TECHNOLOGICAL SAVVINESS AS A MEDIATOR OF OLDER ADULTS' REPORTED LIKELIHOOD OF ADOPTION AND ENDORSEMENT OF AUTONOMOUS VEHICLES

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ABSTRACT

Autonomous vehicles are poised to transform American transportation, offering increased mobility, especially for vulnerable populations such as older adults. While much of the research has focused on the technological and safety aspects of autonomous vehicles, it is crucial to understand the factors influencing older adults' adoption of this technology. This study examines how technological savviness, as measured by frequency of internet use, impacts older adults' attitudes toward autonomous vehicles. Using data from a nationally representative survey conducted by the Pew Research Center in November 2021, the Technology Acceptance Model and the Theory of Planned Behavior were employed to inform a mediation model. The analysis revealed that higher technological savviness is positively associated with favorable views toward autonomous vehicles, including increased willingness to ride in autonomous vehicles, perceptions of autonomous vehicles as reducing transportation stress, being acceptable for sharing the road with, and being used as taxis and buses. Furthermore, technological savviness was found to fully mediate the relationship between age and the perception of autonomous vehicles as beneficial for society and supporting older adults' independence. However, no significant association was found between technological savviness and safety concerns, such as crash likelihood or hacking risks. In addition to technological savviness, demographic factors, particularly gender, influenced attitudes toward autonomous vehicles. These findings suggest that initiatives aimed at improving technological savviness, such as educational programs, user-centered design efforts, and collaborations with advocacy groups, could foster greater acceptance of autonomous vehicles among older populations.

TABLE OF CONTENTS

INTRODUCTION

The proportion of adults aged 65 and older in the United States has tripled over the past century and is projected to reach 28% of the U.S. population by 2050 (Lin & Cui, 2021). As this population continues to grow, it will experience increasing transportation demands, compounded by age-related mobility challenges. These challenges may include declining physical capabilities, slower reflexes, and health conditions that impair the safe operation of conventional vehicles, presenting significant safety concerns. Notably, drivers aged 75 and older who have adverse medical and physical conditions are associated with a heightened risk of crash fatalities (OECD, 2022) with states implementing frequent in-person license renewals and mandatory vision and road tests have demonstrating lower rates of driving-related fatalities among older adults (Shen et al., 2020). Given the convergence of an aging population, growing transportation needs, and age-related limitations, there is a pressing need to explore innovative and accessible transportation alternatives, such as autonomous vehicles, to address the specific needs of this demographic (Eby et al., 2017).

Transportation access remains a persistent challenge in the United States, largely due to infrastructure and zoning policies that prioritize personal vehicle use (Mattioli & Colleoni, 2015). Urban sprawl, with its low-density and dispersed residential zoning, has made private vehicle ownership nearly essential for daily commuting (Andong & Sajor, 2017). This pattern contributes to longer travel times, increased traffic congestion, and greater demands on road infrastructure (Gössling, 2020). This car-centric approach to urban planning has often led to the neglect and underfunding of public transportation systems, particularly in suburban and rural areas, where alternatives to personal vehicles are limited (Cantilina et al., 2021, Ingram et al., 2020). The lack of efficient, reliable, and comprehensive public transit options disproportionately

affects individuals who cannot access or operate a personal vehicle, including older adults facing age-related limitations (Shaheen & Wong, 2022, van Eldijk et al., 2022). This poses significant barriers to mobility and independence for these vulnerable populations (Ingram et al., 2020, van Eldijk et al., 2022).

To address these deficiencies, autonomous vehicles present a promising solution, particularly given some of the more advantageous aspects of U.S. road infrastructure. The United States presents a uniquely favorable environment for the deployment of autonomous vehicles in part due to its highly structured road infrastructure (Othman, 2021). Unlike Europe, where roadways often evolved organically from footpaths and trade routes over centuries, U.S. roads were developed rapidly during the nation's westward expansion and follow a more deliberate, grid-like design (Rana & Hossain, 2021). This grid system, particularly in urban and suburban areas, reduces the complexity of intersections and roadways, making it easier for autonomous vehicles to navigate (Liu et al., 2023). The prevalence of standardized, perpendicular intersections, compared to the more irregular intersections found in Europe, enhances the predictability of driving environments for autonomous systems (Zhu et al., 2023). Additionally, the U.S. benefits from a cultural and legal framework that supports stringent traffic law enforcement and separation of car and pedestrian (Fliss et al., 2020). Compared to countries where roads are not solely reserved for cars, American roadways offer a more controlled and predictable driving environment (Azmi et al., 2024). This level of regulation, coupled with clearly marked lanes, traffic signage, and adherence to speed limits, creates a setting that is more conducive to the integration of autonomous vehicles (Gössling, 2020). These factors, taken together, suggest that the U.S. may be particularly well-suited to the early adoption and widespread use of autonomous transportation (Shaheen & Wong, 2022).

Autonomous vehicles hold the potential to preserve the independence of United States's older adults, enhancing their overall quality of life. The ability to manage daily tasks autonomously is closely associated with higher levels of self-esteem, self-worth, and life satisfaction among older adults (Leeuwen et al., 2019). Such independence helps individuals maintain dignity and a sense of agency, enabling them to make decisions aligned with their personal values and preferences (Soósová, 2016). Furthermore, independent living affords older adults more opportunities for social engagement, which is vital for reducing feelings of loneliness and fostering strong social connections, both of which are integral to mental and emotional well-being (Suragarn et al., 2021, Baker et al., 2018). Independence is also linked to greater physical and cognitive activity, which can help sustain overall health, mobility, and may lower the risk of cognitive decline, including conditions such as dementia (Olivari et al., 2018). In addition to these health benefits, maintaining independence through the use of autonomous vehicles could alleviate the financial strain associated with care centers and reduce the caregiving burden on families and communities.

Despite the numerous benefits autonomous vehicles could offer, older adults' receptivity to this technology remains a significant hurdle, as their current outlook on the technology is, on average, unfavorable (Zoaktafi, Gandy, & Yoon, 2023). In the existing body of literature, there is a consensus that older adults exhibit a significant degree of resistance towards autonomous vehicles (Carr et al., 2023). Studies have consistently reported a pervasive reluctance among older populations regarding their reported likelihood of adoption and endorsement of the technology (Rahman & Thill, 2023). In this study, "reported likelihood of adoption" is operationalized as the personal inclination to use autonomous vehicles, reflecting an individual's direct interest in engaging with this technology (Zoaktafi, Gandy, & Yoon, 2023). Meanwhile,

"endorsement" refers to a broader evaluation of attitudes and perceptions surrounding the use of autonomous vehicles by others, rather than personal adoption (Carr et al., 2023). This captures a general societal viewpoint, not just individual willingness to use the technology.

To fully realize the benefits of autonomous vehicles for older adults, it is essential to address existing research gaps in understanding their adoption and endorsement. A notable gap remains in understanding the relationship between older adults and autonomous vehicle technology. Studies that focus specifically on older adults often rely on small qualitative samples or fail to include younger cohorts for comparative analysis (Abdelrahman et al., 2020, Kadylak et al., 2021). Furthermore, many studies that identify significant age-related differences in attitudes towards autonomous vehicles predominantly concentrate on implications for younger adults, leaving the implications for older adults underexplored. For instance, in analyses of the 2017 American Trends Panel survey, a previous fielding of the survey explored in this study, Mesch and Dodel, as well as Nair and Bhat, found that age was negatively associated with support for autonomous vehicles, indicating that older individuals were less likely to endorse the technology (Mesch & Dodel, 2022, Nair & Bhat, 2021). However, in their discussions, these studies primarily focused on onboarding strategies for the 18-29 year-old demographic, neglecting the potential benefits autonomous vehicles may offer to older adults.

Research on older adults typically explores how demographic factors, such as age, and less mutable traits, such as attitudes, are associated with endorsement of autonomous vehicles (Rahman et al., 2020, Kadylak et al., 2021). However, studies by Mesch and Dodel, as well as Nair and Bhat, examine key mutable factors, including frequency of internet use, with the latter incorporating "living a technological savviness lifestyle" as a latent variable in their path model (Mesch & Dodel, 2022, Nair & Bhat, 2021). These studies highlight the importance of focusing

not only on patterns of adoption and endorsement but also on mutable characteristics that can be shaped by public policy interventions. Despite this, the relationship between immutable demographic factors, such as age, and mutable characteristics, such as technological savviness, in relation to likelihood of adoption and endorsement remains underexplored. This gap in the literature points to the need for deeper investigation into how older adults perceive, adopt, and adapt new technologies, such as autonomous vehicles, particularly given the potential mobility benefits autonomous vehicles offer to this population.

Technological savviness is defined here specifically as an individual's ability to adapt to new technologies. It emphasizes a familiarity with common design patterns across technologies and the ability to work through challenges without external help. Meanwhile, digital/technological skills is more narrowly defined as the practical application of technology, emphasizing learned skills on specific programs and technologies (Falloon, 2020, Erstad, 2022). In stark contrast, digital literacy is defined by accurately evaluating information, with the inclusion of critical thinking abilities for assessing the validity of digital content (Mentzer, Frydenberg, & Patterson, 2024, Harrison, 2023). This paper adopts the term technological savviness to denote a broad, adaptive proficiency in interacting with and applying technology, setting it apart from the more specific constructs of tech skills and digital literacy.

Mutable factors play a critical role in shaping public attitudes and behaviors as they are able to be modified through targeted public policies (Moussaïd et al., 2013). Unlike static factors, which are inherent and unchangeable, mutable factors can be influenced through strategic interventions and policy initiatives (Arias, 2018). As previously mentioned, one such mutable factor that could potentially be used to increase older adults' reported likelihood of endorsement of autonomous vehicles is technological savviness (Zoaktafi et al., 2023, Mesch & Dodel, 2022, Nair & Bhat,

2021). Increasing technological savviness among older adults is hypothesized to significantly enhance their likelihood of adopting and endorsing autonomous vehicles (Carr et al., 2023). As older adults become more adept at using digital technologies, their comfort and confidence in engaging with new technological innovations, such as autonomous vehicles, are likely to improve (Reimer, 2014). This correlation is supported by existing research that suggests technological savviness facilitates a more favorable attitude towards emerging technologies (Criollo-C et al., 2024).

The primary goal of this research project is to test if technological savviness is positively associated with reported likelihood of adoption of autonomous vehicles. When it comes to adopting new technologies, older adults tend to exhibit markedly lower receptivity, a phenomenon influenced by the rapid pace of technological advancements (Broady et al., 2010). One framework for understanding receptivity, the Theory of Planned Behavior (TPB), has been used to analyze the reported likelihood of adoption of autonomous driving technologies in several previous studies (Nastjuk et3 al., 2020, Mesch & Dodel, 2022, Nair & Bhat, 2021). The TPB posits that an individual's intention to engage in a specific behavior is shaped by three key factors: attitude, subjective norms, and perceived behavioral control, accounting for behaviors that may not be entirely volitional (Rossmann, 2020).

In the context of autonomous vehicle adoption, older adults' likelihood to adopt may be influenced by their openness to new experiences and general perceptions of technology. Technological savviness plays a pivotal role in shaping these attitudes, as individuals who are more technologically savvy tend to have more favorable views of technology (Jokisch et al., 2020). Technologically savvy individuals are typically more comfortable and familiar with using technology, which leads them to perceive it as a valuable and efficient tool for daily tasks.

Consequently, they are more likely to embrace new technological advancements, including autonomous vehicles (Kavandi & Jaana, 2020).

Subjective norms, referring to the perceived social pressure to adopt or avoid a particular behavior, play a significant role in older adults' adoption of autonomous vehicles (Rahman & Thill, 2023). If older adults perceive that their peers, family, or society view autonomous vehicles favorably, they may feel motivated to conform to these expectations (Zoaktafi & Gandy, 2023). Tech-savvy individuals, with greater exposure to positive endorsements of technology through online and offline networks, are more likely to engage with content such as product reviews and user experiences that highlight innovation and digital adoption. This frequent exposure through an individual's social circle can foster positive attitudes toward emerging technologies (Carr et al., 2023). In contrast, older adults with limited exposure to such endorsements may remain skeptical or uninformed, making subjective norms more critical in shaping their decisions regarding unfamiliar technologies (Zandieh & Acheampong, 2021).

Perceived behavioral control refers to an individual's belief in their ability to successfully perform a given behavior. For older adults, factors such as physical abilities, access to autonomous vehicle services, and technological savviness can significantly influence their perceived behavioral control regarding autonomous vehicle adoption. Technological savviness, in particular, can enhance an individual's sense of control and confidence in using technology (Moxley et al., 2022). Technologically savvy individuals tend to exhibit higher levels of self-efficacy, which reflects their confidence in operating digital devices, navigating software, and resolving technical issues (Moxley et al., 2022). This heightened sense of perceived control may, in turn, positively influence their intentions to adopt new technologies, such as autonomous vehicles, by reducing apprehensions and fostering a greater willingness to engage with such

innovations. Increased technological savviness can mitigate initial apprehensions related to the complexity and usability of autonomous vehicles by fostering a sense of familiarity and control (Zoaktafi et al., 2023).

HYPOTHESES

This study proposes a path model, summarized in Figure 1, to explore how technological savviness mediates the relationship between age and the likelihood of adopting autonomous vehicles. This specific type of structural equation model allows for the simultaneous analysis of relationships among multiple variables (Lleras, 2005). Path models estimate parameters that indicate the strength and direction of these relationships, with directional arrows representing the influence of one variable on another (Zhang, Jing, & Xu, 2021). While path models are effective in modeling associative relationships, they do not directly establish causality (Naiseh et al., 2024). The robustness of path analysis relies on several fundamental assumptions, such as the assumption of linear relationships, the need to account for all relevant variables without omission, and the requirement for precise measurement of variables with minimal error (Sharma & Mishra, 2021).

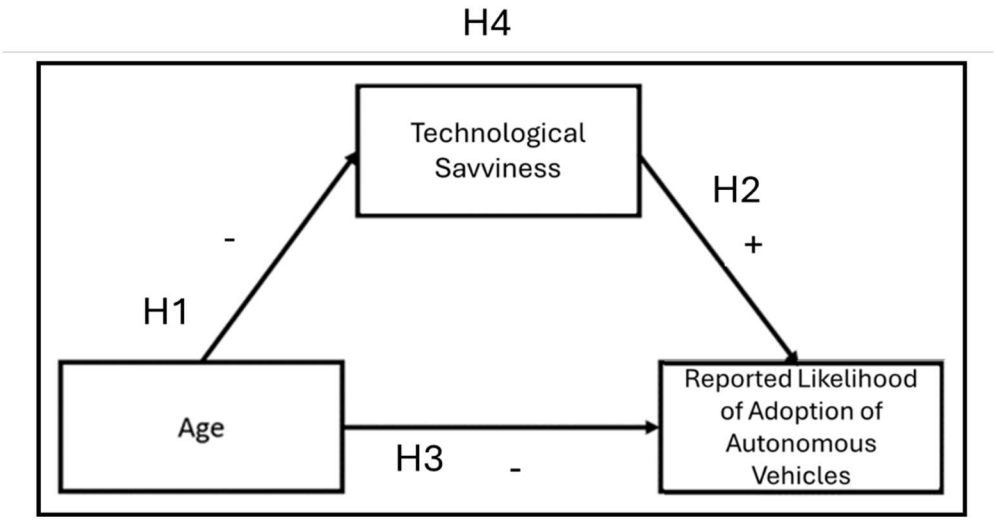

Figure 1. Simplified path model of age and reported likelihood of adoption of autonomous vehicles mediated by technological savviness

This figure above summarizes four hypotheses:

H1: There is a negative association between age and technological savviness, such that as age increases, technological savviness decreases.

H2: There is a positive association between technological savviness and reported likelihood of adoption of autonomous vehicles, such that higher levels of technological savviness are associated with greater reported likelihood of adoption of autonomous vehicles.

H3: There is a negative association between age and reported likelihood of adoption of autonomous vehicles, such that as age increases, the reported likelihood of adoption of autonomous vehicles decreases.

H4: The relationship between age and reported likelihood of adoption of autonomous vehicles is mediated by technological savviness. Specifically, more technologically savvy individuals will have a higher reported likelihood of adoption of autonomous vehicles than less technologically savvy individuals.

Messaging and Likelihood of Endorsement

The secondary goal of this research project is to identify the associations between technological savviness and messages regarding the endorsement of Autonomous Vehicles. Persuasive communication strategies, such as 'foot-in-the-door' and 'door-in-the-face' techniques, have been previously successful messaging techniques for improving endorsement (Myrick et al., 2019). The 'foot-in-the-door' technique, which involves securing a small initial commitment before requesting a larger one, could be effectively utilized to increase acceptance of autonomous vehicles (Garikapati & Shetiya, 2024). Conversely, the 'door-in-the-face' technique, which starts with a large, often unreasonable request followed by a more modest one, may also be leveraged to shift perceptions (Rana & Hossain, 2021). Both strategies capitalize on principles of compliance and cognitive consistency, potentially fostering a more favorable disposition

toward autonomous vehicles through incremental engagement or perceived concessions (Othman, 2021). The endorsement questions asked in this study, a combination of personal attitudes, use cases, predictions, and safety preferences, represent foot-in-the-door messages, as they reflect how the respondent feels about other individuals using Autonomous Vehicles (Garikapati & Shetiya, 2024). This study proposes a path model in Figure 2 to explore how technological savviness mediates the relationship between age and the likelihood of endorsing autonomous vehicles.

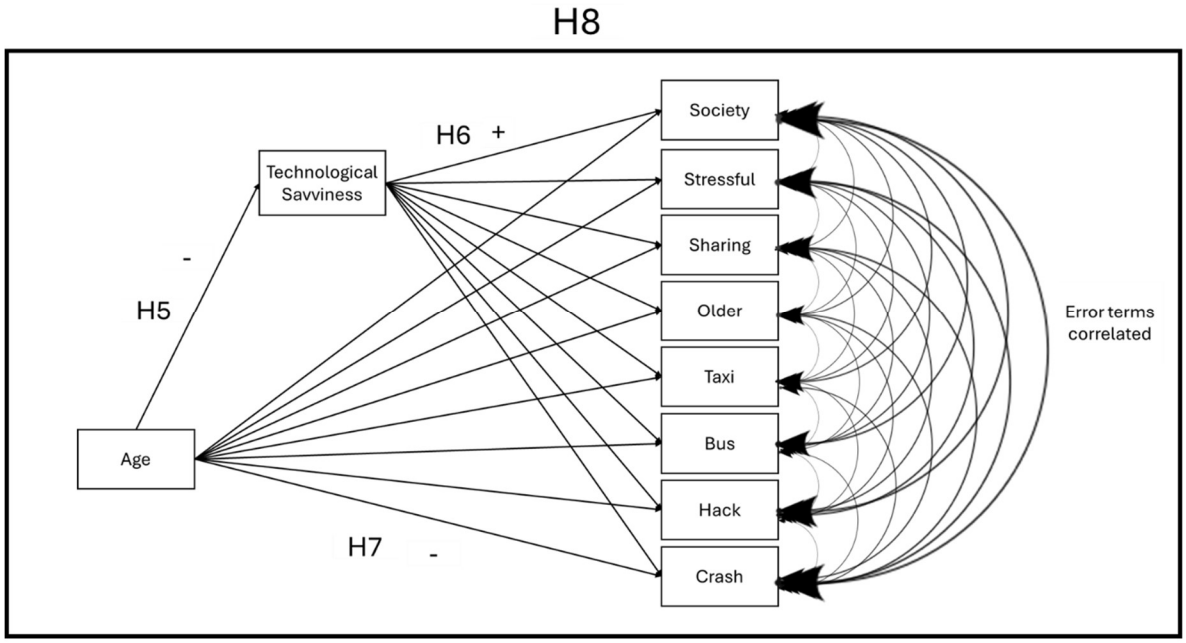

Figure 2. Simplified path model of age and endorsement of autonomous vehicle items mediated by technological savviness

This figure above summarizes four hypotheses:

H5: There is a negative association between age and technological savviness, such that as age increases, technological savviness decreases.

H6: There is a positive association between technological savviness and endorsement of autonomous vehicles, such that higher levels of technological savviness are associated with greater likelihood of endorsement of autonomous vehicles.

H7: There is a negative association between age and endorsement of autonomous vehicles, such that as age increases, the endorsement of autonomous vehicles decreases.

H8: The relationship between age and endorsement of autonomous vehicles is mediated by technological savviness. Specifically, more technologically savvy individuals will have a greater likelihood of endorsement of autonomous vehicles than less technologically savvy individuals.

METHODS

Data Source

This study employs a secondary analysis of data from the American Trends Panel, conducted between November 1st and November 7th, 2021 (Pew Research Center, 2023). The American Trends Panel, designed by the Pew Research Center, is a nationally representative longitudinal panel of U.S. adults, aimed at collecting data on a range of social, political, and economic issues. The panel is primarily conducted online, with internet access provided to participants as needed, ensuring broad accessibility. Recruitment for the panel involves a combination of random sampling and targeted recruitment methods. Initially, a random sample of U.S. adults is selected to complete a survey and are then invited to join the panel. To ensure the panel remains representative of the broader U.S. population, Pew Research Center applies statistical weighting to the data. These weights adjust for demographic factors, internet access, and potential non-response biases, enhancing the accuracy and generalizability of the findings.

Technological savviness

The 2021 Pew Research American Trends Panel measured respondents' internet use frequency with options "Almost constantly", "Several times a day," "About once a day," "Several times a week," or "Less often". To examine the impact of very frequent internet use, this measure was binarized into two groups: "Almost constantly" versus all other frequencies. This binarization highlights a group that represents a distinct level of digital engagement. High-frequency internet users, defined by their "Almost constantly" engagement, exhibit a level of digital reliance and familiarity that may be fundamentally different in kind, not just degree, from other users. This distinction in degree may correlate with higher levels of technological savviness (Lin & Yu, 2023, Kumi-Yeboah et al., 2020).

Separating “Almost constantly” users from all others is theoretically grounded, aligning with principles from the Technology Acceptance Model (TAM). According to TAM, individuals who frequently engage with digital tools are more likely to perceive technology as both useful and easy to use, which may increase their openness to adopting new technologies. By isolating this group, researchers can investigate a cohort likely to display behavioral traits aligned with high technological savviness (Mesch & Dodel, 2022). In addition, the validity of internet use as a proxy for technological savviness can vary by age. For younger individuals, frequent internet use is normative, reflecting routine familiarity rather than distinguishing technological savviness (Yan et al., 2023). Among this group, frequent internet engagement tends to be more habitual and integrated (Jokisch et al., 2022). In contrast, for older adults, frequent internet use is often more deliberate, and as such, it can more accurately reflect technological savviness (Heponiemi et al., 2023). In this demographic, intensive digital engagement can indicate a greater openness to exploring digital solutions and a significant level of comfort with technology relative to peers who use the internet less often (Lin & Yu, 2023).

Reported likelihood of adoption of Autonomous Vehicles

The Pew Research 2021 survey of the American Trends Panel began the autonomous vehicle question block with the item “How much have you heard or read about driverless passenger vehicles?” with options “A lot, A little, Nothing at all”. Respondents who answered “Nothing at all” were not surveyed on any further items in the autonomous vehicle question block.

For respondents who had some measure of prior knowledge about autonomous vehicles as measured in the initial item, additional items were asked that measured reported likelihood of adoption and endorsement. The reported likelihood of adoption measure was identified as individuals reporting that they “personally want[ed] to ride” autonomous vehicles. For

endorsement measures, personal attitudes, use cases, and predictions in regard to autonomous vehicles were collected. Personal attitude items included measures of "how comfortable" the respondent would feel "sharing the road with them" as well as their attitudes regarding the societal good of autonomous vehicles. Use case items included respondents' attitudes toward autonomous vehicles performing a variety of delivery and public transport uses. Prediction items asked about how respondents believed autonomous vehicles would effect "the number of people killed or injured in traffic accidents" as well as predictions about the independence of "older adults and people with disabilities", driving stress, and hacking risk. Details on the wordings of items and the options given are listed below.

Adoption Item

Reported likelihood of adoption is measured with one item:

1. "Would you personally want to ride in a driverless passenger vehicle, if you had the opportunity?" with options "Definitely want, Probably want, Probably NOT want, Definitely NOT want" and higher values indicating a higher desire to ride.

Endorsement Items

Likelihood of endorsement was measured by four items:

Personal attitudes were measured with two items:

1. "If the use of driverless passenger vehicles became widespread, how comfortable would you feel sharing the road with them?" with the options "Extremely comfortable, Very comfortable, Somewhat comfortable, Not too comfortable, Not comfortable at all" and higher values indicating a higher comfortability sharing the road.

2. “Do you think widespread use of driverless passenger vehicles would be a…” with options “Good idea for society, Bad idea for society, Not sure” and higher values indicating belief that driverless vehicles are better for society.

Use cases for autonomous vehicles was measured with the item “The technology used to operate driverless passenger vehicles could be used for a number of purposes. Would you favor or oppose the use of this technology in each of the following purposes?” for topics

- Taxis and ride-sharing vehicles
- Buses for public transportation

with options “Favor, Oppose, Not sure, No answer” and higher values indicating a higher degree of favorability.

Predictions regarding autonomous vehicles were measured with two items:

1. “If the use of driverless passenger vehicles becomes widespread, do you think that would…”
    - “Increase the number of people killed or injured in traffic accidents, Decrease the number of people killed or injured in traffic accidents, Not make much difference” with higher values indicating a belief in a lower number of traffic deaths.

2. “If the use of driverless passenger vehicles becomes widespread, do you think each of the following would happen?”
    - Older adults and people with disabilities will be able to live more independently
    - Getting from place to place would be less stressful

- The computer systems in driverless passenger vehicles would be easily hacked in ways that put safety at risk

with options “Definitely would happen, Probably would happen, Probably would NOT happen, Definitely would NOT happen” and higher values indicating a higher belief the scenario would happen.

Covariates

Items for respondents’ socio-demographics are included in the analysis. Specifically included are predictors such as gender (A man vs A woman, In some other way), racial/ethnic groups (White non-Hispanic vs Black non-Hispanic, Hispanic, Other, Asian non-Hispanic), income brackets (less than $30,000 vs $30,000 to less than $40,000, $40,000 to less than $50,000, $50,000 to less than $60,000, $60,000 to less than $70,000. $70,000 to less than $80,000, $80,000 to less than $90,000, $90,000 to less than $100,000, $100,000 or more), and education levels (H.S. graduate or less vs Associate, College Grad, Postgrad). Additionally, political affiliation (Conservative vs Moderately Conservative, Moderately Liberal, Liberal) was included to ensure that the findings would be relevant across the political spectrum, enhancing the generalizability of the results. The survey responses were binarized into dichotomous variables.

Path Model

First, R, an open-source statistical analysis software, was used to describe the sample’s frequency and weighted percentages. Next, demographic variables were recoded into dummy variables. Lavaan, an R package, was employed to estimate the indirect effects of independent variables on dependent variables through a mediator variable to assess the mediation hypotheses. The analysis involved specifying a path model where the relationships between variables were represented by paths that capture direct and indirect effects. The model was specified to examine the direct

effects of age and frequency of internet use, along with the forementioned covariates. The indirect effects were captured by regressing internet access on age categories and defining interaction terms (Indirect Effect ages 30-49, Indirect Effect ages 50-64, Indirect Effect ages 65+) as products of the age coefficients and internet access. Total effects (Total Effect ages 30-49, Total Effect ages 50-64, Total Effect ages 65+) were calculated by summing the direct and indirect effects for each age group.

By applying bootstrapping techniques within Lavaan, estimates of the indirect effects and their corresponding confidence intervals were obtained. The model was estimated using the Weighted Least Squares Mean and Variance-adjusted (WLSMV) estimator, which is suited for handling the non-normality and ordinal nature of the dependent variables. The WLSMV estimator addresses missing data through a full information approach, using all available data in the estimation process without resorting to pairwise deletion (Enders, 2010). This method allows for the retention of cases with partial missing data, ensuring the maximum use of available information. Sampling weights, applied using the "weight" variable provided by Pew, adjust for unequal selection probabilities. For the endorsement model, represented by Figure 2, the error terms of the individual endorsement items were correlated to account for the possibility that responses to any single item are likely to be correlated with responses on the other. The R code for both the Adoption and Endorsement path models is in the appendix.

In this study, odds ratios were calculated using R with the generalized linear model function. This allows access to the odds ratio for a direct relationship between predictors and the outcome. A sample R code for calculating odds ratios is provided in the appendix. Effect sizes quantify the magnitude of relationships or differences between variables, providing a measure of ‘practical’ significance rather than statistical significance (Pek & Flora, 2018). In this study, the large

sample size of 5,153 participants results in high statistical power, allowing for the detection of small effects. However, as statistical significance alone does not indicate the importance of an effect, effect sizes can help determine whether an effect warrants attention (Pek & Flora, 2018). They assist in understanding the practical implications of research findings, standardizing them across different studies and populations for correct comparison. For binary outcomes, a common effect size measure is the odds ratio, which compares the odds of an event occurring in one group to the odds in another group, offering a standardized measure of effect. The odds ratio is considered statistically significant when its 95% confidence interval does not include 1 (Pek & Flora, 2018). Specific odds ratio values correspond to other established benchmarks of effect size, such as Cohen's d (Chen et al., 2010). The transformation formula Cohen's d to odds ratio is seen below (Sánchez-Meca et al., 2003).

$$\text{log odds ratio} = \frac{d\pi}{\sqrt{3}}$$

Fit statistics do not convey meaningful information about model adequacy in this study as the model was saturated, meaning the model has zero degrees of freedom and could not be statistically tested for fit. In this model, the number of estimated parameters matches the number of unique elements in the covariance matrix, and as such fit indices such as the Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) indicate a perfect fit. The CFI equals 1, indicating that the model fully reproduces the observed data, and the RMSEA equals 0, reflecting an absence of residual discrepancy between the model and the data.

RESULTS

Sample Characteristics

Table 1 summarizes the characteristics of the sample, comprising of 5,153 individuals. Of these approximately 8.7% of participants were aged 18-29, 32.3% aged 30-49, 29.1% aged 50-64, and 29.6% aged 65 and older. In terms of race and ethnicity, the majority of the sample is White non-Hispanic (63.2%), followed by Hispanic individuals (15.7%), Black non-Hispanic individuals (11.4%), Asian non-Hispanic individuals (5.5%), and those categorized as Other (2.8%). Gender distribution is nearly equal, with 46.9% identifying as men, 51.9% as women, and 0.7% identifying in another way. Educational attainment varies, with 21.7% holding postgraduate degrees, 32.2% having completed college, 30.0% holding an associate degree, and 16.1% possessing a high school diploma or less. The mean annual family income was $58,890. The political orientation of the sample includes 25.8% identifying as Conservative, 29.0% as Liberal, 25.7% as Moderately Conservative, and 19.6% as Moderately Liberal.

Table 1 Sample Characteristics

Variable	Sample (5,153)	
Age	Unweighted Frequency	Weighted %
18-29	448	8.7
30-49	1,663	32.3
50-64	1,498	29.1
65+	1,524	29.6
Gender		
A man	2,295	46.9
A woman	2,816	51.9
In some other way	30	0.7
Party		
Conservative	1,589	25.8
Moderately Conservative	1,369	25.7
Moderately Liberal	1,469	19.6
Liberal	1,675	29.0
Family income		
Less than $30,000	822	23.5
$30,000 to less than $40,000	478	11.1
$40,000 to less than $50,000	433	8.7
$50,000 to less than $60,000	430	8.6
$60,000 to less than $70,000	365	6.6
$70,000 to less than $80,000	371	6.1
$80,000 to less than $90,000	267	5.1
$90,000 to less than $100,000	316	5.1
$100,000 or more	1,437	20.4
Education level category		
H.S. graduate or less	873	16.1
Associate	1,506	30.0
College Grad	1,652	32.2
Postgrad	1,105	21.7
Race-Ethnicity		
White non-Hispanic	3,581	63.2
Black non-Hispanic	427	11.4
Hispanic	729	15.7
Other	165	2.8
Asian non-Hispanic	178	5.5

Note: % = percent

Table 2 presents the distribution of respondents' internet frequency, the reported likelihood of adoption, and endorsement items. For internet frequency, the majority of respondents reported using the internet several times a day (45.4%), with 39.3% indicating almost constant use. The

endorsement items related to autonomous vehicle adoption show varying levels of interest: 13.8% of respondents definitely want to ride an autonomous vehicle, while 32.3% definitely do not want to ride. In terms of comfort sharing the road with autonomous vehicles, 34.4% of respondents feel somewhat comfortable, and 26.7% feel not too comfortable. Regarding widespread societal use, 44.5% of respondents viewed autonomous vehicles as a bad idea for society. For specific applications of autonomous vehicles, 40.7% of respondents favored their use for taxis and ride-sharing, whereas 43.4% opposed their use for buses. When asked about potential impacts on traffic deaths, 39.4% believed autonomous vehicles would decrease traffic deaths, while 31.1% felt there would be little difference. Regarding the perceived benefits for older adults and transportation stress, 49.3% of respondents thought autonomous vehicles would likely increase independence for older adults, and 40.1% believed they would reduce transportation stress. 50.8% of respondents thought there was a significant risk of hacking, with 20.1% disagreeing with this assessment.

Table 2 Distribution of Respondent's Internet Frequency, Adoption, and Endorsement Items

Path Model Endogenous Variables		N=5,153
Internet Frequency	Unweighted Frequency	Weighted %
Almost constantly	2,334	(39.3)
Several times a day	2,350	(45.4)
About once a day	273	(5.3)
Several times a week	134	(3.3)
Less often	57	(2.4)
Personally want to ride		
Definitely want	690	(13.8)
Probably want	1,171	(22.8)
Probably NOT want	1,716	(32.3)
Definitely NOT want	1,532	(30.3)
Sharing the road		
Extremely comfortable	348	(7.1)
Very comfortable	690	(13.6)
Somewhat comfortable	1,752	(34.4)
Not too comfortable	1,451	(26.7)
Not comfortable at all	894	(17.9)
Widespread Use		
Good idea for society	1,447	(26.4)
Bad idea for society	2,290	(44.5)
Not sure	1,404	(28.9)
Missing	12	(0.2)
Used for Taxi's and ride-sharing		
Favor	2,154	(40.7)
Oppose	1,695	(33.8)
Not sure	1,283	(25)
Used for Busing		
Favor	1,789	(34.4)
Oppose	2,220	(43.4)
Not sure	1,124	(21.6)
Traffic Deaths		
Increase	1,380	(27)
Decrease	2,077	(39.4)
Not much different	1,572	(31.1)

Table 2 (cont'd)

Older adults more independent		
Definitely would happen	1,185	(22.4)
Probably would happen	2,604	(49.3)
Probably would NOT happen	1,111	(22.6)
Definitely would NOT happen	218	(4.9)
Transportation less stressful		
Definitely would happen	818	(15.7)
Probably would happen	1,976	(40.1)
Probably would NOT happen	1,778	(33.3)
Definitely would NOT happen	537	(9.7)
Hacking security risk		
Definitely would happen	1,238	(25.3)
Probably would happen	2,750	(50.8)
Probably would NOT happen	1,051	(20.1)
Definitely would NOT happen	70	(2.5)

Note: % = percent

Reported Likelihood of Adoption

The results for the demographic of interest, adults aged 65 and older, are presented in Figure 3. The mediation analysis revealed that technological savviness serves as a partial mediator in the relationship between age and the adoption of autonomous vehicles. Specifically, these findings suggest that interventions aimed at enhancing technological savviness among older adults may alleviate the negative impact of age on their willingness to adopt autonomous vehicles. A more detailed breakdown of the results is provided below.

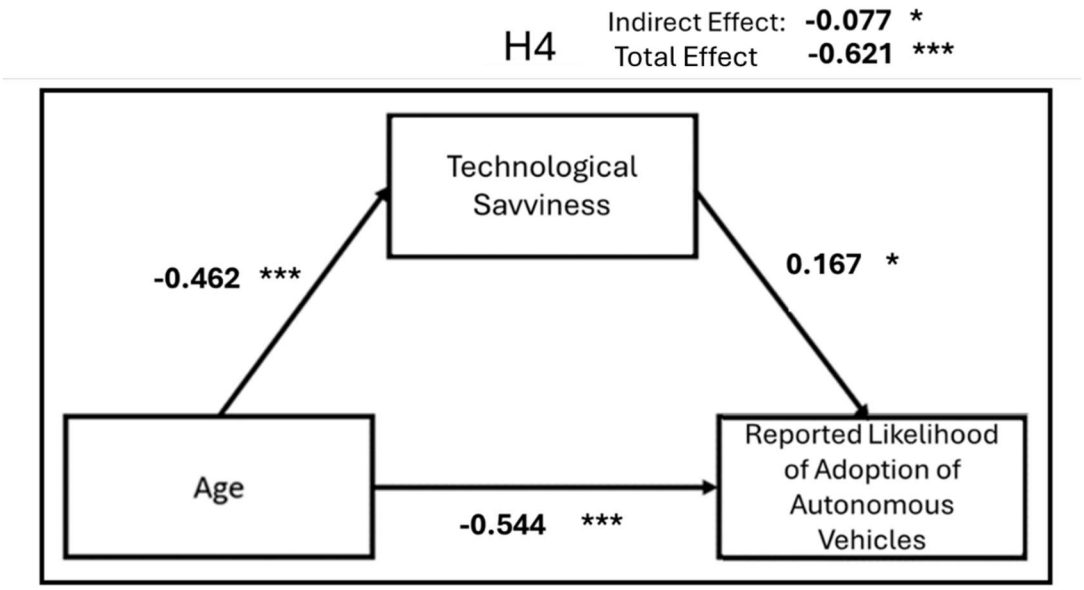

Figure 3. Simplified path model with path weights and significances of Age and Reported Likelihood of Adoption of Autonomous Vehicles mediated by Technological Savviness

H1: Association between Age and Technological savviness

H1, summarized below in Table 3, posited that increased age would be associated with a lower level of technological savviness. The analysis supports this hypothesis, showing significant negative associations between age and technological savviness across all older age groups when compared to the reference group of individuals ages 18-29.

For respondents aged 30-49, the negative coefficient of b = -0.133 (p = 0.002) with an odds ratio of 0.622 (95% CI [0.545, 0.709]) indicates a modest but statistically significant decrease in technological savviness relative to those aged 18-29. This finding suggests that, even among those in early middle age, technological savviness is somewhat lower than in younger adults. The odds ratio of 0.622 corresponds to a small effect size (Cohen's d ≈ 0.2), indicating that the difference in technological savviness between these two groups, while statistically significant, is relatively small in practical terms.

The effect is even more pronounced in the 50-64 age group, where the coefficient of $b = -0.295$ ($p < 0.001$) and an odds ratio of 0.291 (95% CI [0.252, 0.337]) indicate a substantial reduction in technological savviness compared to the 18-29 group. This odds ratio of 0.291 represents a moderate to large effect (Cohen's $d \approx 0.8$), highlighting a clear and practical difference in technological savviness between these age groups. Individuals in this age range appear to be much less technologically savvy than their younger counterparts.

For respondents aged 65 and older, the effect is strongest, with a coefficient of $b = -0.462$ ($p < 0.001$) and an odds ratio of 0.104 (95% CI [0.087, 0.124]). This very low odds ratio suggests that, in comparison to younger adults, individuals in the 65 and older group show markedly lower levels of technological savviness. With an odds ratio of 0.104, corresponding to a very large effect size (Cohen's $d \approx 0.8$), the difference between this age group and younger adults is both statistically and practically significant, indicating a pronounced gap in technological savviness.

The findings consistently support the hypothesis that technological savviness declines with age. Each older age group shows a significant and progressively greater reduction in technological savviness compared to those aged 18-29, highlighting a clear age-related trend in technology-related skills and familiarity.

Other Findings

Gender was not a significant predictor of technological savviness ($b = -0.022$, $p = 0.325$), suggesting that both men and women may have similar levels of technological savviness. However, political attitudes showed significant associations with technological savviness. Moderate liberal attitudes ($b = 0.092$, $p = 0.004$) and liberal attitudes ($b = 0.161$, $p < 0.001$) were

positively correlated with higher internet usage, indicating that more liberal individuals are likely to be more technologically savvy.

Family income results were mixed. Specifically, individuals with incomes ranging from $30,000 to less than $40,000 ($b = 0.094$, $p = 0.016$) and those with incomes ranging from $50,000 to less than $60,000 ($b = 0.126$, $p = 0.013$) exhibited higher technological savviness compared to those earning less than $30,000. Similarly, individuals with an income of $100,000 or more demonstrated the highest levels of technological savviness ($b = 0.136$, $p < 0.001$), with a 1.88 times greater likelihood.

Education level was also a significant predictor of technological savviness. Postgraduates ($b = 0.065$, $p = 0.038$) were more likely to be technologically savvy than those with a high school education or less. Additionally, individuals identifying as Black non-Hispanic ($b = 0.095$, $p = 0.014$) and Hispanic ($b = 0.248$, $p < 0.001$) exhibited higher technological savviness compared to their White non-Hispanic corollaries.

Table 3 summarizes the results of the path model relationships predicting technological savviness as well as the Odds ratios of these relationships.

Table 3 Mediator Regression of Technological Savviness on Age and Socio-Demographic Predictors

Variable	b	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29					
30-49	-0.133	**	0.622	0.545	0.709
50-64	-0.295	***	0.291	0.252	0.337
65+	-0.462	***	0.104	0.087	0.124
Gender vs A man					
A woman	-0.022		0.898	0.816	0.988
In some other way	-0.277		0.325	0.193	0.535
Party vs Conservative					
Moderately Conservative	0.024		1.201	1.034	1.395
Moderately Liberal	0.092	**	1.517	1.331	1.73
Liberal	0.161	***	2.077	1.819	2.373
Family income vs Less than $30,000					
$30,000 to less than $40,000	0.094	*	1.41	1.183	1.682
$40,000 to less than $50,000	-0.013		1.014	0.837	1.227
$50,000 to less than $60,000	0.126	*	1.449	1.201	1.748
$60,000 to less than $70,000	0.055		1.282	1.043	1.575
$70,000 to less than $80,000	0.032		1.082	0.875	1.336
$80,000 to less than $90,000	0.024		1.253	0.99	1.584
$90,000 to less than $100,000	-0.018		1.122	0.888	1.414
$100,000 or more	0.136	**	1.877	1.605	2.197
Education level category vs High School Graduate or Less					
Associate	-0.035		0.911	0.779	1.065
College Grad	0.034		1.107	0.97	1.263
Postgrad	0.065	*	1.445	1.245	1.679
Race-Ethnicity vs White non-Hispanic					
Black non-Hispanic	0.095	*	1.394	1.198	1.623
Hispanic	0.248	***	2.111	1.732	2.582
Other	0.085		1.285	1.012	1.633
Asian non-Hispanic	0.056		0.963	0.765	1.21

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

H2: Association Between Technological Savviness and Reported Likelihood of Adoption of Autonomous Vehicles

H2, as outlined in Table 4, proposed that higher levels of technological savviness would correlate with a greater likelihood of adopting autonomous vehicles. The results confirm this hypothesis. Compared to individuals in the reference group who reported using the internet “Several times a

day," "About once a day," "Several times a week," or "Less often" those with "Almost constant" internet usage, a proxy for higher technological savviness, showed a significant positive association with autonomous vehicle adoption. Specifically, the positive coefficient ($b = 0.167$, $p = 0.021$) and an odds ratio of 1.32 (95% CI [1.14, 1.53]) suggest that individuals with higher technological savviness are substantially more likely to adopt autonomous vehicles than those in the reference group. The odds ratio of 1.32 indicates a small-to-moderate effect size (Cohen's $d \approx 0.2$), meaning that individuals with higher technological savviness have about 32% higher odds of adopting autonomous vehicles compared to those with less frequent internet usage.

H3: Association Between Age and Reported Likelihood of Adoption of Autonomous Vehicles

H3 explored whether increased age would be associated with a lower reported likelihood of adopting autonomous vehicles. The results outlined in Table 4 reveal a significant negative relationship between age and the likelihood of autonomous vehicle adoption in older age groups. Compared to the reference group of ages 18–29, respondents aged 50–64 exhibited a notably lower likelihood of adopting autonomous vehicles, as shown by the coefficient ($b = -0.49$, $p < 0.001$) and an odds ratio of 0.45 (95% CI [0.36, 0.56]). The odds ratio of 0.45 suggests a moderate effect size (Cohen's $d \approx 0.5$), indicating that individuals aged 50–64 have about 55% lower odds of adopting autonomous vehicles than those aged 18-29.

Similarly, respondents aged 65 and older showed an even lower likelihood, with a coefficient of $b = -0.544$ ($p < 0.001$) and an odds ratio of 0.41 (95% CI [0.32, 0.52]). The odds ratio of 0.41 represents a large effect size (Cohen's $d \approx 0.8$), meaning that individuals aged 65 and older have about 59% lower odds of adopting autonomous vehicles compared to those aged 18-29. These results indicate a clear trend of decreased adoption likelihood with increasing age.

In contrast, respondents aged 30–49 did not demonstrate a statistically significant association, with a coefficient of b = -0.138 (p = 0.213) and an odds ratio of 0.81 (95% CI [0.67, 0.97]). The odds ratio of 0.81 is close to 1, indicating no significant difference in the odds of adoption between this group and the 18-29 reference group, suggesting that age has less impact on adoption likelihood in this middle-age range.

Other Findings

Female participants were significantly less likely to report higher likelihood to adopt autonomous vehicles compared to male participants (b = -0.577, p < 0.001). Political orientation also had a significant impact. Moderate conservatives (b = 0.24, p = 0.027), moderate liberals (b = 0.379, p < 0.001), and liberals (b = 0.516, p < 0.001) were all more likely to report higher likelihood of adopting autonomous vehicles compared to conservatives. Results for income were mixed. While most income categories did not show significant effects, individuals with an income of $60,000 to less than $70,000 (b = -0.312, p = 0.027) and $90,000 to less than $100,000 (b = -0.403, p = 0.009) showed significant negative associations compared to individuals making less than $30,000. Higher education levels were significantly associated with a greater likelihood of adopting autonomous vehicles. College graduates (b = 0.27, p = 0.001) and postgraduates (b = 0.374, p < 0.001) were more likely to favor autonomous vehicles than high school graduates or less.

Table 4 summarizes the results of the path model relationships predicting the likelihood of adopting autonomous vehicles as well as the Odds ratios of these relationships.

Table 4 Direct Effect Regression of Autonomous Vehicle Adoption Likelihood on Age, Technological Savviness, and Socio-Demographic Variable

Variable	b	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29					
30-49	-0.138		0.807	0.668	0.973
50-64	-0.490	***	0.449	0.362	0.556
65+	-0.544	***	0.407	0.321	0.516
Internet vs Several times a day, About once a day, Several times a week, or Less often					
Almost constantly	0.167	*	1.324	1.144	1.533
Gender vs A man					
A woman	-0.577	***	0.386	0.336	0.442
In some other way	0.355		1.957	0.868	4.871
Party vs Conservative					
Moderately Conservative	0.240	*	1.489	1.200	1.846
Moderately Liberal	0.379	***	1.871	1.55	2.260
Liberal	0.516	***	2.352	1.941	2.853
Family income vs Less than $30,000					
$30,000 to less than $40,000	-0.184		0.73	0.566	0.939
$40,000 to less than $50,000	-0.126		0.809	0.617	1.059
$50,000 to less than $60,000	-0.099		0.836	0.640	1.090
$60,000 to less than $70,000	-0.312	*	0.597	0.439	0.806
$70,000 to less than $80,000	-0.105		0.844	0.628	1.132
$80,000 to less than $90,000	0.097		1.174	0.86	1.601
$90,000 to less than $100,000	-0.403	**	0.518	0.365	0.728
$100,000 or more	-0.023		0.96	0.769	1.198
Education level category vs High School Graduate or Less					
Associate	0.145		1.277	1.022	1.594
College Grad	0.270	**	1.563	1.30	1.880
Postgrad	0.374	***	1.85	1.50	2.282
Race-Ethnicity vs White non-Hispanic					
Black non-Hispanic	-0.151		0.783	0.630	0.971
Hispanic	-0.036		0.925	0.698	1.225
Other	0.123		1.226	0.867	1.730
Asian non-Hispanic	0.343		1.748	1.264	2.422

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

H4: Mediation Effect of Technological savviness on the Association between Age and Reported likelihood of adoption of Autonomous Vehicles

H4, summarized in Table 5, posited that technological savviness mediates the relationship between age and the likelihood of adopting autonomous vehicles. Specifically, it hypothesized that individuals with greater technological savviness would have a higher reported likelihood of adopting autonomous vehicles than those with less technological savviness. The mediation analysis reveals significant indirect effects. Specifically, the mediation effects for the different age groups show that technological savviness partially mediates the relationship between age and reported likelihood of adoption when compared to the reference group of ages 18–29. For ages 30–49, the indirect effect is negative but not significant ($b = -0.022$, $p = 0.055$). For ages 50–64 and ages 65 and over, the mediation effects are stronger and significant ($b = -0.049$, $p = 0.031$ and $b = -0.077$, $p = 0.027$, respectively).

The significant positive effect of technological savviness on reported likelihood of adoption, shown in Table 4 ($b = 0.167$, $p = 0.021$), indicates that higher levels of technological savviness are associated with an increased likelihood of adopting autonomous vehicles. Additionally, the indirect effects for the older age groups (ages 50–64 and ages 65 and over) confirm that technological savviness plays an important role in influencing adoption among older adults compared to participants ages 18–29, with the effect being strongest for the oldest group.

The total effects of age on the reported likelihood of adopting autonomous vehicles, which encompass both direct and indirect pathways, support the hypothesized relationships. When compared to the reference group of ages 18–29, the total effect for ages 30–49 was not significant ($b = -0.161$, $p = 0.148$). In contrast, the total effects for the age groups 50–64 and ages 65 and over were substantial and negative ($b = -0.539$, $p < 0.001$ and $b = -0.621$, $p < 0.001$,

respectively). These results suggest that, overall, older adults face significant age related barriers to adopting autonomous vehicles, with technological savviness functioning as a mitigating factor. Table 5 summarizes the indirect and total effects of the path model relationships between age, technological savviness, and the likelihood of adopting autonomous vehicles.

Table 5 Indirect and Total Effects of the Adoption Path Model

Path	b	p
Indirect 30-49	-0.022	
Indirect 50-64	-0.049	*
Indirect 65+	-0.077	*
Total 30-49	-0.161	
Total 50-64	-0.539	***
Total 65+	-0.621	***

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Endorsement Items

The results presented in Figure 4 highlight the relationships between age, technological savviness, and perceptions of autonomous vehicles. The analysis reveals that technological savviness mediates the influence of age on attitudes toward autonomous vehicles. The mediation analysis revealed that technological savviness serves as a mediator in the relationship between age and endorsement items of autonomous vehicles. In particular, technological savviness partially mediates the relationship between age and perceptions of autonomous vehicles as reducing transportation stress, being acceptable for sharing the road with, and being used as taxis and buses. Furthermore, technological savviness fully mediates the relationship between age and the perception of autonomous vehicles as beneficial for society and supporting older adults' independence. These findings suggest that efforts to enhance technological savviness may alleviate age-related barriers and foster more positive attitudes toward the adoption of autonomous vehicles. A more detailed examination of these relationships is presented below.

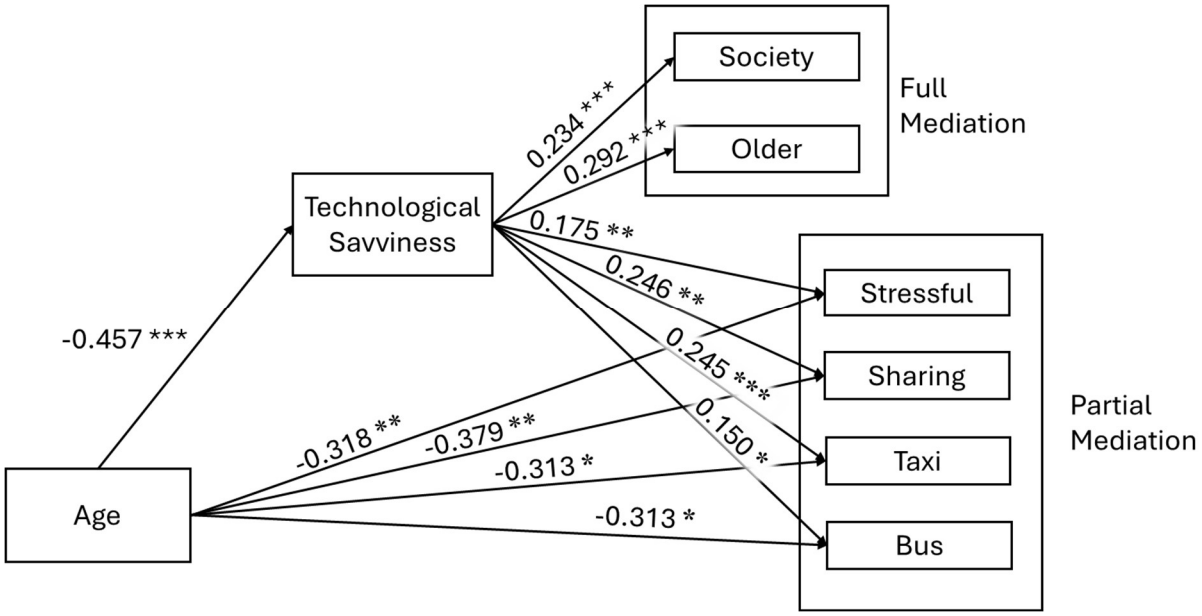

Figure 4. Simplified path model with path weights and significances of Age and Reported Likelihood of Adoption of Autonomous Vehicles mediated by Technological Savviness

H5: Association between Age and Technological savviness

H5, summarized below in Table 6, posited that age would be negatively associated with technological savviness, with older adults exhibiting lower levels of technological savviness compared to younger individuals. The analysis supports this hypothesis, showing significant negative associations between age and technological savviness across all older age groups when compared to the reference group of individuals aged 18-29.

For respondents aged 30-49, the coefficient of $b = -0.132$ ($p < 0.001$) and an odds ratio of 0.622 (95% CI [0.545, 0.709]) indicate a significant reduction in technological savviness relative to those aged 18-29. The odds ratio of 0.622 suggests a small effect size (Cohen's $d \approx 0.2$), meaning that while the difference is statistically significant, it is relatively modest in practical terms.

The negative relationship between age and technological savviness becomes more pronounced in the 50-64 age group, with a coefficient of $b = -0.290$ ($p < 0.001$) and an odds ratio of 0.291 (95% CI [0.252, 0.337]). This indicates a substantial decrease in technological savviness compared to

the 18-29 group. The odds ratio of 0.291 corresponds to a moderate to large effect size (Cohen's $d \approx 0.8$), demonstrating a clear and practical difference in technological savviness between these age groups.

For respondents aged 65 and older, the coefficient of $b = -0.457$ ($p < 0.001$) and an odds ratio of 0.104 (95% CI [0.087, 0.124]) indicate a dramatic reduction in technological savviness. The odds ratio of 0.104 represents a very large effect size (Cohen's $d \approx 0.8$), suggesting a pronounced gap in technological savviness between this age group and younger adults. These findings strongly support the hypothesis that technological savviness declines with age, with the largest disparities observed among the oldest age group.

Other Findings

Gender was not a significant predictor of technological savviness ($b = -0.022$, $p = 0.325$), suggesting no meaningful difference between men and women in their technological skills. However, political party affiliation was significantly associated with technological savviness. Respondents identifying as moderately liberal ($b = 0.089$, $p = 0.003$) and liberal ($b = 0.154$, $p < 0.001$) were more likely to exhibit higher technological savviness compared to conservatives. Family income also showed significant associations with technological savviness. Specifically, individuals with incomes between \$30,000 to \$40,000 ($b = 0.089$, $p = 0.016$) and \$50,000 to \$60,000 ($b = 0.133$, $p = 0.023$) demonstrated higher levels of technological savviness than those with incomes under \$30,000. The highest odds of technological savviness were observed among individuals earning \$100,000 or more ($b = 0.138$, $p = 0.004$). Education level was another significant predictor of technological savviness. Respondents with postgraduate degrees ($b = 0.063$, $p = 0.016$) were more likely to be technologically savvy compared to those with a high school education or less. Race and ethnicity were also significant predictors. Black non-Hispanic

individuals (b = 0.110, p = 0.004) and Hispanic individuals (b = 0.249, p < 0.001) exhibited higher odds of technological savviness compared to White non-Hispanic respondents.

Table 6 summarizes the results of the path model relationships predicting technological savviness as well as the odds ratios of these relationships.

Table 6 Endorsement Path Model Technological Savviness Mediator Regressions

Variable	b	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29					
30-49	-0.132	***	0.622	0.545	0.709
50-64	-0.29	***	0.291	0.252	0.337
65+	-0.457	***	0.104	0.087	0.124
Gender vs A man					
A woman	-0.022		0.898	0.816	0.988
In some other way	-0.272		0.325	0.193	0.535
Party vs Conservative					
Moderately Conservative	0.02		1.201	1.034	1.395
Moderately Liberal	0.089	**	1.517	1.331	1.73
Liberal	0.154	***	2.077	1.819	2.373
Family income vs Less than $30,000					
$30,000 to less than $40,000	0.089		1.41	1.183	1.682
$40,000 to less than $50,000	-0.021		1.014	0.837	1.227
$50,000 to less than $60,000	0.133	*	1.449	1.201	1.748
$60,000 to less than $70,000	0.061		1.282	1.043	1.575
$70,000 to less than $80,000	0.031		1.082	0.875	1.336
$80,000 to less than $90,000	0.029		1.253	0.99	1.584
$90,000 to less than $100,000	-0.02		1.122	0.888	1.414
$100,000 or more	0.138	**	1.877	1.605	2.197
Education level category vs High School Graduate or Less					
Associate	-0.04		0.911	0.779	1.065
College Grad	0.034		1.107	0.97	1.263
Postgrad	0.063	*	1.445	1.245	1.679
Race-Ethnicity vs White non-Hispanic					
Black non-Hispanic	0.11	**	1.394	1.198	1.623
Hispanic	0.249	**	2.111	1.732	2.582
Other	0.087		1.285	1.012	1.633
Asian non-Hispanic	0.041		0.963	0.765	1.21

Note: b = coefficient, * p < 0.05, ** p < 0.01, *** p < 0.001, CI = Confidence Interval

H6: Association between Technological savviness and Endorsement of Autonomous Vehicles

H6, summarized in the “Almost constantly” row in Table 7-10, proposed a positive relationship between technological savviness and favorable views on various aspects of autonomous vehicles. This hypothesis was largely supported, with findings indicating that individuals with higher levels of technological savviness were more likely to endorse the items.

Individuals with higher technological savviness were more likely to express the belief that autonomous vehicles are beneficial for society, as shown by a significant positive coefficient ($b = 0.234$, $p = 0.001$) and an odds ratio of 1.503 (95% CI [1.281, 1.763]). This odds ratio suggests that those with higher technological savviness are approximately 50% more likely to view autonomous vehicles as beneficial to society compared to those with lower technological savviness. The odds ratio of 1.503 represents a moderate effect size (Cohen's $d \approx 0.5$).

In addition, individuals with higher technological savviness were more inclined to view autonomous vehicles as a solution for reducing travel-related stress. A positive coefficient ($b = 0.175$, $p = 0.009$) and an odds ratio of 1.192 (95% CI [1.073, 1.324]) indicate that those with greater technological savviness are approximately 19% more likely to believe that autonomous vehicles can reduce travel-related stress. The odds ratio of 1.192 represents a small to moderate effect size (Cohen's $d \approx 0.3$), meaning that individuals with higher technological savviness are somewhat more likely to perceive autonomous vehicles as a stress-reducing solution.

Higher technological savviness was also associated with stronger endorsement of using autonomous vehicles as taxis ($b = 0.263$, $p < 0.001$, odds ratio = 1.491, 95% CI [1.293, 1.718]) and buses ($b = 0.150$, $p = 0.037$, odds ratio = 1.297, 95% CI [1.119, 1.503]). For taxis, the odds ratio of 1.491 means that individuals with higher technological savviness are about 49% more likely to support using autonomous vehicles as taxis. The odds ratio of 1.491 represents a large

effect size (Cohen's d ≈ 0.8), meaning that individuals with higher technological savviness are significantly more likely to endorse autonomous vehicles as taxis compared to those with lower savviness. Similarly, the odds ratio of 1.297 for buses indicates a 30% increased likelihood of endorsing the use of autonomous vehicles as buses among those with higher technological savviness, with a moderate effect size (Cohen's d ≈ 0.5).

Individuals with greater technological savviness were also more likely to believe that autonomous vehicles could enhance the independence of older adults and people with disabilities, as indicated by a positive and significant coefficient ($b = 0.292$, $p < 0.001$) and an odds ratio of 1.211 (95% CI [1.099, 1.335]). The odds ratio of 1.211 represents a moderate effect size (Cohen's d ≈ 0.5), meaning that those with higher technological savviness are about 21% more likely to believe that autonomous vehicles could help vulnerable populations gain more independence compared to those with lower technological savviness.

Some safety-related beliefs did not show a significant association with technological savviness. Technological savviness was not significantly associated with the belief that autonomous vehicles are less likely to crash ($b = 0.055$, $p = 0.434$, odds ratio = 1.084, 95% CI [0.924, 1.271]) or the perception that autonomous vehicles are susceptible to hacking ($b = -0.004$, $p = 0.958$, odds ratio = 0.996, 95% CI [0.903, 1.098]). These results suggest that technological savviness alone may not strongly influence beliefs about the safety or vulnerability of autonomous vehicles to hacking, implying that other factors may be more relevant in shaping safety perceptions related to autonomous vehicle technology.

H7: Association between Age and Endorsement of Autonomous Vehicles

If the use of driverless passenger vehicles becomes widespread, do you think getting from place to place would be less stressful?

Summarized in Table 7, age had a significant influence on the likelihood of endorsing the belief that getting from place to place in autonomous vehicles would be less stressful. Compared to individuals aged 18-29, respondents aged 30-49 were more likely to report that autonomous vehicles would make getting from place to place less stressful ($b = -0.391$, $p = 0.001$), with an odds ratio of 0.638 (95% CI [0.547, 0.744]), corresponding to a moderate effect size (Cohen's $d \approx 0.5$). Similarly, respondents aged 50-64 were also more likely to endorse the belief that autonomous vehicles would reduce stress in transportation ($b = -0.318$, $p = 0.009$), with an odds ratio of 0.711 (95% CI [0.602, 0.84]), corresponding to a small to medium effect size (Cohen's $d \approx 0.2$).

Other Findings

Gender was a significant predictor, with women ($b = -0.465$, $p < 0.001$) less likely than men to view autonomous vehicles as reducing stress in transportation. Political orientation also played a role, with liberals ($b = 0.509$, $p < 0.001$) more likely to view autonomous vehicles as making getting from place to place less stressful. Income was another influential factor, with individuals with incomes above $60,000 more likely to report that autonomous vehicles would reduce stress. Those with an income between $30,000 and $39,999 were slightly less likely ($b = 0.005$, $p = 0.969$) to view autonomous vehicles as less stressful, and those with income levels above $50,000 showed similar trends. Education also had a significant effect, with individuals holding postgraduate degrees ($b = 0.271$, $p = 0.001$) more likely to view autonomous vehicles as reducing transportation stress.

If the use of driverless passenger vehicles became widespread, how comfortable would you feel sharing the road with them?

Summarized in Table 7, age was a significant factor in the likelihood of feeling comfortable sharing the road with autonomous vehicles. Compared to individuals aged 18-29, respondents aged 30-49 were less likely to feel comfortable sharing the road with autonomous vehicles ($b = -0.449$, $p < 0.001$), with an odds ratio of 0.463 (95% CI [0.367, 0.582]), corresponding to a medium effect size (Cohen's $d \approx 0.5$). Similarly, respondents aged 50-64 were also less likely to endorse the belief in sharing the road with autonomous vehicles ($b = -0.379$, $p = 0.008$), with an odds ratio of 0.537 (95% CI [0.416, 0.691]), corresponding to a medium effect size (Cohen's $d \approx 0.5$).

Other Findings

Gender was a significant predictor, with women ($b = -0.465$, $p < 0.001$) less likely than men to feel comfortable sharing the road with autonomous vehicles. Political orientation also played a significant role, with liberals ($b = 0.384$, $p < 0.001$) more likely to feel comfortable sharing the road with autonomous vehicles. Income also showed notable effects, with those in the $30,000–$39,999 income range less likely to feel comfortable sharing the road with autonomous vehicles ($b = -0.274$, $p = 0.08$). Education also influenced the likelihood of feeling comfortable sharing the road with autonomous vehicles. Individuals with an associate degree ($b = 0.281$, $p = 0.025$) were more likely to endorse this belief, as were those with postgraduate degrees ($b = 0.314$, $p = 0.001$).

Table 7 summarizes the results of the path model predicting the likelihood of endorsement items: that autonomous vehicles reduce the stress of driving, and that respondents feel comfortable sharing the road with autonomous vehicles.

Table 7 Direct Effect Regression of Autonomous Vehicle Endorsement on Age, Technological Savviness, and Socio-Demographic Variable

	Make driving less stressful				Comfortable to share the road with			
Variable	p	odds ratio	2.5% CI	97.5% CI	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29								
30-49		0.803	0.702	0.919		0.821	0.686	0.984
50-64	**	0.638	0.547	0.744	**	0.463	0.367	0.582
65+	**	0.711	0.602	0.84	**	0.537	0.416	0.691
Internet vs Several times a day, About once a day, Several times a week, or Less often								
Almost constantly	**	1.192	1.073	1.324	**	1.474	1.266	1.718
Gender vs A man								
A woman	***	0.662	0.6	0.731	***	0.489	0.422	0.566
In some other way		0.95	0.575	1.542		1.402	0.783	2.411
Party vs Conservative								
Moderately Conservative	*	1.382	1.181	1.615	**	1.666	1.316	2.109
Moderately Liberal	***	1.62	1.416	1.855	***	1.849	1.504	2.278
Liberal	***	1.558	1.357	1.79	***	1.706	1.385	2.106
Family income vs Less than $30,000								
$30,000 to less than $40,000		1.106	0.924	1.322		0.757	0.574	0.991
$40,000 to less than $50,000		1.06	0.873	1.283		0.767	0.571	1.021
$50,000 to less than $60,000		1.217	1.008	1.469		1.034	0.788	1.348
$60,000 to less than $70,000		0.916	0.738	1.133	**	0.516	0.36	0.726
$70,000 to less than $80,000		1	0.805	1.238		0.935	0.688	1.257
$80,000 to less than $90,000		1.165	0.917	1.476		0.904	0.637	1.262
$90,000 to less than $100,000		1.049	0.828	1.324		0.909	0.644	1.264
$100,000 or more		1.025	0.873	1.204		0.816	0.651	1.024
Education level category vs High School Graduate or Less								
Associate		1.048	0.891	1.231	*	1.547	1.23	1.933
College Grad		1.25	1.094	1.428	***	1.852	1.534	2.232
Postgrad	**	1.261	1.084	1.465	**	1.541	1.238	1.912
Race-Ethnicity vs White non-Hispanic								
Black non-Hispanic		0.982	0.838	1.149		0.884	0.696	1.112
Hispanic		0.866	0.71	1.051		1.024	0.789	1.315
Other		0.867	0.669	1.114	*	0.54	0.345	0.809
Asian non-Hispanic		1.512	1.202	1.896		1.497	1.097	2.016

Note = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

The technology used to operate driverless passenger vehicles could be used for a number of purposes. Would you favor or oppose the use of this technology in each of the following purposes: Taxis and ride-sharing vehicles?

Summarized in Table 8, age showed a significant influence on the likelihood of endorsing the belief that autonomous vehicles could be used as taxis. Compared to individuals aged 18-29, respondents aged 30-49 were less likely to support this belief ($b = -0.324$, $p = 0.006$), with an odds ratio of 0.587 (95% CI [0.476, 0.724]), corresponding to a moderate effect size (Cohen's $d \approx 0.5$). Similarly, those aged 50-64 also showed a decreased likelihood of endorsing the use of autonomous vehicles as taxis ($b = -0.313$, $p = 0.012$), with an odds ratio of 0.596 (95% CI [0.475, 0.747]), corresponding to a medium effect size (Cohen's $d \approx 0.5$). This suggests that middle-aged respondents are somewhat less inclined to believe in autonomous vehicles being used as taxis compared to younger adults.

Other Findings

Gender was another significant predictor, with women ($b = -0.54$, $p < 0.001$) less likely than men to believe that autonomous vehicles can serve as taxis. Respondents identifying as a non-binary or other gender were even less likely to support this belief ($b = -1.218$, $p < 0.001$). Political orientation also demonstrated significant associations. Compared to conservatives, moderate liberals ($b = 0.235$, $p = 0.007$) and liberals ($b = 0.421$, $p < 0.001$) were more likely to endorse autonomous vehicles as taxis. Respondents with a college degree ($b = 0.35$, $p < 0.001$) and postgraduate degree ($b = 0.274$, $p = 0.001$) were more likely to believe in autonomous vehicles as viable taxi options. Race also played a role, with Black respondents being somewhat less likely ($b = -0.221$, $p = 0.061$) than white respondents to believe in autonomous vehicles being

used as taxis. Additionally, individuals of other racial or ethnic backgrounds were less likely (b = -0.406, p = 0.02) to endorse this belief.

The technology used to operate driverless passenger vehicles could be used for a number of purposes. Would you favor or oppose the use of this technology in each of the following purposes: Buses for public transportation?

Summarized in Table 8, age was a significant factor in the likelihood of endorsing the belief in using autonomous vehicles as buses. Compared to individuals aged 18-29, respondents aged 30-49 were less likely to support this view (b = -0.352, p = 0.003), with an odds ratio of 0.538 (95% CI [0.433, 0.669]), corresponding to a moderate effect size (Cohen's d ≈ 0.5). Similarly, respondents aged 50-64 were also less likely to endorse this belief (b = -0.313, p = 0.011), with an odds ratio of 0.577 (95% CI [0.456, 0.731]), corresponding to a medium effect size (Cohen's d ≈ 0.5). These results suggest that older respondents are less likely to support the use of autonomous vehicles as buses.

Other Findings

Gender was a significant predictor, with women (b = -0.614, p < 0.001) less likely than men to believe in the use of autonomous vehicles as buses. Political orientation also showed notable associations. Compared to conservatives, liberals (b = 0.377, p < 0.001) were more likely to endorse this belief. Income also influenced endorsement, with individuals earning between $30,000 and $39,999 being less likely (b = -0.245, p = 0.078) to support autonomous vehicles as buses. Education played a significant role, as respondents with a college degree (b = 0.331, p < 0.001) and those with postgraduate education (b = 0.383, p < 0.001) were more likely to believe in the viability of autonomous vehicles as buses.

Table 8 summarizes the results of the path model predicting the likelihood of endorsement items: that autonomous vehicles should be used for taxis, and autonomous vehicles should be used for buses.

Table 8 Direct Effect Regression of Autonomous Vehicle Endorsement on Age, Technological Savviness, and Socio-Demographic Variable

	Should be used for taxis				Should be used for buses			
Variable	p	odds ratio	2.5% CI	97.5% CI	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29								
30-49		0.886	0.735	1.069		0.854	0.706	1.033
50-64	**	0.587	0.476	0.724	**	0.538	0.433	0.669
65+	*	0.596	0.475	0.747	*	0.577	0.456	0.731
Internet vs Several times a day, About once a day, Several times a week, or Less often								
Almost constantly	***	1.491	1.293	1.718	*	1.297	1.119	1.503
Gender vs A man								
A woman	***	0.414	0.362	0.471	***	0.372	0.324	0.426
In some other way	***	0.128	0.044	0.314		2.28	1.051	5.298
Party vs Conservative								
Moderately Conservative		1.41	1.148	1.731		1.128	0.908	1.401
Moderately Liberal	**	1.512	1.264	1.809		1.234	1.023	1.489
Liberal	***	2.046	1.7	2.464	***	1.916	1.586	2.318
Family income vs Less than $30,000								
$30,000 to less than $40,000		1.072	0.84	1.367		0.717	0.552	0.929
$40,000 to less than $50,000		1.046	0.805	1.357		0.763	0.576	1.005
$50,000 to less than $60,000		1.042	0.806	1.346		1.054	0.808	1.372
$60,000 to less than $70,000		0.829	0.622	1.104		0.807	0.597	1.084
$70,000 to less than $80,000		1.199	0.902	1.593		1.033	0.77	1.382
$80,000 to less than $90,000		1.161	0.855	1.575		0.861	0.623	1.183
$90,000 to less than $100,000		0.856	0.623	1.172		0.95	0.687	1.309
$100,000 or more		1.097	0.883	1.363		1.058	0.847	1.322
Education level category vs High School Graduate or Less								
Associate		1.1	0.886	1.363		1.146	0.914	1.432
College Grad	***	1.742	1.458	2.081	***	1.76	1.467	2.111
Postgrad	**	1.58	1.288	1.938	***	1.889	1.535	2.324
Race-Ethnicity vs White non-Hispanic								
Black non-Hispanic		0.683	0.551	0.844		0.998	0.802	1.239
Hispanic		0.981	0.744	1.293		0.943	0.712	1.247
Other	*	0.525	0.365	0.747		0.778	0.537	1.113
Asian non-Hispanic		1.015	0.739	1.392		1.138	0.818	1.574

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

If the use of driverless passenger vehicles becomes widespread, do you think that would decrease the number of people killed or injured in traffic accidents?

Summarized in Table 9, age showed some influence on the likelihood of endorsing the belief that autonomous vehicles decrease traffic accident injuries and fatalities. Compared to individuals aged 18-29, respondents aged 30-49 were more likely to support this view ($b = 0.232$, $p = 0.07$), with an odds ratio of 1.428 (95% CI [1.133, 1.802]), corresponding to a moderate effect size (Cohen's $d \approx 0.4$). While the effect size is moderate, this finding suggests that respondents in this age group are somewhat more likely to believe in the injury- and fatality-reduction benefits of autonomous vehicles.

Other Findings

Gender was a significant predictor, with women more likely than men to believe that autonomous vehicles decrease traffic accident injuries and fatalities ($b = 0.478$, $p < 0.001$). Political orientation was another important factor. Compared to conservatives, moderate liberals ($b = -0.394$, $p < 0.001$) and liberals ($b = -0.578$, $p < 0.001$) were less likely to endorse the belief that autonomous vehicles decrease traffic accident injuries and fatalities. Income level also impacted beliefs. Individuals with an income between $60,000 and $69,999 were less likely to endorse the belief in injury- and fatality-reduction benefits ($b = -0.321$, $p = 0.013$). Additionally, those earning $100,000 or more were less likely ($b = -0.289$, $p = 0.009$) to support this belief. Education played a role, as respondents with a postgraduate degree were less likely to endorse the belief that autonomous vehicles decrease traffic accident injuries and fatalities ($b = -0.212$, $p = 0.01$). Race was also a significant predictor. Black respondents ($b = 0.277$, $p = 0.019$) were more likely to believe in these safety benefits. There was also a trend for Hispanic respondents to endorse this benefit ($b = 0.206$, $p = 0.237$). Conversely, respondents of other racial/ethnic

backgrounds (b = -0.31, p = 0.051) and Asian respondents (b = -0.333, p = 0.066) were less likely to endorse the injury- and fatality-reduction benefits.

If the use of driverless passenger vehicles becomes widespread, do you think the computer systems in driverless passenger vehicles would be easily hacked in ways that put safety at risk?

Summarized in Table 9, age had a notable influence on the likelihood of endorsing the belief that autonomous vehicles will not be easily hacked in ways that put safety at risk. Compared to individuals aged 18-29, respondents aged 30-49 were more likely to report belief in this (b = 0.517, p < 0.001), with an odds ratio of 1.261 (95% CI [1.092, 1.456]), corresponding to a moderate effect size (Cohen's d ≈ 0.45). Similarly, those aged 50-64 also showed an increased likelihood of endorsing this belief (b = 0.439, p = 0.001), with an odds ratio of 1.251 (95% CI [1.072, 1.460]), corresponding to a moderate effect size (Cohen's d ≈ 0.4). This suggests that middle-aged respondents are more inclined to believe that autonomous vehicles are not easily hackable in ways that compromise safety.

Other Findings

Gender was another significant predictor, with women (b = 0.344, p < 0.001) more likely than men to believe that autonomous vehicles are resistant to hacking threats that could jeopardize safety. Political attitudes also showed significant associations. Compared to conservatives, moderate conservatives (b = -0.405, p < 0.001), moderate liberals (b = -0.442, p < 0.001), and liberals (b = -0.559, p < 0.001) were all less likely to endorse the belief that autonomous vehicles are safe from hacking. Income also had some significant effects. Respondents with an income between $90,000 and $99,999 were less likely (b = -0.416, p = 0.016) to believe that autonomous vehicles are resilient to hacking threats. Those with an income of $100,000 or more also showed

reduced endorsement of this belief (b = -0.281, p = 0.027). Educational attainment showed mixed results: individuals with an associate degree were less likely to believe in the resilience of autonomous vehicles against hacking (b = -0.241, p = 0.05). However, no significant associations were found for college graduates or postgraduates. Race was a significant predictor, with Black respondents more likely (b = 0.043, p = 0.74) than their white counterparts to believe that autonomous vehicles are not easily hackable in ways that could compromise safety.

Table 9 summarizes the results of the path model predicting the likelihood of endorsement items: that autonomous vehicles are more likely to be hacked, and autonomous vehicles decrease traffic accident injuries and fatalities.

Table 9 Direct Effect Regression of Autonomous Vehicle Endorsement on Age, Technological Savviness, and Socio-Demographic Variable

	More likely to be hacked				Decrease traffic accident injuries and fatalities			
Variable	p	odds ratio	2.5% CI	97.5% CI	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29								
30-49		1.078	0.945	1.23		1.03	0.83	1.28
50-64	***	1.261	1.092	1.456		1.428	1.133	1.802
65+	**	1.251	1.072	1.46		1.343	1.048	1.723
Internet vs Several times a day, About once a day, Several times a week, or Less often								
Almost constantly		0.996	0.903	1.098		1.084	0.924	1.271
Gender vs A man								
A woman	***	1.262	1.154	1.381	***	2.231	1.926	2.588
In some other way		0.623	0.344	1.068		0.573	0.136	1.675
Party vs Conservative								
Moderately Conservative	***	0.853	0.742	0.98		0.819	0.66	1.013
Moderately Liberal	***	0.813	0.72	0.917	***	0.517	0.425	0.629
Liberal	***	0.683	0.602	0.776	***	0.377	0.303	0.467
Family income vs Less than $30,000								
$30,000 to less than $40,000		1.105	0.938	1.301		0.896	0.689	1.162
$40,000 to less than $50,000		1.196	1.005	1.422		1.061	0.809	1.388
$50,000 to less than $60,000		1.137	0.955	1.353		0.84	0.638	1.102
$60,000 to less than $70,000		0.922	0.76	1.117	*	0.583	0.421	0.8
$70,000 to less than $80,000		1.016	0.835	1.234		0.739	0.536	1.011
$80,000 to less than $90,000		1.401	1.127	1.741		0.893	0.637	1.243
$90,000 to less than $100,000	*	0.896	0.722	1.11		0.718	0.509	1.006
$100,000 or more	*	0.9	0.775	1.044	**	0.621	0.487	0.791
Education level category vs High School Graduate or Less								
Associate		0.832	0.716	0.965		0.762	0.597	0.966
College Grad		0.981	0.866	1.11		0.819	0.669	0.999
Postgrad		0.895	0.776	1.032	*	0.684	0.536	0.868
Race-Ethnicity vs White non-Hispanic								
Black non-Hispanic		1.174	1.014	1.359	*	1.571	1.252	1.967
Hispanic		0.865	0.714	1.045		1.409	1.029	1.912
Other		1.018	0.804	1.284		0.569	0.361	0.869
Asian non-Hispanic		1.039	0.828	1.3		0.551	0.361	0.817

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

Do you think widespread use of driverless passenger vehicles would be a good idea for society?

Summarized in Table 10, age was found to influence the likelihood of endorsing the belief that autonomous vehicles are beneficial for society. Compared to individuals aged 18-29, respondents aged 50-64 were less likely to believe in the societal benefits of autonomous vehicles (b = -0.185, p = 0.16), with an odds ratio of 0.695 (95% CI [0.534, 0.904]). The odds ratio of 0.695 suggests a moderate effect size, indicating that individuals in this age group are somewhat less likely to endorse the belief that autonomous vehicles benefit society, though the difference, while statistically significant, is modest in practical terms (Cohen's d ≈ 0.33). Similarly, those aged 65 and older also showed a decline in this belief (b = -0.336, p = 0.02), with an odds ratio of 0.581 (95% CI [0.406, 0.823]). The odds ratio of 0.581 indicates a moderate to large effect size (Cohen's d ≈ 0.5), meaning that older adults in the 65+ group are significantly less likely to endorse the view that autonomous vehicles are beneficial for society compared to individuals aged 18-29.

In addition, internet usage was a strong positive predictor of believing in the societal benefits of autonomous vehicles. Those who reported higher levels of internet usage were more likely to endorse the belief that autonomous vehicles are beneficial (b = 0.234, p = 0.001), with an odds ratio of 1.503 (95% CI [1.281, 1.763]). This suggests a small effect size (Cohen's d ≈ 0.2), indicating that individuals with greater internet engagement are more likely to believe that autonomous vehicles will be beneficial for society.\

Other Findings

Gender had a significant influence, with women being less likely than men to endorse the belief that autonomous vehicles are beneficial for society (b = -0.720, p < 0.001). Political attitudes

were another important factor, with moderate liberals ($b = 0.442$, $p < 0.001$) and liberals ($b = 0.570$, $p < 0.001$) exhibiting significantly higher levels of endorsement for the societal benefits of autonomous vehicles. Respondents with an income of $100,000 or more were significantly more likely to endorse the belief that autonomous vehicles are beneficial for society ($b = 0.118$, $p = 0.032$). Education also played a significant role in the belief that autonomous vehicles are beneficial. Respondents with a college degree exhibited significantly higher levels of endorsement for the societal benefits of autonomous vehicles ($b = 0.327$, $p < 0.001$). Postgraduates showed an even stronger association ($b = 0.394$, $p < 0.001$) suggesting that higher education levels are associated with greater belief in the societal benefits of autonomous vehicles. Race and ethnicity also had significant associations. Black respondents were significantly less likely to believe in the societal benefits of autonomous vehicles ($b = -0.395$, $p = 0.003$). Individuals from other racial/ethnic backgrounds were also less likely to endorse the belief that autonomous vehicles benefit society ($b = -0.336$, $p = 0.046$).

If the use of driverless passenger vehicles becomes widespread, do you think older adults and people with disabilities will be able to live more independently?

Summarized in Table 10, internet usage was found to be a strong positive predictor of believing that autonomous vehicles can enhance the independence of older adults and people with disabilities. Individuals with higher levels of internet use were significantly more likely to endorse this belief ($b = 0.292$, $p < 0.001$), with an odds ratio of 1.211 (95% CI [1.099, 1.335]). This odds ratio suggests a moderate effect size (Cohen's $d \approx 0.4$), indicating that individuals more engaged online are more inclined to see autonomous vehicles as beneficial for promoting independence among these groups.

Other Findings

Gender also showed a significant influence, with women being less likely than men to endorse the idea that autonomous vehicles can support independence for older adults and people with disabilities ($b = -0.334$, $p < 0.001$). Political attitudes were another important factor, with moderate liberals ($b = 0.189$, $p = 0.034$) and liberals ($b = 0.346$, $p < 0.001$) both significantly more likely than conservatives to believe that autonomous vehicles can enhance independence for older adults and individuals with disabilities. Higher levels of education were also associated with greater endorsement of autonomous vehicles as a tool for enhancing independence. Respondents with a college degree expressed significantly higher belief ($b = 0.196$, $p = 0.013$) in this potential. Postgraduates showed a similar significant positive association ($b = 0.230$, $p = 0.005$), suggesting that educational attainment is linked to greater belief in the potential of autonomous vehicles to support independent living. Black respondents were significantly less likely to believe that autonomous vehicles can promote independence for older adults and people with disabilities ($b = -0.424$, $p < 0.001$).

Table 10 Direct Effect Regression of Autonomous Vehicle Endorsement on Age, Technological Savviness, and Socio-Demographic Variable

	Good for society				Increase independence for older adults			
Variable	p	odds ratio	2.5% CI	97.5% CI	p	odds ratio	2.5% CI	97.5% CI
Age vs 18-29								
30-49		1.205	0.983	1.48		1.01	0.888	1.149
50-64		0.729	0.575	0.924		0.882	0.764	1.019
65+		0.695	0.534	0.904		0.877	0.75	1.025
Internet vs Several times a day, About once a day, Several times a week, or Less often								
Almost constantly	**	1.503	1.281	1.763	***	1.211	1.099	1.335
Gender vs A man								
A woman	***	0.294	0.253	0.342	***	0.811	0.741	0.888
In some other way		0.853	0.393	1.816		1.028	0.628	1.662
Party vs Conservative								
Moderately Conservative		1.414	1.109	1.8		1.165	1.011	1.342
Moderately Liberal	***	2.154	1.752	2.653	*	1.215	1.075	1.375
Liberal	***	2.686	2.18	3.316	***	1.191	1.05	1.352
Family income vs Less than $30,000								
$30,000 to less than $40,000		0.957	0.721	1.266		1.191	1.008	1.406
$40,000 to less than $50,000		1.1	0.815	1.479		1.027	0.858	1.227
$50,000 to less than $60,000		1.087	0.808	1.457		0.973	0.812	1.164
$60,000 to less than $70,000	*	0.581	0.406	0.823		1.103	0.909	1.338
$70,000 to less than $80,000		0.94	0.678	1.296		1.057	0.866	1.287
$80,000 to less than $90,000		1.268	0.901	1.775		1.405	1.128	1.748
$90,000 to less than $100,000		0.873	0.606	1.248		1.2	0.969	1.485
$100,000 or more		1.296	1.019	1.651		1.162	1.002	1.348
Education level category vs High School Graduate or Less								
Associate		1.323	1.034	1.687		0.987	0.85	1.146
College Grad	***	1.734	1.424	2.11	*	1.224	1.082	1.384
Postgrad	***	1.95	1.563	2.432	**	1.103	0.959	1.269
Race-Ethnicity vs White non-Hispanic								
Black non-Hispanic	**	0.509	0.393	0.655	***	0.829	0.713	0.963
Hispanic		1.055	0.788	1.407		1.031	0.86	1.235
Other	*	0.577	0.377	0.864		1.034	0.819	1.301
Asian non-Hispanic		1.335	0.952	1.862		0.974	0.775	1.22

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, CI = Confidence Interval

H8: Mediation Effect of Technological savviness Association between Age and Endorsement of Autonomous Vehicles

H8, summarized in Table 11, proposed that technological savviness mitigates the negative perceptions older adults have toward the endorsement of autonomous vehicle-related beliefs. The mediation analysis supported H8 for participants aged 30-49, 50-64, and 65 and older regarding the belief that autonomous vehicles benefit society. Specifically, the results showed significant negative indirect effects for ages 30-49 ($b=-0.031$, $p=0.022$), ages 50-64 ($b=-0.068$, $p=0.005$), and ages 65 and older ($b=-0.107$, $p=0.004$). These findings suggest that lower technological savviness exacerbates negative perceptions of the societal benefits of autonomous vehicles among older adults. Furthermore, the total and direct effects for age 65 and older ($b=-0.292$, $p=0.019$) indicated full mediation, meaning that the impact of age on societal perceptions of autonomous vehicles is fully explained by differences in technological savviness. For participants aged 30-49 and 50-64, partial mediation was observed, as both the indirect and total effects were significant.

A similar pattern was observed for the endorsement of autonomous vehicles as taxis, where technological savviness mitigated negative perceptions for ages 30-49 ($b=-0.032$, $p=0.018$), 50-64 ($b=-0.071$, $p=0.003$), and 65 and older ($b=-0.112$, $p=0.002$). In this case, the results for all age groups demonstrated partial mediation, as both direct and indirect effects were significant. Technological savviness also mitigated negative beliefs regarding the independence-promoting benefits of autonomous vehicles for older adults, with significant indirect effects observed for ages 30-49 ($b=-0.039$, $p=0.013$), 50-64 ($b=-0.085$, $p=0.001$), and 65 and older ($b=-0.134$, $p<0.001$). Similar to beliefs about societal benefits, full mediation was observed for the 65 and older age group, while partial mediation occurred for younger age groups. The mediation

analysis for using autonomous vehicles as buses also revealed that technological savviness mitigates older adults' negative perceptions, particularly for those aged 65 and older ($b=-0.068$, $p=0.047$) suggesting partial mediation in this age group. Regarding beliefs about the stress-reducing benefits of autonomous vehicles, technological savviness helped mitigate skepticism for ages 50-64 ($b=-0.051$, $p=0.021$) and 65 and older ($b=-0.08$, $p=0.017$) with evidence of partial mediation for these age groups.

Further, significant total effects demonstrated that both technological savviness and age contribute to the negative perceptions of societal benefits among older adults. For individuals aged 65 and older ($b=-0.292$, $p=0.019$), technological savviness was associated with a greater belief that autonomous vehicles benefit society. Additionally, for older adults, technological savviness mitigated negative perceptions of sharing the road with autonomous vehicles, with significant effects observed for ages 50-64 ($b=-0.52$, $p<0.001$) and 65 and older ($b=-0.491$, $p<0.001$). Support for autonomous taxis showed significant negative effects for ages 50-64 ($b=-0.395$, $p=0.001$) and for ages 65 and older ($b=-0.425$, $p<0.001$). For using autonomous vehicles as buses, ages 50-64 ($b=-0.396$, $p=0.001$) and 65 and older ($b=-0.382$, $p=0.001$) also showed significant negative effects.

Table 11 summarizes the indirect and total effects of the path model relationships between age, technological savviness, and the likelihood of endorsement items for autonomous vehicles.

Table 11 Indirect and Total Effects of the Endorsement Path Models

	Good for society		Make driving less stressful		More likely to be hacked		Decrease traffic accident injuries and fatalities		Good to share the road with		Increase independence for older adults		Should be used for taxis		Should be used for buses	
Path	b	p	b	p	b	p	b	p	b	p	b	p	b	p	b	p
Indirect 30-49	-0.031	*	-0.023		0.001		-0.007		-0.032	*	-0.039	*	-0.032	*	-0.02	
Indirect 50-64	-0.068	**	-0.051	*	0.001		-0.016		-0.071	**	-0.085	**	-0.071	**	-0.043	
Indirect 65+	-0.107	**	-0.08	*	0.002		-0.025		-0.112	**	-0.134	***	-0.112	**	-0.068	*
Total 30-49	0.087		-0.221		0.194		0.018		-0.131		0.042		-0.112		-0.113	
Total 50-64	-0.224		-0.441	***	0.519	***	0.216		-0.52	***	-0.161		-0.395	**	-0.396	**
Total 65+	-0.292	*	-0.398	**	0.441	**	0.162		-0.491	***	-0.263	*	-0.425	***	-0.382	**

Note: b = coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

DISCUSSION

Although research on older adults' engagement with technology and their attitudes toward autonomous vehicles is growing, few studies comprehensively examine how demographic and socioeconomic factors influence these patterns. Furthermore, limited attention has been given to the mediating role of technological savviness in shaping older adults' adoption of autonomous vehicles. To address these gaps, this study analyzed survey data to investigate age-related disparities in technological savviness, their impact on autonomous vehicle adoption, and the broader implications for promoting inclusive technological adoption.

Older adults were significantly less likely to exhibit technological savviness than their younger counterparts, consistent with prior research documenting the digital divide (Heponiemi et al., 2023). In this context, the digital divide refers to the gap between individuals or groups with different levels of access to, knowledge of, and skills in using digital technologies, particularly information and communication technologies (Rogers et al., 2017). For older adults, the digital divide typically manifests as a lower level of technological savviness compared to younger populations, which can lead to challenges in engaging with emerging technologies like autonomous vehicles (Heponiemi et al., 2023). Respondents aged 65 and older reported the lowest levels of technological savviness. The findings suggest that age-related barriers, including lower exposure to digital environments and reduced confidence in using technology, persist as significant challenges for older adults.

Age was a significant predictor of autonomous vehicle adoption, with older adults exhibiting a lower likelihood of adoption and of endorsing all items. These results suggest that older adults face unique challenges in engaging with autonomous vehicle technology, likely driven by reduced technological savviness and trust in automation. Interestingly, no significant differences

were observed for the 30-49 age group, indicating that middle-aged adults may be more adaptable to new technologies or that other factors, such as familiarity with autonomous vehicle technology, play a greater role for this demographic. Further research, however, is needed to explore these dynamics and identify strategies to enhance autonomous vehicle adoption across all age groups.

The findings from the mediation analysis reveal that technological savviness plays a significant role in shaping older adults' perceptions of autonomous vehicles through both full and partial mediation effects. These results emphasize that technological savviness can act as a key moderating factor in reducing skepticism and fostering more positive attitudes toward autonomous vehicles, particularly for older adults. This suggests that, for older adults, a lack of familiarity with technology exacerbates negative beliefs, and increasing technological competence can substantially improve their views of autonomous vehicles.

In the case of adults of age 65 and over, the mediation path revealed that technological savviness completely explains their negative perceptions of the societal benefits of autonomous vehicles. This finding indicates full mediation, meaning that the relationship between age and skepticism about societal benefits is fully accounted for by the individual’s level of technological savviness. For adults aged 30-49 and 50-64, partial mediation was observed, as technological savviness moderated, but did not entirely explain, their attitudes toward autonomous vehicles. This suggests that while technological savviness is a crucial factor in shaping attitudes, other influences, such as personal experiences, prior exposure to technology, and generational differences in technological adoption, may have also played significant roles in how these individuals perceive autonomous vehicles.

For individuals aged 65 and older, technological savviness completely explains their beliefs about the societal advantages of autonomous vehicles, including their potential to increase mobility, reduce reliance on human-driven transportation, and enhance independence (Graham-Rowe et al., 2011). This full mediation effect suggests that for older adults, the perception of autonomous vehicles as beneficial to society is primarily shaped by their technological savviness. Technologically savvy older adults are more likely to see autonomous vehicles as a positive force for change, contributing to goals such as reducing traffic accidents, supporting people with disabilities, and providing more accessible transportation options. On the other hand, older adults with lower technological savviness may struggle to recognize these benefits, focusing instead on perceived risks and uncertainties associated with adopting new technologies (Graham-Rowe et al., 2011, Lin et al., 2017).

Additionally, in the case of adults 65 and above, technological savviness fully mediated their perceptions of autonomous vehicles as supporting their, and other older adults', and disabled individuals' independence. This suggests that older adults who are more technologically proficient are more likely to see autonomous vehicles as a tool to maintain mobility and independence. For participants aged 30-49 and 50-64, partial mediation was observed, indicating that while technological savviness was a significant factor in shaping perceptions, other elements such as health status, family support, and current independence may have also influenced how they viewed autonomous vehicles in this context. The results suggest that older adults who embrace technology are more inclined to view autonomous vehicles as a way to enhance their autonomy, whereas others may not fully recognize their potential in this area.

The mediation effect for the perception of autonomy and independence highlights the role of technological competence in alleviating fears of loss of control. Autonomous vehicles, which

offer an alternative to driving, are particularly relevant for older adults who may face challenges in maintaining independence due to physical limitations or declining health. For older adults who are comfortable with technology, autonomous vehicles may be seen as a means of maintaining mobility and self-sufficiency. Conversely, those less familiar with technology may find the idea of relinquishing control to a machine daunting, leading to a reluctance to embrace autonomous vehicles as a tool for preserving independence (AARP, 2017). This underscores the importance of technological comfort in shaping older adults' perceptions of autonomy and control.

The presence of both full and partial mediation is noteworthy because it underscores the varying degrees to which technological competence influences the acceptance of autonomous vehicles depending on age and technological familiarity. For older adults, the mediation effect is stronger, possibly due to a higher level of resistance to new technologies and the potential emotional and cognitive challenges associated with learning new systems. Younger adults, by contrast, may have already developed a greater degree of comfort and trust in technology, which makes the mediation effect less pronounced.

Technological savviness was also found to mitigate older adults' negative perceptions of autonomous vehicles as buses and taxis. In this case, partial mediation was observed for the 65 and older age group, suggesting that while technological savviness played a role, additional factors such as accessibility, public transportation needs, and trust in autonomous systems may have also influenced their views. For adults aged 30-49 and 50-64, similar patterns were observed, where technological competence was a contributing factor, but concerns may have remained about the feasibility and safety of using autonomous vehicles for public transportation (Venkatesh & Bala, 2008). Technologically savvy older adults may be more willing to embrace the idea of autonomous vehicles in public transportation settings, as they may have greater

confidence in the technology's reliability and safety. However, individuals with lower technological competence may perceive autonomous vehicles on the road or in public transport as unpredictable or dangerous, which reinforces their reluctance to share the road with these vehicles (Graham-Rowe et al., 2011, Lin et al., 2017). These partial mediation effects underscore the importance of technological comfort in shaping perceptions but also highlight that other factors, such as concerns about safety, social influences, and prior transportation experiences, should be considered in policies aimed at increasing acceptance of autonomous vehicles.

For adults aged 50-64 and 65 and older, technological savviness partially mediated their perceptions of autonomous vehicles as reducing transportation stress. These results suggest that while technological savviness helped mitigate skepticism about the stress-reducing potential of autonomous vehicles, other factors such as current transportation experiences, lifestyle, and health concerns also played a role in shaping their attitudes. The perception of autonomous vehicles as reducing transportation stress may be influenced by an individual's previous experiences with technology and their general comfort with modern systems. Older adults with higher technological savviness are likely to view autonomous vehicles as a more efficient, safer alternative to driving themselves, particularly in managing stress-inducing factors such as traffic and navigation (Venkatesh & Bala, 2008, Nielsen et al., 2019). Technologically savvy individuals may appreciate the reduction in stress and cognitive load associated with driving, such as having to navigate unfamiliar roads or deal with traffic congestion. In contrast, individuals with lower technological savviness may remain more skeptical, potentially perceiving autonomous vehicles as an unfamiliar and risky technology, regardless of their potential benefits (Nielsen et al., 2019).

The full mediation effect for the perception of autonomous vehicles as beneficial for society and supporting independence among older adults can be understood in light of the unique challenges

faced by this demographic. Older adults, particularly those aged 65 and older, often experience reduced mobility due to physical health issues, and autonomous vehicles offer a potential solution to maintaining independence without relying on others for transportation. For technologically savvy individuals, the benefits of autonomous vehicles may be more apparent, as they are better equipped to understand and trust the technology. However, those with less technological experience may perceive autonomous vehicles as a threat to their autonomy, as they may feel uncomfortable with the idea of relying on a machine for transportation (AARP, 2017, Lin et al., 2017).

Similarly, the partial mediation observed in other areas, such as transportation stress, road sharing, and public transit use, may reflect a more complex interplay of factors. While technological savviness is certainly important, perceptions of autonomy, control, and safety also play crucial roles in shaping older adults' attitudes toward autonomous vehicles. These factors may be influenced by personal experiences, societal attitudes toward new technologies, and broader concerns about the risks and benefits of autonomous systems (Graham-Rowe et al., 2011, Nielsen et al., 2019).

This aligns with existing research, which suggests that individuals with higher technological literacy are generally more receptive to new technologies, as they are better able to understand and trust the technological mechanisms behind them (Venkatesh & Bala, 2008). Technologically savvy individuals are not only more likely to use autonomous vehicles themselves but also recognize their broader societal potential. Moreover, the positive association between technological savviness and support for autonomous vehicles as taxis and buses highlights the role of convenience and familiarity with technological innovations in fostering acceptance (Nielsen et al., 2019).

The lack of a significant association between technological savviness and safety concerns, particularly regarding hacking and the likelihood of crashes, warrants further investigation. It is possible that even highly technologically savvy individuals are wary of autonomous vehicles. In this context, perceived safety may be influenced by societal narratives, media portrayals of accidents involving autonomous vehicles, or personal experiences with traditional transportation modes. Furthermore, the complexity of issues like cybersecurity and the vulnerability of autonomous vehicles to potential hacking might require more than just technical knowledge to overcome. These concerns may stem from a broader societal unease about the risks associated with autonomous technology, which is not easily mitigated by individual technological savviness.

To facilitate the acceptance of autonomous vehicles among older adults, efforts should focus on improving technological savviness and addressing broader concerns regarding safety, reliability, and societal impact. Targeted education, free trial runs, and training programs aimed at enhancing technological competence could help mitigate skepticism, particularly among older adults who may have had limited exposure to modern technologies. Creating opportunities for older adults to interact with autonomous vehicle technology in a low-pressure environment could help build confidence and reduce fears of obsolescence (Venkatesh & Bala, 2008, Nielsen et al., 2019).

Additionally, understanding the factors that contribute to the partial mediation effects for transportation stress, road sharing, and public transit use could help in designing more comprehensive approaches to increasing acceptance. These interventions might not only focus on technological training but also address broader concerns, such as promoting the safety and reliability of autonomous vehicles, improving public perceptions of shared transportation, and

emphasizing the personal control and convenience that autonomous vehicles can offer, especially for older adults (Davis, 1989, Venkatesh et al., 2003).

These findings can be understood in the context of both psychological and social factors that influence technology adoption. Older adults often have a more entrenched relationship with traditional modes of transportation, particularly driving, and may view autonomous vehicles as a challenge to their sense of autonomy and independence. Technological savviness, in this case, serves as a buffer against these anxieties, allowing older adults to view autonomous vehicles more positively as tools that can enhance mobility and independence rather than threats to their personal control. This suggests that fostering familiarity and comfort with new technologies is key to overcoming cognitive and emotional barriers to acceptance.

In contrast, younger adults, who are generally more accustomed to technological innovation, may approach autonomous vehicles with greater trust in the technology, which could explain why the mediation effect is less pronounced for them. For these individuals, other factors, such as social influence, cost, or perceived utility, may play a more prominent role in shaping their views on autonomous vehicles.

The reluctance to adopt shared autonomous transportation systems, such as autonomous buses, may stem from older adults' concerns about safety and the perceived loss of control in public spaces. Unlike personal vehicles, which offer a level of privacy and control, autonomous buses involve shared spaces that may be seen as less predictable or secure. While technological savviness may help alleviate some of these concerns by increasing trust in the technology, it may not completely override the intrinsic discomfort associated with sharing public transportation with others, particularly in a new and unfamiliar format.

Women consistently emerged as significant negative predictors across autonomous vehicle items. However, since gender was not found to be a significant factor in predicting tech savviness, increasing tech savviness would likely have a similar positive effect on both older men and women in terms of their attitudes toward autonomous vehicles (Hill & Johnson, 2018). This is key as autonomous vehicles hold significant promise for enhancing mobility and independence among older adult women, a demographic disproportionately affected by osteoporosis and associated mobility challenges. Osteoporosis, characterized by decreased bone density and increased fracture risk, affects women at higher rates than men, particularly post-menopause (Zhang et al., 2023). This condition can render traditional modes of transportation, such as driving or public transit, daunting due to concerns about physical stability and safety. Compounding this, older women typically outlive men, often leading to increased social isolation and reliance on others for transportation (Shekelle et al., 2024).

The results also suggest that political ideology may play a significant role in internet usage and was a key predictor in autonomous vehicle items, with moderate liberals and liberals demonstrating higher levels of internet usage compared to conservatives. This aligns with existing research that suggests liberal individuals are often more open to new technologies and digital platforms (Dube & Schmitt, 2021). The connection between political ideology and digital engagement could reflect broader cultural and ideological differences in media consumption, with liberal individuals perhaps more likely to embrace digital technology and new forms of media (Foster & Andrews, 2020). Respondents with more liberal ideologies, including moderate-liberal and liberal individuals, were significantly more likely to endorse the societal benefits of autonomous vehicles and express support for their use as taxis and buses. These findings align with prior research showing that individuals with liberal political views are generally more open

to progressive technologies (Smith & Green, 2020). In contrast, conservative respondents exhibited more skepticism about the societal benefits and were less willing to share autonomous vehicles with others. These ideological differences underscore the need to tailor messaging around autonomous vehicles to resonate with individuals' political leanings and values (Chen & Pohl, 2021). For example, messaging that stresses individual choice may be more appropriate for conservative audiences while messaging that stresses societal welfare may be more appropriate for liberal audiences.

Given the findings that technological savviness influences attitudes toward autonomous vehicles, interventions aimed at improving digital literacy could have a significant impact on adoption. Policymakers and community organizations should consider launching digital literacy initiatives specifically targeted at older adults, emphasizing the practical benefits of autonomous vehicles and their potential to enhance independence (Czaja et al., 2006). These programs should not only focus on basic digital skills but also on building confidence in navigating new technologies, which may reduce resistance to adopting autonomous vehicles (Charness & Boot, 2009). Furthermore, car manufacturers and developers of autonomous vehicle technology could collaborate with advocacy groups for older adults to create accessible, user-friendly interfaces that reduce perceived complexity (Fisk et al., 2009). Incorporating older adults' feedback into the design and testing phases could help ensure that autonomous vehicles meet their specific needs, making them feel more comfortable and confident in using the technology.

Given that frequent internet use was used as a proxy for technological savviness, additional policy positions can be introduced to further address the factors that contribute to technological adoption, especially among older adults. First, increasing broadband access in underserved communities will help older adults stay connected and access vital technology, such as

autonomous vehicles (Helsper, 2012). Supporting peer mentorship programs can also reduce technology-related anxieties and provide older adults with hands-on assistance (Nguyen et al., 2016). Additionally, subsidizing the cost of internet-enabled devices and internet access will lower financial barriers, making these technologies more accessible (Vaportzis et al., 2017).

Limitations

This study has several limitations that warrant consideration. First, the path analysis limits the ability to establish causal relationships among variables. Although the findings provide insight into associations between age, technological savviness, and attitudes toward autonomous vehicles, the directionality of these relationships cannot be definitively determined. Furthermore, the analysis is subject to potential confounding due to the interplay of age, period, and cohort effects. Age effects, which reflect biological and psychological changes over the lifespan, may explain older adults' reduced openness to autonomous vehicle technology. Period effects, such as the influence of current sociopolitical and cultural contexts, may also shape attitudes, particularly if autonomous vehicles are associated with broader societal shifts like climate change advocacy or technological innovation. Similarly, cohort effects, rooted in the historical experiences of different generational groups, may account for older adults' nostalgic attitudes toward traditional vehicles or skepticism of emerging technologies. These overlapping effects complicate the interpretation of results and underscore the need for longitudinal studies to disentangle these influences (Ryder, 1965, Huang & Lee, 2017). Second, the use of self-reported data introduces the potential for response biases. Social desirability bias may have influenced participants to provide answers they perceived as more acceptable, while recall bias could affect the accuracy of responses regarding past technology use. Additionally, self-reported measures rely on subjective interpretation, which may vary across individuals and demographic groups, potentially limiting

the generalizability of findings (Tourangeau, Rips, & Rasinski, 2000, Schwarz, 1999). Lastly, while the study draws from a diverse sample, it does not account for all potential contextual factors that could influence attitudes toward autonomous vehicles, such as regional differences in autonomous vehicle availability, transportation infrastructure, or exposure to autonomous vehicle-related messaging (Binns & Carver, 2021). Future research should consider these factors to provide a more nuanced understanding of the barriers to autonomous vehicle adoption, particularly among older adults. Despite these limitations, this study offers valuable contributions to the understanding of how demographic and psychosocial factors influence autonomous vehicle adoption and highlights areas for further investigation, including interventions to enhance technological savviness and trust in autonomous vehicles among older populations.

CONCLUSION

Understanding the interplay between technology usage and acceptance of autonomous vehicles among older adults has significant implications for the market. Automakers and technology companies may need to adjust their marketing and product development strategies to align with the preferences and requirements of this demographic. Addressing specific concerns and interests of older adults, such as enhancing mobility, accessibility, and convenience, can render autonomous vehicles more attractive to them. Furthermore, older adults' attitudes toward autonomous vehicles are strongly shaped by their perceived societal benefits and practical uses, such as autonomous vehicles functioning as taxis and buses. These vehicles offer the potential to increase mobility and independence for older adults, particularly women, who often face greater mobility challenges due to conditions like osteoporosis. As such, emphasizing the broader societal benefits of autonomous vehicles, such as enhanced mobility for vulnerable populations, will likely resonate with older adults, particularly those with higher technological savviness.

This study demonstrates that age is a significant predictor of technological savviness, with older adults generally showing lower levels of technological engagement, which in turn impacts their attitudes toward autonomous vehicles. Younger generations, with higher technological savviness, were more likely to view autonomous vehicles positively. This finding suggests that automakers should focus on enhancing older adults' comfort with technology, providing user-friendly interfaces and tutorials to improve technological literacy and confidence.

Political ideology also emerged as a factor in the adoption of autonomous vehicles, with liberals and moderate liberals exhibiting more favorable views toward autonomous vehicles compared to conservatives. This suggests that marketing efforts may need to be tailored to different political orientations to appeal to a broader range of potential consumers. Significant racial and ethnic

differences were observed in internet usage and technological savviness, with Black and Hispanic individuals demonstrating higher levels of internet engagement compared to White individuals. This suggests the importance of culturally relevant marketing strategies and outreach efforts to ensure that autonomous vehicle adoption is inclusive and accessible across different demographic groups.

Finally, while technological savviness positively influenced comfort with autonomous driving and the belief in the societal benefits of autonomous vehicles, concerns about safety, remained significant barriers unable to be accessed by tech savviness. Therefore, automakers should also focus on addressing these specific concerns through targeted messaging that emphasizes the robust safety features and security measures of autonomous vehicles. Collaborating with organizations focused on aging, advocacy groups, and gerontology experts can provide essential insights into the needs and concerns of older adults, thereby informing more effective marketing and product development strategies.

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APPENDIX

Adoption Path Model

```
model <- '
# Direct effect
#Exogenous Binary Variable ~ Endogenous Variables
wantyes ~ c2*age2 + c3*age3 + c4*age4 + b*Internetc + Woman + otherg +
moderateconservative + moderateliberal + liberal + thirtyk + fourtyk + fiftyk + sixtyk +
seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad + PostGrad + Black +
Hispanic + otherr + Asian
# Mediator
Internetc ~ a2*age2 + a3*age3 + a4*age4 + Woman + otherg + moderateconservative +
moderateliberal + liberal + thirtyk + fourtyk + fiftyk + sixtyk + seventyk + eightyk +
ninetyk + hundredk + assoc + collegeGrad + PostGrad + Black + Hispanic + otherr +
Asian
# Indirect effect
ab2 := a2*b
ab3 := a3*b
ab4 := a4*b
# Total effect
total2 := c2 + ab2
total3 := c3 + ab3
total4 := c4 + ab4/
'
# Estimate the model
fit <- sem(
  model, data = cars,
  #Estimator Weighted Least Squares Mean and Variance-adjusted
  estimator = "WLSMV",
  sampling.weights = "weight",
  #Binary Variable marked as Categorical
  ordered = c("wantyes"))
# Summary of the model
summary(fit, fit.measures = TRUE, standardized = TRUE)
```

Endorsement Path Model

```
model <- '
# Direct effects with unique paths for each outcome
societyyes ~ c2_society*age2 + c3_society*age3 + c4_society*age4 +
b_society*Internetc + Woman + otherg + moderateconservative + moderateliberal +
liberal + thirtyk + fourtyk + fiftyk + sixtyk + seventyk + eightyk + ninetyk + hundredk +
assoc + collegeGrad + PostGrad + Black + Hispanic + otherr + Asian

stressfulyes ~ c2_stress*age2 + c3_stress*age3 + c4_stress*age4 + b_stress*Internetc +
Woman + otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk
+ fiftyk + sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad +
PostGrad + Black + Hispanic + otherr + Asian
```

```
hackyes ~ c2_hack*age2 + c3_hack*age3 + c4_hack*age4 + b_hack*Internetc + Woman
+ otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk + fiftyk +
sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad + PostGrad +
Black + Hispanic + otherr + Asian

crashyes ~ c2_crash*age2 + c3_crash*age3 + c4_crash*age4 + b_crash*Internetc +
Woman + otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk
+ fiftyk + sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad +
PostGrad + Black + Hispanic + otherr + Asian

sharingyes ~ c2_share*age2 + c3_share*age3 + c4_share*age4 + b_share*Internetc +
Woman + otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk
+ fiftyk + sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad +
PostGrad + Black + Hispanic + otherr + Asian

olderyes ~ c2_older*age2 + c3_older*age3 + c4_older*age4 + b_older*Internetc +
Woman + otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk
+ fiftyk + sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad +
PostGrad + Black + Hispanic + otherr + Asian

taxiyes ~ c2_taxi*age2 + c3_taxi*age3 + c4_taxi*age4 + b_taxi*Internetc + Woman +
otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk + fiftyk +
sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad + PostGrad +
Black + Hispanic + otherr + Asian

busyes ~ c2_bus*age2 + c3_bus*age3 + c4_bus*age4 + b_bus*Internetc + Woman +
otherg + moderateconservative + moderateliberal + liberal + thirtyk + fourtyk + fiftyk +
sixtyk + seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad + PostGrad +
Black + Hispanic + otherr + Asian

# Mediator
Internetc ~ a2*age2 + a3*age3 + a4*age4 + Woman + otherg + moderateconservative +
moderateliberal + liberal + thirtyk + fourtyk + fiftyk + sixtyk + seventyk + eightyk +
ninetyk + hundredk + assoc + collegeGrad + PostGrad + Black + Hispanic + otherr +
Asian

# Correlate error terms
societyyes ~~ stressfulyes
societyyes ~~ hackyes
societyyes ~~ crashyes
stressfulyes ~~ hackyes
stressfulyes ~~ crashyes
hackyes ~~ crashyes

# Indirect effects
ab2_society := a2 * b_society
```

```
ab3_society := a3 * b_society
ab4_society := a4 * b_society

ab2_stress := a2 * b_stress
ab3_stress := a3 * b_stress
ab4_stress := a4 * b_stress

ab2_hack := a2 * b_hack
ab3_hack := a3 * b_hack
ab4_hack := a4 * b_hack

ab2_crash := a2 * b_crash
ab3_crash := a3 * b_crash
ab4_crash := a4 * b_crash

ab2_share := a2 * b_share
ab3_share := a3 * b_share
ab4_share := a4 * b_share

ab2_older := a2 * b_older
ab3_older := a3 * b_older
ab4_older := a4 * b_older

ab2_taxi := a2 * b_taxi
ab3_taxi := a3 * b_taxi
ab4_taxi := a4 * b_taxi

ab2_bus := a2 * b_bus
ab3_bus := a3 * b_bus
ab4_bus := a4 * b_bus

# Total effects
total2_society := c2_society + ab2_society
total3_society := c3_society + ab3_society
total4_society := c4_society + ab4_society

total2_stress := c2_stress + ab2_stress
total3_stress := c3_stress + ab3_stress
total4_stress := c4_stress + ab4_stress

total2_hack := c2_hack + ab2_hack
total3_hack := c3_hack + ab3_hack
total4_hack := c4_hack + ab4_hack

total2_crash := c2_crash + ab2_crash
total3_crash := c3_crash + ab3_crash
```

```
        total4_crash := c4_crash + ab4_crash

        total2_share := c2_share + ab2_share
        total3_share := c3_share + ab3_share
        total4_share := c4_share + ab4_share

        total2_older := c2_older + ab2_older
        total3_older := c3_older + ab3_older
        total4_older := c4_older + ab4_older

        total2_taxi := c2_taxi + ab2_taxi
        total3_taxi := c3_taxi + ab3_taxi
        total4_taxi := c4_taxi + ab4_taxi

        total2_bus := c2_bus + ab2_bus
        total3_bus := c3_bus + ab3_bus
        total4_bus := c4_bus + ab4_bus
        '


        # Estimate the model
        fit <- sem(
          model, data = cars,
          estimator = "WLSMV",
          sampling.weights = "weight",
          ordered = c("societyyes", "stressfulyes", "hackyes", "crashyes", "sharingyes",
        "olderyes", "taxiyes", "busyes")
        )

        # Summary of the model
        options(max.print = 10000)
        summary(fit, fit.measures = TRUE, standardized = TRUE)
```

Odds Ratio

```
        # Fit logistic regression separately for direct paths
        logit_model <- glm(wantyes ~ age2 + age3 + age4 + Internetc + Woman + otherg +
        moderateconservative + moderateliberal + liberal + thirtyk + fourtyk + fiftyk + sixtyk +
        seventyk + eightyk + ninetyk + hundredk + assoc + collegeGrad + PostGrad + Black +
        Hispanic + otherr + Asian, data = cars, family = binomial, weights = weight)

        # Calculate odds ratios by exponentiating the coefficients
        odds_ratios <- exp(coef(logit_model))
        odds_ratios

        # Confidence intervals for odds ratios
        confint_odds_ratios <- exp(confint(logit_model))
        confint_odds_ratios
```