

EXPLORE THE STUDY ANALYSIS OF ELECTRIC SCOOTERS IN COIMBATORE THROUGH THE LENS OF DESIGN THINKING

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ABSTRACT:

This study employs a design thinking approach to explore the integration of electric scooters in Coimbatore, a burgeoning urban landscape facing challenges related to transportation, environmental sustainability, and urban mobility. With the rise of technological advancements and the need for eco-friendly transportation options, electric scooters present a promising solution. The research methodology incorporates the principles of design thinking to analyse the feasibility, challenges, and opportunities of introducing electric scooters as a sustainable mode of transport in Coimbatore. Design thinking methodologies such as empathizing with users, defining problem areas, ideating potential solutions, prototyping, and testing will be applied in the context of the city's unique requirements. The study will analyse the current transportation landscape in Coimbatore, including existing infrastructure, traffic patterns, environmental concerns, and the specific needs of the populace. It will also consider the economic and policy landscape,

INTRODUCTION:

One of the main problems which the humanity is facing in the actuality is the climate change. It is well known that the pollution and carbon dioxide (CO₂) produced by humans is speeding up the climate change. The main cause of it is the carbon dioxide emitted by transports with a total of 31% in the world and 33% in Sweden. Nowadays, the entire world

along with technological advancements in electric scooter design and functionality. Through a comprehensive analysis, this study aims to propose innovative solutions and strategies for the successful implementation and adoption of electric scooters in Coimbatore. Recommendations will focus on infrastructure development, regulatory policies, user experience, and environmental impact. The findings of this study will contribute to the discourse on sustainable urban transportation solutions, specifically in the context of Coimbatore. The insights obtained through the design thinking approach will offer a structured and innovative way forward for the integration of electric scooters, addressing the challenges and leveraging the opportunities within the city.

Keywords:

Design Thinking, Electric Scooters, Sustainable Urban Transportation, Coimbatore, Mobility, Sustainability, User-Centric Design.

population has become used to travel longer distances than ever before. These trips are incorporated in our daily life and there is nothing to do in order to try to reduce their amount. Therefore, the only possible way to reduce the carbon emissions to the environment is introduce new clean modes of transport.

For this reason, this thesis is based in the introduction of one of the most modern introductions to the electric transport: Electric Scooters (ES). ES have started to appear in big cities all around the world, starting with San Francisco. These scooters are the logical evolution of the basic scooters which use the driver's foot as a propulsion. ES can be charged in a few hours and can last more than 20km, these characteristics made scooters a potential mode of transport to replace actual car

transports in big cities, where people have to travel distances lower than 20km and they may find traffic jams or busses full of people. With ES it is possible to travel on the bike road (therefore avoid traffic jams) without any exercise (able for non-fit people). For these reasons some companies started to introduce ES with a rental system on big cities, where people are able to take a scooter and leave on the same street, without worrying about finding a place to park them.

EMPATHY

DESIGN THINKING	POTENTIAL QUESTIONS
Empathy	<ol style="list-style-type: none">1. What proportion of your residents use an electric scooter?2. What opinion is this use of electric scooter increasing?3. What do you feel the increase is marginal or significant?4. What proportion buy, lease and hire their vehicles?

STATEMENT OF THE PROBLEM:

Regarding the effect of the logistics operations to the level of congestion it has a huge impact of around 8-18% of the urban traffic flow and it has an effect to the road reduction capacity of 30% [8]. In fact, there is a high potential to reduce this impact using a bike logistic system [8]. In order to prove that it is possible to replace internal combustion engines, four different pilots have been tested in two cities in Italy. For each different pilot, it has been studied different factors such as: price, consumption, battery range, time to charge and load. The results of this study are very promising because, in all test studies, the level

of success is high with only a few weaknesses. Furthermore, the study provides a calculation of costs and CO₂ reduction where it is compared the traditional fleet and the e-fleet. All of them show that e-fleet is worth to be applied. In addition, electric vehicles can mitigate most of the problems which presents the actual urban transport in cities such as noise and smog. The advantages are even bigger when they are used for the last-mile of delivery of goods in city centers.

DEFINE:

DESIGN THINKING STAGE	INTERFERENCE
Define	<ol style="list-style-type: none">1. Are the presences of an applied electric field in a metallic conductor?2. Have you used a shared electric scooter in your city?

SCOPE OF THE STUDY

There are other real-life tests like the one made in Germany during the months of October November in which 38 subjects are provided with electrical scooters. The authors of tested electric scooters for a normal routine period of time and recorded different data. Also, a pre and post survey was released to the users of this test, providing important information about their perception and opinions about a normal day usage.

The results give some controversial opinions which were not expected before such as the advantages of electric scooters in rush hours traffic turned out to be not as good as was expected. This affirmation contradicts most of people expectations to use this kind of transport in cities.

OBJECTIVE:

- Electric scooters have been appeared recently in cities because it makes people's life easier for short distance transports.
- Despite nowadays big cities have a public transport system, it results much faster and comfortable to take a scooter or a bike just in front of the destined place, when the trip distance is not so big.
- For this reason, some cities have used this idea to create a company who has a fleet of this ES on the streets and people can rent them paying for minutes of usage.

LIMITATIONS:

This thesis is based on gathering the data from peer-reviewed articles, reports, book chapters, webpages of existing public companies and news articles. The characteristics of the scooters analysed in this thesis is from webpages, dedicated exclusively to sell products to other business, not particulars. The first part of the thesis is based on research about the main components of the electric scooters and their relation with the performance of the vehicle. This information has been extracted from some webpages and manufacturing guides for scooters. The electric

scooter legislation and policy has been searched in journal databases, but nothing has been found. That is because the incorporation of this vehicles is new and there are no specific laws for electric scooters. In fact, scooters are treated as electric bikes (under some Specifications) and the same rules have to be applied. In consequence, it has been used a document of the normative of electric bikes from the European Union. The specific method used to answer the three research objectives of this report are decided to section of limitations of scooter.

RESEARCH METHODOLOGY:

Research methodology is the specific procedures or techniques used to identify, select, process, and analyse information about a topic. In a research paper, the methodology section allows the reader to critically evaluate

a study's overall validity and reliability. The methodology section answers two main questions, how was the data collected or generated? How was it analysed?

TOOLS USED:

- Percentage analysis
- Chi-Square
- ANOVA

REVIEW OF LITERATURE:

Government of India has given a call for 'only Electric Vehicles' on Road by 2030. This article is contemporary and examines the different Electric vehicles are solutions to be independent and free from imported energy resources. India is one of the largest exporters of crude oil in this work, the estimation of the actual CO2 emission of a conventional IC engine vehicle and an electric vehicle have been studied in different phases. Air pollution contributes to the premature deaths of 2 million Indians every year. In order to minimize the air pollution, Electric Vehicle (EV) Electric vehicles are solutions to be independent and free from imported energyresources. India is one of the largest exporters of crude oil in till now,it was not requiredto obtain a licence for gearless electric scooter since these scooters were exempted. As the government has categorised the scooters as 'light two-wheeler powered vehicle,' a driving licence will be mandatory for using them. The e-scooters will

also have to sport valid licence plates. Electric scooters are safe to ride, if you know what to check before riding to avoid an accident (and wear a helmet). It also helps if you're familiar with riding before jumping on a shared scooter, which is the focus of most accident-related studies. This is the big question, and in the vast majority of cases, the answer is no. In fact, even if an e- scooter is claimed tobe waterproof (or water resistant), many manufacturers will still advise riders to avoid using their products in the rain Teenagers between 16-18 to get valid driving license to drive e-scooters in India. The Road and Transport Ministry of India decided to amend the motor vehicle rules in order to provide a valid driving license to youths between 16 to 18 years of age to drive e-scooters in India at a maximum speed of 70 km per hour.

DATA ANALYSIS AND INTERPRETATION:

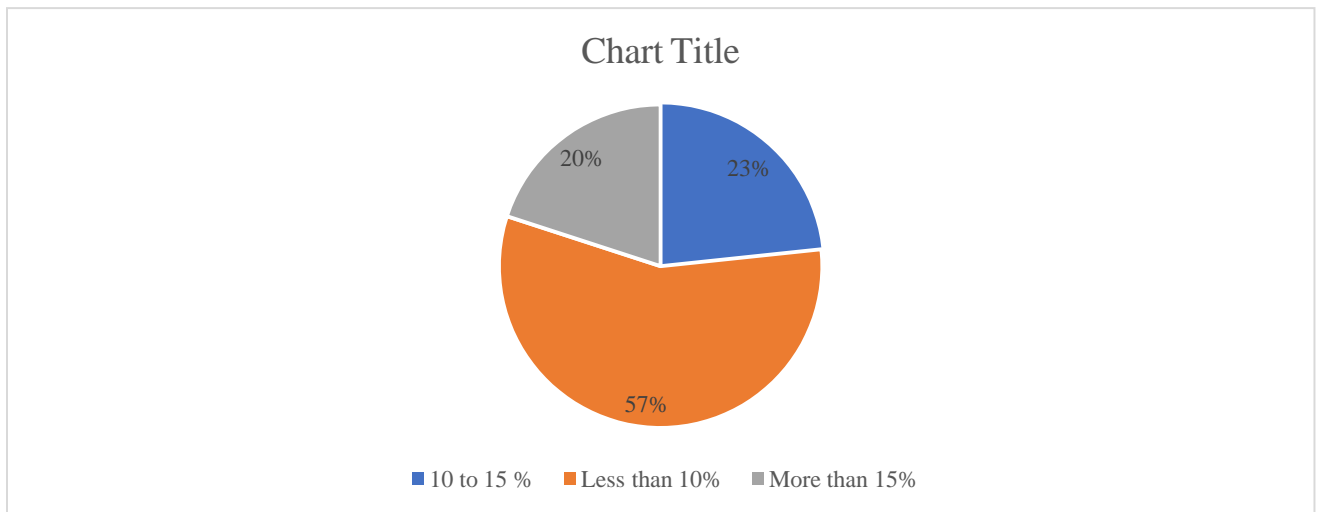
Simple percentage

1) In your estimation, what proportion of your residents use an electric scooter?

Table: 1.1

Residents use				
	Frequency	Percent	Valid Percent	Cumulative Percent
10 to 15 %	28	23.3	23.3	23.3
Less than 10%	68	56.7	56.7	80.0
More than 15%	24	20.0	20.0	100.0
Total	120	100.0	100.0	

Chart: 1.1



INTERPRETATION:

The above table indicates that 23.3% of the respondents prefer 10 to 15 %, 56.7% of the respondents prefer Less than 10%, 20% of the respondents prefer More than 15%.

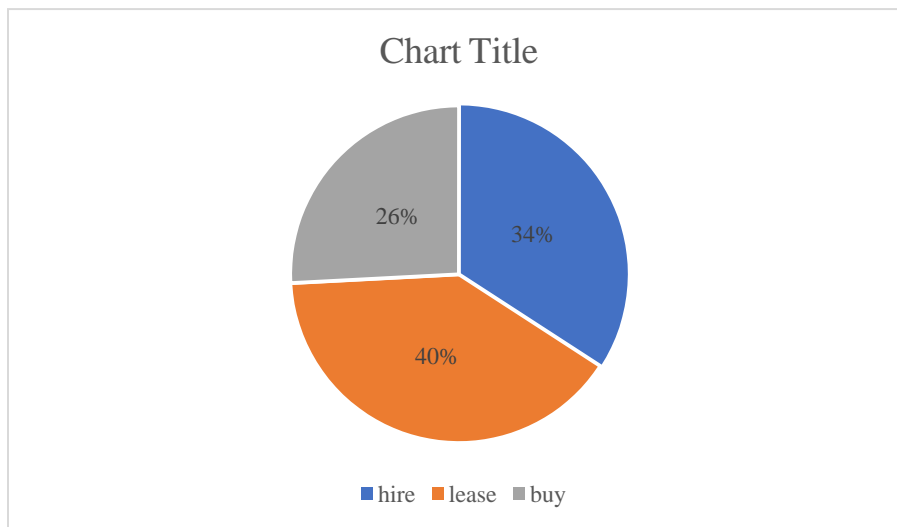
2) In your opinion what proportion buy, lease and hire their vehicles?

Table: 1.2

your Opinion

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid hire	41	34.2	34.2	34.2
lease	48	40.0	40.0	74.2
buy	31	25.8	25.8	100.0
Total	120	100.0	100.0	

Chart: 1.2



INTERPRETATION:

The above table indicates that 34.2% of the respondents prefer Hire, 40% of the respondents prefer Lease, 25.8% of the respondents prefer Buy.

3) If you have used are where to use on electric scooter would you feel safe riding it?

Chi-Square test

Frequencies

Table: 1.3

Feel safe			
	Observed N	Expected N	Residual
Un safe	49	40.0	9.0
Safe	43	40.0	3.0
Very safe	28	40.0	-12.0
Total	120		

Table: 1.3

Test Statistics	
	Feel safe
Chi-Square	5.850 ^a
df	2
Asymp. Sig.	.054

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 40.0.

INTERPRETATION

The above table indicates that 49% of the respondents prefer Unsafe, 43% of the respondents prefer Safe, 28% of the respondents prefer Very safe.

4) In the presences of an applied electric field in a metallic conductor?

Chi-Square Test

Frequencies

Table: 4.1

electric field			
	Observed N	Expected N	Residual
The electrons move in the opposite direction	29	40.0	-11.0
The electrons move in the direction	31	40.0	-9.0
The electrons move in the positive direction	60	40.0	20.0
Total	120		

Table: 4.2

Test Statistics	
	electric field
Chi-Square	15.050 ^a
df	2
Asymp. Sig.	.001

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 40.0.

INTERPRETATION:

The above table indicates that 29% of the respondents prefer the electrons move in the opposite direction, 31% of the respondents prefer the electrons

move in the direction, 60% of the respondents prefer the electrons move in the positive direction.

5) Ever electronic scooter will be had the following components?

Table: 1.5

		Components			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Throttle button or level	47	39.2	39.2	39.2
	Battery	43	35.8	35.8	75.0
	Motor	30	25.0	25.0	100.0
	Total	120	100.0	100.0	

Table: 1.5.1

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
components	120	1.8583	.79172	1.00	3.00

Table: 1.5.2

ANOVA

Components

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.331	2	4.166	7.355	.001
Within Groups	66.260	117	.566		
Total	74.592	119			

INTERPRETATION:

The above table indicates that 39.2% of the respondents prefer Throttle button or level, 35.8% of the respondents prefer Battery, 30% of the respondents prefer Motor.

FINDINGS:

The average speed of electric scooters is around 15 mph (24 km/h). Many people are fine to not travel any faster than this on the road, but you can get e- scooters that can reach much higher speeds. For example, the Raine One has a top speed of 50 km/h (31 mph), which is double the average

speed.25-Jan- 2021The wooden kick scooter with skate wheels, crude but very effective, dates back to sometime in the late 19th century, when motorized bikes were also developed. The first motorized scooter for adults, the Auto pod, was developed in 1913 and patented in 1916 by inventor Arthur Hugo Cecil Gibson.

SUGGESTIONS:

The Bajaj Chetak is unique in the fact that it gets a proper metal body compared to most electric scooters which get plastic or fibre body panels. The Bajaj Chetak is powered by a 3kWh battery pack that sends power to a 3,800W BLDC motor. It features a range of around 95 kilometres in one charge. Electric scooters are great for the environment, as their use doesn't result in greenhouse- gas emissions. They are very energy-efficient and only use as much electricity as a bigger household appliance. That requires awareness of their unique risks: small wheels, effortless acceleration, and often limited braking. They don't handle rough terrain as safely as a bicycle. It's also easy for electric scooter riders to endanger others by riding too quickly in crowds.

injuries per mile than bicyclists and were twice as likely to be injured because of potholes, pavement cracks, lampposts, and signposts, although bicyclists were three times as likely to be hit by a motor vehicle. E-scooters are currently classified as Personal Light Electric Vehicles (PLEVs), so they're treated as motor vehicles and are subject to all the same legal requirements – MOT, tax, licensing and specific construction. Because they don't always have visible rear lights or a number plate, they can't be used on the road.

CONCLUSION:

Hybrid cars are definitely more environmentally friendly than internal-combustion vehicles. Accordingly, manufacturing and using the electric cars is not a big hurdle. According to a report by NITI Aayog, India can save 64% of anticipated passenger road-based mobility-related energy demand and 37% of carbon emissions in 2030 by pursuing a shared, electric, and connected mobility future. Scooters are more than 1,000% more efficient per mile than the average combustion vehicle based on the energy needed to move them. Even if e-scooters' batteries are

powered by a grid that relies on fossil fuels, the emissions per mile from the electricity generation is negligible. Electric vehicles (EVs) offer an opportunity to replace fossil fuels in the transport sector. Electrification of the transport sector can also bring benefits in terms of increased energy efficiency and reduced local pollution. To conclude, the car of the future, built according to a new model, will be electric, autonomous and connected. It will bring a number of benefits to society: less pollution, more safety, more free time and services.

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