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Exploring Consumer Attitudes Toward Sustainable Innovation in Electric Two-Wheelers in Nagpur City

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ABSTRACT :

This study examines how consumers in Nagpur's urban setting see environmentally friendly advancements in electric two-wheelers. These automobiles are an essential way to lessen the harm that traditional modes of transportation do to the environment. Despite growing consumer awareness of the environmental advantages of electric mobility, obstacles like high upfront costs, a lack of adequate charging infrastructure, and range concerns still prevent broad adoption. Consumer decisions are greatly influenced by technological advancements, especially in the areas of battery efficiency and charging capabilities, green branding, and focused marketing. Although government incentives and policies have a significant impact on consumer choices, their efficacy is mostly dependent on outreach and regional execution. To increase adoption rates, this study recommends the creation of more affordable car options, increased charging infrastructure, and marketing campaigns that prioritize the environment. In order to promote sustainable growth in the electric two-wheeler market, future research should look more closely at long-term behavioral patterns, regional variations in adoption, and the contribution of early adopters to increasing acceptance.

Keywords: Green innovation (GI), consumer preferences (CP), electric two-wheelers (E2W), sustainable mobility (SM), and urban transportation (UT)

1. Introduction

Urban mobility has emerged as a pivotal challenge in modern cities, as rapid urbanization and increasing vehicular density continue to stress transportation networks and contribute significantly to environmental degradation. Sustainable urban mobility, therefore, is gaining attention as an essential strategy to mitigate the adverse effects of transportation on the environment. By promoting eco-friendly and efficient modes of transit, cities worldwide are seeking to balance the growing demand for mobility with the imperative of environmental conservation.

Electric two-wheeler vehicles represent a transformative solution within this framework, offering a sustainable alternative to conventional internal combustion engine (ICE) vehicles. These vehicles operate on electric power, significantly reducing carbon emissions and air pollution. Moreover, advancements in battery technology, improved energy efficiency, and government incentives have made Electric Two-Wheelers (E2W) an increasingly viable choice for environmentally conscious consumers. Their compact design and low operational costs further enhance their appeal in urban areas where congestion and affordability are critical factors.

Nagpur, a bustling city in central India, serves as a compelling case study for examining the adoption of electric two-wheeler vehicles. As the city grapples with growing urbanization and the environmental impacts of transportation, Electric Two-Wheelers (E2W) is gaining traction as a Sustainable Mobility (SM) option. The city's efforts to expand its electric vehicles (E2W) infrastructure, including the development of charging stations and the introduction of government subsidies, have facilitated a gradual shift in consumer preferences. However, despite these advancements, adoption rates remain influenced by factors such as consumer awareness, perceived value, and the availability of innovative features in electric two-wheelers.

This study aims to explore consumer attitudes toward sustainable innovation in electric two-wheeler vehicles within the unique urban mobility landscape of Nagpur. By analysing the interplay between sustainability concerns, technological advancements, and consumer preferences, the research seeks to provide insights that can guide policymakers, manufacturers, and marketers in promoting the adoption of Electric Two-Wheelers (E2W) as a cornerstone of sustainable urban mobility.

2. Consumer Attitudes Toward Sustainability

Sustainable consumer attitudes are essential to the success of green technology like electric two-wheelers. This section examines the public's perspective of electric vehicles, environmental awareness levels, and important elements affecting Nagpur consumers' mindsets.

2.1 Awareness of Environmental Challenges

In Nagpur, there is growing concern over environmental degradation, especially air pollution from transportation. Public awareness of environmentally friendly transportation options has grown as a result of campaigns, but many consumers are still unaware of the precise advantages of electric two-

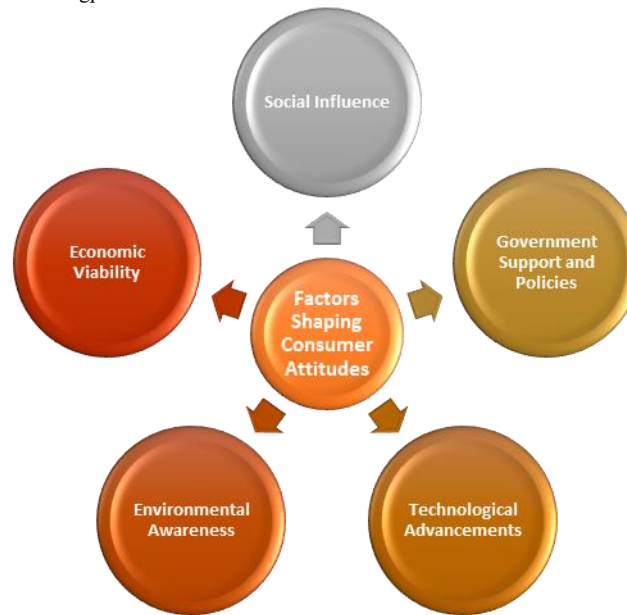
wheelers. Promoting sustainable transport practices requires bridging this knowledge gap through targeted education and engagement programs.

2.2 Perceptions of Electric Vehicles

In general, electric two-wheelers are regarded as creative and environmentally responsible substitutes for conventional bikes and scooters. They are valued for their cheap operating expenses and little effect on the environment. However, concerns about battery performance, initial purchase cost, and infrastructure still exist. These views are increasingly changing as a result of technological advancements, particularly in the areas of range and charging times.

2.3 Factors Influencing Attitudes

Several factors influence how consumers in Nagpur view sustainable innovation in electric two-wheelers:



Factors Shaping Consumer Attitudes

- **Environmental Awareness:** Individuals who possess a heightened sense of responsibility toward environmental preservation tend to value the ecological advantages offered by electric two-wheelers. These consumers are often motivated by the potential reduction in carbon emissions and their contribution to sustainable urban mobility.
- **Economic Viability:** Although electric vehicles (E2W) present considerable savings in the long run due to reduced fuel consumption and lower maintenance costs, the substantial upfront investment required for purchasing these vehicles can act as a deterrent. Consumer perceptions regarding the overall affordability and financial benefits of Electric Two-Wheelers (E2W) significantly shape their preferences.
- **Government Support and Policies:** Incentives such as subsidies, tax reductions, and financial benefits provided by government initiatives have a profound influence on consumer inclination toward electric two-wheelers. Furthermore, policies that prioritize the development of charging infrastructure and other EV-related facilities are instrumental in fostering positive attitudes and wider adoption.
- **Social Influence:** The opinions and recommendations of friends, family members, and social networks play a crucial role in influencing consumer decisions. Favourable experiences and endorsements from early adopters of Electric Two-Wheelers (E2W) often spark greater interest and confidence among potential buyers, leading to increased consideration of these vehicles.
- **Technological Advancements:** Cutting-edge features like smart connectivity, advanced safety measures, and aesthetically modern designs resonate strongly with tech-oriented consumers. These innovations enhance the appeal of electric two-wheelers, making them an attractive choice for those seeking a blend of functionality and sophistication.

3. Adoption of Electric Two-Wheeler Vehicles

The adoption of sustainable technology by consumers is critical to the development of electric transportation in Nagpur. This section covers consumer desires for cutting-edge, environmentally friendly automobiles, adoption barriers, and developments in the E2W industry.

3.1 Innovations Driving Sustainability

Manufacturers are using the following sustainable developments to meet consumer needs:

- **Advanced Battery Systems:** When compared to prior technologies, lithium-ion batteries provide greater energy efficiency, quicker charging, and a longer lifespan.
- **Infrastructure Development:** Purchasing portable chargers and fast-charging stations reduces range anxiety.
- **Energy Optimization:** Features that improve energy saving and lower operating expenses include regenerative braking and lightweight materials.

- **Smart Technologies:** The user experience is enhanced by IoT-enabled capabilities including navigation, live battery tracking, and app integration.
- **Eco-Friendly Production:** A dedication to sustainability is demonstrated by the use of recyclable materials and appropriate battery disposal.

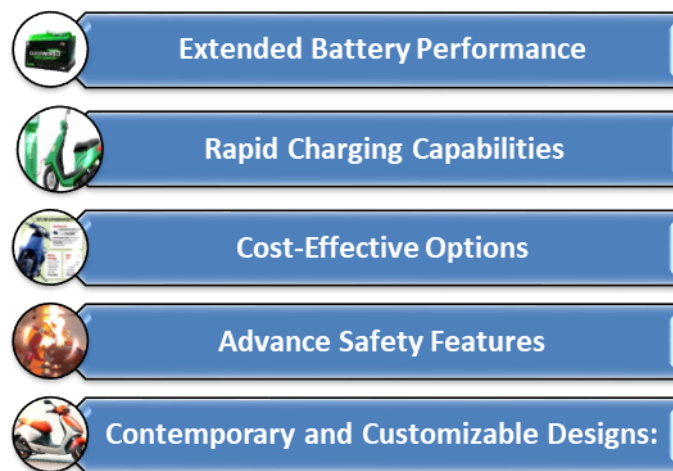
3.2 Challenges to Adoption

Despite progress, the adoption of E2Ws faces several hurdles:

- **Limited Charging Infrastructure:** Lack of charging stations outside urban centres remains a key barrier.
- **High Initial Costs:** E2Ws still cost more upfront than conventional vehicles, limiting their appeal to budget-conscious consumers.
- **Range Anxiety:** Concerns about battery range and charging availability persist.
- **Battery Life and Replacement Costs:** Questions around battery durability and replacement pricing discourage adoption.
- **Awareness Gaps:** Misconceptions and limited understanding of long-term financial benefits hinder market growth.

3.3 Consumer Preferences in Innovation

Understanding Consumer Preferences (CP) is critical for driving the adoption of electric two-wheelers. Key innovations that resonate with consumers include:



Consumer Preferences for Innovation

- **Extended Battery Performance:** One of the top priorities for consumers is Electric Two-Wheelers (E2W) with enhanced battery longevity. A longer battery range minimizes the frequency of recharging, offering user's greater convenience and flexibility, particularly for daily commutes and longer travel distances.
- **Rapid Charging Capabilities:** Technological advancements enabling quick charging solutions, which significantly reduce the charging time from hours to mere minutes, are highly attractive to time-conscious consumers managing busy lifestyles.
- **Cost-Effective Options:** Affordable pricing models, supported by initiatives like government subsidies or flexible instalment payment plans, make Electric Two-Wheelers(E2W) more accessible and appealing to budget-sensitive buyers.
- **Contemporary and Customizable Designs:** Sleek and modern aesthetics, coupled with options for personalization, play a crucial role in enhancing the visual appeal of electric two-wheelers. These features particularly resonate with younger audiences seeking stylish and unique vehicles.
- **Advanced Safety Features:** State-of-the-art safety enhancements, such as anti-lock braking systems (ABS) and improved handling dynamics, significantly boost consumer confidence. These features make Electric Two-Wheelers (E2W) a compelling choice for individuals prioritizing safety and reliability in their transportation.

4. Role of Government Policies and Incentives

Policy frameworks play a fundamental role in encouraging the adoption of electric two-wheelers in Nagpur. This section outlines the initiatives in place and their influence on public behaviour.

4.1 Government Initiatives Supporting E2Ws

- **Subsidies and Tax Breaks:** State-level incentives further lessen financial burdens, while programs like the FAME scheme lower purchase costs.
- **Infrastructure Development:** Government initiatives to construct battery-swapping facilities and fast-charging networks enhance usability and lessen consumer worry.

- **Public Awareness Campaigns:** Collaborations with NGOs and educational institutions help spread knowledge and drive behavioral change.
- **R&D Support:** Funding innovation in battery and vehicle technologies ensures continuous product improvement.

4.2 Influence on Consumer Mind-sets

- **Improved Affordability:** Financial incentives make E2Ws a cost-effective option for many.
- **Increased Consumer Trust:** Government backing lends credibility and encourages adoption.
- **Eco-Conscious Behaviour:** State-led campaigns promote sustainable values, aligning individual decisions with broader environmental goals.
- **Infrastructure Confidence:** Development of charging stations directly addresses range-related concerns.

4.3 Building Trust Through Technology

Innovations in technology are essential for boosting consumer confidence. Important elements consist of:

- **Reliable Batteries and Safety Features:** Users are guaranteed safety and longevity thanks to advancements in thermal management, ABS, and battery guarantees.
- **Smart Features:** App integration and real-time diagnostics meet the demands of contemporary users.
- **Behavioral Impact:** More people are inclined to switch to electric vehicles as technology become more dependable and user-friendly.

Conclusion

Given Nagpur's growing infrastructure and environmental problems, electric two-wheelers provide a viable and sustainable urban mobility option. This study highlights the necessity of an integrated strategy that incorporates government assistance, technical advancement, and consumer education. Through tackling obstacles linked to trust, infrastructure, and the economy, stakeholders can promote wider usage of E2Ws. Promoting electric mobility will require sustained innovation and focused legislative actions, which will support long-term environmental and economic sustainability in addition to cleaner urban transportation.

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