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Revolutionizing the Drive: Exploring Consumer Perceptions of Innovative Automatic Transmission Technologies in India's Automobile Sector

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Abstract: ***The automobile sector today is one of the important sectors of the country contributing the majority to the economic development of India. The challenges that today's automotive manufacturers face are enormous. Internationalization, the rapid pace of technological progress, and customer demand have all had an impact on how businesses are conducted. Product innovation has been a trademark of the auto industry for the last decades. One of the major innovations of automakers is the development of automatic transmission technologies in a different form which has been successfully adopted by Major players like Maruti Hyundai, Tata and others to lower driving efforts and to experience stress-free driving among consumers. There are majorly five types of automatic transmission technologies available in the Indian market. These are AMT (Automated Manual Transmission), CVT (Continuously Variable Transmission), IMT (Intelligent Variable Transmission), DCT(Dual clutch transmission), and Torque Converter (TC). The demand for automatic cars is increasing remarkably in the last five years, especially in small passenger car segments. This study is about understanding the consumers' perception of different types of automatic transmission technologies adopted by carmakers.***

Keywords: AMT, CVT, DCT, IMT

1. Introduction

In recent years, the automotive industry has witnessed a significant shift in transmission technology, with a growing emphasis on Automatic Transmission (AT) and Automated Manual Transmission (AMT) cars. These innovative transmission systems offer a range of benefits, such as enhanced driving comfort, improved fuel efficiency, and simplified operation, making them increasingly popular among car manufacturers and consumers alike. As the world moves towards a more automated and technology-driven future, understanding consumer attitudes towards adopting AT/AMT cars becomes paramount for automakers seeking to cater to evolving consumer preferences. This research aims to delve into the intricate nuances of consumers' perceptions, preferences, and potential hesitations surrounding AT/AMT cars. By gaining valuable insights into the factors influencing their adoption decisions, car manufacturers and marketers can tailor their strategies effectively to meet consumer demands and expectations.

The current study seeks to answer crucial questions, including the reasons consumers opt for AT/AMT cars over conventional manual transmissions, the perceived advantages and disadvantages associated with these transmission types, and the impact of factors such as age, gender, and driving habits on their attitudes towards adopting such vehicles. Additionally, exploring the comparison between AT and AMT technologies and their impact on consumer preferences will provide a comprehensive understanding of the transmission landscape.

To achieve our research objectives, we will employ a mixed-method approach, encompassing surveys, interviews, and focus groups to gather data from a diverse sample of potential car buyers. By combining qualitative and quantitative data, we aim to paint a nuanced picture of consumer sentiments towards AT/AMT cars, shedding light on both the practical and emotional aspects of their decision-making process.

The findings of this study hold potential implications for the automotive industry, enabling car manufacturers to fine-tune their product offerings, marketing strategies, and customer engagement initiatives. Moreover, insights gained from this research will contribute to the existing body of knowledge on consumer behaviour and technology adoption trends, fostering innovation and growth in the ever-evolving automotive landscape.

2. Overview of Transmission Technologies

1) AMT (Automated Manual Transmission)

The acronym AMT refers to Automated Manual Transmission, which functions as a semi-automatic transmission mechanism. Nevertheless, numerous automobile manufacturers also refer to it using alternative brand designations. Maruti Suzuki refers to this technology as Auto Gear Shift (AGS), which is extensively employed in several automobile models like Swift, Celerio, Wagon R, New Baleno 2022, and Cappuccino, among others. The Automated Manual Transmission (AMT) employs a conventional clutch and gear arrangement while emulating the functionality of a manual transmission through the utilization of sensors, actuators, processors, and pneumatics. The aforementioned transmission variant is characterized by a lower cost compared to conventional automatic transmissions. However, it offers users the advantages of

improved fuel efficiency and the added convenience of dual-pedal technology. In addition to Maruti Suzuki, Tata Motors also incorporates automated manual transmission (AMT) technology in its vehicle lineup, including the Nexon SUV, Tigor compact car, Tiago, and Punch. The Hyundai Santro, Renault Kwid, and Triber easy-R versions are also constructed using Automated Manual Transmission (AMT) technology

2) CVT (Continuous Variable Transmission)

CVT, short for Continuously Variable Transmission, is a variant of automatic transmission. Instead of utilizing conventional steel gears, this technique leverages the use of belts or pulleys. The transmission system offers seamless gear transitions by employing a diverse range of gear ratios that are contingent upon the engine's revolutions per minute (RPM). A continuously variable transmission (CVT) system emphasizes achieving maximum fuel efficiency while simultaneously ensuring consistent acceleration. When compared to alternative automatic transmission systems, it is observed that the engine noise produced by a continuously variable transmission (CVT) vehicle might be relatively high. In the Indian market, several automotive models, including the Maruti Suzuki Baleno, Honda Jazz, Nissan Micra, and Honda Amaze, are equipped with a Continuously Variable Transmission (CVT) system in their highest variant.

3) IVT (Intelligent Variable Transmission)

The newly developed Intelligent Variable Transmission (IVT) employs a continuous shifting mechanism to attain enhanced fuel efficiency compared to automated transmissions, similar to that of a continuously variable transmission. The achievement of this objective is facilitated through the manipulation and adjustment of the pressure inside the pulley system of the transmission, which is done by the driver's commands and the prevailing driving conditions. The pulley system exhibits a substantial ratio, so establishing a direct association with a significantly broader scope of operation in comparison to numerous alternative transmission techniques. This elucidates the reason behind the enhanced fuel efficiency shown in higher gear ratios, as opposed to the superior performance exhibited by lower gear ratios. The technology in question has been implemented in Hyundai's Verna, Elantra, and i20 models.

4) Torque Converter

A torque converter is a mechanical device used in automotive applications to transmit power from the engine to the transmission. Traditional automatic gearboxes, referred to as torque converter automatic transmissions, are very prevalent in the automotive industry as a prevalent form of self-shifting technology. Instead of employing a clutch mechanism, the task of gear shifting is accomplished by the utilization of either a hydraulic fluid coupling or a torque converter. The Engine Control Unit (ECU) of the vehicle is directly linked to the system to facilitate seamless and accurate control of the vehicle's engine. The aforementioned technology In the Indian automotive market, prominent automakers such as Hyundai, Mercedes-Benz, BMW, and Audi have included automatic gearbox technology in a significant portion of their vehicle and SUV models.

5) IMT (Intelligent Manual Transmission)

Intelligent Manual Transmission (IMT) is a technological advancement in the field of automotive engineering. Hyundai is set to become the inaugural automaker to introduce this technological advancement on a subcompact sport utility vehicle (SUV) in the Indian market, namely on the Venue model. However, it was the Kia Sonet subcompact SUV, which is the sister vehicle of the Venue, that was originally intended to showcase this technology during its unveiling. The Kia Sonet is expected to offer an intelligent manual transmission (iMT) option as well. Kia Motors also incorporates this technology on a global scale. The technology was specifically designed for implementation in mild-hybrid vehicles. The Toyota Fortuner offers a diesel engine option, which includes an intelligent Manual Transmission (iMT) variation. One potential advantage is that the ease of driving in congested traffic may be enhanced. Moreover, it successfully retains the tactile experience of using a manual transmission when changing ratios. According to sources, iMT technology is purported to provide enhanced fuel efficiency due to its utilization of electronically controlled clutch movements.

6) DCT

The Dual Clutch Transmission (DCT) is a hybridized transmission system that integrates elements of both automated and manual gearbox systems. The absence of a torque converter is a distinguishing feature of this transmission, as it deviates from the conventional design of automatic transmissions. This technological system consists of two distinct shafts, each equipped with its clutch mechanism for gear shifting. One shaft is dedicated to even-numbered gears, while the other is dedicated to odd-numbered gears. The transition between higher and lower gears with this technology is characterized by a smooth operation, albeit accompanied by occasional noise and roughness during gear shifting. The Dry Clutch Transmission (DCT) is a type of transmission system that eliminates the need for periodic gearbox fluid changes, hence providing convenience to the driver. This technique effectively maintains the dryness of the clutches, hence preventing the gradual deterioration of their frictional quality over time. The technology in question was implemented by both the Kia Seltos and Hyundai Venue.

3. Literature Review

The review of the literature is a crucial research activity since it aids in the researcher's understanding of the study's concept and the issue it will investigate. By comparing the statistical tools used in previous research using various methods and ways of doing research, as well as the results of such research and their theoretical significance, the review of literature is also helpful in learning about the suitability of various statistical tools.

Rogers (1995) used the diffusion of innovation theory to analyze the study on consumer adoption of a technological framework. There is no house in modern life without a car. The AMT automobile appeals to the concept that everyone can drive it effortlessly. Many individuals are writing and discussing it. Price, design, and the dealer's after-sales services were cited by Muruganandam (1997) in his study

"A Consumer Brand Preference for Motor Cars in Coimbatore City" as the variables that affect consumers' choice of a car. He concluded that Maruti and Ambassador Cars were more popular because of their price and design, and he also mentioned how outstanding the after-sales service was. In their study titled, Kaur and Sandhu (2004) analyze the elements that the consumer takes into account when deciding to buy a new car. The survey includes people who live in the major cities of the state of Punjab and the Union Territory of Chandigarh who own passenger cars. According to the survey participants, luxury is second to safety and comfort as the most crucial attributes of a passenger car. Therefore, manufacturers must design their products to give these elements the most weight possible. In her research, Kusuma (2015) revealed the patterns of customer behaviour when deciding to purchase tiny automobiles. A framework has been created to investigate the behavioural trends that affect consumers' choices to buy compact automobiles. Market impact is determined by elements like resale value, money value, market goodwill, and ease of accessibility. The influences of family, parents, and coworkers are external. Manufacturers, brands, mileage, performance, price, exterior and interior design, safety and comfort features, and price all have an impact on the product. The most unconventional factor was included as the level of buyer satisfaction in a major study on the use of AMT automobiles in Erode City (Vijayalaksmi, 2018). Most AMT car users are in the middle age range (35 to 45 years). Through this study, it can be inferred that owners of AMT cars have had issues such as low mileage, discomfort while driving uphill, expensive spare part costs, and insufficient service support.

4. Objective of the study

The objective of the study is to understand the intention of adopting and tasting different types of automatic transmission technologies implemented by car makers in small passenger car segments. Also to enquiry about different parameters which affect the buying behaviour of AT cars. This study will find out the most economical and popular Automatic transmission technology among the consumers which will dominate the passenger car segment in upcoming years.

5. Methodology

The study of descriptive research is carried out for finding the taste and attitudes among consumers about the different automatic transmission cars in different locations across India (segmented as semi-urban, urban and rural areas). This study is presented considering various parameters of cars like price, fuel economy maintenance cost, easy drivability etc. The respondents are from various aged groups but mainly focused on young and middle age people. The survey was conducted through a structured questionnaire format to get the response. The data was collected among the 750 respondents of different age groups atdifferent locations mainly in the state of West Bengal, Jharkhand & Karnataka

6. Data Analysis and Interpretation

Table 1

Age Group		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	517	68.9	68.9	68.9
	31-40	103	13.7	13.7	82.7
	41-50	66	8.8	8.8	91.5
	51- 60	64	8.5	8.5	100.0
Total		750	100.0	100.0	

Table 2

Gendeer		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	462	61.6	61.6	61.6
	Female	288	38.4	38.4	100.0
Total		750	100.0	100.0	

From these tables (1 &2) out of 750 respondents, a total of 517 respondents (68.9%) respondents belong to the age group of (18to30) and 462 respondents (61.6%) are male.

Table 3

Location		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Urban	614	81.9	81.9	81.9
	Semi- Urban	97	12.9	12.9	94.8
	Rural	39	5.2	5.2	100.0
Total		750	100.0	100.0	

From Table 3, it is noted that most of the respondents are from Urban areas (81.9%)

Table 4

Reliability of Technology	Frequency	Percent
Neutral	442	58.9
Agree	109	14.5
Strongly Agree	199	26.5
Total	750	100.0

From the above table, about 58.9 % of the respondent are indifferent about the reliability of technology in cars.

Table 5

Pricing is pocket friendly	Frequency	Percent
Disagree	337	44.9
Neutral	135	18.0
Agree	95	12.7
Strongly Agree	183	24.4
Total	750	100.0

About 44.9% of the respondents are not satisfied with the price range of the different automatic transmission technology cars. This will lead to affects the buying decision of potential car buyers.

Table 6

Fuel economy is satisfactory	Frequency	Percent
Disagree	299	39.9
Neutral	156	20.8
Agree	120	16.0
Strongly Agree	175	23.3
Total	750	100.0

From the above table, it is clear that only 39.3% of respondents believe that the fuel economy of AT/AMT cars will be Satisfactory. Increased fuel prices also affect the buying process of Automatic cars.In general, acceptance is that the fuel economy of automatic cars is lower than manual transmission cars.

Table 7

Fun in driving	Frequency	Percent
Disagree	372	49.6
Neutral	122	16.3
Agree	105	14.0
Strongly Agree	151	20.1
Total	750	100.0

Only 34.1% of respondents believe that AT cars are fun to drive.

Table 8

Easier to drive	Frequency	Percent
Disagree	296	39.5
Neutral	148	19.7
Agree	126	16.8
Strongly Agree	180	24.0
Total	750	100.0

40.8% of respondents believe that AT/AMT cars are easier to drive as it requires less effort than manual transmission cars.

Table 9

Lower Maintenance Cost	Frequency	Percent
Strongly Disagree	271	36.1
Disagree	127	16.9
Neutral	134	17.9
Agree	86	11.5
Strongly Agree	132	17.6
Total	750	100.0

Around 70.9% of the respondent believe that keeping AT/AMT cars are costly than their manual counterparts due to complex and advanced technology mechanism in the transmission system

Table 10

Willlig to buy AT/ AMT/ car paying extra money	Frequency	Percent
Yes	532	70.9
No	163	21.7
Yes, if convinced	55	7.3
Total	750	100.0

Almost 70.9% of respondents were willing to pay extramoney for manual transmission cars to buy AT Cars and 21.7% (163 respondents) were not interested in AT/AMT cars.

Table 11

Location		10K-20K	20K-30K	30K-40K	40K-50K	50K-70K	Total
Gender	Male	277	58	34	31	4	404
	Female	42	34	47	27	33	183
Total		319	92	81	58	37	587

Among them about 70% of the respondent willing to pay a range extra (10k-30k) than manual transmission cars to buy AT/AMT cars. Only 4.9% of respondents are willing to more than 50k than manual transmission and Most of them are Female respondents

Table 12

Value for Money Technology	Frequency	Percent
AMT	396	52.8
CVT	167	22.3
DCT	126	16.8
TC	42	5.6
IMT	19	2.5
Total	750	100.0

About 52.8 % of respondents believe that AMT (Automated Manual Transmission) technology is the most value-for-money technology among the different automatic transmission technologies.

Regression Analysis

Independent Variables	Dependent variable
[1] Maintenance Cost	Purchase intention by paying extra money than manual transmission cars
[2] Price	
[3] Reliability of Technology	
[4] Fuel Economy	
[5] Easy Drivability	

Table 13: Model Summary

Model	R	R Square	Adjusted R Square	Std. the error in the estimate
1	.740	.548	.545	.415

Predictors: 1) Maintenance cost 2) Price 3) Reliability 4) Fuel Economy 5) Easy Drivability.

From this model summary, R Square = 0.548 and it signifies that about 54.8% of independent variables predict the dependent variable (purchase intention by Paying extra Money than manual transmission cars)

Table 14

Model		Sum of Squares	df	Mean Squares	F	Sig.
1	Regression	155.366	5	31.073	180.243	.000[b]
	Residual	128.262	744	.172		
	Total	283.628	749			

From this Anova table F stats (Prob) value is less than 0.05, so it is clear that the overall model is very much significant (Fit).

Table 15

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	St. Error	Beta			Tolerance	TVF
1	(Constant)	-.274	.100		-2.741	.006		
	Reliability	.020	.035	.028	.570	.569	.252	3.965
	Price	-.166	.024	-.334	-6.991	.000*	.266	3.763
	Fuel Economy	.295	.029	.576	10.004	.000*	.183	5.450
	Easy Drivability	.290	.042	.389	6.974	.000*	.196	5.114
	Maintenance Cost	.031	.017	.076	1.785	.075	.339	2.949

From the Coefficient table, The value of Beta is positive in the following independent variables 1) Reliability 2) Fuel Economy 3) Easy Drivability 4) Maintenance Cost, and negative in one independent variable price.

Independent variable

1) Reliability positively affects the purchase intention but it does not significantly affect the model (P value>.05)
2) Price (0.20) negatively affects the purchase intention and it is significant (p< 0.05)
3) Fuel Economy positively affects the purchase intention and it is significant (p<0.05)
4) Easy drivability positively affects the purchase intention and it is very much significant(p< 0.05)
5) Maintenance cost very less positively affects the purchase intention and it is not significant

The model equation in general

Y = Constant + Reliability+ Price + Fuel Economy +Easy Drivability + Maintenance Cost

Y = Constant + 0.02(R)-0.166(P)+0.295(F)+0.29(E)+0.075(M)

Modified equation –

Y = Constant -0.166(P)+0.295(F)+0.29(F)

From the Collinearity Statistics VIF (Variable Inflation Factor) of all variables is less than 10, so there is not a very significant level of collinearity exists among them.

Independent Variable Importance

	Importance	Mormalized Importance
Reliability of Technology	.103	22.4%
Price	.144	31.6%
Fuel Economy	.457	100.0%
Easy Drivability	.162	35.4%
Maintenance Cost	.134	29.4%

From the above table, it is clear that fuel economy among the different types of AT/AMT cars plays a very crucial role among the consumer while adopting the technologies.

When considering the adoption of AT (Automatic Transmission) or AMT (Automated Manual Transmission) cars, the importance of Variables, including price, reliability of technology, fuel economy, easy drivability, and maintenance cost, is crucial. Here's a closer look at the significance of each variable:

1) Reliability of Technology:

The reliability of the transmission technology is of utmost importance. As automatic and automated manual transmissions involve more intricate mechanical and electronic components, it becomes crucial to ensure that the technology has a good track record of durability and minimal issues. Researching the reliability ratings of specific car models and the manufacturer's reputation can help you make an informed choice

2) Price:

The price of the car is a significant consideration in any purchase decision. AT/AMT cars typically come at a higher price compared to their manual counterparts due to the added complexity of the transmission system. It's essential to evaluate your budget and assess whether the convenience of automatic or automated manual transmissions justifies the higher upfront cost.

3) Fuel Economy:

Fuel economy remains a critical factor for many car buyers. Traditionally, manual transmissions were considered more fuel-efficient than automatic transmissions. However, advancements in automatic transmission technology have led to improved fuel efficiency in many AT/AMT cars. Comparing the fuel economy figures of specific models in both manual and automatic versions will help you understand the trade-offs between the two options.

4) Easy Drivability:

One of the primary reasons for choosing AT/AMT cars is their easy drivability. With automatic or automated manual transmissions, drivers are relieved of the task of manually shifting gears, making driving in traffic and stop-and-go situations more convenient and less tiring. For individuals who are not comfortable with manual gear changes or have physical limitations, the easy drivability of AT/AMT cars can be a significant factor in their adoption.

5) Maintenance Cost:

Maintenance cost is a critical consideration throughout the vehicle's lifespan. While automatic and automated manual transmissions offer convenience, they can sometimes be more expensive to maintain and repair than manual transmissions. The complexity of these transmissions may require specialized skills and parts, contributing to higher

maintenance costs. It's essential to research the maintenance costs of specific models and compare them with your budget expectations.

Ultimately, the importance of each variable will vary depending on your personal preferences, driving habits, and financial situation. If convenience and easy drivability are top priorities for anyone, the higher price and maintenance cost of AT/AMT cars might be justifiable. On the other hand, if anyone is more concerned about long-term cost savings and fuel efficiency, it may lean towards evaluating the reliability, fuel economy, and maintenance cost aspects more critically.

To make an informed decision, test drive different vehicles, gather information on specifications and ownership experiences, and carefully consider how each variable aligns with one's specific needs and budget constraints.

7. Conclusion

The study sheds light on the evolving preferences and attitudes of consumers toward automatic transmissions. The research explored various types of automatic transmission technologies, such as traditional torque converters, dual-clutch, and continuously variable transmissions, and assessed how consumers perceive and evaluate these options. Through the analysis of consumer surveys and feedback, it becomes evident that consumers' perceptions are influenced by a numberless of factors like fuel economy, reliability, price, maintenance cost etc. The study also highlights a gradual shift in perception towards newer technologies, such as dual-clutch and continuously variable transmissions, which are perceived as more fuel-efficient and responsive, especially by younger and more tech-savvy consumers. Additionally, consumers' preferences are heavily influenced by their driving habits and the intended purpose of their vehicles. Some consumers prioritize performance and driving dynamics, while others prioritize fuel efficiency and comfort, leading to a diversity of preferences across different automatic transmission technologies. Among different types of technologies, AMT technology is proven to be the most value of money technology as it is the most fuel-efficient and easily affordable. Moreover, the study indicates that education and awareness play a pivotal role in shaping consumers' perceptions. Manufacturers and dealerships need to invest in educating consumers about the benefits and drawbacks of different automatic transmission technologies to help them make informed decisions that align with their preferences and driving needs. Furthermore, environmental consciousness emerges as a growing concern among consumers. As the automotive industry moves towards sustainable practices, consumers are becoming more inclined to opt for transmission technologies that offer improved fuel efficiency and reduced emissions. This trend may accelerate the adoption of innovative transmission technologies, promoting sustainability in the automotive sector. In conclusion, the study highlights the dynamic nature of consumers' perceptions of automatic transmission technologies in passenger cars. As technology continues to evolve, so too will consumer preferences, demanding constant adaptation and innovation from automakers. Understanding these perceptions and addressing consumer needs and preferences will be crucial for automotive companies to stay competitive and meet the expectations of their target markets in the rapidly changing automotive landscape.

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