermanshachi S, Rosenberger JM, Foss A. 2023 Exploring willingness to use shared autonomous vehicles. *Int. J. Transp. Sci. Technol*. **12**, 765–778. (doi:10.1016/j.ijtst.2022.06.008)
80. Aasvik O. 2024 Perceptions of service enhancements in shared autonomous vehicles: a demographic perspective. *Findings* (doi:10.32866/001c.123811)
81. Dolins S, Strömberg H, Wong YZ, Karlsson M. 2021 Sharing anxiety is in the driver's seat: analyzing user acceptance of dynamic ridepooling and its implications for shared autonomous mobility. *Sustainability* **13**, 7828. (doi:10.3390/su13147828)
82. Yuen KF, Choo LQ, Li X, Wong YD, Ma F, Wang X. 2023 A theoretical investigation of user acceptance of autonomous public transport. *Transportation* **50**, 545–569. (doi:10.1007/s11116-021-10253-w)
83. Hagenzieker MP, Boersma R, Nuñez Velasco P, Ozturker M, Zubin I, Heikoop D. 2021 *Automated Buses in Europe: an inventory of pilots: final version (no. Final Version edn). TU Delft*. See https://research.tudelft.nl/en/publications/automated-buses-in-europe-an-inventory-of-pilots-final-version.
84. Roche-Cerasi I. 2019 Public acceptance of driverless shuttles in Norway. *Transp. Res. Part F* **66**, 162–183. (doi:10.1016/j.trf.2019.09.002)
85. Samuelson W, Zeckhauser R. 1988 Status quo bias in decision making. *J. Risk Uncertain*. **1**, 7–59. (doi:10.1007/bf00055564)
86. Mouratidis K, Cobeña Serrano V. 2021 Autonomous buses: intentions to use, passenger experiences, and suggestions for improvement. *Transp. Res. Part F* **76**, 321–335. (doi:10.1016/j.trf.2020.12.007)
87. NESH. 2022 *Guidelines for Research Ethics in the Social Sciences and the Humanities. Forskningsetikk*. See https://www.forskningsetikk.no/en/guidelines/social-sciences-and-humanities/guidelines-for-research-ethics-in-the-social-sciences-and-the-humanities/.
88. Hu L, Bentler PM. 1999 Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model*. **6**, 1–55. (doi:10.1080/10705519909540118)
89. Xia Y, Yang Y. 2019 RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: the story they tell depends on the estimation methods. *Behav. Res. Methods* **51**, 409–428. (doi:10.3758/s13428-018-1055-2)
90. Amrhein V, Greenland S, McShane B. 2019 Retire statistical significance. *Nature* **567**, 305–307. (doi:10.1038/d41586-019-00857-9)
91. Wasserstein RL, Lazar NA. 2016 The ASA statement on p-values: context, process, and purpose. *Am. Stat*. **70**, 129–133. (doi:10.1080/00031305.2016.1154108)
92. Ziliak S, McCloskey DN. 2008 *The cult of statistical significance: how the standard error costs us jobs, justice, and lives*. Anne Arbor, MI: University of Michigan Press.
93. Lance CE, Butts MM, Michels LC. 2006 The sources of four commonly reported cutoff criteria: what did they really say? *Organ. Res. Methods* **9**, 202–220. (doi:10.1177/1094428105284919)
94. Nunnally JC. 1994 *Psychometric theory 3E*. New York, USA: Tata McGraw-Hill Education.
95. Aasvik O, Ulleberg P, Hagenzieker M. 2025 Exploring the general acceptance factor for shared automated vehicles: the impact of personality traits and experimentally altered information. *Front. Psychol*. **16**, 1531386. (doi:10.3389/fpsyg.2025.1531386)
96. Gruijters SLK. 2022 Making inferential leaps: manipulation checks and the road towards strong inference. *J. Exp. Soc. Psychol*. **98**, 104251. (doi:10.1016/j.jesp.2021.104251)
97. Nadler JT, Weston R, Voyles EC. 2015 Stuck in the middle: the use and interpretation of mid-points in items on questionnaires. *J. Gen. Psychol*. **142**, 71–89. (doi:10.1080/00221309.2014.994590)

98. Denman DC, Baldwin AS, Betts AC, McQueen A, Tiro JA. 2018 Reducing 'I don't know' responses and missing survey data: implications for measurement. *Med. Decis. Making* **38**, 673–682. (doi:10.1177/0272989X18785159)
99. Statens Vegvesen. 2025 *Reisevaner 2024*. Reisevaner. See https://www.vegvesen.no/fag/fokusomrader/nasjonal-transportplan/den-nasjonale-reisevaneundersokelsen/reisevaner-20242/.
100. Morgan DL. 2023 Exploring the use of artificial intelligence for qualitative data analysis: the case of ChatGPT. *Int. J. Qual. Methods* **22**, 16094069231211248. (doi:10.1177/16094069231211248)
101. Lim S, Jahng S. 2019 Determining the number of factors using parallel analysis and its recent variants. *Psychol. Methods* **24**, 452–467. (doi:10.1037/met0000230)
102. Nordhoff S *et al*. 2022 Profiling the enthusiastic, neutral, and sceptical users of conditionally automated cars in 17 countries: a questionnaire study. *J. Adv. Transp.* **2022**, 1–22. (doi:10.1155/2022/8053228)
103. Morales-Vives F, Navarro-González D, Vigil-Colet A. 2020 To reverse or to not reverse Likert-type items: that is the question. *Psicothema* **1**, 108–114. (doi:10.7334/psicothema2019.286)
104. Ingebrigtsen R, Ciccone A, Fyhri A, Meyer S. 2018 *Perceived insecurity in Oslo. Knowledge and results from a map-based web survey (no. 1642/2018; TØI-Rapport)*. See https://www.toi.no/getfile.php?mmfileid=48296.
105. United Nations Development Program. 2023 Gender Inequality Index. In *Human development reports*. United Nations. See https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index.
106. Nordhoff S, Lehtonen E. 2025 Examining the effect of personality on user acceptance of conditionally automated vehicles. *Sci. Rep*. **15**, 1091. (doi:10.1038/s41598-024-84776-4)
107. Kaye SA, Somoray K, Rodwell D, Lewis I. 2021 Users' acceptance of private automated vehicles: a systematic review and meta-analysis. *J. Saf. Res*. **79**, 352–367. (doi:10.1016/j.jsr.2021.10.002)
108. Hilgarter K, Granig P. 2020 Public perception of autonomous vehicles: a qualitative study based on interviews after riding an autonomous shuttle. *Transp. Res. Part F* **72**, 226–243. (doi:10.1016/j.trf.2020.05.012)
109. Debbaghi FZ, Rombaut E, Vanhaverbeke L. 2025 Lessons learned from shared automated vehicles pilots in Europe: an evaluation of safety, traffic, and user acceptance. *Case Stud. Transp. Policy* **20**, 101447. (doi:10.1016/j.cstp.2025.101447)
110. Aasvik O. 2025 PCI RR - SAVA. *OSF* (doi:10.17605/OSF.IO/RGCW4)
111. Aasvik O, Ulleberg P, Hagenzieker M. 2025 Supplementary material from: A Simple Model for Complex Technology: Introducing and Testing a Framework to Understand Acceptance of Shared Automated Vehicles. FigShare. (doi:10.6084/m9.figshare.c.8172454)