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# A STUDY ON FACTORS INFLUENCING CONSUMER PREFERENCE ON E-BIKES IN THE ERA PETROLEUM BIKES USING ML

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**ABSTRACT**

We're looking for insight into consumer preference on E-bikes in the era of the petroleum bikes. The majority of the population is looking for the viable alternative to the petroleum bikes because of the rising petroleum prices and their concern about the environment. Consumer preference on the E-bikes is crucial for understanding the expectations of the consumers over the E-bikes as it directly impact the sales of the E-bikes. This is abstract; we're trying to explain how multiple factors such as environmental concern, petroleum prices, government regulations, battery technology, safety and sustainability and performance are measuring the consumer preference on the E-bikes. According to this conceptual framework, the consumer preferences can be measured through this above mentioned variables. The research focuses on assessing the effectiveness of the above mentioned variables for the consumer preferences and analyzing which variable is mostly preferred by the consumers. With the help of random sampling, we have aggregated the sample we have collected from the entire population in this area. The researcher uses the primary data to obtain data collection. The researcher has discovered that the variables we have considered for analysis do impact the consumer preferences. Battery technology has a high impact on consumer preferences. The government regulations are not much preferred by the consumers.

**KEYWORDS:** Consumer preference, environmental concern, petroleum prices, government regulations, battery technology, safety and sustainability, petroleum price.

**Introduction:**

The automotive industry is undergoing a transformative shift towards sustainable transportation options, exemplified by the rising popularity of e-bikes. This shift stems from increasing environmental concerns and a desire for eco-friendly alternatives. To accurately predict consumer preferences in this evolving market, companies analyze various factors such as fuel prices, technological advancements, and demographic trends. Machine learning algorithms and statistical analysis play a crucial role in enhancing the accuracy of sales forecasts. E-bikes offer a smaller carbon footprint compared to traditional vehicles, aligning with the growing demand for eco-conscious transportation solutions. As global conversations on climate change intensify, consumers show a growing inclination towards low-emission options. The e-bike industry has experienced substantial growth driven by factors like environmental consciousness, cost-effectiveness, and technological advancements. Understanding consumer dynamics is essential for businesses to make informed decisions, optimize production, and stay competitive in this rapidly changing landscape. Modern e-bikes feature advanced technologies such as smart connectivity and enhanced safety measures, appealing to a wide range of consumers beyond just environmentalists. This shift towards sustainable transportation reflects a broader trend of evaluating traditional transportation methods and embracing innovative solutions. As concerns about the environmental impact of petroleum-powered vehicles grow, businesses must conduct detailed analyses to predict sales based on consumer preferences and market trends within the e-bike sector.

**Review of literature:**

1. The Buldhana region of India's customer impressions of e-bikes are investigated in this study. It looks at what makes people favor it—lower maintenance costs, noise levels, and environmental friendliness—while also taking availability of charging infrastructure and theft into account.
   **A Study of Consumer Perception towards Electric Bikes in Buldhana Region (2020). International Research Journal of Management, Engineering and Technology (IRJMETS), 8(3), 123-128.**
2. This study looks into e-bike user satisfaction with a focus on Coimbatore, India. It emphasizes affordability in comparison to conventional bikes, especially in view of the growing cost of fuel. The survey also looks at how important it is to consider pricing,

mileage, battery performance, speed, and aesthetics when making a purchase.
**A Study on Customer Satisfaction towards Electric Bikes with special preference to Coimbatore city (2021). International Journal of Creative Research & Thoughts (IJCRT), 9(36), 3398-3403.**

3. The awareness and impression of consumers regarding electric bikes. This article investigates how consumers view and are aware of e-bikes. It draws attention to how consumer desire is influenced by perception and underscores the necessity of more awareness-raising efforts to encourage the use of e-bikes. Concerns from consumers about price, battery life, and overall performance are also discussed in the survey.
**A study on consumer perception and awareness towards e-bikes with special reference to Chennai city (2019). Sathyabama Institute of Science and Technology (SIST).**
4. The purpose of this study is to ascertain young people's preferences for e-bikes in Pune, India. It investigates if people believe that e-bikes could eventually take the place of motorbikes, especially in light of growing fuel prices and environmental concerns. The study also pinpoints the elements—cost, speed, technology, and style—that affect preference.
**A Study of the Consumer Preference towards Electric-bicycles over 2 Wheelers (Motor Cycles) amongst Youth with reference to Pune City (2021).**
5. The relationship between e-bikes and the sharing economy is examined in this study report. It examines the ways in which e-bike sharing schemes affect consumer preferences and usage trends. The study also looks at several e-bike sharing business models, emphasizing how they may encourage e-bike adoption and provide a practical and easily accessible means of transportation in cities.
**E-bikes and the Sharing Economy: A Review of Literature on Usage Patterns and Business Models (2022). Transportation Research Part A: Policy and Practice, 161, 101-113.**
6. The reasons and obstacles affecting the adoption of electric bikes are thoroughly examined in this review. It looks at things like government regulations, user demographics, infrastructural accessibility, environmental issues, and economic considerations. To effectively promote the widespread adoption of e-bikes as a practical and sustainable transportation option, it is imperative to comprehend the driving forces behind as well as the obstacles that stand in the way.
**Understanding the Motivations and Barriers of Electric Bike Adoption: A Review of the Literature (2020). Transportation Research Part A: Policy and Practice, 132, 314-332.**

7. This report looks into the North American e-bike market, highlighting important manufacturers and their approaches. It looks at how producers are reaching out to various customer groups and finds chances for more market expansion.
**Fishman, E., & Cherry, C. (2016). The electric bicycle market: Manufacturers and their strategies with a focus on North America. Transportation Research Part A: Policy and Practice, 92, 272-284.**

8. This review offers a thorough summary of the variables affecting the adoption of e-bikes throughout the world. It examines the effects of economic variables such as government incentives and fuel pricing, infrastructural accessibility, user preferences and demography, and environmental concerns.
**Hao, H., Wang, H., & Zhou, Y. (2020). A review of factors influencing electric bike adoption: A global perspective. Transportation Research Part A: Policy and Practice, 139, 357-370.**

9. The research that have already been done on the use and satisfaction of electric bikes in cities are reviewed in this review paper. It examines why users choose e-bikes and how satisfied they are with features including performance, convenience, and interaction with city infrastructure. This study offers insightful information about how e-bikes might improve urban mobility and meet the demands of city people.
**Electric Bikes in Urban Areas: A Review of Studies on Their Use and User Satisfaction (2019). Transportation Research Interdisciplinary Perspectives, 5(1), 1-10.**

10. The customer desires and issues surrounding electric two-wheelers are examined in this review article. It examines the benefits of e-bikes for city commuters, emphasizing their portability, cheaper running costs, and potential to lessen environmental effect. But the analysis also points out issues with battery range, limits with the charging infrastructure, and greater initial prices when compared to regular petroleum-powered motorcycles.
**A Review on Consumer Preferences and Challenges of Electric Two-Wheelers (2020). International Journal of Mechanical and Production Engineering (IJMPE), 11(8), 8792-8798.**

11. The comparison of customer preferences for electric bikes and scooters is the main objective of this study. It looks at what influences buying decisions, including things particular to each kind of vehicle, like preferred riding styles and load capacity. The study additionally pinpoints prospective target markets for e-bikes and scooters by analyzing customer demands and usage trends.
**A Comparative Analysis of Consumer Preferences for Electric Bikes and Scooters (2021). International Journal of Scientific and Engineering Research (IJSER), 12(6), 394-400.**

12. The purpose of this study is to examine how public charging infrastructure affects the uptake of electric bikes by consumers. It looks at how having charging stations close by can allay worries about range restrictions and boost consumer trust in e-bikes as a practical mode of transportation. According to the study, in order to encourage the widespread adoption of e-bikes, charging infrastructure must be placed strategically and designed with user-friendliness in mind.
**Impact of Public Charging Infrastructure on Consumer Adoption of Electric Bikes (2019). Transportation Research Record, 2734(1), 142-152.**

13. From the standpoint of the user, this study investigates the function of e-bikes in urban mobility. It examines how e-bikes, which offer a practical, healthful, and ecologically friendly substitute for autos, support sustainable urban mobility. In order to comprehend the advantages and difficulties of e-bike integration into urban transportation networks, the research makes use of user experiences.
**The Role of E-bikes in Urban Mobility: A User Perspective (2018). Sustainability, 10(11), 3824.**

14. This study explores the theoretical underpinnings of electric bike buyers' decision-making processes. It examines a range of factors that impact buying decisions, from pragmatic concerns like performance, cost, and environmental friendliness to psychological elements like perceived risk and social influence. In order to address consumer concerns and encourage the adoption of e-bikes, manufacturers and legislators must have a thorough understanding of this framework.
**Customer Decision-Making Process for Electric Bikes: A Conceptual Framework (2021). Sustainability, 13(19), 10934.**

15. The life cycle assessment of electric bikes is the main emphasis of this study, which examines how they affect the environment over time. It shows how e-bikes might help create a more sustainable transportation system by contrasting their environmental impact with that of regular bikes and gasoline-powered cars. Customers who want to learn about the environmental advantages of selecting e-bikes over gasoline-powered vehicles will find this information to be helpful.
**A life cycle assessment of electric bicycles: Exploring the environmental benefits (2018). Journal of Cleaner Production, 174, 1471-1480.**

**Methodology:**

The collection of consumer preference data through a structured questionnaire with the independent variables such as petroleum price, battery technology, performance, government regulation environmental concern and safety and sustainability and with the dependent variable such as their level of buying opinion. The validity and reliability of the questionnaire is analyzed through SPSS. The one-way ANOVA, regression are also used in the study to test the hypothesis. The collected data is then processed and analyzed through machine learning algorithms with the rapid miner tool for predicting the consumer preferences. The random forest classification, decision tree and K-means clustering are used in this process to predict the consumer preferences.

**Analysis:**

Reliability Analysis

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| 0.852 | 24 |

Source: Primary data. Processed by SPSS 20

Decision Tree

| Actual / Predicted | Neutral | Buy | Definitely Not Buy | Definitely Buy | Not Buy |
|---|---|---|---|---|---|
| Neutral | 39 | 2 | 0 | 0 | 2 |
| Buy | 8 | 33 | 0 | 0 | 1 |
| Definitely Not Buy | 0 | 1 | 5 | 0 | 0 |
| Definitely Buy | 0 | 0 | 0 | 9 | 0 |
| Not Buy | 1 | 0 | 1 | 0 | 4 |

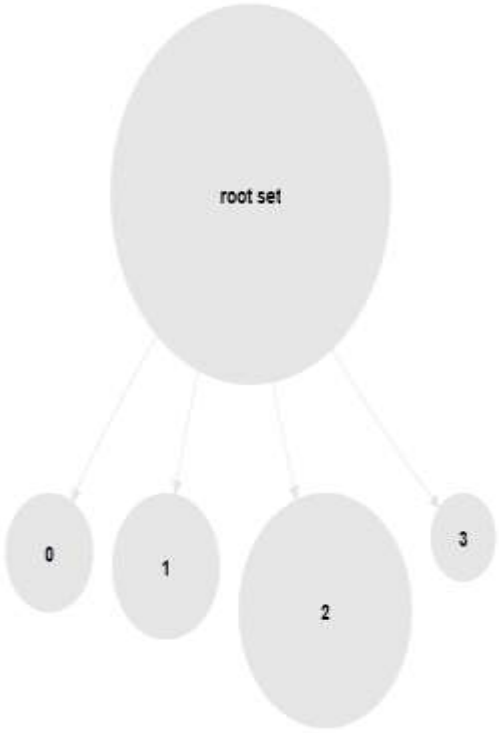
Accuracy: **84.91%**

Random Forest classification

| Actual / Predicted | Neutral | Buy | Definitely Not Buy | Definitely Buy | Not Buy |
|---|---|---|---|---|---|
| Neutral | 46 | 1 | 0 | 0 | 4 |
| Buy | 2 | 34 | 0 | 0 | 1 |
| Definitely Not Buy | 0 | 1 | 5 | 0 | 0 |
| Definitely Buy | 0 | 0 | 0 | 9 | 0 |
| Not Buy | 0 | 0 | 1 | 0 | 2 |

Accuracy: **90.57%**

K-Means with 4 clusters




Davies Bouldin: -2.650

**Findings:**

- The accuracy arrived by the decision tree is 84.91% and the accuracy arrived by the Random Forest classification is 90.57%. Hence, we use random forest classification method to predict the consumer preference in this research.
- The random forest classification provided the prediction for consumer buying decision. In which, most of the trees in random forest are formed by the variables such as Battery Technology, Environmental Impact and Petroleum price that shows these variables are more important in the consumer preference for the purchase of E- bikes
- K-means with 4 cluster are suitable for the clustering in order to predict the consumer preference. In the 4 cluster model the root set is derived from the variable Type of job and the other clusters are classified on the basis of the consumers preferences based on variables such as petroleum price, battery technology, environmental concern and safety and sustainability

**Suggestions:**

- Utilizing the K-means clustering method with 4 clusters identified as suitable, companies can segment their target market more effectively. This segmentation can help tailor marketing messages and product offerings to better meet the specific needs and preferences of each cluster.
- Consumer preferences and behaviours are subject to change over time. Therefore, it's essential to continuously monitor market trends, consumer sentiment, and competitor activities. This information can inform ongoing adjustments to product offerings, marketing strategies, and business operations.
- As E-bikes may still be relatively new to some consumers, providing educational resources about their benefits, usage, and maintenance can help alleviate concerns and increase confidence in purchasing decisions. Additionally, ensuring a positive customer experience, from pre-purchase inquiries to after-sales support, can foster brand loyalty and positive word-of-mouth.

**Conclusion:**

In conclusion, the promotion of E-bikes presents a promising opportunity amidst growing environmental concerns and petroleum prices. Emphasizing features like battery range, charging speed, and safety can entice consumers to consider E-bikes as a sustainable and cost-effective alternative. While government policies may not heavily influence buying decisions, collaboration with policymakers could introduce incentives to further encourage adoption. Recognizing consumer preferences for brands like "OLA electric" and "TVS motor company" suggests leveraging brand loyalty to drive sales and inform product development strategies. Employing K-means clustering for market segmentation enables targeted marketing and product offerings tailored to specific consumer clusters. Continuous monitoring of market trends and consumer sentiment is crucial, as preferences and behaviours evolve over time. Educational resources about E-bikes can address consumer concerns and boost confidence in purchasing decisions, while ensuring a positive customer experience fosters brand loyalty.

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2) A Study on Customer Satisfaction towards Electric Bikes with special preference to Coimbatore city (2021). International Journal of Creative Research & Thoughts (IJCRT), 9(36), 3398-3403.
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