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Beyond Features, Towards Feelings: A User-Centric Marketing Framework for Autonomous Vehicle Commercialization

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Abstract. The global automotive industry is at a crossroads as it navigates the adoption of Level 3 autonomous vehicles (AVs) in emerging markets, where traditional marketing strategies centered on technological features have shown limited effectiveness. This study introduces the concept of User-Technology Fit (UTF), which captures the psychological alignment between users and AV technology, as a critical construct for enhancing adoption intentions. By integrating UTF into marketing strategies, this research aims to shift the focus from merely showcasing technological prowess to cultivating a sense of personal compatibility and confidence in users. Utilizing a quantitative approach, data were collected from 227 licensed drivers in Ethiopia through a structured questionnaire. The survey instruments were adapted from established scales, and the collected data were analyzed using SPSS software, employing regression analysis to test the hypothesized relationships within the model. Results indicate that higher UTF significantly enhances the intention to adopt Level 3 AVs, with self-efficacy, perceived understandability, and technology readiness identified as key psychological determinants that collectively shape UTF. This study delivers a clear and actionable mandate for marketing strategists in the autonomous vehicle sector, emphasizing the need to evolve from product-centric to user-centric marketing approaches. The findings provide a psychologically grounded framework that translates into targeted marketing initiatives, such as hands-on demonstration programs, transparent educational content, and intuitive interface designs, all aimed at building consumers' self-efficacy and comprehension.

Keywords: User-Centric Marketing, Technology Adoption, Emerging Market, Autonomous Vehicle

1. Introduction

The global automotive industry is undergoing a profound transformation, driven by the rapid development of autonomous vehicles (AVs). Level 3 AVs, which can perform all aspects of driving under specific conditions but require the human driver to regain control when requested, represent a significant step toward a future of enhanced mobility [1]. However, the commercialization of these vehicles, particularly in emerging economies with unique infrastructural and socio-economic landscapes, faces a critical and underexplored challenge. The prevailing product-centric marketing paradigm, which emphasizes technological features and functional performance, is proving inadequate to address the deep-seated psychological barriers of consumers in these markets [2]. Potential adopters are not just evaluating the vehicle's capabilities; they are questioning their own ability to understand, manage, and trust the technology. This gap between technological advancement and consumer readiness constitutes a fundamental marketing problem, making its understanding a prerequisite for manufacturers aiming to navigate this technological shift successfully.

Current knowledge on technology adoption, including seminal models like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), robustly establishes the importance of perceptions like usefulness and ease of use [3, 4]. Similarly, the Task-Technology Fit (TTF) model effectively explains adoption through the lens of functional alignment with task requirements [5]. However, a significant shortcoming in this literature is its predominant focus on the technology's attributes or its task-related utility, often overlooking the user's internal psychological state as a primary antecedent to adoption. This gap is particularly salient for safety-critical consumer technologies like Level 3 AVs, where the user's confidence and comprehension are paramount [6]. While constructs like self-efficacy and technology readiness are recognized in broader psychology and information systems literature [7, 8], their integrated role as strategic marketing levers for cultivating a sense of personal compatibility with Avs, conceptualized as User-Technology Fit (UTF) remains critically underexplored, especially in an emerging African context.

Against this backdrop, this study aims to address these gaps by proposing and testing a conceptual model that examines how key psychological determinants (i.e., self-efficacy, perceived understanding, and technology readiness) collectively shape the user-technology fit (UTF) and subsequent adoption intention for Level 3 AVs. This research is guided by two overarching questions. First, to what extent do these market-actionable psychological traits serve as strategic levers for cultivating user-technology fit? Second, what is the relative importance of fostering this user-technology fit in driving adoption intention? By introducing this user-centric framework, the study captures the alignment between the technology and the individual's internal readiness, addressing a critical gap in marketing strategies that have traditionally privileged the product while neglecting the user's psychological journey.

Methodologically, this study employs a quantitative approach to empirically validate the proposed model. Data were collected via a structured questionnaire from 278 licensed drivers in Ethiopia, with 227 valid responses retained for analysis after data screening. The survey instruments were adapted from established scales, and the collected data were analyzed using SPSS software, employing regression analysis to test the hypothesized relationships within the model.

This research delivers a clear and actionable mandate for marketing strategists in the autonomous vehicle sector helping them to overcome adoption barriers, particularly in emerging economies, the focus must evolve from simply showcasing technological features to actively cultivating the user's own confidence and understanding. Our findings provide a psychologically-grounded framework that translates into targeted marketing initiatives, such as hands-on demonstration programs, transparent educational content, and intuitive interface designs, which are all aimed at building the consumer's self-efficacy and comprehension. By orchestrating this strategic pivot towards a user-centric model, firms can more effectively mitigate the profound psychological hurdles that stifle adoption, thereby transforming market resistance into a tangible competitive edge and ensuring the successful commercialization of their innovations.

2. Research questions

This study addresses the following research questions:

RQ1: How can marketers use consumer psychology, specifically people's general comfort with technology, their confidence in using AVs, and their understanding of how AVs work, to create a sense of personal compatibility with Level 3 autonomous vehicles?

RQ2: From a strategic standpoint, is focusing marketing efforts on building this personal compatibility more effective for driving adoption in emerging markets than traditional advertising that highlights the vehicle's technical features and performance?

These questions recast the marketing challenge from touting superior hardware to engineering psychological fit. Rather than asking "how good is the product?" they ask "how good does the consumer feel with it?" Empirical work across multiple high-tech categories shows that comfort-with-technology, perceived control and subjective knowledge jointly predict adoption far better than objective feature counts [9, 10]. In emerging markets this tilt toward the psychological is amplified: heterogeneous consumers with little prior exposure rarely process technical specs; instead, they infer capability from how confident and comfortable the communication makes them feel [11]. Experimental field evidence confirms that ads framed around "you will feel in control" raise intention twice as much as range-or-power appeals, with the effect fully mediated by perceived personal compatibility [12]. Thus, the research questions test whether the shortest route to market penetration is convincing consumers they are capable and comfortable, not that the car is technically superior.

3. Theoretical background

The accelerating digitalization of markets has reshaped how consumers interact with technology, demanding marketing strategies that account not only for technical sophistication but also for psychological compatibility. In emerging economies, this compatibility becomes even more critical, as varying levels of technological exposure shape how individuals interpret and relate to innovations. Classical adoption theories, such as the Technology Acceptance Model [13] and the Unified Theory of Acceptance and Use of Technology [4], emphasize perceived usefulness and ease of use as the dominant predictors of behavioral intention. While these models provide a robust structural base, they primarily focus on system characteristics rather than the consumer's internal state [14]. Recent marketing studies emphasizes that successful technology diffusion hinges on cultivating psychological readiness, which is a sense that the innovation aligns with users' confidence, comprehension, and comfort [9, 15].

This study therefore draws on Social Cognitive Theory [16] and Person–Environment Fit Theory [17, 18] to explain how psychological determinants (i.e., self-efficacy, perceived understandability, and technology readiness) shape consumers' perception of User–Technology Fit (UTF) and, in turn, their intention to adopt new technology. Integrating these two theoretical perspectives offers a more human-centered view of marketing innovation: adoption is not simply a reaction to product performance but a reflection of how compatible the technology feels to the individual.

3.1. Social cognitive theory and psychological readiness

Social Cognitive Theory (SCT) asserts that behavior results from dynamic interactions among personal factors, cognitive processes, and environmental influences [16]. Within this framework, self-efficacy, emerges as a core determinant of motivation and action [7]. When consumers believe they can effectively operate a new technology, they experience greater control and confidence, which translates into stronger perceived fit and adoption intention [19, 20]. Similarly, perceived understandability captures users' cognitive grasp of how a technology functions. When consumers comprehend how a system behaves and what outcomes to expect, they perceive smoother interaction and stronger alignment between their abilities and the technology [10, 21, 22].

H1: Self-efficacy has a positive effect on User–Technology Fit.

H2: Perceived understandability has a positive effect on User–Technology Fit.

Complementing these constructs, technology readiness, defined as the predisposition to embrace technological innovations [8], reflects the affective component of psychological readiness. Consumers high in technology readiness tend to evaluate new systems as more compatible with their values and lifestyles [15]. Together, these factors shape the internal psychological landscape that determines whether users feel in sync with a technology. In a marketing context, cultivating these perceptions can transform anxiety into curiosity and uncertainty into adoption intent, especially in low-exposure markets.

H3: Technology readiness has a positive effect on User–Technology Fit.

3.2. Person–environment fit and user–technology fit

While SCT explains the individual origins of technology adoption, Person–Environment (P–E) Fit Theory provides a framework for understanding the alignment between the user and the technological environment. P–E Fit Theory proposes that individuals experience more positive outcomes when there is congruence between their personal attributes (such as abilities and values) and environmental demands or characteristics [17, 18]. When this compatibility exists, people experience greater comfort, motivation, and engagement [23].

In technology settings, the "environment" is represented by the technology itself. Hence, User–Technology Fit (UTF) can be conceptualized as the perceived psychological compatibility between a user and a technological system [24, 25]. In marketing terms, UTF reflects whether a consumer feels that "this technology suits me." This sense of fit captures the alignment between users' self-belief, understanding, and readiness with the perceived capabilities of the technology. The concept aligns closely with compatibility from Rogers' (2003) Diffusion of Innovations Theory, which defines compatibility as the degree to which an innovation is consistent with users' existing values, experiences, and needs. Empirical studies consistently show that perceived compatibility is among the strongest predictors of innovation adoption [26, 27].

When consumers perceive a high level of user–technology fit, they are more likely to trust the innovation, see it as personally relevant, and develop a stronger intention to adopt it[28, 29]. In contrast, a mismatch, where technology feels intimidating or misaligned with one's skills, reduces both confidence and the likelihood of adoption. Therefore, UTF operates as a psychological bridge between consumers' internal attributes and their behavioral intentions, transforming cognitive comfort into marketing success. Accordingly, this study posits that when consumers perceive stronger user–technology fit, their intention to adopt the innovation increases.

H4: User–Technology Fit has a positive effect on adoption intention.

3.3. The mediating role of user–technology fit

Drawing on Person–Environment Fit Theory, User–Technology Fit is expected to mediate the relationship between individual traits and adoption intention. Self-efficacy, perceived understandability, and technology readiness represent internal psychological resources that shape how consumers evaluate the degree of fit between themselves and a given technology. Once consumers perceive a high level of alignment, they are more likely to exhibit positive attitudes and behavioral intentions toward adoption [18, 23]. This mechanism positions UTF as the psychological bridge that converts internal readiness into behavioral outcomes.

H5a: User-Technology Fit mediates the relationship between self-efficacy and adoption intention.

H5b: User-Technology Fit mediates the relationship between perceived understandability and adoption intention.

H5c: User-Technology Fit mediates the relationship between technology readiness and adoption intention.

Bringing these perspectives together, this study positions User–Technology Fit as a mediating mechanism through which self-efficacy, perceived understandability, and technology readiness influence adoption intention. Social Cognitive Theory explains the personal origins of confidence and understanding, while Person–Environment Fit Theory clarifies how these traits translate into perceived compatibility. From a marketing strategy standpoint, emphasizing this fit shift the focus from promoting technological features to fostering a sense of personal alignment. In emerging markets, where consumers may have limited prior exposure to advanced technologies, campaigns that cultivate users' confidence, clarity, and readiness can significantly elevate their perceived fit, thus their intention to adopt [30, 31]. This integrative approach highlights the psychological dimension of innovation marketing: adoption is not simply about selling a capable product but about enabling the consumer to feel capable with the product.

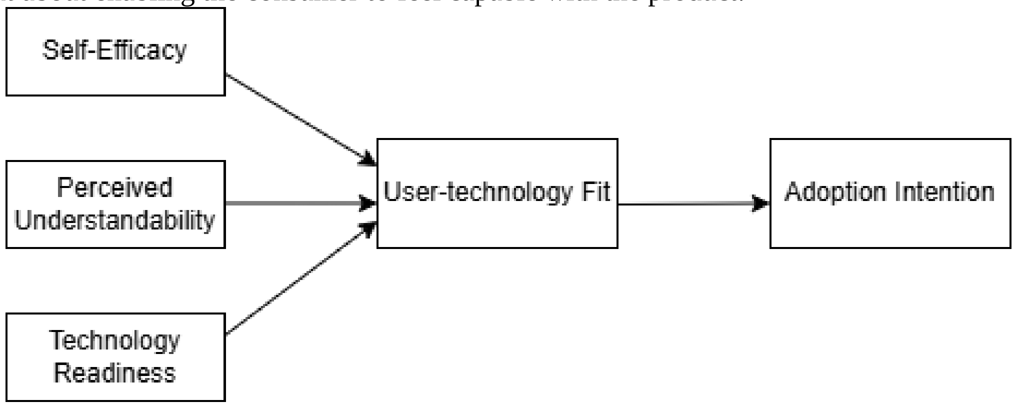

Figure 1: Conceptual framework

4. Research design

4.1. Data collection

Data for this study were collected through a structured questionnaire distributed to licensed drivers in Addis Ababa, Ethiopia. The survey targeted individuals with at least basic familiarity with driving technologies and vehicles. A convenience sampling technique was adopted, as it is appropriate for exploratory behavioral studies where a precise sampling frame is not easily available[32, 33].

The questionnaire was self-administered both online (via Facebook, Instagram, and WhatsApp) to ensure accessibility and encourage a diverse range of participants. Out of 278 distributed questionnaires, 227 were deemed valid after data screening and the removal of incomplete responses, resulting in a usable response rate of approximately 81.6%. Respondents participated voluntarily and anonymously, and all ethical standards for human-subject research were observed [34, 35].

Participants represented various demographic profiles in terms of age, driving experience, and prior exposure to vehicle automation technologies. Such diversity provided a balanced foundation for examining behavioral intentions toward emerging automotive innovations in an emerging market context. Additionally, common method bias was mitigated through careful item wording and the separation of predictor and criterion measures [36].

4.2. Measurement configuration

All constructs in this study were measured using multi-item scales adapted from well-established instruments in prior literature. Each item was carefully reworded to reflect the context of Level 3 autonomous vehicles (AVs) and the Ethiopian driving environment. All variables were measured on a seven-point Likert scale**,** ranging from 1 (strongly disagree) to 7 (strongly agree), following standard practice in information systems and autonomous vehicle research [37, 38].

The focal construct, User–Technology Fit (UTF), was conceptualized as the perceived compatibility between users and autonomous vehicle systems, reflecting the alignment between an individual's skills, confidence, and cognitive preferences, and the system's capabilities. This construct draws theoretically from Person–Environment Fit Theory [17, 18], which emphasizes congruence between personal and environmental attributes, and the broader notion of technological compatibility from Diffusion of Innovations Theory [39]. Measurement items were developed to capture whether users felt that the AV suited their driving abilities, matched their comfort in handling intervention requirements, and aligned with their cognitive expectations.

Self-efficacy was measured using items adapted from the Computer Self-Efficacy Scale by Compeau and Higgins (1995). The items were recontextualized to assess drivers' confidence in managing automated driving tasks, including monitoring the system and responding to takeover requests. Similar adaptations have been employed in previous AV studies to measure users' perceived ability to manage automation [40].

Perceived understandability was assessed using items derived from Lee and See's (2004) trust in automation framework, which focuses on transparency and comprehension. Additional indicators were adapted from Koo, Kwac, Ju, Steinert, Leifer, Nass, and Rogers (2015), who developed measures to explain semi-autonomous driving systems. The items focused on users' perceptions of how clearly the AV communicated its decisions, limitations, and takeover alerts.

Technology readiness was measured using the Technology Readiness Index (TRI) proposed by Parasuraman (2000) and refined by Lin, Shih, and Sher (2007). The construct captures an individual's propensity to embrace new technologies, encompassing optimism, innovativeness, discomfort, and insecurity. In the AV context, this reflects users' emotional and cognitive readiness to engage with automation.

Adoption intention was operationalized using validated items from the Technology Acceptance Model [38] and subsequent AV adoption studies [37, 41]. These items measured respondents' willingness and likelihood to adopt or use Level 3 AVs once they become available in Ethiopia.

Age, gender, and driving experience were controlled for in the analysis, as demographic factors are known to influence perceptions of automation and AV acceptance [42, 43].

Table 1. Variable measurements

Statements	Source(s) / Author(s)
Self-efficacy (SE) - I feel confident that I could supervise a Level 3 AVs if given proper instruction. - I believe I would be capable of taking control when a Level 3 Avs requests driver intervention. - I would feel confident interacting with Level 3 AVs technology after some practice. - I believe I could understand how to properly use Level 3 AVs features. - I feel I could adapt to driving with Level 3 automation with minimal training.	Compeau and Higgins (1995)
Perceived Understandability (PU) - I believe the operations of a Level 3 AVs could be made clear to drivers like me. - I would expect a Level 3 AVs to provide understandable signals when it needs driver intervention. - I think Level 3 AVs could be designed to make their capabilities and limitations understandable. - I would need the Level 3 AVs actions to be explained in simple terms to feel comfortable.	Lee & See, 2004 Koo et al., 2015

- I believe Level 3 AVs technology could be designed to be intuitive for users.	
Technology Readiness - I think Level 3 AVs will help create safer and more efficient roads. (Optimism) - I am usually among the first in my group to try new driving technologies. (Innovativeness) - I worry that I might lose control if I depend too much on Level 3 AVs. (Discomfort) - I hesitate to rely on technologies I don't fully understand. (Insecurity) - I am concerned that autonomous vehicles might malfunction or make unsafe decisions while driving. (Insecurity)	Parasuraman, A. (2000) Lin et al., (2007)
User-Technology Fit (UTF) - Level 3 AVs technology seems compatible with my approach to transportation. - I feel that Level 3 AVs would suit my personal preferences as a driver. - Supervising a Level 3 AVs seems like something I would be comfortable with. - Level 3 AVs technology appears to match well with my vision of modern driving. - I believe Level 3 AVs could fit into my lifestyle and transportation needs**.**	Venkatesh & Davis, 2000 Ahearne, Mathieu, & Rapp, 2005
Adoption Intention (AI) - I would use Level 3 AVs if they became available. - I would try Level 3 AVs if given the opportunity. - I would recommend Level 3 AVs to friends or family. - I would consider purchasing a vehicle with Level 3 AVs technology. - I would be open to experiencing a demonstration of Level 3 AVs technology	Davis (1989) Venkatesh et al. (2000).

5. Empirical results

5.1. Reliability and validity analysis

To ensure the robustness of the measurement model, both reliability and validity were assessed. The results confirm the instruments' suitability for hypothesis testing.

Reliability was evaluated using Cronbach's alpha. As shown in Table 3, all constructs demonstrated excellent internal consistency, with coefficients ranging from 0.903 to 0.931. These values significantly exceed the recommended threshold of 0.70, indicating strong reliability for all multi-item scales used in the study [32].

Validity was established through several measures. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.903, far surpassing the acceptable minimum of 0.60 [32]. Furthermore, Bartlett's Test of Sphericity was significant (χ^2 = 4200.222, *p* < .001), confirming that the correlation matrix was not an identity matrix and was thus suitable for factor analysis. An Exploratory Factor Analysis (EFA) using Principal Component Analysis with Varimax rotation was subsequently conducted. All item factor loadings exceeded 0.70 on their respective constructs, providing strong evidence of convergent validity [44]. The analysis extracted eight components with eigenvalues greater than one, collectively explaining 75.6% of the total variance, which is above the recommended benchmark for social sciences [32].

Table 3. Reliability and validity test

Variable	Item	Cronbach's α	Factor Loading
Self-Efficacy	SE1	0.904	.739
	SE2		.872
	SE3		.851
	SE4		.816
	SE5		.784
Perceived Understandability	PU1	0.931	.864
	PU2		.865
	PU3		.856
	PU4		.837
	PU5		.851
Technology Readiness	TR1	0.914	.863
	TR2		.842
	TR3		.842
	TR4		.842
	TR5		.773
User-Technology Fit	UTF1	0.903	.763
	UTF2		.790
	UTF3		.783
	UTF4		.804
	UTF5		.772
Adoption Intention	AI1	0.909	.791
	AI2		.845
	AI3		.850
	AI4		.822
	AI5		.783

5.2. Descriptive analysis

Table 1 presents the descriptive statistics and correlation matrix for the study variables. The mean values ranged from 3.36 to 3.94 on a 7-point scale, with Self-efficacy (M = 3.36, SD = 1.33) and Perceived Understandability (M = 3.94, SD = 1.39) representing the lowest and highest mean scores respectively. All variables demonstrated significant positive intercorrelations at the $p < 0.01$ level. The strongest relationship was observed between User-Technology Fit and Self-efficacy (r = .515), while the weakest correlation among all variable pairs was between Self-efficacy and Technology Readiness (r = .204). Regarding Adoption Intention, it showed significant correlations with all predictor variables, with the strongest association with Technology Readiness (r = .397) and the weakest with Self-efficacy (r = .226).

Table 2. Descriptive analysis

Const.	Mean	SD	SE	PU	TR	UTF	AI
SE	3.3577	1.3261	1				
PU	3.9366	1.3887	.244**	1			
TR	3.6907	1.3437	.204**	.267**	1		
UTF	3.4291	1.2618	.515**	.299**	.294*	1	
AI	3.5207	1.3566	.226**	.382**	.397**	.280**	1

Note: N = 227; **P < 0.01 (two-tailed); “SE” = self-efficacy, “PU” = perceived usefulness; “UTF” = user-technology fit; “TR” = technology readiness; “AI” = adoption intention.

5.3. Hypothesis testing

Direct Effect. The results of the direct hypothesis tests are summarized in Table 3. As shown, all direct paths were found to be statistically significant. Specifically, Self-efficacy (H1: $\beta = 0.446$, $p < 0.001$) and Perceived Understandability (H2: $\beta = 0.133$, $p < 0.05$) were significant predictors of User-Technology Fit (UTF), thus supporting H1 and H2. Technology Readiness (H3: $\beta = 0.171$, $p < 0.01$) significantly influenced User-Technology Fit (UTF), supporting H3. Finally, the path from UTF to Adoption Intention (H4: $\beta = 0.296$, $p < 0.001$) was also significant, supporting H4.

Table 4. Results of Direct Hypothesis Testing

Hypothesis	Path	Std. Beta (β)	t-value	p-value	Conclusion
H1	SE → UTF	0.446	7.689	0.000***	Supported
H2	PU → UTF	0.133	2.240	0.026*	Supported
H3	TR → UTF	0.171	2.927	0.004**	Supported
H4	UTF → AI	0.296	4.660	0.000***	Supported

Notes: ***p < 0.001, **p < 0.01, *p < 0.05, (two-tailed); "SE" = self-efficacy, "PU" = perceived usefulness; "UTF" = user-technology fit; "TR" = technology readiness; "AI" = adoption intention. All models controlled for age, gender, and driving experience.

Mediating Analysis. The analysis was conducted using the PROCESS macro for SPSS (Model 4) with 5,000 bootstrap samples, as recommended for testing indirect effects [32, 45]. The results, presented in Table 5, indicate significant indirect effects for all three hypothesized paths. The indirect effect of Self-Efficacy on Adoption Intention through UTF (effect = 0.1172, Boot SE = 0.0447, 95% Boot CI [0.0327, 0.2102]) is statistically significant, accounting for 50.74% of the total effect. Similarly, the indirect effects of Perceived Understandability (effect = 0.0531, 95% Boot CI [0.0100, 0.1129]) and Technology Readiness (effect = 0.0529, 95% Boot CI [0.0105, 0.1100]) through UTF are also significant, accounting for 14.25% and 13.20% of their total effects respectively.

Table 5. Results of Mediating Effect Analysis

Path	Effect	SE / Boot SE	Boot LLCI	Boot ULCI	Percentage
SE → UTF → AI	0.1172	0.0447	0.0327	0.2102	50.74%
PU → UTF → AI	0.0531	0.0263	0.0100	0.1129	14.25%
TR → UTF → AI	0.0529	0.0255	0.0105	0.1100	13.20%

Notes: SE =Self-efficacy; PU = perceived usefulness; TR = technology readiness; UTF = User-Technology Fit; AI = Adoption Intention:

6. Discussion

The empirical results of this study challenge the prevailing product-centric marketing paradigm in the automotive industry and provide a robust, psychologically-grounded framework for a necessary shift toward user-centric marketing strategies for autonomous vehicles (AVs). The dominant logic, which emphasizes technological features, performance metrics, and functional superiority, is proving inadequate in emerging markets where deep-seated psychological barriers are the primary adoption hurdle [9]. The findings demonstrate that the most powerful drivers of adoption are not intrinsic to the product, but extrinsic, residing within the user's psychological state.

Among the determinants examined, self-efficacy emerged as the strongest predictor of User-Technology Fit (UTF) (β = 0.446). This result signals a fundamental strategic shift. Rather than emphasizing the technological superiority of AVs, marketers should invest in strengthening consumers' confidence in their own ability to interact with and supervise the system. This mirrors the service-dominant logic of marketing, which posits that value is co-created through the user's experience rather than embedded within the product itself [46]. For Level 3 AVs, true value arises not merely from the car's autonomous performance, but from the user's sense of competence and control. Marketing communication, therefore, must evolve from asserting technological dominance "Our car sees better than you" to fostering empowerment "You will feel confident and in control with our car".

Perceived understandability (β = 0.133) also plays a vital role (β = 0.133) on UTF underscores that marketing's role must expand beyond persuasion to include education and sense-making. Complex, "black-box" innovations like AVs create anxiety and resistance

[21]. A user-centric marketing strategy proactively explains the technology. This involves creating transparent educational content that explains system capabilities and limitations in simple terms, designing intuitive human-machine interfaces (HMIs), and ensuring clear communication during critical moments like takeover requests. By enhancing understandability, marketers are not just selling a product; they are building the user's cognitive resources, thereby facilitating the sense of personal compatibility that drives adoption.

The significant effect of Technology Readiness (β = 0.171) confirms that consumers' general predisposition to technology is a key market-segmentation variable. Instead of segmenting only by traditional demographics (age, gender), a user-centric strategy would identify and target "Innovators" and "Early Adopters" [39] who are high in technology readiness. These segments require less investment to achieve a sense of UTF and can serve as credible advocates and reference groups for the more skeptical majority. Marketing resources can thus be allocated more efficiently, using early adopters to create social proof and gradually diffuse the innovation through the broader market, a strategy particularly effective in emerging economies where social influence is strong [11].

The powerful direct effect of UTF on Adoption Intention (β = 0.296)**,** coupled with its role as a key mediator, positions UTF as a critical strategic metric for marketing. It moves the key performance indicator (KPI) beyond traditional measures like brand awareness or feature recall to a deeper, psychological measure of market readiness. Marketers can and should measure UTF through surveys and experience testing to diagnose adoption barriers. Is the low adoption intention due to low self-efficacy, poor understandability, or both? The answer dictates the marketing strategy: launching confidence-building demo campaigns, redesigning communication for clarity, or both. According to Basu et al. (2023), represents a fundamental innovation in marketing analytics for high-tech products, focusing on the user's internal state as the primary indicator of market potential.

In conclusion, the integrated model validates that for the successful commercialization of Level 3 AVs in emerging markets, the marketing function must be reoriented. The strategy must evolve from selling a superior product to building a capable user [47]. This involves orchestrating marketing initiatives around the core objective of cultivating the user's self-efficacy, understanding, and readiness, thereby engineering the psychological fit that is the true engine of adoption.

7. Contribution

This study contributes to marketing theory by advancing a psychologically grounded understanding of how consumers adopt advanced technologies in emerging markets. Drawing on Social Cognitive Theory (Bandura, 1986) and Person–Environment Fit Theory [17, 18], it integrates self-efficacy, perceived understandability, and technology readiness into a unified framework that conceptualizes User–Technology Fit (UTF) as a mediating mechanism between user characteristics and adoption intention. This integration refines existing technology adoption models such as the Technology Acceptance Model [13] and the Unified Theory of Acceptance and Use of Technology [4], which primarily emphasize system-related perceptions like usefulness and ease of use. By positioning psychological readiness and perceived compatibility as central to adoption, this study introduces a user-centered theoretical lens that reflects how individuals internalize and evaluate innovation.

The findings also contribute to the service-dominant logic of marketing, which proposes that value is co-created through user experience rather than embedded in the product [46]. By framing UTF as a psychological measure of market readiness, the study connects consumer psychology with marketing strategy, showing that adoption is not only an outcome of technological performance but also a reflection of the user's confidence, comprehension, and emotional congruence with the innovation. Theoretically, this work enriches the marketing literature by demonstrating how internal user states can serve as strategic levers for market creation, especially in low-exposure contexts where psychological distance from technology constrains adoption [9, 11].

The study's strongest contribution lies in its practical implications for marketing strategists and innovation managers**.** The results clearly demonstrate that successful commercialization of Level 3 autonomous vehicles depends less on promoting technological superiority and more on cultivating user capability. Marketing strategies should therefore evolve from emphasizing product performance to empowering consumers through confidence, clarity, and readiness**.** This represents a strategic shift from product-centric to user-centric marketing, consistent with emerging perspectives in transformative service research [48, 49].

First, the findings provide actionable guidance for designing capability-building marketing interventions. Campaigns that focus on hands-on demonstrations, interactive trials, and transparent educational communication can enhance users' self-efficacy and comprehension. Such experiential approaches help consumers feel competent and in control when engaging with automation, translating psychological comfort into adoption intent. These findings align with contemporary marketing thought that emphasizes co-creation and psychological engagement as essential for technology acceptance.

Second, the study introduces User–Technology Fit (UTF) as a strategic marketing metric. Traditional key performance indicators (KPIs) such as brand awareness and purchase intention capture surface-level engagement but overlook the underlying psychological readiness of consumers [50]. UTF offers a diagnostic tool that helps marketers identify whether adoption resistance stems from low confidence, poor comprehension, or emotional discomfort. Measuring UTF through user surveys or experiential testing allows firms to design targeted responses, confidence-building programs for low self-efficacy, clarity-based campaigns for poor understandability, or trust-enhancing efforts for insecurity. This approach aligns with emerging research that positions marketing analytics as a bridge between consumer psychology and managerial decision-making [51]. Targeting early adopters with high readiness can generate social proof, accelerating adoption through reference groups, particularly in emerging markets where social influence plays a pivotal role [30, 39].

Finally, this research redefines marketing communication for high-tech products. Complex technologies like autonomous vehicles require communication that educates rather than merely persuades. Transparent messaging about system capabilities, limitations, and safety boundaries builds both comprehension and trust, transforming marketing from a promotional function into an educational and empowering process. This user-oriented communication strategy mirrors the evolving paradigm of marketing as a discipline that enhances consumer well-being and market readiness.

8. Limitation of the study

While the findings make substantial theoretical and practical contributions, several limitations must be acknowledged to guide future investigation. The study was conducted within the context of a single emerging economy, which may constrain the generalizability of results to other cultural and infrastructural environments. Markets differ in technological familiarity, cultural openness, and institutional support, all of which may moderate the relationships between user characteristics, perceived fit, and adoption behavior. Comparative research across multiple emerging and developed markets would therefore enrich understanding of contextual influences on user readiness.

The study also relies on self-reported perceptual data, which, although widely employed in marketing and behavioral research, may not fully capture actual behavioral adoption. Future research could enhance external validity by employing longitudinal tracking to evaluate how psychological readiness translates into sustained technology use. Such approach would provide more robust evidence of causal relationships and deepen insights into the temporal evolution of user confidence and comprehension.

Furthermore, while the current model focuses on self-efficacy, understandability, and technology readiness, additional psychological constructs such as emotional assurance or Fear of missing out may further illuminate the complexity of consumer–technology interaction. Incorporating these constructs could refine the understanding of user readiness, particularly for technologies where safety and reliability concerns dominate consumer perception. Extending this model to other innovation domains, for example artificial intelligence services, smart mobility systems, or intelligent home technologies, would also enable broader generalization of the proposed user-centered marketing framework.

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