Intention to Adopt Electric Vehicles Among Early Adopters in a Developing Economy: An Oaxaca-Blinder Decomposition Approach

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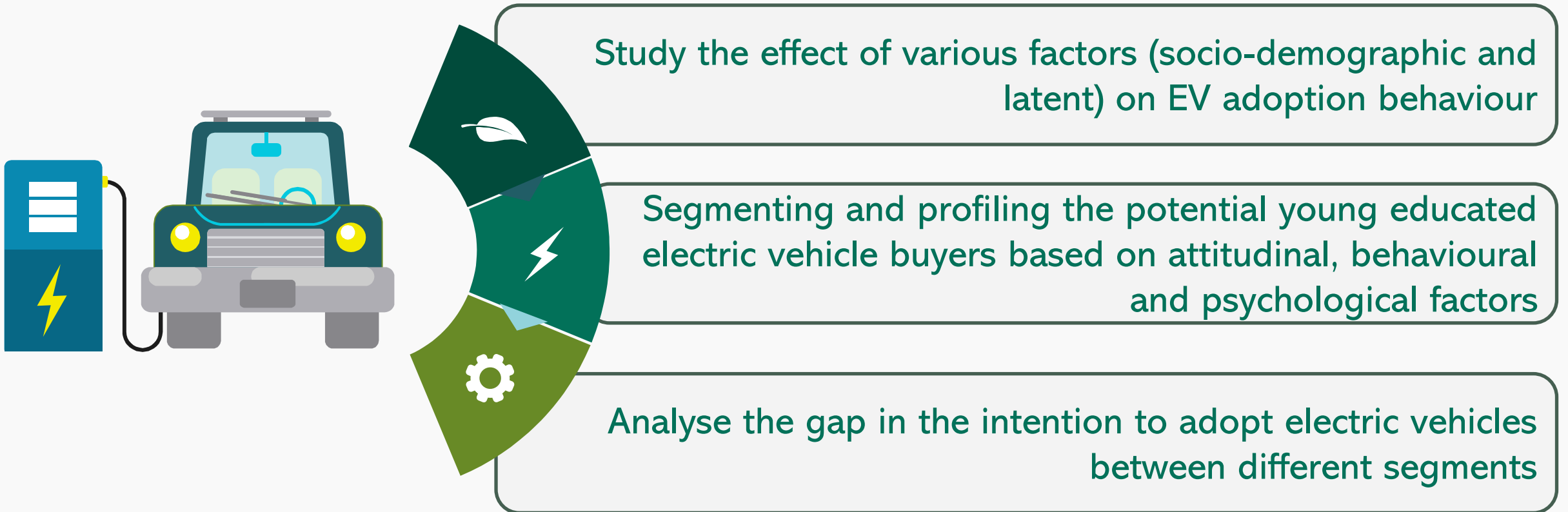Indian Institute of Science (IISc),
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Outline

- Study context
- Objectives
- Methodology
- Variables and data
- Data analysis and results
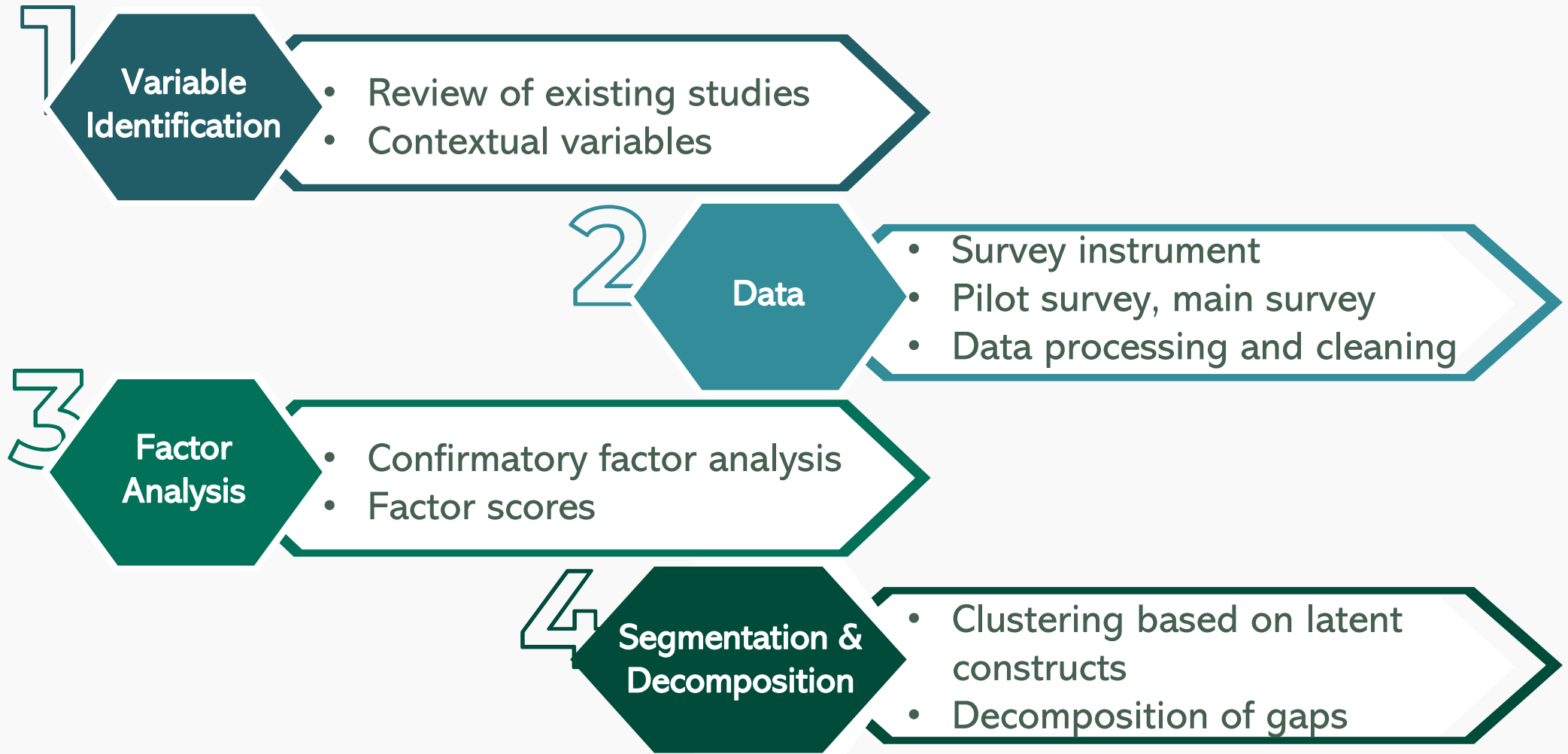- Conclusions, limitations and future scope

Study Context

- India is characterised by a median age of little more than 28 years

- India has the world's largest millennial population standing at around 440 million, which makes up approximately one-third of the country's population

- Two-thirds of the country's people are between the ages of 20 and 35 years

- Younger people have been found to be more open to the early adoption of innovations and sustainable technologies such as electric vehicles because of their technological enthusiasm and environmental concerns (Sovacool et al., 2018).

- Indian-educated youngsters have also been found to have a higher propensity toward purchasing a vehicle (Verma et al., 2017)
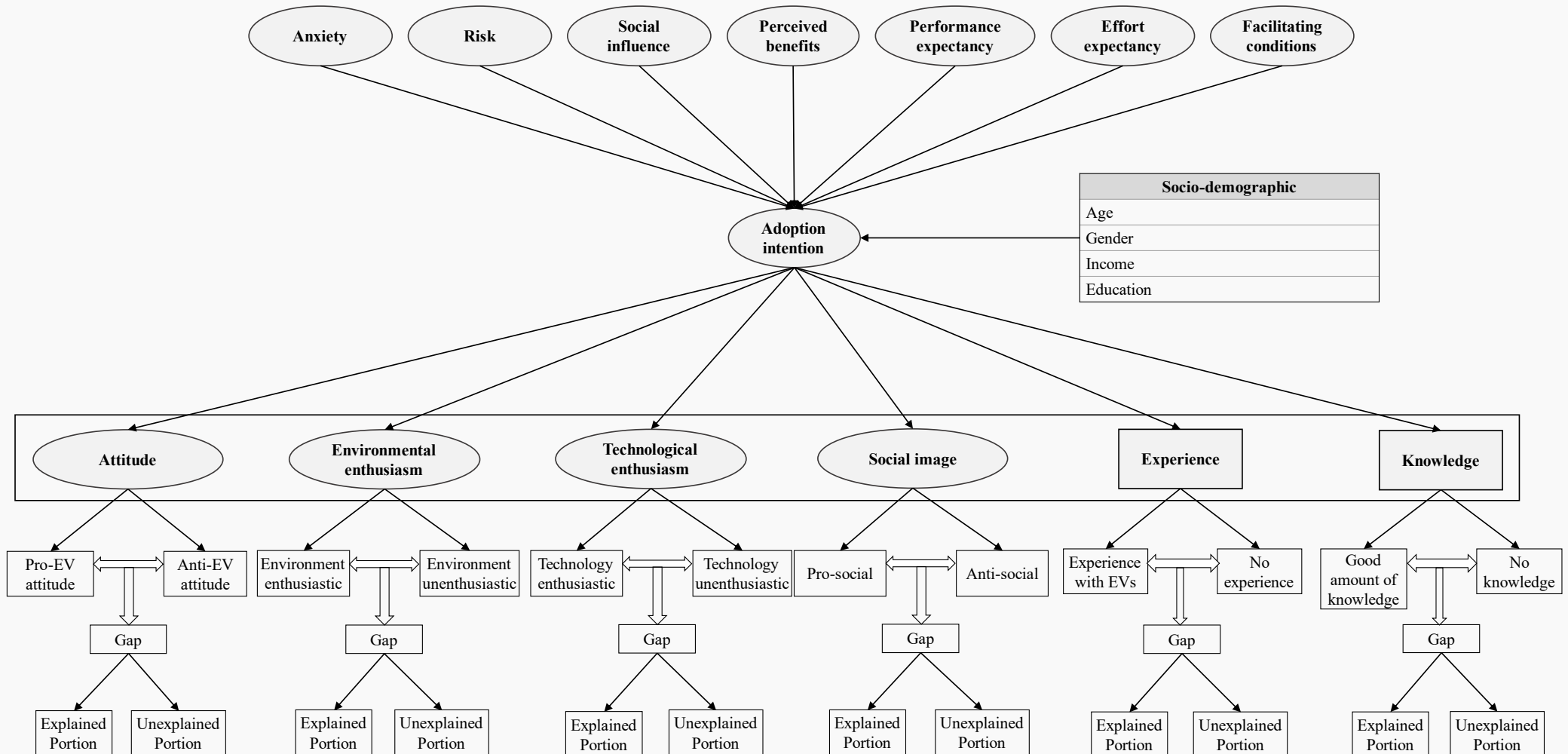
Objectives

Study the effect of various factors (socio-demographic and latent) on EV adoption behaviour

Segmenting and profiling the potential young educated electric vehicle buyers based on attitudinal, behavioural and psychological factors

Analyse the gap in the intention to adopt electric vehicles between different segments

Methodology

1 **Variable Identification**
- Review of existing studies
- Contextual variables

2 **Data**
- Survey instrument
- Pilot survey, main survey
- Data processing and cleaning

3 **Factor Analysis**
- Confirmatory factor analysis
- Factor scores

4 **Segmentation & Decomposition**
- Clustering based on latent constructs
- Decomposition of gaps

Methodology

Questionnaire

| Constructs	Items	Codes
Environmental Enthusiasm	I think we need to address environmental problems	EnvEnth1
	I think we owe it to our future generations to provide them with a quality environment	EnvEnth2
	I feel bad about the degrading environment	EnvEnth3
	I am willing to pay extra money for things to protect the environment	EnvEnth4
Technological Enthusiasm	I get excited about a new product in the market	TechEnth1
	I like to buy new products early after their launch	TechEnth2
Anxiety (Perceived risk)	I would not be able to charge the vehicle at home	Anx1
	There are not enough charging stations in and around the places I travel to	Anx2
	Electric vehicles take too long to charge	Anx3
Social Image	Driving an EV would make people perceive me as a person who cares about the environment	SocIma1
	Driving an EV would make me feel like a responsible citizen of the society	SocIma2
	It will give me a feeling of satisfaction to drive an EV	SocIma3
Social Influence	I will buy an EV if I read good reviews about them	SocInf1
	I will buy an EV if my friends recommend me to buy	SocInf2
	I will buy an EV if my relatives recommend me to buy	SocInf3
Perceived Benefits	Driving an EV reduces the carbon footprint	PerBen1
	Driving an EV reduces our dependence on fossils	PerBen2

Variables
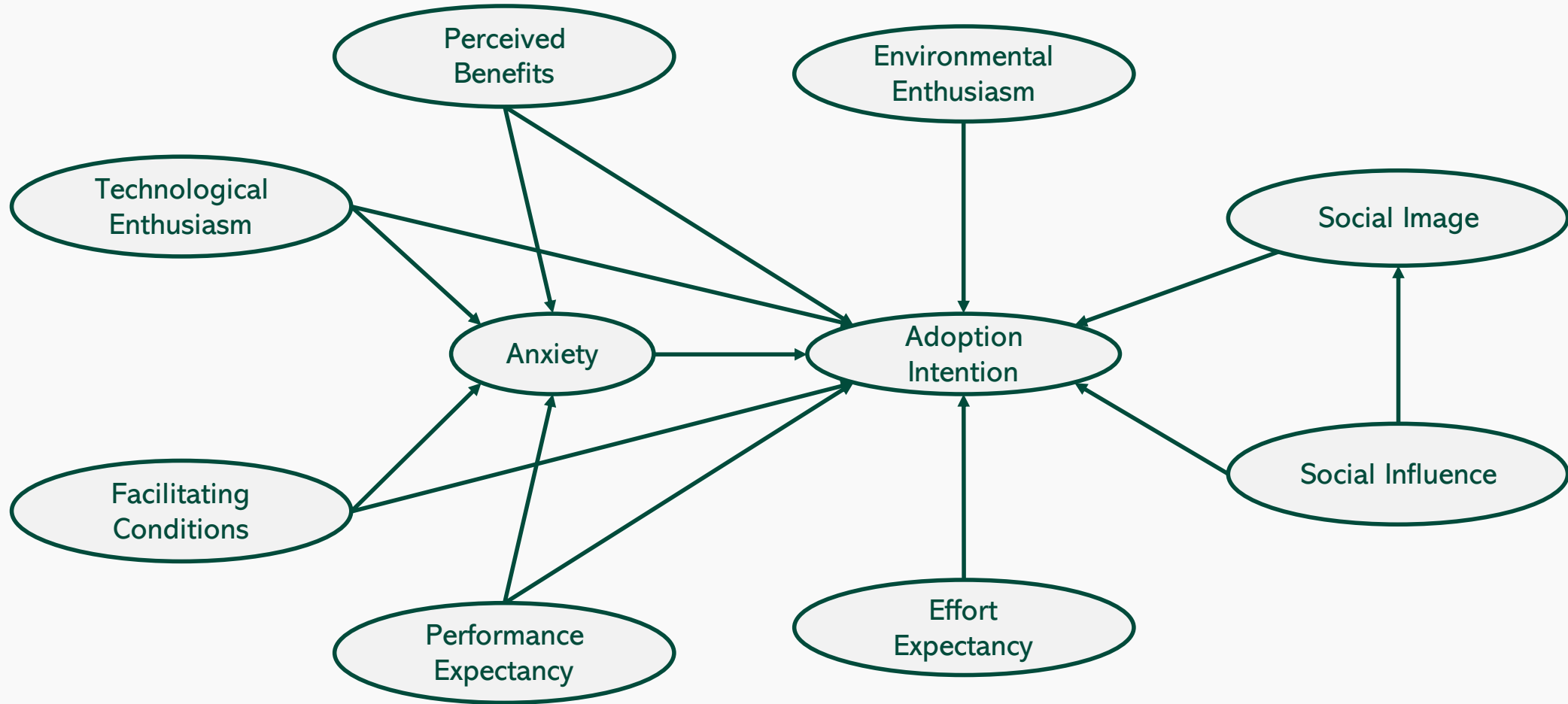
Data Description

- Sample data collected from the students at Indian Institute of Science, Bengaluru
- Simple random sampling method followed by snowball sampling
- A total of 656 valid responses were obtained from February to April 2021
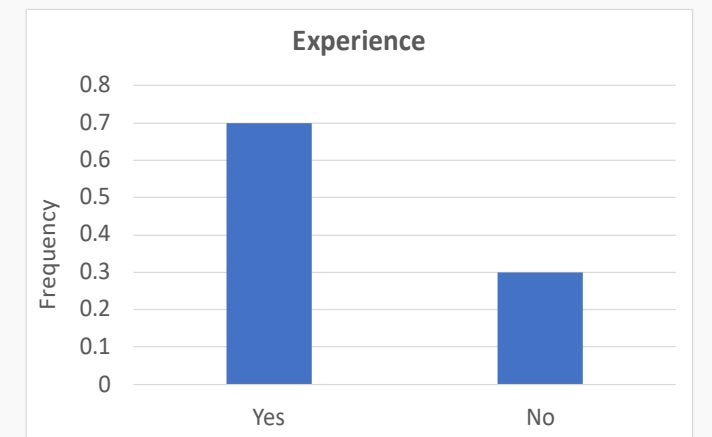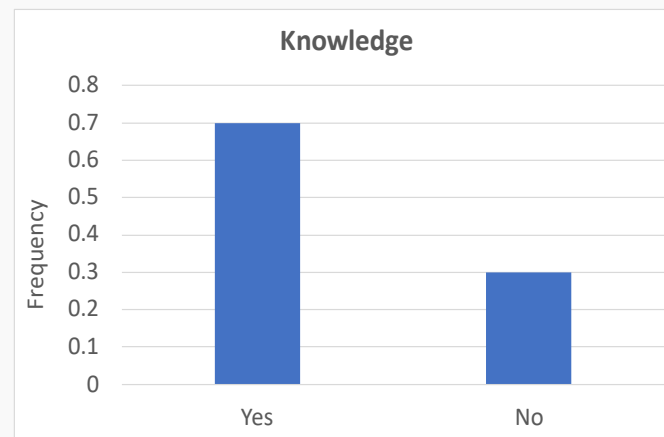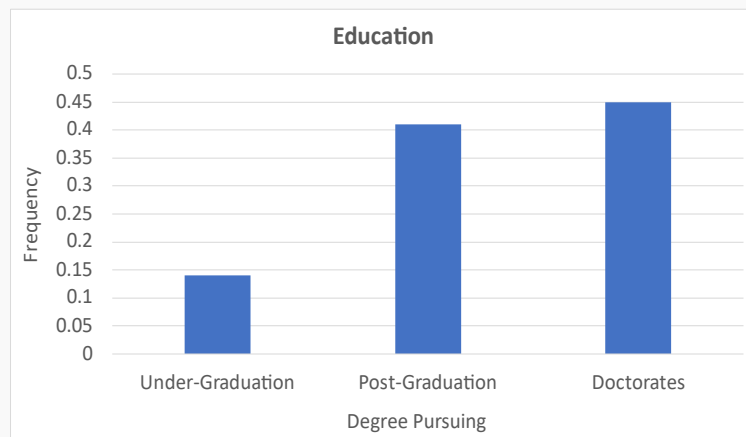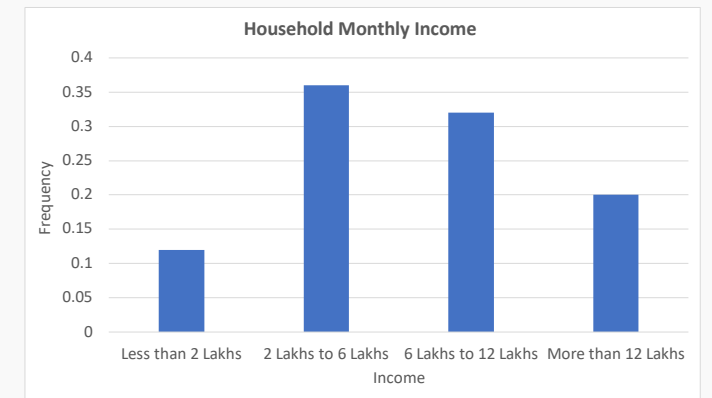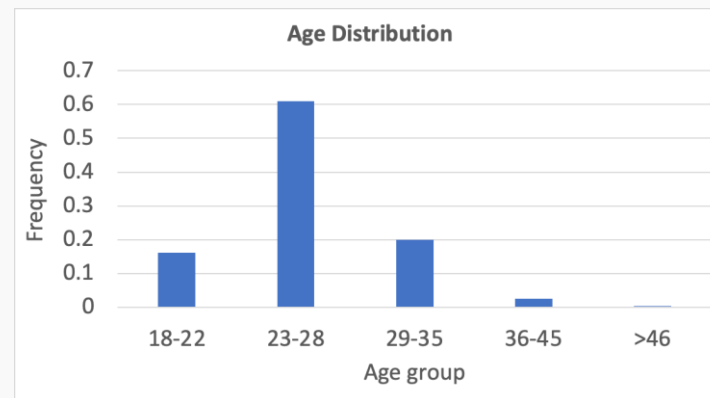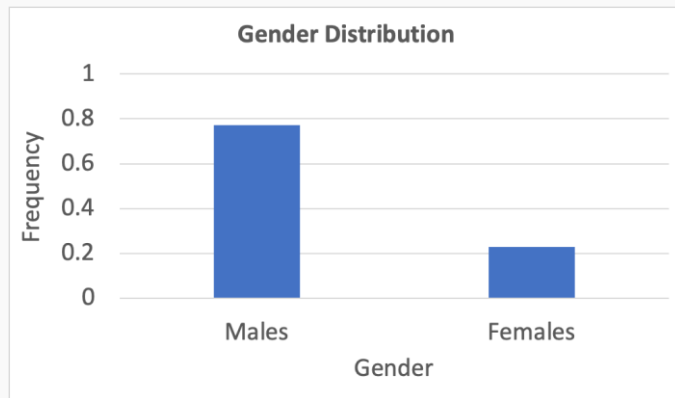
Factor analysis
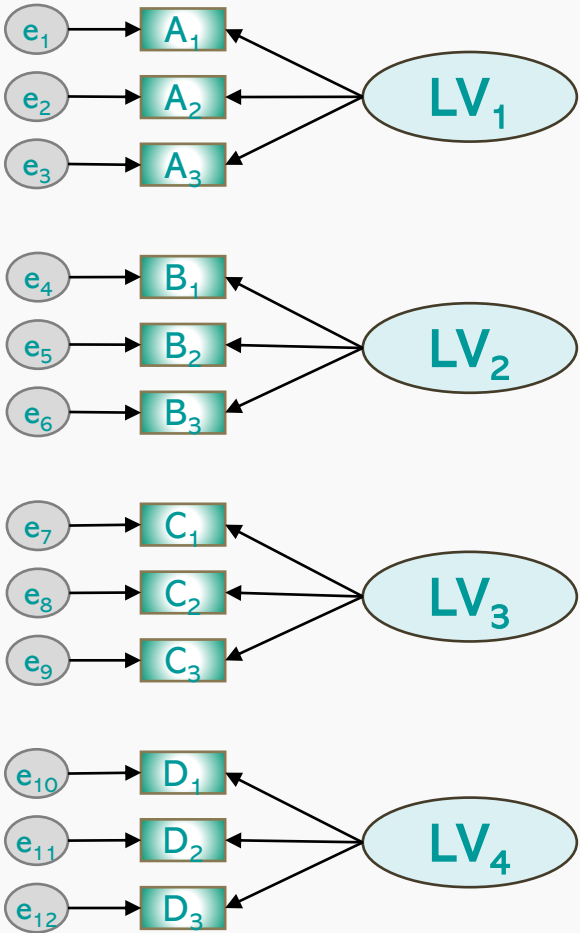
Construct	Items	Loadings	Composite Reliability	Cronbach's alpha	AVE
Environmental Enthusiasm	EnvEnth1	0.832	0.796	0.848	0.593
	EnvEnth2	0.816			
	EnvEnth3	0.710			
	EnvEnth4	0.714			
Technological Enthusiasm	TechEnth1	0.899	0.759	0.709	0.592
	TechEnth2	0.612			
Anxiety	Anx1	0.714	0.712	0.766	0.547
	Anx2	0.883			
	Anx3	0.593			
Social Image	SocIma1	0.787	0.815	0.824	0.652
	SocIma2	0.756			
	SocIma3	0.876			
Social Influence	SocInf1	0.540	0.841	0.805	0.681
	SocInf2	0.964			
	SocInf3	0.907			
Perceived Benefits	PerBen1	0.929	0.765	0.835	0.739
	PerBen2	0.783			
Attitude	Att1	0.763	0.841	0.881	0.657
	Att2	0.783			
	Att3	0.838			
	Att4	0.855			
CFI = 0.990	TLI = 0.998		RMSEA = 0.046		SRMR = 0.050

Results

Construct	Group	N	Mean	f-value	Mean difference	p-value
Attitude	Pro-EV attitude	278	0.508	493.2	0.93	< 0.001
	Anti-EV attitude	348	−0.422			
Environmental enthusiasm	Pro-environment	313	0.338	207.4	0.69	< 0.001
	Anti-environment	313	−0.356			
Technological enthusiasm	Pro-technology	301	0.257	97.55	0.512	< 0.001
	Anti- technology	326	−0.255			
Social Image	Pro-social	372	0.300	253.6	0.762	< 0.001
	Anti- social	254	−0.462			
Knowledge	Good knowledge	188	0.279	49.6	0.412	< 0.001
	No knowledge	438	−0.133			
Experience	Experience	435	0.033	5.3	0.139	0.022
	No experience	191	−0.106			

Construct	Group	Mean	Gap	Endowment	Coefficient	Interaction
Attitude	Pro EV attitude	0.508	0.930 (100%)	0.642 (69.1%)	0.274 (29.4%)	0.014 (1.5%)
	Anti EV attitude	0.422				
Environmental enthusiasm	Pro-environmental	0.338	0.695 (100%)	0.412 (59.3%)	0.258 (37.2%)	0.024 (3.5%)
	Anti- environmental	−0.357				
Technological enthusiasm	Pro-technology	0.257	0.512 (100%)	0.247 (48.2%)	0.291 (56.9%)	−0.025 (−4.9%)
	Anti-technology	−0.255				
Social Image	Pro-social	0.300	0.762 (100%)	0.384 (50.4%)	0.317 (41.6%)	−0.061 (−8%)
	Anti- social	−0.462				
Knowledge	Knowledge	0.279	0.412 (100%)	0.282 (68.4%)	0.138 (33.5%)	−0.008 (−1.9%)
	No knowledge	−0.133				
Experience	Experience	0.033	0.139 (100%)	0.067 (48.2%)	0.069 (49.6%)	0.003 (2.2%)
	No experience	−0.106				

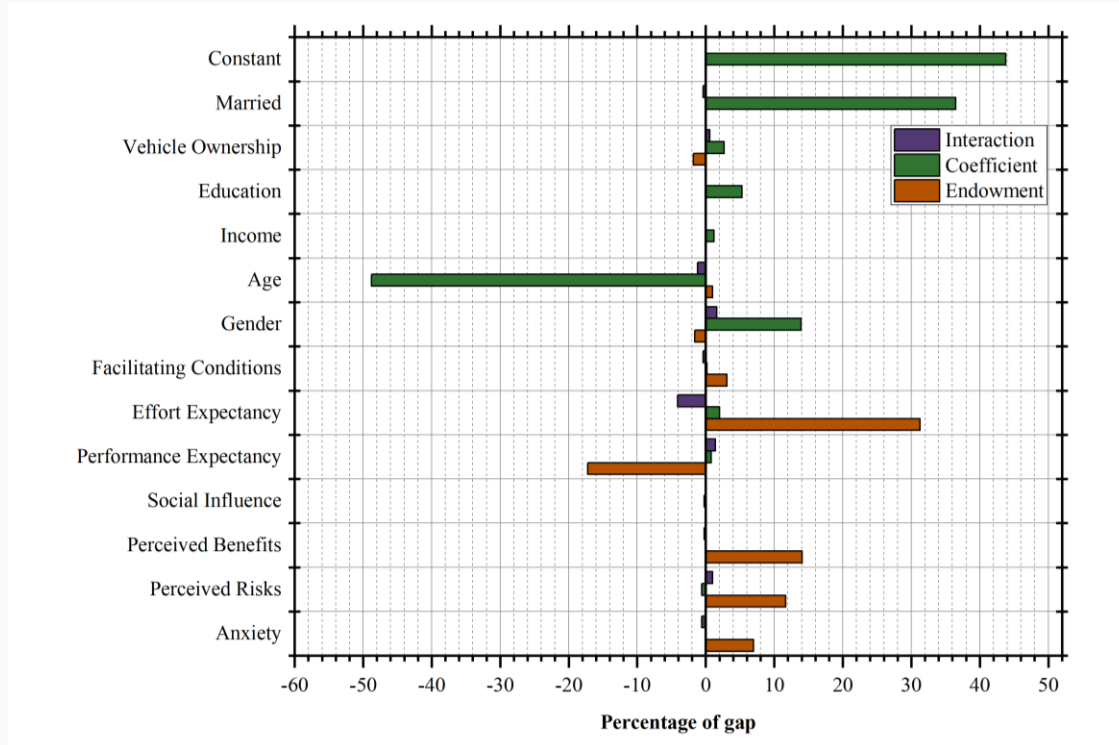# Decomposition of gap
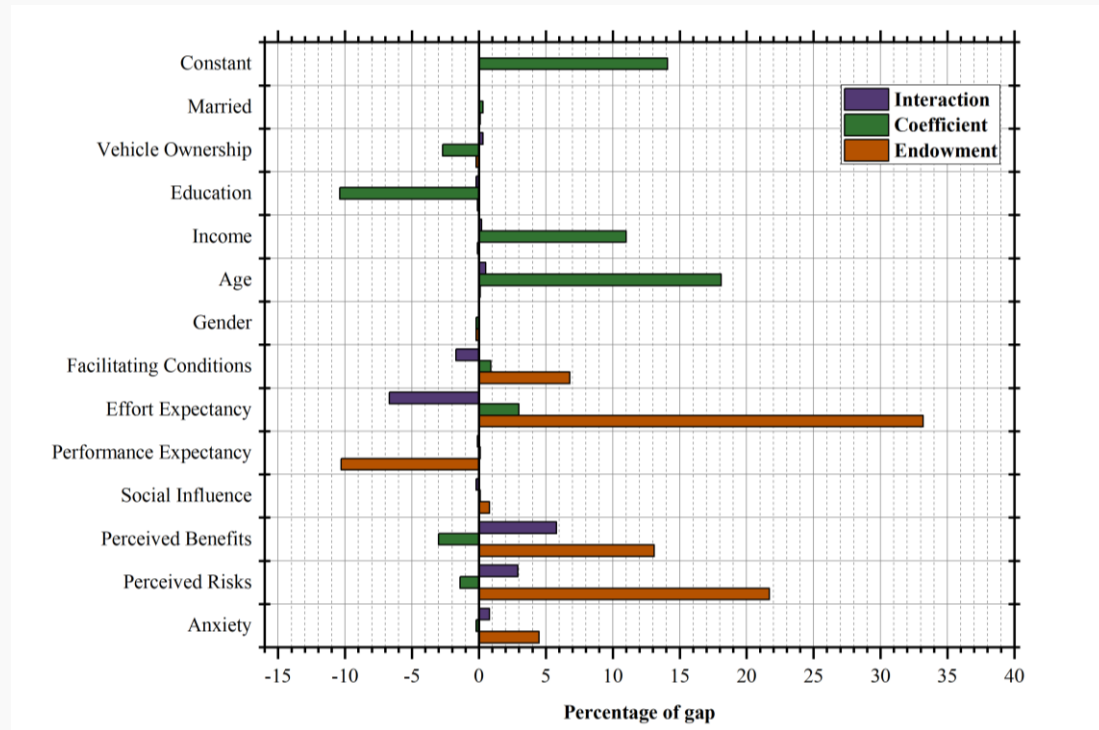
Contribution to the endowment, coefficient, and interaction portion in mean <u>attitude</u> towards electric vehicles
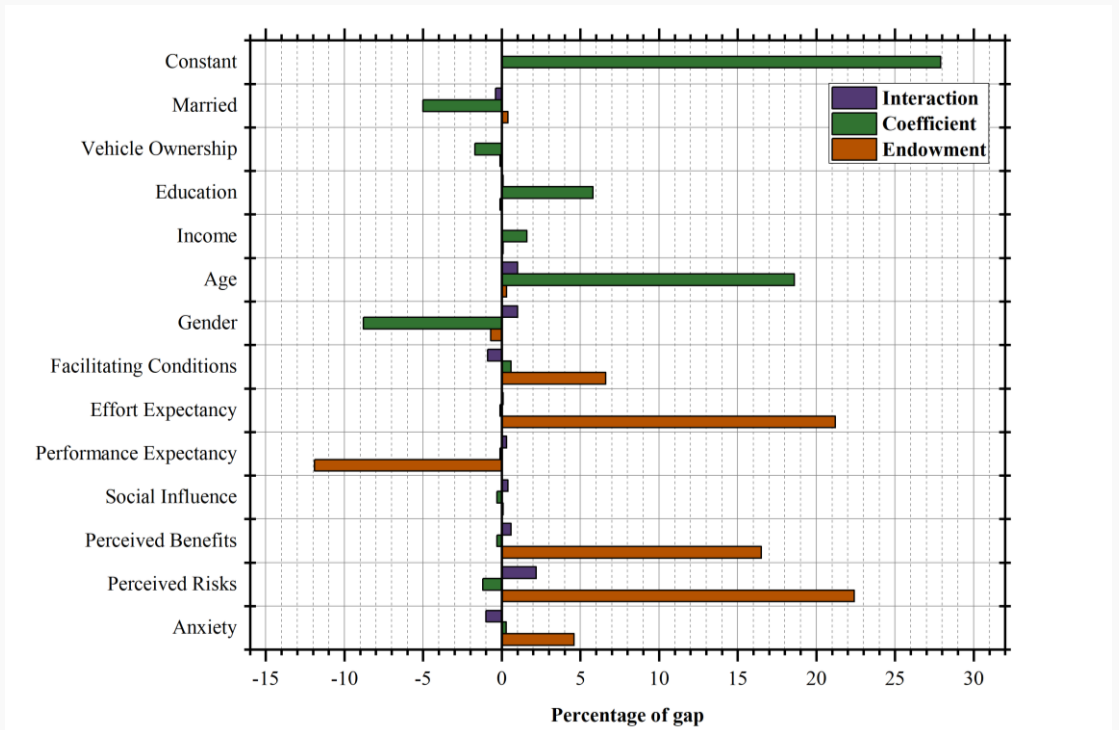
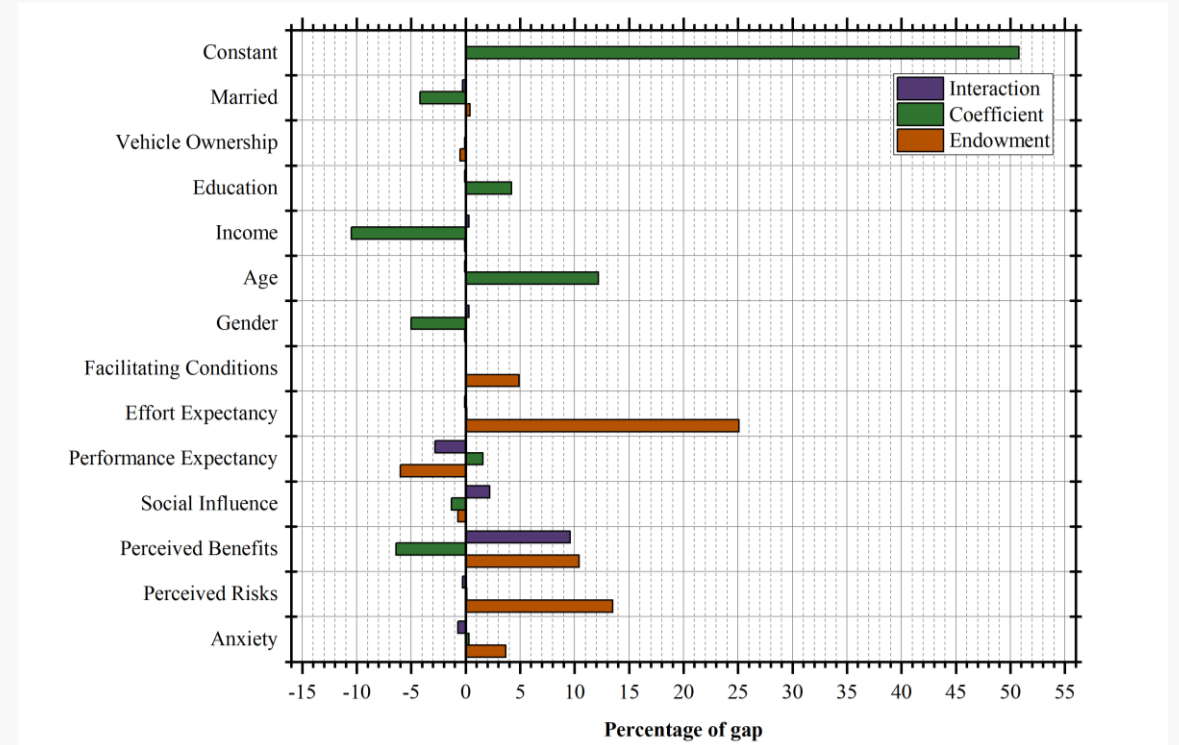Contribution to the endowment, coefficient, and interaction portion in mean <u>environmental enthusiasm</u> towards electric vehicles

Decomposition of gap

Contribution to the endowment, coefficient, and interaction portion in mean **technological enthusiasm** towards electric vehicles

Contribution to the endowment, coefficient, and interaction portion in mean **social image** towards electric vehicles
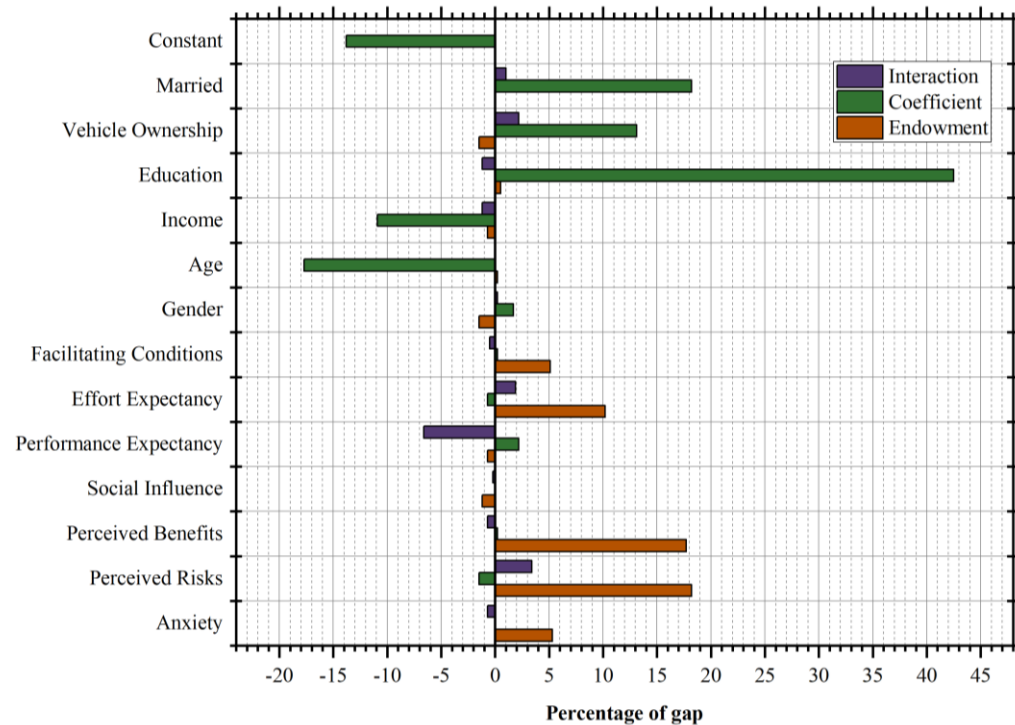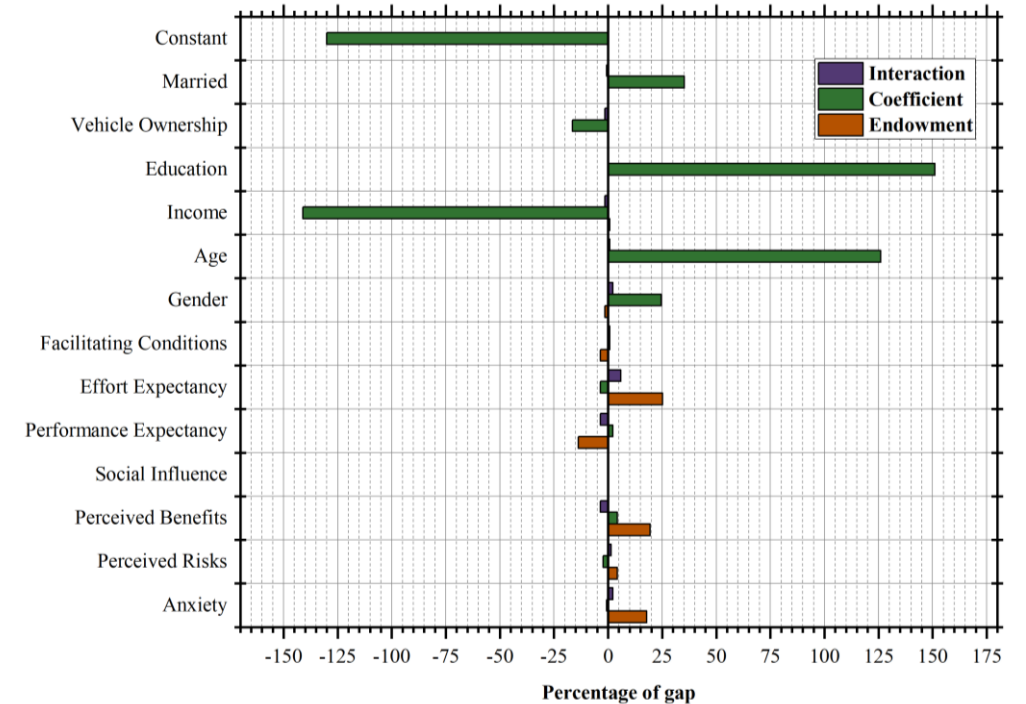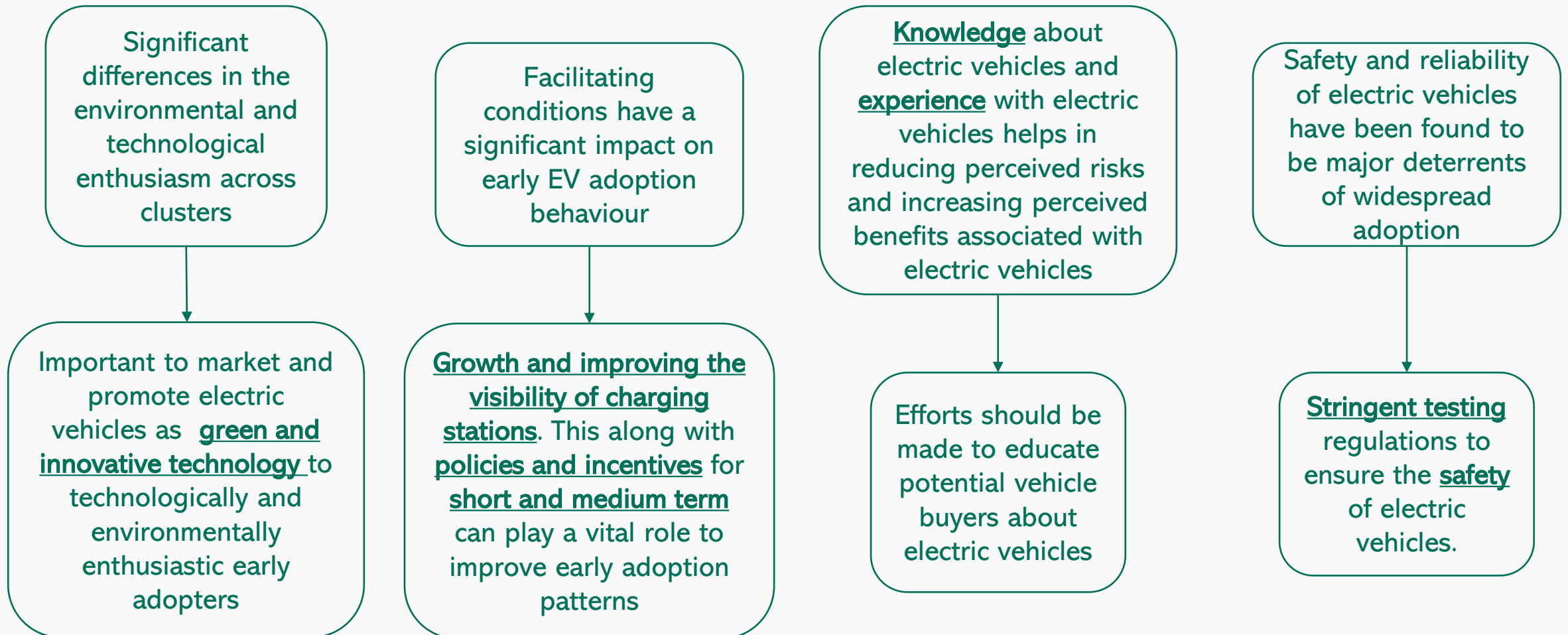
Decomposition of gap

Contribution to the endowment, coefficient, and interaction portion in mean <u>knowledge</u> towards electric vehicles

Contribution to the endowment, coefficient, and interaction portion in mean <u>experience</u> towards electric vehicles

Findings and implications

Significant differences in the environmental and technological enthusiasm across clusters

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Important to market and promote electric vehicles as **green and innovative technology** to technologically and environmentally enthusiastic early adopters

Facilitating conditions have a significant impact on early EV adoption behaviour

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Growth and improving the visibility of charging stations. This along with **policies and incentives** for **short and medium term** can play a vital role to improve early adoption patterns

Knowledge about electric vehicles and **experience** with electric vehicles helps in reducing perceived risks and increasing perceived benefits associated with electric vehicles

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Efforts should be made to educate potential vehicle buyers about electric vehicles

Safety and reliability of electric vehicles have been found to be major deterrents of widespread adoption

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Stringent testing regulations to ensure the **safety** of electric vehicles.

Policy implications

- Marketing campaigns should be designed to highlight the <u>green and innovative image</u> of electric vehicles. This will cater technologically and environmentally enthusiastic early adopters.

- <u>Growth</u> and improving the <u>visibility</u> of <u>public charging stations</u> will help in inducing electric vehicle adoption.

- Policies to reduce the initial purchase cost can help improve the uptake of electric vehicles. These can be <u>subsidies and incentives</u> in the short-term and better business models such as <u>subscription-based battery services</u> in the long run.

- <u>Stringent testing</u> regulations to ensure the <u>safety</u> of electric vehicles.

- Electric vehicles in the Indian market can be customised with some <u>female-friendly features</u> such as automatic transmission, assisted navigation, and rear parking cameras to make electric vehicles more lucrative to females.

- <u>Knowledge</u> about electric vehicles and <u>experience</u> with electric vehicles helps in reducing perceived risks and increasing perceived benefits associated with electric vehicles. Hence, efforts should be made to educate potential vehicle buyers about electric vehicles.

Conclusions

- The study demonstrates the usefulness of different psychographic factors in segmenting potential electric vehicle buyers into different segments.

- By investigating these features, the respondents were segmented into three clusters, namely innovation adoption leads, innovation adoption indifferents and innovation adoptions idlers.

- The first segment of idlers is found to display particularly disapproving opinions regarding all the latent variables, with cluster means for all the latent factors being negative and lower than the mean values.

- On the contrary, the cluster means for all clustering variables in the case of leads is observed to be positive and higher than the mean values, implicating a positive perception of these variables among this group.

- It is very important for strategists and planners to target and capture this cluster of technology leaders as this can help in the widespread adoption of electric vehicles in the near future.

Thank you for listening

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