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Acceptance of connected vehicle technology in emerging markets: A multi-method approach

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Highlights

- This study explores factors influencing consumers' intention to use Connected Vehicle Technology (CVT) in India's market.
- This study applies a multi-method approach of SEM and fsQCA to explore factor combinations influencing intention to use CVT.
- SEM analysis found six key factors influencing consumers' intention to use CVT; perceived risk was not significant.
- fsQCA found three core and two peripheral conditions leading to consumers' intention to use CVT.
- Automakers, policymakers, and designers can better promote CVs in emerging markets, boosting societal benefits and competitiveness.

Abstract

Connected vehicles present a wide range of applications that have the potential to revolutionize the transportation landscape, offering benefits to drivers, passengers, and transportation systems while enabling innovative business models for automakers. Despite these opportunities, consumer acceptance of Connected Vehicle Technologies (CVT) has progressed at a slower pace than anticipated, creating obstacles for automakers in monetizing the associated data. As a result, it becomes essential to determine the factors influencing consumers' behavioural

intention to use CVT, particularly in emerging markets like India. This study addresses this gap by gathering data from various metropolitan cities across India to identify the factors influencing intention to use CVT. Using a multi-method approach incorporating Structural Equation Modelling (SEM) and Fuzzy-Set Qualitative Comparative Analysis (fsQCA), the study reveals that *perceived usefulness, perceived ease of use,* and *brand consciousness* serve as core factors driving the intention to use CVT. Meanwhile, *perceived enjoyment* and *social influence* function as complementary factors, further supporting this intention. *Perceived risks* and *technology readiness* of consumers were not found to influence intention to use CVT. The findings provide valuable insights into consumer behavior concerning advanced transportation technology and offer actionable recommendations to stakeholders to promote the acceptance of CVT.

Introduction

Connected Vehicle Technologies (CVT) are advanced communication technologies that enable seamless data sharing between vehicles, infrastructure, and the Internet (Uhlemann, 2015). Connected vehicles are vehicles integrated with CVT that produce and utilize a vast amount of real-time data, unlocking opportunities for automakers to create innovative products, enhance safety features, and develop new revenue streams. Automakers can collect and analyze connected vehicle data—such as speed, condition, direction, braking patterns, location, and driver behavior—and monetize it to create CVT applications such as adaptive traffic management, predictive maintenance, and personalized insurance services. For example, insurance companies use consumer's driving data such as mileage, location, and time to automatically calculate premiums, giving rise to the Usage-Based Insurance (UBI) business model (Bian et al., Jan. 2018). Another example is that automakers and third-party service providers also leverage data on engine performance, battery health, tire pressure, and more to deliver predictive maintenance services. These services notify drivers or fleet managers of potential issues before they escalate, enabling business models built around subscriptions, pay-per-alert diagnostics, and service-based partnerships (Cavus et al., 2025). These applications foster a self-sustaining ecosystem that drives revenue generation, enhances customer experiences, and boosts brand value (Elliott et al., Apr. 2019). CVT also significantly transforms the transportation landscape, providing advantages for both drivers and passengers, while supporting the development of innovative business models within the automotive industry (Kumar et al., Oct. 2023, Siegel, 2018). Despite the promising benefits of CVT, automakers face obstacles in monetizing connected vehicle data, largely stemming from its slower-than-anticipated consumer acceptance as indicated by industry reports (Bertoncello et al., 2024, Bertoncello et al., 2024). Globally, the trend indicates that the growth of electric vehicles has complemented the advancement of CVT. The development of CVT also facilitates Autonomous Vehicles (AVs), which are vehicles featuring varying degrees of autonomy, enabling them to navigate and operate independently without the need for human control. CVT ensures the safe and efficient operation of AVs on roads. As a result, automotive Original Equipment Manufacturers (OEMs) are introducing a diverse range of new CVT features, targeting not just the luxury segment but also the mainstream market. Yet, uncertainty lingers over consumer acceptance of CVT, especially in emerging markets where CVT is still in its early stages (Bernardini et al., Oct. 2017, Sharma et al., 2021).

India, as one such market, saw the introduction of connected vehicles in 2019. With the Indian government's push for accelerated electric vehicle acceptance with the FAME (Faster Adoption and Manufacturing of Electric Vehicles) I and II schemes, the connected vehicle market is expected to experience substantial expansion in the coming years (Kohli, 2024). Similarly, continuous application of Intelligent Transport System under the National Road Safety Policy is encouraged by the Ministry of Road Transport and Highways. Lately, the Indian Government has been pushing to offer better ratings to cars with CVT technology (Indian Government Proposes Connectivity-Enhanced Car Ratings, 2023). However, achieving widespread consumer acceptance remains a pivotal challenge that could determine the success of CVT in India. If consumers do not use CVT, its full potential cannot be realized. Hence, it is

crucial to understand the factors influencing consumers' behavioural intention to use CVT, especially in emerging markets.

This study, therefore, seeks to explore the factors influencing consumers' behavioural intention to use CVT in India. The research focuses on two central questions: (1) Which factors influence consumers' behavioural intention to use CVT? (2) How do these factors influence consumers' behavioural intention to use CVT? The process of technology acceptance is shaped by numerous factors that can differ widely across various geographical and cultural settings (Lee et al., Jan. 2013). In the Indian context, it becomes crucial to examine these dynamics, given the country's distinct socio-economic and technological landscape. This study contributes to the existing body of research on technology acceptance and consumer behavior within the transportation sector. The insights gained from this study can play a pivotal role in helping developing nations like India promote consumers' behavioural intention to use CVT and harness its transformative potential.

Section snippets

Acceptance of connected vehicles

Connected vehicles (CVs) integrate a wide array of transportation technologies and applications, such as intelligent transportation systems, vehicular information services, and automotive electronics. They provide several advantages, including improved safety, better energy efficiency, environmental benefits, increased mobility, and enhanced entertainment while driving. Nonetheless, there are ongoing concerns, such as the higher costs and maintenance expenses relative to traditional vehicles, …

Conceptual framework and hypotheses development

This study integrates the TRAM model with other attitudinal factors like *perceived usefulness, perceived ease of use, perceived enjoyment, perceived risks, social influence*; and *brand consciousness.* It examines the influence of *Technology Readiness* and other factors on *intention to use CVT.* …

Data collection

The study used an online survey to collect data from licensed drivers aged 25 or above in four major Indian cities: Delhi, Mumbai, Ahmedabad, and Bangalore. These Tier-1 cities were strategically selected due to their metropolitan character and their role as economic hubs that draw individuals from diverse parts of the country in search of employment opportunities. This demographic heterogeneity and population mobility are likely to increase exposure to CVT, thereby enabling the collection of …

Data preparation

Descriptive statistics that include the demographic details of the sample are presented in Table 1. Outlier detection was performed using Mahalanobis distance technique and 10 outliers were detected (p-value of the Mahalanobis distance was less than 0.001). After removing the outliers, the effective sample size was 391. Also, as all the questions in the survey were mandatory, the dataset was free from no response bias and includes 391 complete responses. Also, Common Method Bias was tested using …

Implications

This study extended the TRAM by incorporating additional variables like *perceived enjoyment*, *perceived risks*, *social influence*, and *brand consciousness*. This contributed to the theoretical understanding of technology acceptance in emerging markets by demonstrating the relevance of these factors in the Indian context, thus enriching the existing theoretical framework on extensions of TRAM. Secondly, this study also explored the interplay between *technology readiness* and other variables like …

Limitations & future research Directions

The cross-sectional nature of the study limits the ability to draw causal inferences about the relationships between the examined variables. The study's focus on India may limit the generalizability of the findings to other developing markets with different technological infrastructures and user characteristics. The study did not have control for all relevant variables that could influence CVT usage, such as prior experience with similar technologies, access to infrastructure, or individual …

Conclusion

This study investigates the factors influencing the behavioural intention to use Connected Vehicle Technologies (CVT) in India's emerging market. The results indicate that CVT applications, that are perceived as useful, user-friendly, and enjoyable, enhance their acceptance among consumers. Additional factors such as social influence and brand consciousness also significantly affect consumers' intention to use CVT. Conversely, risk perceptions were found to have no significant impact on …

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Microsoft Copilot to refine language, correct grammar, and achieve clarity and coherence. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article. …

CRediT authorship contribution statement

Jastina Mariam Mathai: Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Merlin Nandy:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization. **Prasanna Kumar Gurugubelli:** Writing – review & editing, Validation, Methodology, Conceptualization. …

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. …

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References (97)

Y. Bian *et al.*
Good drivers pay less: A study of usage-based vehicle insurance models
Transp Res Part A Policy Pract (Jan. 2018)

D. Elliott *et al.*
Recent advances in connected and automated vehicles
Journal of Traffic and Transportation Engineering (English Edition) (Apr. 2019)

C. Bernardini *et al.*
Security and privacy in vehicular communications: Challenges and opportunities
Vehicular Communications (Oct. 2017)

S.G. Lee *et al.*
The impact of cultural differences on technology adoption
Journal of World Business (Jan. 2013)

M.T. Pascale *et al.*
Examining longitudinal experiences with connected vehicle technology in Australia's largest C-ITS pilot
Transp Res Part F Traffic Psychol Behav (Jan. 2025)

S. Acharya *et al.*
Public acceptance of connected vehicles: An extension of the technology acceptance model
Transp Res Part F Traffic Psychol Behav (Jul. 2022)

S. Acharya *et al.*
Measuring data sharing intention and its association with the acceptance of connected vehicles
Transp Res Part F Traffic Psychol Behav (Aug. 2022)

S. Acharya *et al.*
Importance of the reputation of data manager in the acceptance of connected vehicles
Communications in Transportation Research (Dec. 2022)

R. Lin *et al.*
Intention to perform eco-driving and acceptance of eco-driving system
Transp Res Part A Policy Pract (Dec. 2022)

R. Madigan *et al.*
What influences the decision to use automated public transport? Using UTAUT to understand public acceptance of automated road transport systems
Transp Res Part F Traffic Psychol Behav (Oct. 2017)

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