FLORIDA INTERNATIONAL UNIVERSITY

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WHAT FACTORS INFLUENCE THE CONSUMER USE OF FULLY AUTONOMOUS VEHICLES WITHIN THE UNITED STATES?

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To: Dean William Hardin
College of Business

This dissertation, written by Michael André Russell, and entitled What Factors Influence the Consumer Use of Fully Autonomous Vehicles within the United States?, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Florida International University, 2022

DEDICATION

I dedicate this dissertation to my Lord and Savior, Jesus Christ. Then also to my parents and both sets of paternal and maternal grandparents. It includes extended family, mentors, role models, and my childhood community as a nurturing village. They have instilled a deep desire for learning and a search for higher knowledge.

Their examples of achievement, commitment, love, perseverance, and support inspire me to excel, serve, and lead, always focusing on compassion for others. Especially for those who are less fortunate than me.

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ABSTRACT OF THE DISSERTATION

WHAT FACTORS INFLUENCE THE CONSUMER USE OF

FULLY AUTONOMOUS VEHICLES WITHIN THE

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by

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Miami, Florida

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The inclusion of autonomous vehicle technology in modern cars is causing both consumer familiarity and consternation amidst a growing interest in the future of fully autonomous vehicles (FAVs). This study's contributions are the key research constructs and interrelationships that positively influence consumers' behavioral intention to use FAVs. The research study concludes and advances a better understanding of perceptions and opinions from consumers about their behavioral intentions to use FAVs and the level of favorability toward self-driving vehicular technology.

As full vehicular autonomy does not yet exist, few extensive studies and experts exist within the automotive industry. Nevertheless, the number of those interested in working within and researching this coming technology is growing. Existing auto luxury and mass-market brands currently offer limited autonomous features within their cars. The coming technology's challenge is introducing it to consumers and complimenting that introduction with effective marketing communications to taut the benefits of fully autonomous vehicles.

A lack of familiarity may exist if you not are a current vehicle owner with (or user of) Semi-Autonomous Vehicle technology (SAV). It means most consumers may not be familiar with the automotive technology itself or what it has to offer them. FAV technology will continue to migrate downward within the United States (US) vehicular market into moderately and low- priced automotive brand segments. Therefore, this study attempts to define what consumers currently know about fully self-driving cars, their overall expectations, and to what extent they are willing to consider operating and owning or using FAVs in the future.

This cross-sectional, descriptive, and cross-relational research identifies factors influencing consumers' perceptions of autonomous vehicle technology. Specifically, it addresses the following significant attributes that are related to FAVs: performance expectation, price value, hedonistic motivation, societal influence, locus of control, risk aversion, individual attitude, subjective norm, affective trust, cognitive trust, fully autonomous vehicle technology attractiveness, and affordability, as well as the behavioral intention to use it. To this end, thirteen hypotheses are forwarded and empirically tested.
Keywords: Artificial Intelligence, Attitude, Autonomous Technology, Automobiles, Cars, Fully Autonomous Vehicles, Intelligent Transportation, Intention, Self-Driving Cars, Consumer Behavior, Consumer Marketing, Smart Mobility, and Technology Adoption.

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Introduction

The United States is currently undergoing a national vehicular transportation change in thinking not seen since the early 20th Century, when automobiles began to replace the horse and buggy (Miller & Heard, 2016). Fully autonomous vehicles (FAVs) will become commercially available and viable, coexisting with driver-controlled cars within ten years (Brimont et al., 2017). The first real-world FAV technology testing on US soil by Ford Motor Company (Ford) was in November 2015 at Mcity in the University of Michigan Transportation Center. Mcity is a 32-acre full scale simulated real-world transportation interactive environment built to evaluate and improve the technology in standard traffic patterns with multiple pedestrian and non-automotive street interactions. This real-world-like simulation environment gauges how consumers will interact with this coming FAV technology. As a result of Ford's successful FAVs testing partnership with the University of Michigan, the company created a new entity Ford Smart Mobility to further explore the viability of FAVs.

Ford Smart Mobility defined consumer marketing plans and tangible benefits concerning the future of FAVs. Furthermore, the company delivers increased vehicle connectivity, including enhanced personal mobility options to expand autonomous vehicle technology, improve the overall customer experience, and capture increased big data to accomplish these goals (Ford Motor Company, 2013). FAVs with hands-free driving technology are currently in development for consumer use. As the technology is new to consumers, they will have questions and concerns.

Current drivers express hesitation and concerns about the future of fully self-driving vehicles. The crux of future technology challenges is consumer trust, attitude, intention, and acceptance (Hegner et al., 2019). Semi-Autonomous Vehicles (SAVs) and FAVs are now conducting tests within multiple cities alongside human drivers on public city roadways (including Miami, Florida). What has not helped consumers become more comfortable with the technology is the number of accidents, including multiple fatalities, caused by autonomous vehicles evaluated in public roadway accidents (Shariff et al., 2017). Unfortunately, these occurrences may raise consumers' safety concerns about this self-driving technology.

Beyond safety, other areas include consumers expressing concerns about losing the ability to control the vehicle completely. Older individuals are more uncomfortable with totally acceding driving power control to FAVs than younger drivers (Rahman et al., 2019). Consumers have concerns about dependability, privacy, security, and accountability. Privacy denotes whether the occupants' data is secure and protected within the technology (Collingwood, 2017). Dependability refers to whether the occupants can trust the FAV to do what it is supposed to do. The dependability of FAVs is substantial on consumers' expectations of deliverables (Koopman & Wagner, 2017). Security is whether the FAV is fully ready for any cyber-security threat, such as external hacking (Petit & Shladover, 2014). Accountability means to what extent individuals, governmental, or corporate entities are responsible if things go wrong (Pagallo, 2017). These multiple concerns are an overall testimony of the general problems and challenges facing FAVs from the consumers' perspective.

This research study determines the key factors positively influencing consumers' behavioral intention to use FAVs. It contributes to the growing body of research on the future transportation technology of FAVs. Therefore, I propose the following research question: *What factors influence the Consumer use of FAVs within the United States?* To effectively answer this question, I utilize the various theories of Unified Theory Acceptance and Use of Technology (UTAUT) and Unified Theory Acceptance Use of Technology Two (UTAUT2) for factor determination and testing.

Background Information

General Motors Corporation (GM) is the first domestic automaker to initiate a foray into developing and showcasing fully autonomous vehicles (FAVs) technology at its GM Futurama Exhibit for The 1939 World's Fair in New York City New York. GM and its partner Norman Bel Geddes jointly build the exhibit as the sponsor and co-designer. Mr. Bel Geddes, at the time, is a major American Industrial Designer (Bimbraw, 2015). His partnership with GM successfully introduces the concept of FAVs to the World's Fair attendees as GM's vision for the coming automobile future. The miniature automobile design exhibit includes embedded circuits to power electric cars. A small circuitry system built into the road surface is within the roadway to communicate directly with the vehicles and control driverless model cars' movements.

FAVs rely solely on external radar and sensors and internally artificial intelligence, machine learning, neural networks, actuators, powerful processors, and complex algorithms to make this technology a reality to accomplish a hand-free vehicular travel experience. After more than eight decades later, United States (US) domestic automakers are now focusing on developing FAVs consumer mass market introductions.

The Society of Automotive Engineers International (SAE) developed a measurement scale for autonomous vehicle driving technology. Level 0 with no driver support or semi-autonomous features. Levels 1 and 2 for some driver support features. Level 3 is for some semi-autonomous features. Finally, Levels 4 and 5 for fully autonomous features (SAE Levels of Driving Automation ™ Refined for Clarity and International Audience, 2021). See *Appendix E*.

General Motors Corporation first unveiled its initial Level Two Autonomous Vehicles Technology called "*Super Cruise ™*" in 2017, initially on its 2018 Model Year Cadillac Luxury Sedan CT6. *Super Cruise ™* navigates certain divided highways with advanced mapping using

Geo-Fencing Software. Additionally, the GM autonomous vehicles technology has an infrared light monitoring system built into the top of the vehicle's steering wheel to monitor the driver's eyes to ensure they are on the road while *Super Cruise* TM is in use.

The GM company's goal is to become the automotive leader in FAVs and autonomous vehicles technology. GM announced a much improved second advanced driver-assistance technology product named "*UltraCruise* TM" General Motors Corporation (2021, October 6). This newer technology can navigate 200,000 miles inside the US and Canada on paved highways and roads (both divided and undivided), representing 95 percent of all driving scenarios. *Super Cruise* TM and *UltraCruise* TM will co-exist as optional equipment for the entire line-up of the GM car family.

The former will be available for mass-marketed cars, and the latter will only be available for the company's premium vehicle offerings. GM charges consumers a $2500 upfront options fee for *Super Cruise* TM in its Cadillac luxury vehicles. *UltraCruise* TM adds LiDAR (Light Detecting and Ranging) Sensors, Radar, and Cameras to create a 360-degree field of view around the vehicles. GM has set no pricing for *UltraCruise* TM. General Motors sees this new autonomous vehicle technology upgrade as a continuation of its goal of reaching zero crashes, zero emissions, and zero congestion. Its fellow automotive competitors understand they must successfully tackle this new technology (General Motors Corporation, 2021).

Ford established a separate unit to solely focus on its autonomous vehicle technology, Ford Autonomous Vehicles LLC. (Ford Motor Company, 2018). After half a million miles of road testing for its autonomous software, Ford introduced its semi-autonomous vehicle driving optionally equipped software suite called *"Blue Cruise* TM*."* Their self-driving technology offering requires a $600 annual subscription fee, increasing after three years. Currently, it is only for use on divided highways (100,000 miles of the US Interstate Highway System, to be exact). The technology deploys both exterior cameras and LiDAR sensors to operate the system safely. An interior camera tracks the driver's movements and a forward sight to ensure they are fully alert and attentive when the software is engaged (Ford Motor Company, 2021). Ford currently offers *Blue Cruise* ^{TM} on two model lines, the new Mustang Mach E Electric Sports Utility Vehicle and Lightning Electric Truck and its other gasoline F-150 Trucks. This technology will require an acceptable industry standard and scale of measurement for FAVs performance.

Most new vehicles operating today have some semi-autonomous vehicle technology features at SAE Level 2 (e.g., adaptive cruise control, lane-keeping assistance, automatic braking, or parking assistance). Bavarian Motor Works (BMW), Lucid Motors (another electric vehicles company), and Mercedes-Benz are preparing SAE Level 3 autonomous vehicle models for near-future US market introductions (Kahn et al., 2022). For FAVs access to become widely used by consumers, Artificial Intelligence (AI) and Neural Networks will play significant roles in the technology's competence.

The method by which AI (embedded within an autonomous vehicle) processes accident decision-making scenarios where injury or loss-of-life is possible differs from that of a human driver. Then it becomes essential that OEMs focus on successfully programming the AI to accomplish no harm outcomes as much as possible for daily consumer operations. Trust also has to do with the credibility of extensive technology testing for consumers. Before embracing it, they will want to know and feel comfortable rigorously robust testing on fully self-driving technology. Deploying differing methods of automotive company testing is crucial for the technology's success.

Electric automaker Tesla Motors found an innovative way of testing and getting real-time consumers to use feedback metadata on its self-driving technology they have deemed "*Autopilot* ^{TM}." The branding of the suite of technology initially builds and further gains the trust of its owners in their semi-autonomous driving features as they increase through over-the-air software updates. Some have said that labeling the Tesla suite of technology *Autopilot* ^{TM} has given its drivers a false sense of the technology to operate at a fully autonomous SAE Level 5, requiring no human supervision or interaction.

Telsa *Autopilot* ^{TM} is a semi-autonomous SAE Level 2 technology that requires continuous driver monitoring and input. Currently, Tesla charges its consumers $12,000 for its optional and unavailable Full Self-Driving (FSD) autonomy suite. The federal government transportation department believes Telsa's promotion of the not ready FSD unsuccessfully states consumers' desires for its immediate consumer-market availability.

These challenges have caused some auto industry pundits to speculate that FAVs becoming a reality is far into the future. Some say it will be a five-to-ten-year window. While others state that it could be more like 2035 before seeing recognizable numbers of FAVs navigating the country's highways and byways (Baldwin, 2020). The automotive industry and governmental entities still do not know the diversity and complexity of regulatory frameworks necessary to make FAVs consumers trustworthy and real.

Consumers appear to be ahead of any FAV technology regulatory frameworks or safety protocols. The proof is the growing number of drivers involved in accidents and their purposeful attempts to completely release drivers' controls when using limited semi-autonomous vehicle technology. Many consumers feel the technology is farther advanced than it is, attempting to use it as if full autonomy already exists. This SAVs confusion is causing a disconnect between perception and reality among many consumers. Federal, state, and local jurisdictions are responsible for creating a workable and seamless set of FAVs guidelines for safe operation and as regulatory references for automotive original equipment manufacturers (OEMs) to protect consumers. Once those guidelines are entirely in place, the crucial consumer point will be to what extent FAVs technology is safe and dependable. Only recently, the federal government publicly announced its first significant guidance approval for FAVs. The National Highway Transportation Safety Administration (NHTSA) ruling eliminates the requirement of vehicular interior device controls (e.g., steering wheel and foot controls) for all future FAVs testing domestically (National Highway Transportation Safety Administration, 2022).

There are looming insurance and liability issues relating to FAVs, which its stakeholders will have to resolve regarding financial and legal exposure for both the auto manufacturer and consumers. As there will no longer be a human driver, insurance liability coverage may move from the fully autonomous vehicle owner or user to the manufacturer, whose role is to develop and build the vehicle and the vehicle technology.

Original Equipment Manufacturers may agree to take on the automotive insurance liability responsibility if there is an agreeable resolution. Doing so could result in a negative overall economic impact on the viability of the personal automobile insurance industry. Daimler's Mercedes-Benz Luxury Vehicles Division is the first automaker to announce usage of its coming Level 3 semi-autonomous *Drive Pilot* *TM* software suite and to carry an insurance liability (Mercedes-Benz, 2021). The no-cost automotive maker insurance coverage is only good up to 37 miles per hour while the vehicle is in motion.

The annual US auto insurance industry's financial, property and personal losses from automobile accidents are significant. The potential number of lives saved annually from reducing crash deaths if this technology became standard and safely utilized by drivers is substantial (Mennie, J., 2019). In 2021, NHTSA announced that fatalities in vehicular accidents reached 42,915 within the United States (US). It is the highest number of fatalities in a single year since 2005. It represents a 10.5 percent increase from the 38824 fatalities in 2020. Fatalities among drivers 65 and older are up to fourteen percent (National Highway Traffic Safety Administration, 2022).

The technology of FAVs may reduce the number of deaths, injuries, and costs from auto accidents. If so, there may be additional benefits for making FAV technology worthwhile and available. The amounts of consumer financial resources not spent or recouped in fewer accidents, avoiding insurance and legal costs, medical treatments, hospitalizations, productivity loss time from work absences, lost personal income, and work product contributions are also considerable.

The losses in consumers' time and resources directly address how AI technology may alleviate some deaths and suffering and reduce the growing numbers of fatal vehicular mishaps. Acceptance and usage will result when auto manufacturers and their marketers resolve these challenges and make them tangible benefits consumers fully understand. If successful, it will also increase consumers' behavioral intention to use Fully Autonomous Vehicles.

Current Research Gaps

As broad scientific consumer research on FAVs is growing. Prior research studies focus on FAV technology itself. Rather than granular consumer perceptions of it. Gaps in consumer perceptions of FAVs exist. The major one is the consumers' viewpoints on fully autonomous vehicle technology once there is marketplace mass introduction. Whether consumers consider FAVs something, they may want to embrace early into the marketplace or wait and see how others engage and use them first, as time itself will tell us. Another research gap is positioning the coming FAVs technology successfully and from a consumer marketing standpoint. Addressing these gaps in scientific research may yield significant answers.

Some past social research studies reveal challenges concerning consumer use of a Shared Autonomous Vehicle (SAV) in three specific areas: behavioral, operational, and policy analyses (Wang & Zhao, 2019). Behavioral deals with consumer perceptions, acceptance, and use of the technology. Operational policy issues include big data analytics, cloud computing, corporate competitiveness strategies, cost-effective performance, supply chain management, and overall sustainability. The operational policy directly deals with the overall impact of FAVs on the companies producing and marketing them to consumers. The legal policy deals with the effectiveness and oversight of FAVs by various governmental entities responsible for keeping consumers safe from the technology while in transit (e.g., federal, state, and local) and regulating and monitoring the technology operation.

Literature Review

The lion's share of the current research on FAVs also speaks to the technology's overall development and how it will effectively operate. Drivers-at-large may see their perceptions of FAV technology as consumers differently from the OEMs and their marketers. The burning point is to what extent consumers will accept and use FAVs in the future. Many of these are the researchers whose theories have informed the public that Autonomous Vehicles (AV) are solely about their technology (Kaslikowski, 2019). This research does not sufficiently probe future consumers' perceptions about FAV technology and identify any other critical areas of concern. For instance, whether it will be hackproof, will drivers' confidential information be secure, and what level of control drivers can retain.

The personal information and operational security of technology devices and software are top of mind today, especially with the growing number of hacks and software ransom demands. Unless these areas are of sufficient focus, consumer acceptance of FAV technology will not happen. The Technology Acceptance Model (TAM), introduced by F. D. Davis in 1989, is the research standard to gauge consumers' innovative technology user acceptance behavior. Technology Acceptance Model attempts to quantify the extent of consumer acceptance by gauging their levels of perceptions for ease of use, usefulness, and behavioral intention. However, it cannot account for consumers giving up complete operational control in fully autonomous vehicles. It is essential to understand whether consumers feel FAV technology is a known entity for my research purposes. More importantly, OEMs' consumer marketing communications for FAVs must effectively convince it is in their best interest to accept, embrace, and use the technology.

FAVs' successful marketing communications must effectively speak directly to consumers and educate them on all facets of fully autonomous vehicles. If successful, there are other apparent consumer benefits, such as travel convenience, less chance of accidents and health injuries, and more transportation safety. The positive perceptions of these consumers' benefits may heavily contribute to the overall behavioral intention to use self-driving vehicles. Buckley et al. (2018) used an AV driving simulator to determine if perceived usefulness and ease of use in the technology resulted in positive health and safety results for the research study participants. The technology can reduce human stress while in transit, increase personal productivity, reduce injuries and deaths, and improve mood and disposition. Another study goal was to gauge consumer viewpoints on the efficacy of safety and security within fully autonomous vehicles.

There are good benefits for consumers who feel FAVs sufficiently protect them, their families, and friends. These findings support my conclusions in promoting future FAVs consumer usage.

As former FAVs research proves, safety is also an essential attribute of FAVs because consumers may expect the technology to reduce accidents and save lives. A public opinion survey conducted in the United States, the United Kingdom, and Australia uncovered some consumer opinions on autonomous vehicles. Schoettle and Sivak (2014) studied 1,096 adults; most participants expected fewer accidents from autonomous vehicles (85.9%). Safety improvements were also top of mind with consumers there (84%). Less driver distraction fell third in the respondents' minds (61.2%). The key finding was the belief that saving lives would be an essential benefit of FAVs (84%). The bottom line for safety for consumers is the significance of personal safety while considering the overall viability of self-driving cars.

The Vietnam country-based research study by Yuen et al. (2020) concerning Shared Autonomous Vehicles (SAVs) aims to ascertain the influential factors in building consumers' adoption of SAVs as an alternative to other forms of public transportation. The authors' study results include certain benefits to these autonomous commuter vehicles, such as increased safety due to fewer accidents and injuries and less traffic congestion under more targeted trip deployments. The nature of dynamic ridesharing can offer centralized pick-up and drop-off zones, contributing to cost savings for both consumers and cities and offering consumers a public transportation alternative. Its challenges include privacy, safety, security, and legal and regulatory concerns. We also saw the benefits of probing similar personal preference usage issues within the behavioral intention of consumer use in self-driving vehicles.

I do not know if consumers will believe and embrace any positive influences of usage, attitudes, behavioral intention, ease of use, safety, and usefulness, of fully self-driving vehicles.

Nordhoff et al. (2016) evaluated this hypothesis by undertaking an experiment that placed occupants in a pod-like driverless car. The study had unique self-driving pods with no steering wheel or foot control pedals. The research study aimed to examine the factors of usage, attitudes toward perceptions, behavior, subjective norms, and perceived behavioral control. They were significant predictors of consumers' intentions to use autonomous vehicles. The factors above will contribute heavily to consumer usage of FAV technology, just as the overarching issue of consumer trust plays a major role.

Trust correlates with credibility and will contribute to the consumers' ability to accede total driving control to FAVs. There are two types of trust, cognitive and affective, contributing to consumer trust in FAVs (Johnson & Grayson, 2005). Researchers isolated several consumer concerns about whether autonomous cars and self-driving technology would rate their trust (Koopman & Wagner, 2017). Artificial Intelligence (AI) software programs can successfully navigate many unstructured road environments; human drivers regularly negotiate effortlessly with consumers and are top of mind. Correlates issues of concern relate to machine learning and inductive inference. Human drivers normally can operate a vehicle focusing on not harming others; most drivers prefer to harm themselves first in an accident than willfully endangering or hurting others such as their passengers, other car occupants outside their own, or pedestrians.

Whom FAVs choose to harm or not harm while in transit will no longer be up to the consumer inside a FAV. These vital safety decisions solely reside with the FAVs' Artificial Intelligence software programming capabilities. The decisions speak directly to the locus of control issue (I will delve into it later). The revised TAM model by Davis (1989) looks at the consumers' embrace of newer technology. Autonomous vehicles are different because consumers must give over complete control of the vehicle to the technology. As we earlier stated, TAM offers no valid methodology to gauge consumers' willingness to relinquish complete operational driving control in self-driving vehicles.

TAM does not offer the option to study consumer use of FAVs properly. The following scientific research areas of study focus meet the need: The Unified Acceptance of Technology and Use of Technology (UATUT) and Unified Acceptance of Technology and Use of Technology 2 (UATUT2) model theories by Venkatesh et al. (2012) are much more appropriate for doing so. They are the building blocks of my methodology for this research purpose. The two theories speak directly to the consumer adoption of an innovative product affected by dimensions relating to expectations, values, habits, and enjoyment. Another research theory, The Theory of Planned Behavior (TPB) (Azjen, 1991), is not acceptable for FAVs study usage. TPB's theory also addresses an innovative product that can affect attitudes, control, and norms, not necessarily in FAVs, as consumers must relinquish complete human control to utilize them.

The Locus of Control (LC) speaks to specific personality traits that can influence driving behavior whenever drivers use fully autonomous vehicle technology (Rudin-Brown & Ian Noy, 2002; Rudin-Brown & Parker, 2004; Ward et al., 1995). Locus of control echoes how individuals feel they control external events that affect them. There are two types in the locus of control: external and internal. Those who exhibit external control will believe that human drivers will always cause vehicular accidents. In the minds of these consumers, FAV technology may be far superior to human drivers. Within consumers' internal control thinking, they may believe that they fully control the events that affect them.

Consequently, consumers may not perceive FAV technology superior to human driving control. Furthermore, autonomous vehicle research has shown that an external locus of control may cause individuals to assume passive roles using FAVs (Stanton & Young, 2005). External control-oriented drivers will give way to using this technology because they tend less to own their driving skills than internal control drivers would (Rudin-Brown & Ian Noy, 2002). Additionally, FAVs research has shown that risk-averse individuals are less likely to embrace or adopt this innovative technology (Mosley & Verschoor, 2005).

Consumers have valid concerns about the reliability and safety of FAVs. There are inherent risk factors that correlate with individuals' risk preferences (Kyriakidis et al., 2015). Specifically, three research studies (Kam, 2012; Liu, 2013; Tanaka et al., 2010) found that individual-specific variables elicited generic risk preference. Furthermore, individualized risk preferences are necessary and owe their heterogeneity across the population (De Palma et al., 2008).

Specific research survey data was the foundation for constructing individual risk preference parameters. Subsequently, a choice model analyzes how risk preference influences the adoption of autonomous vehicles. Consumers within the studies listed four specific areas of concern that contribute to a particular risk aversion profile: protecting personal data, reliability, overall safety, and the chances of software hacking. Risk aversion attributes may contribute to consumers' under-consumption of this technology (Grewal et al., 1994). If so, successful governmental policy initiatives may help to improve its overall adoption rate.

Research Theory

The research goal of the views and positions expressed in UTAUT2 (Venkatesh et al., 2003, 2012) is to develop more contexts in overall consumer behavior and their usage relating to the adoption of new technology. The theory's overall objective is to present a more robust and richer understanding of certain phenomena that may identify the predictors and mechanisms that prove vital to extending the findings of earlier theories into more significant insights such as

UTAUT (Venkatesh et al., 2012). Within my research, I specifically focus on using similar predictors and mechanisms to quantify consumer behaviors, which will lead to a positive association between attitude and the behavioral intention to use (BITU) FAVs.

The research and model aim to determine the factors that can prompt the consumer behavioral intention to use FAVs and identify the latent constructs and interrelationships (Figure 1). In TPB, the consumers' adoption of innovative technologies, such as FAVs, can verify through two important psychological constructs: attitudes and subject norms. I include them both and add a new construct: locus of control. Secondly, UATUT2 represents a comprehensive theoretical model that combines its predecessors, such as the unified theory of acceptance and technology use (UATUT).

Additionally, the theory of reasoned actions (TRA), diffusion of innovation (DOI) theory, and technology acceptance model (TAM) all probe consumer attitudes as these are the key factors influencing the usage of innovative technology, but not for FAVs. The following variable components further influence these consumer attitudes: Performance Expectation (PE), Price Value (PV), Hedonistic Motivation (HM), Locus of Control (LC), Societal Influence (SI), Risk Aversion (RA), and Subjective Norm (SN), which can all positively influence the formation of certain consumer Individual Attitudes (IA) towards the use of FAVs.

The earlier mentioned theories yield the basis for this research under the following explanation of these constructs: PE is the degree to which an individual believes that using a certain product or service will be beneficial and helpful to them; PV is the trade-off between benefits that customers derive from using a product or service and the monetary cost of using it; HM is the fun or enjoyment that users derive from using a technology; SI whether something offers overall human and financial benefits to the greater society; LC addresses a personality trait that echoes the extent to which a person thinks to be in control of external events that affect them. If it is external control, the person will believe human drivers will always cause vehicular accidents. Those who have an internal control focus will think they are totally in control of events. BITU speaks to one's ability to perform a specified consumer behavior (i.e., use FAVs).

Hung et al. (2012) deduced that perceived behavioral control positively influences factors such as trust. The factor of trust considers the willingness of a first party to be vulnerable to the actions of a second party regarding the expectation that the second party will conclude a particular action vital to the first-party or trustor. However, the first-party's inability to control the second party still exists (Mayer et al., 2011). A person's disposition to trust may also play a role in trusting FAVs. Trust is a multidimensional concept consisting of cognitive and affective components. The cognitive dimension of trust is a knowledge-based factor, whereas the affective dimension is primarily an individually driven emotion (Lee et al., 2015).

There are two types of trust: Cognitive and Affective (Johnson & Grayson, 2005). Cognitive Trust (CT) applies to one's knowledge of a particular subject matter. Affective Trust (AT) speaks to whether one believes in and is confident in something or someone. I hope to add further contextualization by exploring and expanding the theories for these constructs.

Risk Aversion (RA) is an individual trait avoiding the performance of a certain behavior or task, not knowing whether it will result in a positive outcome. Subjective Norm (SN) is how an individual perceives essential people or significant reference groups want them to perform or avoid performing a particular behavior. It facilitates the approval of specific family members, friends, and other referents' opinions about using new technology like FAVs.

Individual Attitude (IA) is an individual's predilection to form certain opinions, feelings, or behaviors toward a specific thing or subject matter. Attractiveness (AN) is whether a product or service is perceived by consumers as positively, physically, or emotionally attributable. Affordability (AF) pertains to the cost of a product or service perceived as reasonable, within the right budget constraint, and worth the price demanded. Behavioral Intention to Use (BITU) speaks to one's ability to perform a specified or desired consumer outcome.

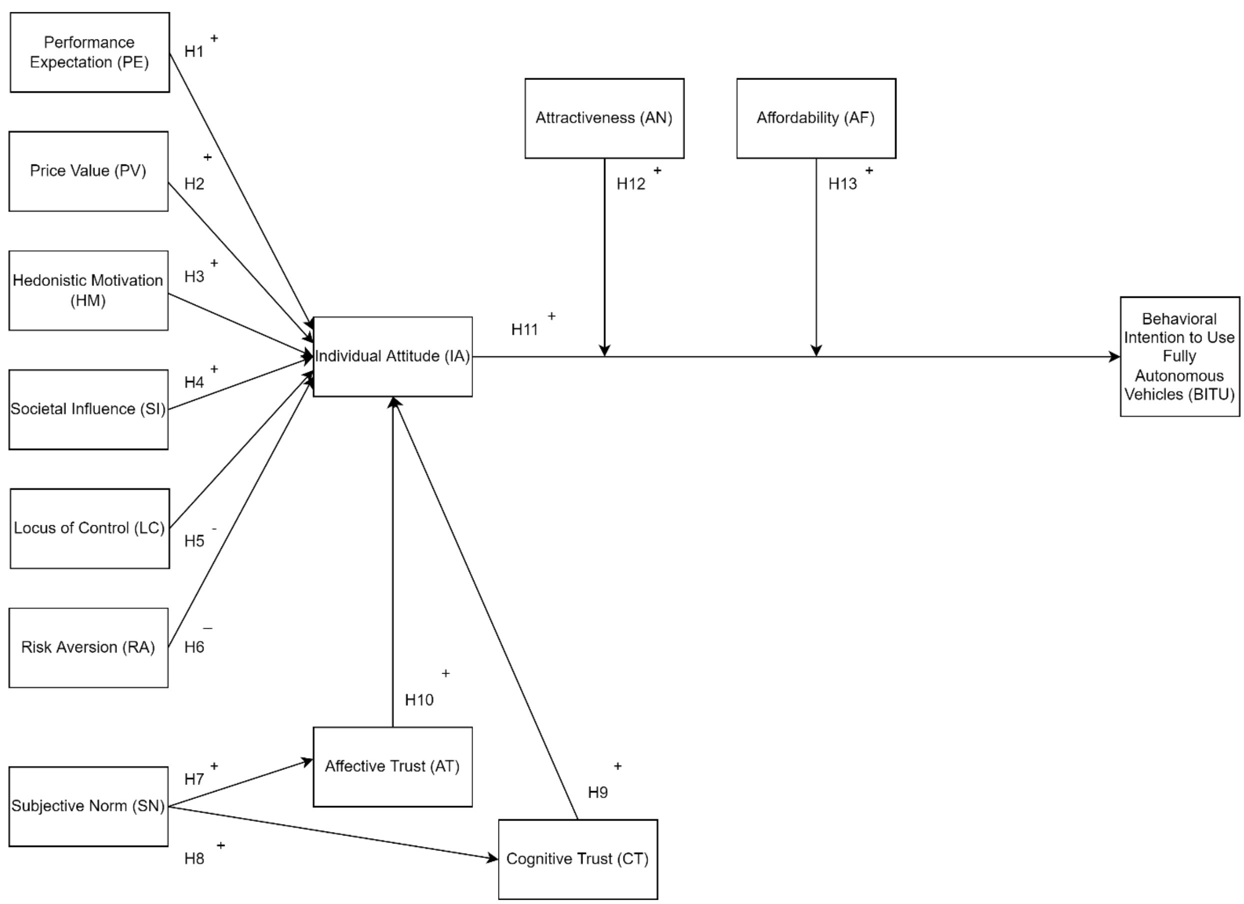
Several components of UTAT2 (e.g., performance expectancy, social influence, hedonistic motivation, and price value) have considerable influences on consumers' Individual Attitudes (IA) towards using FAVs. Attitude in using a product or service, such as a FAV, depends on the users' perception of its utility. It also refers to the emotional and behavioral orientations regarding technology. Attitudes also play a vital role in consumer usage of a particular technology product or service, such as FAVs. Consumer attitudes can change under the influences of the economy, education, emotions, income, and perceived value.

Applied research behavioral theories (e.g., DOI, TAM, TPB, TRA, and UTAT) validate, apply, and accept to quantify consumer behaviors toward modern technology adoption. I seek to identify the dimensions influencing consumer use attitudes regarding FAVs, employing the UTAT2 predictive framework to evaluate the constructs, revealing the consumer intention to accept this coming technology. Those constructs are performance expectation, price value, hedonistic motivation, societal influence, locus of control, risk aversion, subjective norm, individual attitude, cognitive trust, and affective trust. The moderating constructs of attractiveness and affordability are those I devise to accomplish a more granular research methodology.

Therefore, I propose the following Model and Hypotheses:

FIGURE 1

Research Model 3



Hypotheses Development & Definitions of Study Constructs

The research model is developed based on UTAUT2. UTAUT2 suggests that Performance Expectation (PE), Price Value (PV), Hedonistic Motivation (HM), and Societal Influence (SI) impact consumer attitudes toward FAVs, influencing their intention to use self-driving vehicles. In addition to PE, PV, and HM, I use Locus of Control (LC), Risk Aversion

(RA), Subjective Norm (SN), Affective Trust (AT), Cognitive Trust (CT), and Individual Attitude (IA) as additional factors within the model to adequately test these two theories. The model includes two moderating factors, Attractiveness (AN) and Affordability (AF), between IA and Behavioral Intention to Use (BITU). Therefore, the research model above guides the following hypothesis development.

The research model takes consumer behavior and intention constructs from several theories. They are the Theories of Planned Behavior, Reasoned Action, UTAUT, and UTAUT2. I then went on to craft the best research structure to investigate consumer opinions and future behaviors concerning a technology that does not yet exist.

The Diffusion of Innovation (DIT) Theory is the primary basis of support for the relationship between performance expectation (PE) and attitude (Nordhoff et al., 2021). Previous research studies suggest that consumers expect that the technology they use is compatible, meets their performance needs, is easy to use, and is not too complex. PE is how using technology will benefit the consumers performing certain activities (Venkatesh et al., 2012).

With a basis on the UTAUT2 model, performance expectation is essential to changing people's attitudes toward an innovative technology (Azizi et al., 2020; Ramírez-Correa et al., 2019; Ravangard et al., 2019; Tam et al., 2020). Accordingly, I posit that performance expectation plays a significant role in determining consumers' attitudes about fully autonomous vehicle usage (Zheng & Gao, 2021). Most consumer expectations are typically multi-dimensional, and they expect comparative advantages and extrinsic benefits from FAVs.

Past research has shown that fully autonomous vehicles will improve travel efficiency and overall quality of life (Zheng & Gao, 2021). They will also provide extrinsic benefits such as the ability to regain productive time accomplishing personal tasks other than just driving while in transit. When such performance expectations are satisfactory, the consumers' positive attitude towards FAVs will increase.

Moreover, most consumers expect compatibility, trialability, and observability from FAVs (Nordhoff et al., 2021). Compatibility in innovation is perception consistent with any potential adopters' current needs, values, and experiences (Rogers, 2003). Trialability is how the consumer can first try and experience the technology before adoption. Observability is the consumer seeing others use and benefit from the technology itself. These expectations are essential to consumers because FAVs will combine high-level technology and personal transportation, and consumers will not have control of the vehicle itself.

Therefore, FAVs may satisfy their demands for a higher performance expectation overall. They include whether FAVs are compatible with their lifestyle and safety demand and offer them the benefits of additional free time to accomplish personal or work tasks while in transit. Consumers may very readily understand and fully operate FAVs from their first experiences because of FAVs' high trialability. When FAVs can meet such high-performance expectations, consumers' positive attitudes towards FAVs will increase. Within the context of FAVs, the relationship between the consumers' performance expectation and their attitudes toward FAVs is valid (Zheng & Gao, 2021).

Therefore, I hypothesize:

- H1: Consumers' PE positively influences consumers' IA toward FAVs.

The overall consumer pricing is vitally essential to consumer attitudes to accept FAVs. Unlike past new vehicle optionally technology equipment (consumers typically pay upfront for optional equipment in the initial purchase transaction), FAV technology may include an upfront price and an annual subscription fee to gain ongoing access to improvements in the technology.

Therefore, pricing and how it may occur over the car's life will become fundamentally important to the consumers' attitudes and the usage of FAVs.

In PV, there is a trade-off when consumers perceive certain benefits they derive from a technology versus the price the technology costs them (Yuen et al., 2020; Haboucha et al., 2017; Nordhoff et al., 2016; Venkatesh et al., 2012; Zeithaml, 1988; Dodds et al., 1991). The PV is highly relevant to this research because if FAVs are made safe and available to consumers, but there is the perception of being too expensive, they will not be attractive for trial, use, or acceptance. Semi-Autonomous Vehicle (SAV) technology was first made widely available inside expensive luxury vehicles. To change consumer attitudes toward accepting FAVs, it needs to migrate into mid-price vehicles successfully.

Based on the UTAUT2 Model, the positive perception of PV is essential to changing people's attitudes towards a new technology (Venkatesh et al., 2012). For FAVs to receive wide consumer usage, they must be economically approachable to the consumer masses. If consumers are willing to let cars drive them, it may not equate to a willingness to pay an additional out-of-pocket amount to let FAVs do so. In essence, the general market pricing model for FAVs will somewhat determine consumers' attitudes (Daziano et al., 2017).

The pricing model for FAVs will also play a significant role in consumer adoption and usage (Ali & Anwar, 2021). Two pricing options are under consideration: an upfront automotive pricing purchase option or an ongoing monthly consumer-paid subscription pricing option. Which option consumers feel best benefits their lifestyle and pocketbooks will be left solely up to them. Today, consumers in the US keep their cars longer than ever before; the subscription model may be more profitable over time to the automotive industry companies; these are also called Original Equipment Manufacturers (OEMs).

Price sensitivity is also one area this research study hopes to query consumers and FAVs successfully. Furthermore, this hypothesis (PV) proves that consumers will positively view PV if they perceive the benefits and advantages are more significant than the costs. As PV deals not just with the initial costs of acquisition, it also includes ownership over time.

Therefore, I hypothesize:

- H2: Consumers' PV positively influences consumers' IA toward FAVs.

Personal enjoyment from driving is a primary motivation from childhood for gaining a personal driver's license (Nelissen & Meijers, 2011). Previous studies have shown that enjoyment of use is one of the primary drivers of innovative technology adoption (Anton et al., 2013; Brown & Venkatesh, 2005; Koenig-Lewis et al., 2015). I expect that FAV technology will be no different. These will be consumers who will seek adventure, excitement, and the novelty of FAVs. The overall entertainment value and hedonistic purpose will influence consumers' attitudes toward FAVs.

The construct of HM is the enjoyment of using a particular technology (Brown & Venkatesh, 2005). HM describes extrinsic benefits (e.g., emotional and experiential benefits) of using technology and plays an essential role in consumer acceptance and use of technology (Hirschman & Holbrook, 1982). There are two critical components in hedonistic motivation: enjoyment and sensation seeking (Babin et al., 1994). FAVs remove the task of having to drive for oneself.

The factor of HM (e. g., the overall experience of fun and enjoyment) may play an even more significant role in the consumers' choices of the specific FAVs they select (Chtourou & Souiden, 2010; Kim et al., 2007; Meyer-Waarden & Cloarec, 2022; Venkatesh et al., 2012). Suppose there is a loss of enjoyment in driving oneself with FAVs. In that case, consumers will have the additional options of reading and relaxing, surfing the internet, freely watching their media selections, or even napping while in transit. The opportunity to do so may become new tangible benefits for consumers who can comfortably or safely enjoy them. These additional benefits may positively change consumers' attitudes toward FAVs.

Therefore, I hypothesize:

- H3: Consumers' HM positively influences consumers' IA toward FAVs.

Concerning FAVs, Societal Influence (SI) speaks to how one's closest family, friends, and business associates, will feel about a consumer's usage of FAVs. Therefore, societal influence positively affects individual consumer attitudes toward accepting FAVs. With SI, it is the extent to which others significant to a consumer will approve of using a particular technology (Venkatesh et al., 2012).

Other research studies have proven the importance of understanding the effect of social influence on the behavioral intention to use certain technologies (Khalifa & Cheng, 2002; Song & Kim, 2006). The social influence theory effectively informs the ongoing use of technologies because the expectation–confirmation model examines consumers continued use simply from the angle of technology per se (i.e., internal factors) rather than from beyond (i.e., external factors). The social influence theory thus serves to make up for any such deficiency in the consumer's use of FAV technology.

The internal factors of technology refer to whether the technology can meet its users' expectations. Consumers will continue to use it if there is a fulfillment of their expectations. For instance, users may expect the technology to improve their overall in-transit experience without demanding considerable effort and then continue to use it if it lives up to their expectations (Yong-Ming, 2019).

In the context of FAVs, the effect of social influence speaks to how one's closest family, friends, and business associates will feel about the usage of FAVs. One's family members, friends, and colleagues have a considerable influence on the day-to-day actions of their life (Nowak et al., 2003; Tan et al., 2010). It extends to the choices they make and the lives they may lead. It will also be the same for their decision to use or not use FAVs. If their referents approve of FAV technology and its benefits, they will be more likely to move to trial, acceptance, and, ultimately, usage.

The overall consumer benefits of FAVs may become more than are currently known. It includes picking up and dropping off children daily for school and post-school activities. The necessary need to take senior citizen parents, who can no longer drive to their medical appointments or handle general tasks, will have the option of using FAVs with no need for additional adult supervision (Lawton et al., 2002; Rapkin & Fischer, 1992). The occupants will also be able to accomplish other enjoyable tasks while in transit. When consumers witness family members enjoying more transportation options and time freedoms without supervision inside the vehicle, their attitudes toward FAVs will become positive.

Select consumers tend to be the early adopters of innovative technology like FAVs. However, they will probably only do so with the advance discussion and tacit approval of those referents. Using them early on can create social influence dissonance within family, friends, and co-workers, who may not positively view the benefits of FAVs.

Hence, I hypothesize:

- H4: Consumers' SI positively influences consumers' IA toward FAVs.

The construct of Locus Control (LC) addresses the individual's perception of control as an external or internal orientation. In this regard, LC refers to an individual's belief of having a high expectation that they are in complete control of events, environments, engagements, and outcomes. The Theory of Planned Behavior (TPB) is where LC got its origin (Azjen, 1991). LC has become a very influential framework for the comprehensive study of human behavior (Cleveland et al., 2005; Cleveland et al., 2012; Cleveland et al., 2020).

A recent research study unravels the subject matter of LC and personal transportation full autonomy in its usage by individuals who are entirely blind (Papadopoulos et al., 2013). This study is the most authentic personal level of trust in the SAE certifications of four and five-level fully autonomous technology performances for FAVs. A recent study's findings confirm that the construct locus of control does break down into consumer internal and external factors (Bennett et al., 2020). Internally, it centers around the individual's belief that events and outcomes determine effort and ability. Externally, it speaks to consumer perceptions that outside forces determine outcomes.

Consumers have complete vehicle driving control. It has been this way ever since the invention of automobiles. FAVs will challenge this control and may completely strip it away. How consumers may feel about the loss of control when traveling in vehicles with no steering wheel or foot control pedals cannot yet be seen in the current marketplace. Consumers may be more willing to accept FAV technology if proven safe, dependable, beneficial, and easy to use. My research proves that consumers are willing to relinquish driving control and embrace and use FAVs widely. However, those with high LC are less likely to do so.

Consumers with high LC tendencies believe they can control external events affecting them. So, they are less likely to become too dependent on FAVs or carelessly acceding their close supervision and personal responsibility for the Artificial Intelligence software to solely monitor the overall performance of the technology. Rudin-Brown and Parker (2004) found that high sensation seekers are less likely than low sensation seekers to exhibit the behavior of adapting to the use of driving assistance systems, such as Fully Autonomous Vehicles.

Therefore, I hypothesize:

- H5: Consumers' LC negatively influences consumers' IA toward FAVs.

When an individual chooses to avert a risk if any arbitrary risk exists, it shows Risk Aversion (RA) in action. They prefer certain equality between the expected value and the known risk. Consumers prefer a guaranteed decisional outcome versus one that could be more probabilistic. It is the essence of RA's meaning (Qualls & Puto, 1989). The concept of risk aversion research owes its origin to early economic decision theorists exploring the consumers' overall limits on it. Risk-averse individuals prefer a riskless outcome over a riskier outcome with the same value expectation.

This construct also plays a significant role in consumer behavior, as it may impact product choice, trial, and purchase (Aren & Hamamci, 2020; Di Mauro et al., 2020; Schleich et al., 2019). In this regard, it relates to a self-measuring scale for the attributes of risk aversion within a specific domain (Moorthy et al., 1997). They could be financial investments or new vehicle purchases, including which technology options one may select for those transactions.

Consumers plan to do something, and their expectation of a payoff is critical in their decisional process. When the decision-making process is fraught with risk, there are also chances for an unexpected outcome. Consumers may fall all along the continuum from risk-averse to risk-seeking or fall between as risk-neutral (Masiero et al., 2020). Risk Aversion may affect their embrace and use of FAV technologies and their abilities. The higher the level of consumer RA the greater the chance they will not use FAVs.

Therefore, I hypothesize:

- H6: Consumers' RA negatively influences consumers' IA toward FAVs.

Societal Norm (SN) has to do with an individual's perception of whether performing a desired behavior is accessible, challenging, and falls within the acceptable norms of their referents. It also addresses whether there is a perception that there are the proper resources and opportunities to achieve the desired behavior. How someone perceives this innovative technology is also relevant. Suppose the individual exhibits the proper income, time, understanding of the technology, and the approval of their referents. In that case, they will have a greater propensity to acquire, trust, and use FAV technology. In this case example, the result is a higher level overall of the behavioral control to use it.

Affective and cognitive trusts are both heavily influenced by SN. Affective trust speaks to whether the consumer feels they are aware and knowledgeable about the technology. Cognitive trust addresses the consumer's ability to gather the necessary information and honestly know the technology itself. So, there is a heavy influence on both by SN.

An individual's belief that the people most important to them think they should or should not perform a specific behavior deals with SN (Azjen, 1980). When one's family and friends think positively about fully autonomous vehicles, the individual will trust the technology and be more likely to use it. The theory further supports that if a person's friends and loved ones are more favorable to the technology, the individual themselves may be more likely to use it even if they are still undecided about doing so.

This construct is a component of The Theory of Planned Behavior (TPB). The definition is an attitudinal social factor referring to the perception of social pressure to perform or not perform a particular behavior (Azjen, 1991). Consumers with higher levels of favorable attitude, subjective norms, and perceived behavioral control will have a greater probability of performing the behavior under consideration (Azjen, 1980, 1991). The total components of these behavioral attributes will act to inform consumers' decision-making regarding FAV technology.

TPB has a positive influence on the SN influence on an individual's propensity to conduct a specific behavior (Basha & Lal, 2019; Cai et al., 2019; Judge et al., 2019; Pandey et al., 2019; Zhao et al., 2019). Consumers value the opinions of referent groups, such as family, friends, and colleagues. Consumers consciously or unconsciously seek the approval of their reference groups before making decisions and performing the behaviors that may take place post-decision. These influences represent a form of social pressure that consumers can bear (Azjen & Fishbein, 2005).

The consumer use of FAVs may hinge on the heavy influences from these groups. Fully self-driving technology must be seen as safe, easy to understand, execute, and beneficial to reach the high consumer acceptance and usage threshold. Perceived behavioral control speaks directly to the consumers' understanding of their referents' approval to use FAV technology. SN also influences whether consumers ultimately trust (cognitive and affective) FAVs.

My research goal is to ascertain to what extent the role of SNs may influence consumers thinking of FAVs overall. Furthermore, whether that influence will make them more or less likely to view the technology positively, resulting in their using or not using it. Social pressures on consumer decisions and behaviors may not be easy to quantify or have a very apparent and tremendous effect that can contribute to possibly preventing consumer acceptance and usage. These critical consumer considerations will have a greater impact on FAVs' overall behavior and intention to use.

For consumers, trust is a crucial mediator and moderator of pre-purchase and post-purchase decision-making processes that, in turn, lead to long-term brand and customer loyalty

(Singh & Sirdeshmukh, 2000). Trust becomes a leading indicator pointing to the consumer's brand or service experience and loyalty. The study believes negative experiences cannot positively increase customer behavior. A consumer's overall experience must increase their trust in advance to positively influence the levels of consumer loyalty (Ardyan & Aryanto, 2015). If it does not do so, consumers will select a different alternative to meet their needs.

Therefore, I hypothesize:

- H7: Consumers' SN positively influences affective trust in FAVs.
- H8: Consumers' SN positively influences cognitive trust in FAVs.

The concept of trust (whether cognitive or affective) is multi-faceted and addresses whether an individual believes in and is confident in the technology itself (Lewis & Weigert, 1985). Cognitive Trust (CT) speaks to the extent consumers feel they are both aware of and knowledgeable about this technology. This type of trust must first occur for consumers to use the technology for the very first time. It is a type of trust addressing the reception of information overall and the perceptions of the technology by themselves and those who may influence them.

Awareness and knowledge contribute directly to consumers' FAVs Affective Trust (AT). It may vary depending on experience, exposure, interest, and the pursuit of information. The extent of information known and gathered will determine the CT in the technology. Conversely, if the information received is negative, it will lower cognitive trust and the attitude toward it (Moorman et al., 1992). When auto manufacturers can ensure consumers that FAV technology will be safe, dependable, and beneficial, their CT and positive attitude will both increase.

The consumer's ability to comfortably rely on a business or service provider addresses the meaning of CT (Moorman et al., 1992; Rempel et al., 1985; Punyatoya, 2018). The construct of Affective Trust speaks to the confidence someone places in others based on the feelings generated and the care and concern expressed (Johnson-George & Swap, 1982; Rempel et al., 1985). Cognitive Trust also has its basis in consumer knowledge. If that knowledge is incomplete or non-existent, consumer trust must play a significant role. For AT to exist, it must be closely related to the individual's belief that the actions of the person or entity they decide to partner with are intrinsically motivated (Rempel et al., 1985). FAVs, as a new technology, must build Affective and Cognitive Trust within consumers through dependability, ease of use, safety, and security.

The constructs of AT and CT are fundamental to consumers' product embrace and derived from the terms cognition and affect. Marketing and advertising company mediums efficiently use these trust constructs to craft consumer messaging successfully. The terms of trust speak directly to consumers about the products or services they attempt to sell (Edell & Burke, 1987; Johnson & Grayson, 2005). Consumer feelings about FAVs will play a significant role in their acceptance and use. The two trusts work together to form a general consumers' overall trust factor (Morrow et al., 2004). If consumers do not trust the technology, they will surely not try nor embrace and use it. The consumer marketing messaging for FAVs must be highly effective in building a base of informative knowledge, communicating its consumer benefits, and assuaging any possible fear of and dangers within the technology.

Another component of trust is behavioral. My research hopes to show that overall trust (affective, cognitive, and behavioral) in FAVs will positively impact individual attitudes, resulting in the Behavioral Intention to Use (BITU) FAVs. Therefore, consumer trust actions should move them along the spectrum towards the BITU (Lewis & Weigert, 1985). It is a consumer decision-making process that flows directly from AT and CT to behavior acceptance and usage.

Therefore, I hypothesize:

- H9: Consumers' CT positively influences consumers' IA toward FAVs.
- H10: Consumers' AT positively influences consumers' IA toward FAVs.

Individual Attitude (IA) is an SN that speaks to how someone may perceive people important to them or their reference groups, want them to perform a particular behavior or not do so. If family, friends, or colleagues want them to perform this behavior, they will have a much greater propensity to do so. One's peer groups have a significant role in influencing the behavior of others. These attitudes also play an essential role in accepting FAV technology. Unlike past new vehicles optionally technological equipment (which were a part of and paid for in full at the point of initial purchase), FAV technology may include an upfront price and an annual subscription fee to gain ongoing access to improvements in the technology. Therefore, pricing over the car's life will be fundamental to consumers' attitudes and the BITU for the usage of FAV technology.

Consumers tend to make certain judgments and behavioral assessments about various brands, products, and services. In this regard, individual attitudes define and comprise a significant component of human perceptions. These perceptions can also influence specific consumer behavioral intentions. If the BITU exists, the predicates of SNs, IAs, and inevitable human perceptions must first occur within the minds of those consumers (Ajzen, 1991; Ajzen, 2002; Yean et al., 2015). Within numerous academic research studies, attitude is a primary construct to quantify consumer behavioral intention to use (Schwartz, 2009). Consumer attitudes may change over time depending on the influences of a dynamic marketplace and the products, services, and pricing options available to them.

This research will gauge IAs about FAV technology and quantify its impact on consumer BITU. If consumers' attitudes about the technology are negative, they will not view it positively or move to consideration, trial, purchase, and use. The constructs of AT and CT play significant roles in IAs and SNs and the reference groups important to these individuals.

Therefore, I hypothesize:

- H11: Consumers' IA toward FAVs positively influences BITU.

Attractiveness (AN) positively moderates the relationship between individual attitude and BITU (DuBrosky et al., 1997). It addresses whether consumers find vehicles designed with the focus on FAVs as being attractive to them enough to influence their behavioral intention to use them. The former AN and the after-mentioned AF are from other non-automotive technology consumer research studies, not traditionally seen within the deployment of FAV or SAV technology acceptance and usage research. Their additions add value to the contextualization of a better understanding of consumers' intrinsic perceptions of the overall acceptance of FAVs.

The attractiveness of consumer technologies helps determine whether consumers will ultimately embrace, accept, and use these products. Whether consumers perceive FAV technology as attractive speaks directly to how auto manufacturers and their marketers best position FAVs to add a positive value to their lifestyles.

Therefore, I hypothesize:

- Hypothesis H12 – AN to FAVs positively moderates the relationship between IA and BITU.

A research study showed that if ninety percent of personal transportation became fully autonomous vehicles, the economic and comprehensive cost-savings benefits per car would be $4060 (Manyika et al., 2013). It is not just the upfront price of a FAV that matters. The cost savings in ownership over time include better fuel efficiency, less parking expenses, and more productive time recouped while in transit. The factors that will contribute directly to the possibility include the consumer cost of the technology for those interested in using the technology. If FAV technology is at a high price, it will prevent a significant percentage of the potential users from affording it.

Additionally, suppose the technology is only widely available in high-end luxury cars. In that case, it will prevent those who purchase lower to mid-priced market new vehicles from gaining access to it. Transversely, suppose the technology is of a moderate price. It will give broader consumer access and positively affect the BITU and acceptance of FAVs. As the technology migrates down into the mass production levels of vehicles, the technology costs for FAVs should decline.

Affordability (AF) is the working definition of a consumer's desirable purchase price choice. When I compare the possible trade-offs, the decision remains on whether the vehicle fits within the budget range and offers as much utility as the other purchase options within the marketplace (DuBrosky et al., 1997; Wall & LaCivita, 2016). Many consumers may not be able to effectively project future pricing levels as FAVs do not currently exist within the current marketplace.

Currently, SAV technology exists, and those consumers who have cars using this technology are aware of its retail pricing ranges today. As SAV technology began as optional equipment in luxury vehicles, the technology was a premium price offer. SAV technology has only recently migrated down into mid-level retail automotive pricing. Future pricing on FAVs in the consumers' minds will view them through the lens of currently existing luxury brand SAVs' optional equipment offerings. Concerning future pricing projections for FAVs, in the minds of consumers, there may be perceptions that it may be too expensive or out of their reach until FAV technology further migrates down into the mid to lower price ranges of the automotive retail market (Ghorayeb et al., 2021; Reddick et al., 2020; Towse & Mauskopf, 2018). In the past, other migrations of automotive technology took the same higher to lower pricing moves over time.

In their recent research study, Woldeamanuel and Nguyen (2018) targeted Millennials to gauge their technology fluency perceptions about FAVs technology. Their study audience expects costs will be prohibitive for FAVs initially. Consumers see the model, price, and costs, in determining whether FAVs will reach adoption in a future US marketplace. The same is also true for the adoption rate of any new technologies (Lee, 2014; Lee & Coughlin, 2015). The study participants' beliefs directly correspond with Everett Rogers' Diffusion of Innovation Theory framework (Rogers, 2003). The initial costs of development, marketing/promotion, and distribution must be re-cooped at introducing new technology. Once market penetration increases to a breakeven point, those upfront costs disappear, decreasing the price point without negatively impacting profitability. Therefore, the ability of consumers to financially afford FAVs within the relationship between IA and BITU for FAVs will strengthen.

Hence, I hypothesize:

- H13: Consumers' AF to FAVs positively moderates the relationship between IA and BITU.

To this end, the thirteen hypotheses are forwarded within this research study and empirically tested. The analytical results yield insightful findings. They directly address the consumers' behavioral intention to use fully autonomous vehicles.

Methodology

The research study is a cross-sectional, descriptive, correlational design. The research objective is to generate helpful consumer insights for the automotive companies, suppliers, marketers, and advertisers of FAVs. The units of analysis and observations are both at the individual level. The survey method is suitable for this study, focusing on consumers' perceptions and attitudes. The instrument design is simple, straightforward, and user-friendly (Dillman et al., 1998). Using Qualtrics online platform for survey instrument design and execution gave me the best tool for overall research study data effectiveness.

The construct measurement scales were developed based on an extensive literature review to ensure content validity. The four items for Performance Expectation are from Venkatesh et al., 2012; the three items for Price Value, Societal Influence, Hedonistic Motivation, and Behavioral Intention To Use are also from Venkatesh et al., 2012. The three items for Locus of Control are from Rudin-Brown and Ian Noy, 2002. Risk Aversion has two items from Qualls and Puto (1989). The three items for Affective and Cognitive Trust come from Johnson and Grayson, 2005. The two items for Social Norm and the three items for Individual Attitude are from Azjen & Fishbein, 1980; the three Attractiveness items are from Shen et al., 2019; the three Affordability items are from DuBrosky et al. (1997). These past research studies give the constructs a proven basis for my FAVs consumers study.

Boudreau et al. (2001) validate that research study instruments must be appropriately evaluated and refined through two pre-tests and a separate pilot study. My survey instrument was evaluated and refined through two pre-tests and one pilot study utilizing past research literature instrument standards (Boudreau et al., 2001). The objective of the pre-tests was to validate the wordings, instructions, and overall flow of the survey instrument. Nineteen pre-test participants were graduate students and professors from a Doctoral Degree Program in Business Administration at a research university in the US. The participants took the survey and gave verbal and written feedback to improve the overall instrument. The survey instrument was revised twice to make it more easily readable, fully understandable, and readily accessible to take.

The survey was pilot tested using 40 anonymous United States participants from MTurk. It is well above the participant number of 30, a number suggested by the literature for construct reliability within a pilot study (Memon et al., 2017). All survey participants read and gave their approval of a consent form before taking the survey. The survey data and any written and verbal contribute to further refining and improving the survey instrument questions in preparation for the primary data collection in this study. The most effective survey instrument response tool to accomplish overall data validity is to deploy a Likert seven-point scale (e.g., strongly disagree, disagree, somewhat disagree, neither disagree nor agree, somewhat agree, agree, strongly agree).

Amazon Mechanical Turk (Mturk) is the primary data collection tool. The study goal of 350 participants is the research sample which gave me the data validity I sought. For 43 responses, I deem as inadequate responses to a single attention check question as an elimination tool, yielding 357 complete survey responses out of four hundred total for the primary study use. Table 1 shows the demographic information of the sample.

TABLE 1:

Final Dissertation Sample Demographics

Characteristics	Indicators	Frequency	Proportion (%)
Gender	Male	178	50
	Female	175	49
	I prefer not to say	4	1
Age	18 – 29 years	60	17
	30 – 44 years	158	44
	45 – 59 years	82	23
	60 – 74 years	57	16
Race	American Indian	0	0
	Asian	41	11
	Black or African Descent	20	6
	Hawaiian	0	0
	White or Caucasian	291	82
	Other	5	1
Ethnicity	Latino	34	10
	Non- Latino	323	90
Marital Status	Single	97	27
	Married	213	60
	Divorced	23	6
	Widowed	3	1
	Domestic Partnered	21	6
Education	High School	29	8
	Some College	62	17
	Undergraduate Degree	148	41

	Graduate or Professional Degree	118	33
Employment	Part-Time	45	13
	Full Time	250	70
	Student	8	2
	Unemployed	22	6
	Disabled	29	8
	Retired	3	1
HH Income	$20K – $34.99K	84	24
	$35K - $49.99K	48	13
	$50K - $64.99K	59	17
	$65K - $79.99K	44	12
	$80K - $94.99K	27	8
	$95K - $109.99K	28	8
	>$110	58	16
Vehicle Ownership	Own	320	90
	Leasing	21	6
	Non- Owner	9	3
	Planning to Purchase	7	2
Driving Experience	None	10	3
	<1 year	59	17
	1 – 5 years	62	17
	5 – 10 years	224	63
	>10 years	2	1
Current Car has Semi-Autonomous Driving Features	Strongly Disagree	90	25
	Disagree	78	22
	Neither of both	21	6
	Agree	128	36

	Strongly Agree	40	11

The participants are solely from the United States as 357 overall, slightly more male (178) than female (175) overall, and four who did not designate a gender. The ages of participants are from a majority age range from 30 to 59 years old. The balance of the population in the remaining minority represents the front and back ends of a standard bell curve, presenting the age ranges of between 18 to 29 and 45 to 74 years old (117).

The racial composition of the participants is a large majority are White or Caucasian (291). At the same time, the more significant minority (41) are Asian and Black or of African descent. There are 0 American Indians or Hawaiians who choose to participate. The non-designated category of Other represents a much smaller number (5). The ethnicity majority is Non-Latino (320) and a minority (34) Latino. In the area of marital statuses, the lion's share is married (213), domestically partnered (21), single (97), divorced (23), and widowed (three).

Most participants hold a four-year college degree (148) in education. Some have a graduate or professional degree at a slightly less level (118), while others have some college attendance (62). Fewer participants have some high school or a high school diploma (29).

As it relates to employment, full-time workers (250) were the lion's share of the participants. Part-time workers represent a lessor number (45), disabled workers are more of a minority (29), and unemployed workers are even smaller (22). Students (eight) and retirees (three) were among the minuscule employment numbers of others to participate.

Household income amounts are spread widely across the various survey participants. The most significant number of participants (84) is in the average US household income range of $20,000 to 34,999 for a family of four. While $35,000 to 49,000 represents the following highest number (48). $50,000 to 69,499 is a slightly higher number (59). The range of $65,000 to 79,999 is slightly less (44). Concerning $80,000 to 94,999 the number is even less (27). Furthermore, the range of $95,000 to 109,999 is comparable in the number size (28). The final household income range of $110,000 or more comprises a considerable number (58).

Additionally, and in keeping with the research study questions protocol, I only ask specific questions regarding the experience level of drivers, vehicle ownership, or leasing status. It is essential to note their plans to acquire a vehicle in the future and whether their current vehicle has any SAV technology. The survey instrument data results were informative and instructive.

Of the overall participants, a large majority were vehicle owners (320), and a much smaller number were leasing their vehicles (21). Those who do not own or lease a vehicle (nine). Those who plan to acquire a vehicle (seven). The levels of drivers' experience in years represent none (59), one to five years (52), five to ten years (224), and greater than ten years (two).

The Likert five-point scale, which is universal within academic research, is used to ascertain whether participants are aware of SAV technology within their current cars: strongly agree (40), agree (128), neither agree nor disagree (21), disagree (78), and strongly disagree (40). It allows me to gauge just how much current consumers feel they know about the technology in their current vehicles. As well as to what degree they feel the technology is readily available to use.

Data Analysis

For this research study, I believe the utilization of Structural Equation Modeling (SEM) is the best data analysis method (Chin, 1998, 2010). Therefore, I used the PLS-SEM approach (Bagozzi & Yi, 1988). PLS-SEM is also known as Partial Least Squares Path Modeling-Structural

Equation Modeling (Hulland, 1999; Hair et al., 2011; Hair et al., 2014). This analysis software is the best option when a study's purpose is a prediction and not a confirmation (Vinzi et al., 2010). Also, it is best to use PLS-SEM when the research sample is medium to small (Reinartz et al., 2009). My study falls within this research category size range.

The PLS-SEM analysis consists of two parts (Anderson & Gerbing, 1988); the first is SmartPLS, and the second is the use of SPSS. The first determines the measurement model's reliability and validity. The second part of the analysis estimates the structural model. The goal is to define the paths' significance and the R2 values (Anderson & Gerbing, 1988). I accomplish this goal with my study analysis overall result.

Results

The software suites of SPSS v27 and SmartPLS v3 are the basis for data analyses within this dissertation. The analytical research methodology of SmartPLS was first in use by Ringle et al. (2005). The SPSS application yielded an Exploratory Factor Analysis (EFA), while SmartPLS is the testing software for the Structural Equation Measurement (SEM) models. SmartPLS is a software that performs partial least squares structural equation modeling (PLS-SEM). PLS-SEM is appropriate for developing theory, adequately handles complex models well, and has been acknowledged scientifically as a proper SEM technique (Hair et al., 2020). The analysis software is very useful for determining a consumer model such as mine.

Verifying the proper measurement model speaks to the overall research reliability, discriminant, and convergent validity. The initial test used an EFA with SPSS to check discriminant validity and convergent validity. To accomplish convergent validity, construct items must have loadings of 0.6 or higher and cross-loadings less than 0.4 (Gefen et al., 2011). Construct items with loadings lower than 0.6 are not valid for discriminant and convergent validity. The final construct loadings are detailed below in Table 2.

To validate the reliability of the thirteen latent constructs, I checked the Cronbach's Alpha values for Composite Factor Reliability (CFR) and Average Variance Extracted (AVE). As Table 1 shows, the Cronbach's Alpha values significantly exceed the conventional threshold of 0.70. All CFR values are well above the acceptable cutoff value of 0.70. Total AVE values are also well above the cutoff value of 0.50 (Gefen et al., 2011). The results establish the reliability of the survey instrument.

Furthermore, the square root of AVE for each construct is greater than the correlations of that construct with other constructs (Fornell & Larcker, 1981). Table 1 reflects that the criteria for discriminant validity are satisfactory. The results prove solid evidence for the convergent and discriminant validity.

TABLE 2:

Reliability and Discriminant Validity of Variable Constructs

Constructs	Cronbach's Alpha	CR	AVE	Inter-Construct Correlation matrix												
				1	2	3	4	5	6	7	8	9	10	11	12	13
AT	.873	.922	.798	**.893**												
AF	.647	.825	.708	.317	**.841**											
AN	.764	.866	.686	-.270	-.115	**.828**										
BITU	.962	.975	.929	-.377	-.208	.720	**.964**									
CT	.922	.945	.851	.695	.195	-.098	-.058	**.922**								
HM	.950	.968	.910	-.414	-.137	.692	.822	-.155	**.954**							
IA	.861	.915	.782	-.455	-.108	.708	.745	-.288	.815	**.884**						

LC	.836	.901	.753	.632	.223	-.101	-.150	.641	-.185	-.267	**.867**					
PE	.821	.895	.741	-.299	-.087	.672	.704	-.092	.762	.723	-.139	**.861**				
PV	.949	.967	.908	.077	-.177	.463	.553	.300	.473	.368	.233	.488	**.953**			
RA	.793	.848	.743	.380	.313	.019	.031	.367	.004	-.056	.379	.010	.135	**.862**		
SI	.886	.929	.814	-.296	-.125	.649	.719	-.061	.705	.696	-.092	.643	.488	.028	**.902**	
SN	.879	.943	.891	-.261	-.193	.582	.595	-.086	.558	.619	-.082	.493	.423	-.014	.547	**.944**

Note: Bold font values on the diagonal of the correlation matrix are the square root values of AVEs.; AT: Affective Trust; AF: Affordability; AN: Attractiveness; BITU: Behavioral Intention to Use Fully Autonomous Vehicles; CT: Cognitive Trust; HM: Hedonistic Motivation; IA: Individual Attitude; LC: Locus of Control; PE: Performance Expectation; PV: Price Value; RA: Risk Aversion; SI: Societal Influence; SN: Subjective Norm

A Confirmatory Factor Analysis (CFA) examines my thirteen first-order latent constructs. This analysis determined the convergent and discriminant validity. As reported within Table 3, all items loaded significantly on the corresponding latent variables with all loadings greater than the conventional threshold of 0.70 (McKnight et al., 2002); this suggests sufficient convergent validity. It establishes the discriminant validity of the constructs, as the loadings of all items are higher than their cross-loadings.

Although there were some irregularities with certain loadings, which may speak to possible survey instrument challenges, the usage of attention check questions was the sole process for eliminating surveys not valid within the research study. In addition to doing so, it may have been helpful also to deploy a survey instrument length of time taken check to improve the overall research data results.

TABLE 3:

Confirmatory Factor Analysis

Constructs	Item	1	2	3	4	5	6	7	8	9	10	11	12	13
Affective Trust (1)	AT_1	**.899**	.295	-.232	-.325	.592	-.384	-.404	.547	-.265	.063	.334	-.263	-.281
	AT_2	**.890**	.275	-.267	-.416	.589	-.405	-.406	.542	-.300	.014	.281	-.303	-.249
	AT_3	**.891**	.279	-.225	-.263	.688	-.315	-.408	.610	-.234	.136	.409	-.223	-.164
Affordability (2)	AF_1	.253	**.961**	-.108	-.222	.110	-.150	-.103	.160	-.109	-.210	.283	-.133	-.179
	AF_3	.358	**.701**	-.088	-.086	.336	-.049	-.076	.298	.002	-.021	.266	-.056	-.153
Attractiveness (3)	AN_1	-.016	-.097	**.702**	.540	.217	.435	.348	.100	.433	.499	.161	.425	.348
	AN_2	-.284	-.074	**.890**	.617	-.202	.634	.706	-.159	.621	.343	-.046	.577	.538
	AN_3	-.345	-.115	**.880**	.627	-.218	.634	.676	-.169	.602	.325	-.048	.598	.543
BITU (4)	BITU_1	-.378	-.190	.693	**.953**	-.079	.786	.715	-.147	.668	.521	-.006	.682	.600
	BITU_2	-.359	-.206	.709	**.971**	-.033	.793	.727	-.139	.697	.538	.038	.697	.567
	BITU_3	-.354	-.203	.680	**.967**	-.056	.797	.710	-.148	.671	.540	.057	.699	.554
Cognitive Trust (5)	CT_1	.701	.209	-.168	-.188	**.947**	-.253	-.352	.634	-.188	.183	.312	-.165	-.129
	CT_2	.590	.117	-.002	.097	**.899**	-.023	-.168	.538	.032	.369	.358	.068	-.014
	CT_3	.587	.181	-.016	.076	**.920**	-.037	-.190	.568	.013	.385	.381	.046	-.041
Hedonistic Motivation (6)	HM_1	-.405	-.099	.690	.801	-.176	**.947**	.795	-.197	.768	.469	0.012	.712	.533
	HM_2	-.365	-.127	.625	.757	-.103	**.946**	.756	-.157	.696	.441	0.006	.617	.517
	HM_3	-.413	-.167	.663	.792	-.163	**.968**	.780	-.174	.715	.444	-0.007	.686	.545
Individual Attitude (7)	IA_1	-.439	-.104	.651	.678	-.322	.746	**.898**	-.252	.635	.294	-0.065	.618	.556
	IA_2	-.339	-.084	.515	.518	-.246	.583	**.839**	-.198	.564	.273	-0.031	.573	.506
	IA_3	-.418	-.097	.691	.751	-.201	.807	**.914**	-.252	.705	.396	-0.051	.652	.577
Locus of Control (8)	LC_1	.558	.170	-.052	-.068	.584	-.084	-.196	**.833**	-.086	.275	0.368	-.026	-.021
	LC_2	.586	.219	-.087	-.121	.586	-.162	-.246	**.898**	-.120	.194	0.341	-.093	-.080
	LC_3	.507	.189	-.118	-.190	.506	-.220	-.247	**.870**	-.149	.153	.288	-.111	-.102
Performance Expectation (9)	PE_1	-.303	-.117	.621	.705	-.078	.748	.679	-.148	**.913**	.477	-.005	.624	.462
	PE_2	-.239	-.007	.479	.421	-.154	.504	.523	-.131	**.743**	.250	-.007	.437	.386
	PE_3	-.229	-.088	.623	.662	-.022	.693	.652	-.081	**.915**	.504	.035	.582	.422
Price Value (10)	PV_1	.096	-.142	.425	.510	.306	.443	.339	.229	.447	**.957**	.161	.445	.394
	PV_2	.050	-.186	.449	.551	.255	.470	.375	.212	.497	**.944**	.095	.501	.415
	PV_3	.077	-.175	.448	.516	.298	.438	.333	.225	.447	**.958**	.133	.445	.398
Risk Aversion (11)	RA_1	.308	.288	.031	.007	.249	.029	-.005	.322	.063	.073	**.699**	-.026	-.057
	RA_3	.376	.307	.018	.032	.367	.002	-.059	.374	.005	.137	**.998**	.031	-.010
Societal Influence (12)	SI_1	-.266	-.069	.603	.680	-.046	.666	.660	-.097	.616	.448	.046	**.904**	.510
	SI_2	-.279	-.114	.579	.644	-.084	.644	.632	-.085	.586	.411	.043	**.903**	.473
	SI_3	-.255	-.160	.573	.619	-.033	.594	.589	-.065	.533	.463	-.018	**.900**	.498
Subjective Norm (13)	SN_1	-.227	-.200	.553	.567	-.051	.529	.572	-.041	.461	.434	-.018	.507	**.933**
	SN_3	-.263	-.168	.547	.559	-.106	.526	.597	-.107	.469	.371	-.009	.526	**.955**

Note: the following items were removed from the model because of having insufficient factor loading less than 0.: AF_4RC, AN_4RC, AT_4RC, BITU_4RC, CT_4RC, HM_4RC, IA_4RC, LC_4RC, PE_4RC, PV_4RC, RA_4RC, SI_4RC, SN_4RC, AF_2, RA_2, SN_2

TABLE 4:

Summary of Hypotheses Testing

Path Shape	Path Coefficient	Standard Error	T-value	P-value	Hypothesis Result
PE➔IA	.201***	.053	3.815	.000	H1) Supported
PV➔IA	-.013	.035	.358	.720	H2) Rejected
HM➔IA	.482***	.057	8.499	.000	H3) Supported
SI➔IA	.220***	.048	4.593	.000	H4) Supported
LC➔IA	-.022	.039	.562	.574	H5) Rejected
RA➔IA	.005	.038	.119	.905	H6) Rejected
SN➔AT	-.261***	.052	5.067	.000	H7) Rejected
SN➔CT	-.086	.054	1.591	.112	H8) Rejected
CT➔IA	-.164**	.051	3.219	.001	H9) Rejected
AT➔IA	-.003	.050	.069	.945	H10) Rejected
IA➔BITU	.555***	.056	9.883	.000	H11) Supported
AN*IA➔BITU	.127***	.026	4.901	.000	H12) Supported
AF*IA➔BITU	.040	.034	1.190	.234	H13) Rejected

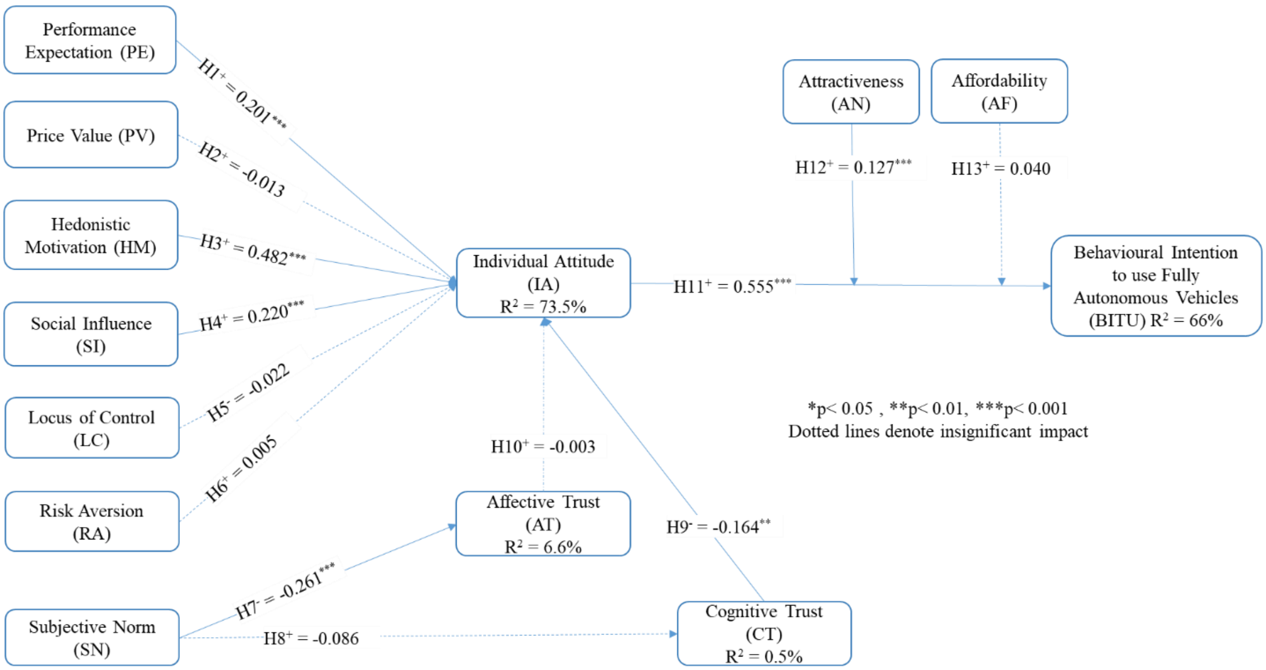
Note: *p< 0.05 , **p< 0.01, ***p< 0.001; AT: Affective Trust; AF: Affordability; AN: Attractiveness; BITU: Behavioral Intention to Use Fully Autonomous Vehicles; CT: Cognitive Trust; HM: Hedonistic Motivation; IA: Individual Attitude; LC: Locus of Control; PE: Performance Expectation; PV: Price Value; RA: Risk Aversion; SI: Societal Influence; SN: Subjective Norm

SmartPLS was also used to test the structural model. Table 4 demonstrates the path coefficients, p-values for two-tailed t-statistics tests, and R^2. According to Van Tonder and Petzer (2018), R^2 must be greater than 0.1 to be acceptable. The R^2 value for intention to use is 66.0%. The independent variables explain more than 73.5% of the behavioral intention to use FAV technology.

Of the 13 constructs seen above in the Summary of Hypotheses Testing analysis (Table 4), eight do not receive support, and five do. Table 4 details the path coefficients and the p-values for two-tailed t-statistics tests for each hypothesis. The results reflect that most of the constructs operationally validate the overall hypotheses.

FIGURE 2:

Results of Model Estimation



H1 proposes that PE positively influences IA in consumers' use of FAVs is supported. (β = 0.201, t = 4.771, p 0.00). H2 proposes that PV positively influences IA in consumers' use of FAVs is not supported. d (β = 0.013, t = .358, p < 0.720). H3 proposes that HM positively influences IA in consumers' use of FAVs is supported. (β = 0.482, t = 4.771, p < 0.01).

H4 proposes that SI positively influences IA in consumers' use of FAVs is supported. (β = 0.318, t = 8.499, p 0.00). H5 proposes that LC negatively influences IA in consumers' use of FAVs is not supported. (β = -0.022, t = .562, p < 0.574). H6 proposes that RA negatively influences IA in consumers' use of FAVs is not supported. (β = 0.005, t = 0.119, p < 0.905).

H7 proposes that SN positively influences AT in consumers' use of FAVs is not supported. (β = 0.261, t = 1.591, p < 0.01). H8 proposes that SN negatively influences CT in consumers' use of FAVs is not supported. (β = -0.086, t = 0.119, p < 0.112).

H9 proposes that CT positively influences IA in consumers' use of FAVs is not supported. ($\beta = -0.164$, $t = 0.051$, $p < 0.001$). H10 proposes that AT negatively influences IA in consumers' use of FAVs is not supported. ($\beta = -0.003$, $t = 0.069$, $p < 0.945$). H11 proposes that IA positively influences consumers' BITU for FAVs is supported. ($\beta = 0.555$, $t = 9.883$, p 0.00).

H12 proposes that AN positively moderates the consumers' IA ➔ BITU) using FAVs is supported. ($\beta = 0.127$, $t = 4.901$, p 0.00). H13 proposes that AF positively moderates the consumers' IA ➔ BITU with FAVs is not supported. ($\beta = 0.040$, $t = 1.190$, $p < 0.234$).

Discussion

This research study aims to understand overall consumer acceptance of and behavioral intention to use FAVs. To predict consumers' acceptance of FAVs, I use the UTAUT2 theory to devise a model for consumer attitude and acceptance behavior and use related to FAVs. We collected data from consumers via a survey study. I found that Performance Expectation (PE), Price Value (PV), Hedonistic Motivation (HM), Locus of Control (LC), Societal Influence (SI), and Subjective Norm (SN) positively influence the formation of consumer Individual Attitudes (IA). They, in turn, also impact consumers' overall acceptance of FAV technology.

Hypothesis H1 – PE ➔ IA is supported. The finding suggests that FAVs automakers should exact extreme dependability and high-performance standards for FAVs to win over consumers successfully. The road testing of FAVs for millions of miles gives additional validity to the dependability of any performance improvements (Benenson et al., 2008; Godoy et al., 2015) and helps boost consumers' confidence in PE.

At this early stage in their development, FAV technology's perceptions of performance by consumers are hard to project, especially since FAVs do not yet exist (Kaur & Rampersad, 2018). However, our finding confirms that OEMs must ensure FAVs deliver the overall performance consumers expect to gain mass-market appeal. Offering advanced artificial intelligence to provide performance improvements above human-controlled vehicles may help boost PE and then IA (Paden et al., 2016).

Hypothesis H3 – HM ➔ IA is supported. The perception of a hedonistic concept relates to the levels of fun, enjoyment, and sensation-seeking in the consumers' experience, especially for new technology usage (Hirschman& Holbrook, 1982; Venkatesh et al., 2012). The finding confirms that corporate marketers continually probe consumers' perceptions of product or service value differences in their purchase decisions versus their desire to enjoy hedonistic motivation (HM) against a product or service utilitarianism performance (Warren & Cloarec, 2022). To develop successful FAV consumer marketing campaigns through this consumer lens, OEMs must highlight the sensation-seeking attributes within fully autonomous technology that speaks directly to the desire for hedonistic motivation.

Hypothesis H4 – SI ➔ IA is supported. Societal Influence (SI) speaks to the overall influence of human society on individual consumers' usage of new technology, such as FAVs. However, the influence of SI as a useful construct may continue to decline as consumers' technology usage is standard in both the workplaces and within their personal lives (Wilsa, 2003). Humans tend to be social beings generally. Within my research study, the participants are confident in using new technology. However, outside influences from their referent groups are still a factor in their decision-making processes.

My finding is in line with the literature that most consumers long to be an affiliate of one group or another, and the basis for the decision to join a group within SI is how important the individual perceives the group to be and whether it fits their lifestyle or professional choices

(Zambrano, 2001). By the same token, consumers' IA toward FAVs is determined by their social groups' choices and attitudes toward FAVs.

Hypothesis H11 – IA ➔ BITU is supported. Individual Attitude (IA) comes from the exposure to learning, which a consumer equates to a reaction over time. This type of learning forms an attitude that can trigger an automatic response concerning a specific action or thought (Fazio, 1995). The finding suggests that if FAV technology emotes a consumer's positive response, he/she will act in an affirmative action over time.

In other words, only when consumers view FAVs positively will they have serious consideration for BITU regarding the technology. FAV Technology may emote a positive consumer response if their exposure to it falls in line with their thinking and lifestyle over time. Individual attitude positively influences the Behavioral Intention to Use (BITU). Unless consumers view FAVs positively, they cannot attain the proper IA. Only then can it move them into serious consideration for BITU regarding FAV technology.

- Hypothesis H12 – AN to FAVs positively moderates the relationship between IA and BITU is supported.

Attractiveness (AN) speaks to consumer attitudes about the exterior and interior designs of FAVs. In this regard, it is not primarily about the behavioral intention to use FAVs. It confirms the antecedent relationship of attractiveness between individual attitude and BITU (Meyer-Waarden & Cloarec, 2022). AN speaks to whether consumers find FAVs vehicles' overall design visibly appealing enough to secondarily support the positive influence for the behavioral intention to use them.

The former AN and the after-mentioned AF are from other non-automotive technology consumer research studies. These constructs are not traditionally seen within the deployment of

FAV or SAV technology acceptance research. Their additions add value to the contextualization of a better understanding of consumers' intrinsic perceptions of the overall acceptance of FAVs.

The attractiveness of consumer technologies helps determine whether consumers will ultimately embrace, accept, and use these products. Whether consumers perceive FAV technology as attractive speaks directly to how auto manufacturers and their marketers best position FAVs to add a positive value to their lifestyles.

Now, please allow me to review the hypotheses that did not successfully receive confirmation within the research study relationships:

Hypothesis H2 – PV ➔ IA is not supported. The FAVs adoption rate will tend to accelerate if the ratio of PE over PV is greater than for a non-fully autonomous vehicle (Ram & Sheth, 1989; Zsitkovits & Gunther, 2015). The PV is not supported because it negatively influences individual consumer attitudes. There is a projection by FAVs researchers that by 2035 FAVs will be approaching most new vehicle sales within the US. It will only occur if consumers are willing to overcome any hesitations about FAV technology pricing. The amount consumers are willing to pay to do so is yet unknown for this to happen.

Earlier research shows that if there is additional pricing of $1000 or less for FAV technology on new vehicles, this will propel the adoption rate of FAVs beyond 50%. Transversely, if the additional pricing structure is greater than $10,000 for FAV technology on new vehicles, the market share will not reach a majority percentage (Bansal & Kockelman, 2017). Consumers expect FAV technology to be affordable once it reaches the mass market. Their perceptions of FAVs' affordability in the future may have some basis on SAV technology pricing today. Once again, my study participants cannot accurately gauge any future FAVs pricing as they do not yet exist.

Hypothesis H5 – LC ➔ IA is not supported. LC addresses the individual's perception of control as an external or internal orientation. It did not relate positively to influencing consumers' attitudes in this study. In this study context, consumers with external LC tendencies do not see themselves being able to control FAVs. They probably feel that they can become too dependent on FAVs and thus uncomfortably acceding the close supervision and personal responsibility for monitoring the performance of FAVs technology. It may explain why LC did not lead to significant attitude change within this study.

How consumers may feel about the loss of control when traveling in vehicles with no steering wheel or foot pedals cannot yet be seen in today's marketplace. When the technology is proven safe, dependable, beneficial, and easy to use, consumers may agree to relinquish driving control and embrace and use it. Nevertheless, those with high LC may still be less likely to do so. Based on our findings, FAVs manufacturers should make note that high sensation seekers may be less likely than low sensation seekers to exhibit the behavior of adapting to driving assistance systems, such as FAV technology. Automakers need to develop marketing strategies to persuade those with high LC to willingly give up their control over FAVs while increasing their positive IA.

Hypothesis H6 – RA ➔ IA is not supported. The variable RA is when an individual chooses to avert a risk if any arbitrary risk exists. They then prefer certain equality between the expected value and the known risk (Mendes and Henson, 1970). RA is the consumer preference for a guaranteed decisional outcome versus a more probabilistic one. (Qualls and Puto, 1989). The concept of risk aversion starts early on from economic decision theorists.

Risk-averse individuals prefer a riskless outcome over a riskier outcome with the same value expectation. As RA negatively influences individual attitudes, this is the primary reason it is not supported. The higher the level of consumer RA the greater the chance they will not use FAVs. Within their FAVs marketing efforts, OEMs must effectively address any risk aversion orientations consumers may have.

RA also plays a significant role in consumer behavior, as it may impact product choice, trial, and purchase (Aren & Hamamci, 2020, Di Mauro et al., 2020; Schleich et al., 2019). In this regard, it relates to a self-measuring scale for the attributes of risk aversion within a specific domain, such as financial investments or new vehicle purchases, to include which technology options one may select for that transaction (Moorthy et al., 1997). When consumers plan to do something, their expectation of a payoff is critical in their decision process.

When the decision-making process is fraught with risk, there are also chances for an unexpected outcome. Consumers may fall all along the continuum from risk-averse to risk-seeking or falling in between risk-neutral (Masiero et al., 2020). The study shows RA may negatively affect their embrace and use of FAV technologies and ability.

Hypothesis H7 – SN ➔ AT is not supported. Instead, the result points to SN's significant and negative impact on AT. It is the opposite direction of our initial hypothesis. The finding is not in line with the literature that a consumer's perception of his/her referent group's approval of certain behaviors influences the consumer's intention (Kamal et al., 2015). A possible reason for such a negative impact is that many consumers (including people in their social circle) do not trust FAVs, leading to a less good affective trust. Based on this finding, FAVs automakers must focus their market campaigns on consumers instead of referent groups. Indeed, avoiding referent groups may minimize any negative consumer influences of SN ➔ AT.

Hypothesis H8 – SN ➔ CT is not supported. A possible explanation is that consumers' reference groups do not believe in the OEMs' ability to build FAV technology they can trust. Thus, they cannot develop CT in FAVs as a result.

Consumers make value judgments to decide pre-purchase as to whether a company, product or service can deliver to them whatever the promise or benefit is. The intention to trust is relevant to any consumer decision to adopt new technology (Gefen et al., 2003). For consumers to embrace FAVs, they must believe the OEMs to be valid trust partners in providing dependable, safe, and secure FAV technology within their new vehicles.

SN➔CT is not supported probably also because of the overarching evaluation process that negatively influences consumers' attitudes and the ability to rely on FAV technology. Societal norms are also another area OEM marketers should craft marketing communications that positively show the greater public benefits of FAVs and how consumers embrace the technology.

Hypothesis H9 – CT ➔ IA is not supported. The result points to an opposite direction of H9 that CT had a negative influence on IA. CT deals with whether consumers feel the entities responsible for FAVs (OEMs) are doing so in good faith and will act responsibly to ensure the technology is genuinely safe. CT is also the consumer's ability to rely on a business or service provider comfortably.

As consumers see growing media stories of accidents and deaths from SAVs usage today, their overall effect of CT is negative. It may explain why the finding relating to H9 is not in line with past research studies concerning its impact on the constructs for consumer acceptance of FAVs and SAVs (Choi & Ji, 2015; Daziano et al., 2017; Krueger et al., 2016; Lee et al., 2015; Mennie, 2019; Wang et al., 2019). It becomes tantamount for automakers marketing FAVs to focus on the safety and dependability of the technology to gain consumer approval and acceptance heavily.

Hypothesis H10 –AT ➔ IA is not supported. Affective Trust (AT) negatively influences individual attitude (IA). It is why AT is not supported. The AT construct belies the consumers' perception that an external party's actions are intrinsically motivated (Rempel et al., 1985). Consumers may accurately ascribe the OEMs' actions to extrinsic motivation concerning the introduction of FAVs. If so, the necessary levels of trust in FAVs will not occur with consumers, thereby preventing their movement toward the behavioral intention to use them. OEMs should focus on exhibiting intrinsic motivation for the consumer introduction of FAVs.

Individual attitude (IA) speaks to consumers' cognition and how they respond to certain marketing and advertising messaging. If OEMs deliver what they promise in FAVs, consumers' trust in the technology will grow accordingly. If viable, OEMs' reliable FAV technology performance acts as the first party of trust, increasing consumers' affective trust. If done so successfully by OEMs, it will positively influence the consumers' behavioral intentions to use FAVs (Edell & Burke, 1987). When crafting FAVs marketing and advertising campaigns, the OEMs must keep these consumers' FAVs perceptions and opinions very top of mind.

Hypothesis H13 – AF IA ➔ BITU is not supported. This finding could be that currently, FAVs are not available on the market. Thus, consumers cannot precisely judge their affordability as what is affordable or not has a wide range of possibilities depending on the income and lifestyle of consumers' who are gauging it.

However, automakers may promote information on the vehicles where extreme underuse of those capital assets still requires ongoing personal expenditures of costs for fuel, maintenance, insurance, licensing, and registration. A personal vehicle sits dormant and empty for 95% of the time. A car normally only carries one person in transit at a time (Shaheen, 2018). Promoting that sharing FAVs may offer a more attractive consumer financial case for less expensive transportation costs versus owning the vehicles outright may increase the effect of affordability on IA ➔ BITU.

Contributions

The implications from a research contributions standpoint may give manufacturers more insight or a better roadmap for how to best market FAVs to consumers once the technology is ready for marketplace introduction. This research study and the model's theoretical implications and contributions extend and support the current theory. Additionally, it provides a roadmap to better focus on getting direct consumer feedback about FAV technology and their perceptions of it. The novelty is getting to the heart of how the usage and acceptance of FAVs may best meet the consumers' needs and lifestyles.

This research's practical implications and contributions may prompt consumers to feel more confident in the data they receive and the overall performance of FAVs technology. Various FAVs stakeholders (e.g., auto manufacturers, suppliers, marketers, dealerships, and federal, state, and local governmental entities) exist. The research and model implementations are vital contributions in gaining crucial consumer insights to craft an even more effective & valuable FAVs technology, more granular marketing & sales messaging, and more effective governmental oversight.

Consumers feel FAVs will improve their productivity and save them time. They expect discount purchase prices on FAV technology, and the subsequent use of FAVs will save them money. FAVs will be fun, enjoyable, and pleasant to use. Consumers feel they will have their families, friends, and co-workers' approval to use FAVs. While using FAVs, they feel it will be harder to prevent accidents because of unforeseen events.

The consumers for this study state they like to have exciting experiences and new opportunities in their lives. As a new technology they anticipate enjoying, FAVs are very attractive to them in this regard. They do not necessarily see themselves as being risk-takers. Nevertheless, for them, technological advancements in FAVs are a positive thing. Therefore, there is excitement about the possibilities of using FAVs. They see reducing carbon emissions by FAVs as positive for creating a more sustainable climate. Consumers feel they will have the knowledge and the financial wherewithal to afford FAVs once available.

Consumers have some questions about whether FAVs operationally will be deceptive or untrustworthy. Concern exists about whether FAVs are harmful or dangerous. Moreover, they do not feel as confident about using FAVs as they would own for themselves. Optimistically, they think FAVs will offer more transportation flexibility and freedom overall. FAVs will be attractive to senior citizens and allow them added personal transportation options. However, there is concern that FAVs may not be available and affordable to poor consumers in the future.

Projecting once FAVs are available, consumers are quite substantial in their opinions about possibly using them. Additionally, they have no qualms about recommending FAVs to family, friends, and associates in the future. It speaks to the overwhelming conclusion of a positive behavioral intention to use fully autonomous vehicles.

Consumers feel FAVs will improve their productivity and save them time, but not in any specificity. They believe a discount purchase price and subsequent use of FAVs will save consumers money without a basis for thinking about it. Consumers believe that FAVs will be pleasurable and offer a pleasant hands-off experience. As FAVs are not yet in the marketplace, no appreciable standard exists for this belief. Consumers feel they will have their families, friends, and co-workers' approval to use FAVs. Again, there is no basis for this belief or a predicate for this thinking. While using FAVs, consumers feel it will be harder to prevent accidents because of unforeseen events. Interestingly, they also believe FAVs will reduce the probability of vehicular accidents and deaths.

There are specific extrinsic benefits drivers behind the wheel (and sometimes even passengers) formerly could not comfortably or safely enjoy. The need for the driver to keep his hands on the steering wheel and eyes on the road can limit the enjoyability of human-controlled vehicular traffic. After the market availability of FAVs, the interiors of FAVs vehicles will become a real-time passenger lounge on wheels far more than they were before fully autonomous technology.

How OEMs successfully design the vehicle interiors of fully autonomous vehicles for human fun, enjoyment, and interaction may increase the positive consumer perception of FAV technology. This technology may also reduce human stress while in transit, increase personal productivity, prevent further injury and deaths, and improve passengers' moods and disposition. If proven scientifically sound, this research may positively influence the consumers' behavioral intention to use fully autonomous vehicles.

Limitations and Future Study

The primary limitation of the research study is that FAVs (e.g., SAE International Certification Levels 4 and 5, see *Appendix E*) do not currently exist within the current consumer marketplace, and consumers have not yet driven and used them. A future research study could establish a real-world observation laboratory to view, gauge, and observe the consumer interactions with and usage of FAV technology. Once the technology becomes available for mass consumer testing and use, this future research study may successfully gauge the real-world operation and acceptance of FAVs. A viable option for doing so would be to propose a new research study partnership with an existing FAVs development company (e.g., Alphabet's Waymo or GM's Cruise) to gain access to the not yet available technology and then bring consumers in for direct interaction, trial observation, and usage, within the future study.

During this research study, I could not as deeply delve into some of the more nuanced consumer perceptions concerning FAVs. Doing so would require more direct human interaction with consumers to probe further their thinking about FAVs and study language and body movements while I engage them. Utilizing a focus group methodology could help research these consumer perceptions more deeply for future studies. Additionally, a FAV test track to give research study participants hands-on experiences would also be very helpful in gaining new insights. OEMs and their marketers currently solicit and receive consumer feedback and ask if their occupying vehicles are safe during a global Pandemic.

Fully Autonomous Vehicles Issues Impacting the Future

The Novel Coronavirus-19 (COVID-19) makes OEMs seriously address this question and many more concerns. COVID-19 continues to negatively impact the worldwide automotive industry (Alonso-Ameida et al., 2022). The setbacks include regularly stopping plant manufacturing of vehicles worldwide due to the population COVID-19 Virus spread. Employees must operate in close quarters unsafely while assembling vehicles and the growing supply chain disruptions. Lastly, a pandemic influenced global computer chip shortage as a major component of the current vehicles.

The Pandemic impacts current and future FAVs development and testing. The real world of FAVs testing requires multiple engineers to record data and act in intervention if the FAV

Technology goes awry. FAVs testing must occur on roads and highways while safely coexisting with passenger-driven vehicles in transit. Social distancing is a must within the time of a Pandemic. Making it impossible to do so within an automobile's confines, especially with those you may not be of relation with or know.

Consumers may use a significant percentage of FAVs to share fully autonomous vehicular transportation fleets. The ability to keep them free of bacteria and viruses is of utmost importance. The deployments of Shared Autonomous Vehicles (SAVs) may also positively influence individual consumer usage of FAVs. The publicly used vehicles raise the issue of protecting consumers' health while in transit and the need for sanitizing shared fully autonomous vehicles (Fayyaz et al., 2022). Since there are no human drivers, the only viable option for cleanliness is the need to invent an autonomous automobile sanitizing system the car regularly deploys independently after each vehicle's fares exit.

Another central transportation area in which fully autonomous technology may impact the future of FAVs is the public transport and delivery of consumer products (Chottani et al., 2018). A fully autonomous tractor-trailer semi-trucks (FATs) network will crisscross the United States. The FAT technology is yet undetermined and may need further research study. Currently, semi-truck drivers are only allowed to drive a certain number of hours each day. The period mandate given by federal law is to prevent drivers' fatigue. The drivers are also to take periodic breaks to combat fatigue and lessen the chance of accidents. Commercial FATs operating by computer AI neural networks will not require limiting hours of operation over a twenty-four-hour period. Consumers' commercial FATs acceptance, which may occur before FAVs are available to individuals, could positively influence or negatively damage consumer acceptance and usage of FAV technology. Future research studies for SAVs and FATs will deliver greater consumer insights and perceptions of FAV technology.

As an academic researcher and close observer of the auto industry I am aware that governmental entities have been extremely slow to devise the necessary public regulatory frameworks to make FAVs a consumer marketplace reality is of concern (Taeihagh et al., 2019). As federal, state, and local regulatory frameworks will craft, govern and monitor all full autonomy consumer use and safety concerns, a sizeable percentage of fully autonomous vehicle usage will be for consumers sharing ride-hailing services or shared fully autonomous vehicles.

Governmental entities, OEMs, dealer bodies, and consumers (e.g., the smart mobility stakeholders) must coalesce to fast-track the necessary FAVs oversight laws and workable, sustainable, and safe mobility solutions for consumers in the future (Mack et al., 2021). It is another area of future research study focus. Driving today is often personally frustrating, especially with growing traffic gridlock. Enabling smart traffic signals and roadways may alleviate much of this frustration and loss of time while sitting in traffic. Vehicle-to-vehicle communications (V2V) allow cars to communicate with each other via artificial intelligence and neural networks (Khan et al., 2022) dynamically. This technology aims to prevent collisions, allow vehicles to drive with more precision and efficiency, reduce traffic congestion, and seamlessly navigate traffic patterns, all while in transit.

Smart mobility is an approach that incorporates modern technologies into transportation systems. Smart mobility and V2V work in tandem to equip cars for communicating directly with each other and traffic signals, enabling the ability to trip a traffic signal change dynamically, but only when they approach street intersections (National Highway Traffic Safety Administration, 2018). Speeding is often a vehicular issue in personal driving. If drivers could successively hit all green lights just by driving the speed limit, it would eliminate most of their orientation for speeding while on the roads. These are just a few outside-the-box thinking traffic innovations possible through smart mobility and AI software solutions (Al-Rahamnen et al., 2022). All the smart mobility stakeholders must work closely to make this a reality to accomplish them.

Just as the former mentions FAVs stakeholders working together more seamlessly to ensure the consumer success of FAV technology, there should also be a national entity for which all the various companies and manufacturers could become members (Anderson et al., 2021). I propose creating a national FAVs organization like The Alliance for Automotive Innovation for international automakers who sell their vehicles within the United States. I deem the new FAVs membership entity the American Autonomous & Sustainable Mobility Alliance (AASMA). A national trade organization comprises OEMs, FAVs component suppliers, dealer bodies, governmental oversight entities, and consumer safety entities.

The role of AASMA would be to create and advance the necessary private-public partnerships for legal policies and lobbying practices, infrastructure frameworks, consumer marketing, and business engagements for the sustainable successes of FAVs, Electric Vehicles, and Electric Vertical Takeoff Landing (eVTOL) flying taxis. The burgeoning US Flying Taxis industry will require substantial planning and financial investments for eVTOL infrastructure development. Vertical Flying Ports (Veriports) will locate atop new and existing high-rise buildings for the departures and arrivals of passengers in major city centers (Hakim et al., 2022). These FAV technology areas of opportunity would also benefit from additional research studies and pursue private-public partnerships to succeed.

The City of Miami, which wants to become an example of transportation leadership in unique mobility solutions, recently became the first US city to announce a public/private partnership for a memorandum of understanding with Hyundai Motor Group's Urban Air Mobility Division called Supernal. Their mutual goal is a sustainable advanced air mobility (AAM) joint strategy, which will create and promote eVTOL and Veriports within Miami (Supernal, 2002). It can become an example for other US cities in the future. It is another example of what is possible when the best minds come together to accomplish sustainable and equitable smart mobility and transportation.

Creating a viable pipeline for new ideas in sustainability and equality in smart mobility and FAVs should also have an academic research component (Faisal et al., 2021). Furthermore, the AASMA proposal should include partnering with and residing at a major research university (like Florida International University) to establish the Autonomous & Sustainable Mobility Institute (ASMI). The ASMI aims to use academic scientific research to address the myriad challenges and issues surrounding sustainable transportation and smart mobility solutions for US cities, mobility manufacturers, suppliers, governmental/safety entities, and consumers. I think they are the unique solutions that will advance smart mobility and transportation sustainability across the country.

Equity in personal transportation and smart mobility is challenging for many urban and inner-city consumers. Transportation mobility companies, such as Uber and Lyft, which use human drivers, have the power to decide not to travel to certain urban areas or reject picking up certain fares on a basis solely on race. Transportation industry prognosticators ask if AI can eliminate these types of biases. The removal of human operators within FAVs as SAVs fleets will do so to a certain extent.

However, I propose there must be ongoing proactive actions to ensure equity in mobility moving forward. Urban governmental entities can pass legislation and financial or tax incentives

(Aoyama & Leon, 2021). An example of such proactive action is special tax incentives districts to generate increases in inner-city and urban financial investment developments, which can also be a model for new solutions to promote smart mobility equity.

Past US financial discriminatory measures brought about the Redlining of certain urban and minority neighborhoods preventing residents from ready access to home mortgages, commercial development, and community financial investments (Dreier, 1991; Flournoy, 2021). The result is a longstanding severe unequal financial level playing field for those consumers. Public/private partnerships through FAVs and SAVs may offer some unique opportunities to right some of these past wrongs. The passage of Equity in Smart Mobility Opportunity Districts (eSMODs) legislation could give minority and female disadvantaged businesses the opportunity through tax incentives to create and operate fleets of SAVs within cities across the country. Companies like Uber and Lyft, through the same tax incentives, could offer urban and inner cities areas lower per trip charges and enjoy higher per trip profits by operating their SAVs fleets within the special mobility opportunity districts. Once again, if transportation and smart mobility inequity challenges are successful, these are the types of new solutions I expect. The research study exploration of these areas is important to FAVs' future developments

Consumer sharing of FAVs (SAVs) allows for a more flexible and accessible public transportation mode without fixed routes or schedules (Wali et al., 2021). SAVs will be summoned via cellular telephone applications and automatically pick up and drop off passengers. Unlike taxicabs, there are various economic and climate benefits to shared FAVs transportation fleets (Acheampong et al., 2021). The benefits may include savings in fuel expenses, relieving traffic congestion, and tremendously reducing greenhouse gasses released into the atmosphere.

Once they are available, there will be a transitional period for the co-existence of human and smart mobility AI control of vehicles on roads and highways within the US. It will help the transition if an alignment co-exists between the automotive Original Equipment Manufacturers (OEMs), its marketers, and the retail dealers to strategically craft clear FAVs marketing communications and informative educational messaging concerning the technology's availability, key attributes, and benefits.

An example of an OEM attempting to do so is The Ford Motor Company. They have restructured specifically for their internal autonomous vehicles development process. James Farley, President, and CEO, in late 2021, created a new umbrella organizational effort called The Ford+ Plan. (Ford Motor Company, 2022). Its purpose is to oversee the two new divisions: *Ford Model e* and *Ford Blue*, divide the businesses to focus on the electric and gasoline engine products and separately explore new FAVs and other technologies and how to monetize their many benefits. The Ford+ Plan will also contribute to creating crucial and effective consumer marketing messaging and services concerning the company's future FAVs (Naughton & Welch 2022). Theirs is an excellent example of totally integrating FAVs as a separate company marketing brand (e.g., *Blue Cruise* ™) and simultaneously building a consumer information and education component.

For the first time, OEMs are developing their own in-house chip manufacturing facilities to counter the current global computer microchip shortages. Their former business practice of relying on independent microchip suppliers places the OEMs and sales at risk if these companies keep their commitments to deliver within the dynamically changing global auto industry. The mass-market introduction of FAVs will increase global demand for computer microchips to grow exponentially, a key building block of artificial intelligence components. The OEMs must continue to remake the auto industry to take advantage of new thinking and strategic movements to meet the needs of the consumers for fully autonomous vehicles.

OEM franchise dealers are building newer or readying their sales and service facilities by training employees in the technology and bringing new employees to prepare for the coming electric and fully autonomous vehicles. Doing so represents significant capital expenditures by these franchise entrepreneurs to satisfy the various auto manufacturers' dealer facilities investments and consumer engagement guidelines. The retail dealers may be optimistically thinking: If we build or expand their businesses, it may increase consumer traffic into those dealerships. However, those substantial capital investments may not necessarily equate to increasing dealership floor traffic levels, higher sales of vehicles and service work, or growth in dealership profitability. It is one of the financial risks they must take as automotive retail entrepreneurs. These mandates are within the legal franchise agreements originating from the OEMs as their business partners.

Fully autonomous vehicle interiors will offer marketers a new and unique landscape for advertising and social media opportunities to capture the eyeballs and in-transit time of consumers traveling within what will be mobile living rooms. A Forbes magazine author (Hawthorne-Castro, 2018) opines that fully autonomous vehicles will become the new 360-degree entertainment field for consumers commuting to work or on their daily errands. The ability to freely use internet-enabled phones and computers or to interact with in-car touchscreens and holograms on side windows and windshields will offer a tremendous marketing value proposition for those brands hoping to successfully reach these consumers in what will be a captive environment. Consumer feedback will be critical as marketing brands decide what content should be made available and how to monetize that content best. Some of it may be free through advertising support, and other content can be made available per usage or click-through basis. More content can be made available through in-vehicle All-Access Subscriptions.

Conclusions

This cross-sectional, descriptive, cross-relational research method study successfully defines the factors speaking to the consumers' perceptions and the behavioral intention to use FAVs. The research study's key findings extend and support the theoretical viewpoint of consumer behavioral intention to use self-driving vehicles: a) Study data analysis and results point to the positive influence of consumers' behavioral intention to use fully autonomous vehicles. b) Consumers' perceptions concerning FAVs' ability to improve their overall productivity and possibly save them time and money also positively influence their behavioral intention to use fully autonomous vehicles. c) Consumers' perception that FAVs offering them competitive pricing over non-FAVs vehicles is attractive and positively influences their behavior and intention to use FAVs. These study findings help advance a better understanding of perceptions and opinions from consumers about their behavioral intentions to use FAVs and the level of favorability toward the technology.

From this study vantage point and moving forward, a future research study after the introduction of FAVs may cause researchers to pose another "so what" question: Now that FAVs are widely available, what impact do they have on the personal transportation system within the US? The research study data and analysis results successfully prove consumers' desire to use them. The research study also moves beyond existing FAVs research studies to gauge general consumer awareness about FAVs. The more considerable significance of the study is the usable consumer perspectives about the behavioral intention I successfully uncover about FAVs. As the technology of FAVs becomes mainstream; it may fundamentally change the way personal transportation evolves in the future.

The existing body of academic and scientific research on FAVs focuses on the general awareness levels of consumers about the technology. It also probes their cursory feeling about the overall concept of the FAVs. My focus in this area was to approach the research at a much more granular level to gain necessary consumer research FAVs data to yield and project key findings. The research study offers an innovative approach, valuable consumer perspective, and keen insight into the general awareness and a more holistic concept of FAVs. It speaks directly to the perception of seeing oneself utilizing FAV technology, and then their family members and referents also observe them doing so.

The overall framing of this study adds to the body of research, hopefully contributing to a better understanding of consumer viewpoints about the technology, acceptance, and usage of FAVs as a future product and service. The OEMs and their retail dealers must also work very closely in the marketplace introduction of FAVs. The joint goal is to create the types of co-branding marketing of the FAV technology and the parent automotive brands. Then support them with key marketing communications messaging and retail consumer educational or informational campaigns. Doing so will prompt consumers to trial, use, and ultimately accept FAVs. If successful, all these efforts may usher in a major personal vehicular transportation shift within the country. This personal transportation shift will represent a level of change not seen since the early 21st Century, when motorized automobiles began to replace the horse and buggy in the United States.

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Appendices

APPENDIX A: Survey Participant Consent Form.

ADULT ONLINE CONSENT TO PARTICIPATE IN A FIU RESEARCH STUDY

What is your Amazon M-Turk ID?

____

ADULT ONLINE CONSENT TO PARTICIPATE IN A FIU RESEARCH STUDY

What Factors Influence the Consumer Use of Fully Autonomous Vehicles?

This Doctoral Research Study and Survey Instrument are the stated property of the Authors and Florida International University (FIU). There is no use outside this express purview without written consent.

SUMMARY INFORMATION: Things you should know about this study Purpose: This study aims to gather your opinions on Fully Autonomous Vehicles (FAVs), also known as fully Self-Driving Cars. Procedures: You must complete an online question survey concerning how you feel about FAVs.

DURATION: It should take about 10-minutes to complete this survey.

RISKS: The risks for participating in this study are minimal. However, if you feel uncomfortable while answering the questions, you may stop at any time. Your participation in this survey is anonymous.

BENEFITS: There are no direct benefits for participation other than nominal compensation offered to participants through Amazon M-Turk. However, researchers will learn more about consumers' opinions regarding fully self-driving cars through your participation. Alternatives:

There are no known alternatives other than not participating in this study.

PARTICIPATION: Taking part in this research project is voluntary.

Please carefully read the entire document before deciding to participate.

PURPOSE OF THE STUDY: This study aims to gather your opinions on Fully Autonomous Vehicles (FAVs). IT REQUIRES A CERTAIN NUMBER OF STUDY PARTICIPANTS. If you decide to be in this study, you will be one of 425 people in this research study.

PROCEDURES: If you agree to be in the study, we will ask you to do the following things: 1. There are a series of statements for you using one of the multiple single choice answers 2. Choose the response that best represents your situation or sentiments regarding the statements provided. 3. You must give basic information about yourself.

RISKS AND DISCOMFORTS: The risks involved are psychological. Imagine what it will be like to ride in a fully autonomous vehicle with no steering wheel or foot pedals for human control. The probability of potential illness or injury is only mental, and during the ten-minute survey.

ALTERNATIVES: There are no known alternatives to participation available to you other than not taking part in this study.

CONFIDENTIALITY: The records of this study are secure, and we will protect them as possible by law. In any report that we might publish, we will not include any that will make it possible to identify you. We will securely store all research records, and only the research team will have access to the records. However, we may inspect your records. The university must authorize itself or other agents who will keep your information confidential.

THE USE OF YOUR INFORMATION: We will remove all identifiers about you regarding identifiable confidential information. After such removal, we may include your information in future research studies or distribute it to another investigator for future research studies without additional informed consent from you or your legally authorized representative.

COMPENSATION: The nominal compensation offered to participants through Amazon M-Turk is $.45 per completed survey. There are no costs to you for participating in this study.

RIGHT TO DECLINE OR WITHDRAW: Your participation in this study is voluntary. You are free to participate in the study or withdraw your consent during the study. The investigator reserves the right to remove you without your consent at such a time that they feel it is in the best interest of this study.

RESEARCHER CONTACT INFORMATION: If you have any questions about the purpose, procedures, or any other issues relating to this research study, you may contact Michael Russell at (954) 261-2237 or email at mruss011@fiu.edu.

IRB CONTACT INFORMATION: If you would like to talk with someone about your rights to be a subject or ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or email at ori@fiu.edu.

PARTICIPANT AGREEMENT: I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions about this study, and the answers were freely available to me. I am providing my informed consent by clicking on the "Consent to Participate" button below.

○ I Consent to Participate (1)

○ I Do Not Consent to Participate (2)

APPENDIX B: Survey Instrument[2].

What Factors Influence the Use of Fully Autonomous Vehicles (FAVs) within the US?

Performance Expectation (α = .82, AVE = .74)

1. Using FAVs will improve my productivity. .91
2. Using FAVs will free me from driving. .74
3. Using FAVs will enable me to save time. .91
4. Using FAVs will not improve my productivity. *Dropped*

Price Value (α = .95, AVE = .91)

5. FAVs will offer valuable pricing discounts to me if I use or purchase one. .96
6. I could save money using or purchasing FAVs. .94
7. I could get more significant discount pricing deals when using or buying a FAV. .96
8. FAVs will not offer me more significant discount pricing deals if I use or purchase one. *Dropped*

Hedonistic Motivation (α = .95, AVE = .91)

9. Using FAVs for me will be pleasant. .77
10. Using FAVs for me will be fun. .70
11. Using FAVs for me will be enjoyable. .72
12. Using FAVs for me will not be pleasant or fun. *Dropped*

Societal Influence (α = .89, AVE = .81)

13. My best friend will approve of me using FAVs. .90
14. I feel my spouse will approve of my using FAVs. .91
15. I feel my boss will approve of my using FAVs. .91
16. My best friend will not approve of my using FAVs. Dropped

Locus of Control (α = .84, AVE = .75)

17. It will be hard to prevent accidents while using FAVs. .90
18. Using FAVs without accidents will be a matter of luck. .83
19. Accidents will usually happen while using FAVs because of unexpected events. .87
20. It will be easy to prevent accidents while using FAVs. *Dropped*

Risk Aversion (α = .79, AVE = .74)

21. I am incredibly cautious about making significant changes in my life. *Dropped*

22. In general, it is difficult for me to take risks. .70
23. I do not like new and exciting experiences. .10
24. I am always happy to make significant changes in my life. *Dropped*

Individual Attitude (α = .86, AVE = .78)

25. I think technology advancements in using FAVs are a positive thing. .90
26. Reducing carbon emissions using FAVs will be more efficient and positive. .84
27. I am excited about the new possibilities offered by using FAVs. .91
28. I think technological advancement in using FAVs will not be positive. *Dropped*

Subjective Norm (α = .88, AVE = .89)

29. Whether or not I use FAVs will be entirely up to me. *Dropped*
30. Within 5 - 10 years, I will have the necessary resources, time, and opportunities to use FAVs. .93
31. Within 5 - 10 years, I will have the necessary knowledge to use FAVs. .96
32. Whether or not I use FAVs will not be entirely up to me. *Dropped*

Cognitive Trust (α = .92, AVE = .85)

33. I will be suspicious of using FAVs' intent, actions, or outputs. .95
34. While using FAVs, they will behave in an underhanded manner. .90
35. When using FAVs, they will be deceptive. .93
36. I will not be suspicious of using FAVs' intent, actions, or outputs. *Dropped*

Affective Trust (α = .87, AVE = .80)

37. I would not be confident in using a FAV if it were my own. .90
38. I am wary of using FAVs. .89
39. Using FAVs will have a harmful or dangerous outcome. .89
40. I would be confident in using a FAV if it were my own. *Dropped*

Attractiveness (α = .76, AVE = .69)

41. Using FAVs will be more attractive to older consumers. .70
42. Using FAVs will offer more personal transportation flexibility. .89
43. Using FAVs will give more transportation freedom to everyone. .88
44. Using FAVs will be less attractive to older consumers. *Dropped*

Affordability (α = .65, AVE = .71)

45. FAVs will not be available or affordable for the poor in 5 - 10 years. .96
46. FAVs must have an affordable price of between $25,000 to $50,000 for you within 5 - 10 years. *Dropped*
47. FAVs will not be available or affordable for consumers in 5 – 10 years. .70
48. FAVs will be available and affordable to the poor in 5 -10 years. *Dropped*

Behavioral Intention to Use (α = .96, AVE = .93)

49. When FAVs are available, I intend to use them. .95
50. When FAVs are available, I will recommend using FAVs to my family and friends. .97
51. When FAVs are available, I predict I will recommend using FAVs to others. .97
52. When FAVs are available, I do not intend to use FAVs. *Dropped*

[2.] Participants responded to these questions using the Likert Seven-Point Scale: 1. Strongly disagree; 2. Somewhat disagree; 3. Disagree 4. Neither disagree nor agree; 5. Agree; 6. Somewhat agree 7. Strongly agree concerning various opinion questions about FAVs (Fully Autonomous Vehicles).

Appendix C. Dissertation Constructs Definitions

Affective Trust (AT): refers to whether one believes in and is confident in something or someone.

Affordability (AF): refers to the consumer's purchase choice considering any possible trade-off.

Attractiveness (AN): refers to the pleasing qualities of the technology.

Behavioral Intention to Use Fully Autonomous Vehicles (BITU): refers to the recognizable intention to use or not a FAV.

Cognitive Trust (CT): refers to whether one possesses the knowledge and understands the technology subject matter.

Hedonistic Motivation (HM): refers to the maximization of pleasure over the minimization of pain.

Individual Attitude (IA): refers to a set of emotions, beliefs, and behaviors regarding a particular object, person, or event.

Locus of Control (LC): refers to how an individual feels a sense of agency in their life.

Performance Expectation (PE): refers to how somebody expects results, actions, or behaviors related to a particular technology.

Price Value (PV): refers to the perceived monetary value or worth.

Risk Aversion (RA): refers to the extent to which somebody will avoid an object or event that confers some level of risk or uncertainty.

Societal Influence (SI): refers to the change in behavior that a group will cause in an individual, intentionally or unintentionally.

Subjective Norm (SN): refers to the recognizable opinions of others that maintain influence over a particular decision's behavior to perform or not perform an action.

Appendix D. Dissertation Terms and Acronyms Table

AASMA: American Autonomous & Sustainable Mobility Alliance.
AF: Affordability.
AI: Artificial Intelligence.
AN: Attractiveness.
ASMI: Autonomous & Sustainable Mobility Institute.
AT: Affective Trust.
AV: Autonomous Vehicles.
AVE: Average Variance Extracted.
BITU: Behavioral Intention to Use Fully Autonomous Vehicles.
BMW: Bavarian Motor Works.
CFA: Confirmatory Factor Analysis.
CFR: Composite Factor Reliability.
CT: Cognitive Trust.
DIT: Diffusion of Innovation.
DOI: Diffusion of Innovation.
eSMODs: Equity in Smart Mobility Opportunity Districts.
eVTOL: Electric Vertical Takeoff and Landing.
FAT: Fully Autonomous Truck
FATs: Fully Autonomous Trucks.
FAV: Full Autonomous Vehicle.
FAVs: Fully Autonomous Vehicles.
FSD: Full Self-Driving.
GM: General Motors Corporation.
HM: Hedonistic Motivation.
IA: Individual Attitude.
LC: Locus of Control.
NHTSA: National Highway Transportation Safety Administration
PE: Performance Expectation.
PLS-SEM: Partial Least Squares Path Modeling- Strategic Equation Modeling.
PV: Price Value.
RA: Risk Aversion.
OEM: Original Equipment Manufacturers.
SAE: Society of Automotive Engineers.
SAV: Semi-Autonomous Vehicle.
SAVs: Shared Fully Autonomous Vehicles.
SEM: Structural Equation Modeling.
SI: Societal Influence.
SN: Subjective Norm.
TAM: Technology Acceptance Model.
TPB: Theory of Planned Behavior.
TRA: Theory of Reasoned Actions.
US: United States.
UATUT: Unified Acceptance Theory and Use of Technology.
UATUT2: Unified Acceptance of Technology and Use of Technology 2.

V2V: Vehicle to Vehicle Communications.

TABLE 5. Formal Pilot Study Demographics

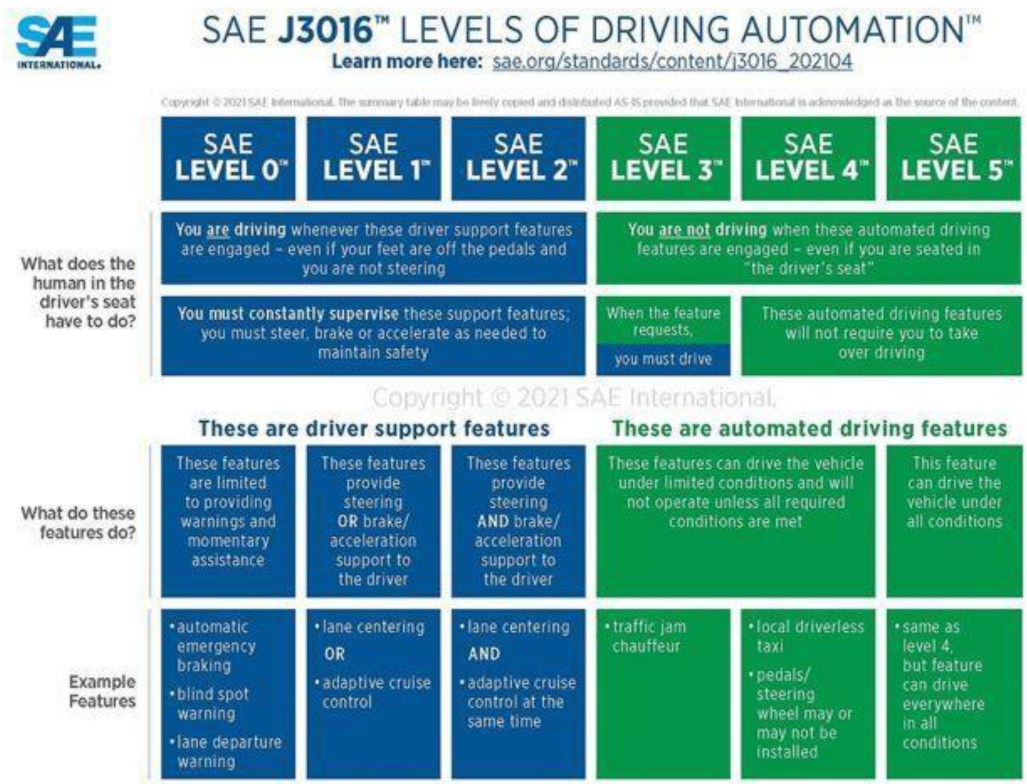
Characteristics	Indicators	Frequency	Proportion (%)
Gender	Male	21	52.5
	Female	18	45.0
	I prefer not to say	1	2.5
Age	18 – 29 years	6	15.0
	30 – 44 years	22	55.0
	45 – 59 years	10	25.0
	60 – 74 years	2	5.0
Race	American Indian	0	0
	Asian	2	5.0
	Black or African Descent	1	2.5
	Hawaiian	2	5.0
	White or Caucasian	34	85.0
	Other	1	2.5
Ethnicity	Latino	10	25.0
	Non- Latino	30	75.0
Marital Status	Single	14	35.0
	Married	24	60.0
	Divorced	1	2.5
	Widowed	0	0
	Domestic Partnered	1	2.5
Education	High School	2	5.0
	Some College	10	25.0
	Undergraduate Degree	11	27.5
	Graduate or Professional Degree	17	42.5
Employment	Part-Time	6	15.0
	Full-Time	28	70.0
	Student	3	7.5
	Unemployed	2	5.0
	Disabled	0	0
	Retired	1	2.5
HH Income	$20K – $34.99K	13	34.2
	$35K - $49.99K	6	15.8
	$50K - $64.99K	10	26.3
	$65K - $79.99K	2	5.3
	$80K - $94.99K	0	0
	$95K - $109.99K	4	10.5

	>$110	3	7.9
Vehicle Ownership	Own	35	87.5
	Leasing	1	2.5
	Non- Owner	2	5.0
	Planning to Purchase	2	5.0
Driving Experience	None	1	2.5
	<1 year	2	5.0
	1 – 5 years	8	20.0
	5 – 10 years	5	12.5
	>10 years	24	60.0
Current Car has Semi-Autonomous Driving Features	Strongly Disagree	11	27.5
	Disagree	11	27.5
	Neither of both	4	10.0
	Agree	10	25.0
	Strongly Agree	4	10.0

TABLE 6. Descriptive Statistics for the 40 Cases in The Pilot Study

Latent Construct	Mean	SD	Skewness	Kurtosis	Minimum	Maximum
Performance Expectation (PE)	5.2688	0.84426	-0.968	0.68	3	6.75
Price Value (PV)	4.9188	1.09981	-0.836	-0.679	2.5	6.25
Hedonistic Motivation (HM)	5.2313	0.9153	-1.075	0.558	3	6.5
Social Influence (SI)	5.0063	0.83874	-0.349	-0.19	3.25	6.75
Locus of Control (LC)	4.9438	1.00557	-0.768	0.171	2.5	6.75
Risk Aversion (RA)	4.9063	0.81392	0.006	-0.77	3.5	6.5
Individual Attitude (IA)	4.94	0.70631	-0.709	0.777	3	6.4
Subjective Norm (SN)	5.1063	0.90562	-1.197	2.087	2.25	7
Cognitive Trust (CT)	4.675	1.19185	-0.704	-0.589	2.25	6.5
Affective Trust (AT)	4.8625	1.09332	-1.052	0.234	2.25	6.25
Attractiveness (AN)	5.1875	0.7484	-0.748	1.199	3	6.75
Affordability (AF)	4.8063	0.91548	-0.473	-0.509	2.5	6
Behavioral Intention to use Fully Autonomous Vehicles (BITU)	4.9563	1.00462	-0.901	0.509	2.5	6.5

Appendix E. SAE International J3016 TM Levels of Driving Automation TM



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