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Editorial

The Journal of IMS Group is pleased to present its latest issue, Volume 22, Issue 1, for January-June 2024. This edition showcases five research articles that explore significant and diverse topics within management, technology, and environmental sustainability, all of which reflect the journal's commitment to fostering high-quality research. These papers, authored by distinguished scholars, bring fresh perspectives to pressing global challenges, from sustainable business practices to alternative fuels and digital transformation in human resource management.

The first paper, authored by **Shweta Bansal**, delves into the growing market for refurbished electronics in India. The paper emphasizes the multifold benefits of investing in refurbished electronics, particularly in reducing electronic waste and promoting sustainable consumption. Bansal's research highlights the innovative strategies used by key players in the refurbished electronics sector, such as Cashify and Amazon Renewed, to bridge the demand-supply gap while creating a competitive, environmentally conscious market ecosystem. This study provides critical insights into sustainable business practices, aligning with the goals of the circular economy and SDG 12 (Responsible Consumption and Production).

The second paper, by **Swati Sharma**, investigates the impact of financial performance on the capital structure of Indian automobile companies. Using a robust empirical analysis, Sharma examines variables such as profitability, asset size, growth, and liquidity, and their relationship to capital structure decisions. The research provides valuable implications for the automobile sector, particularly in optimizing capital structure to balance financial risk and performance, thereby contributing to the ongoing discourse on financial strategies in emerging markets.

In the third paper, **Vanshika Ahuja** explores emerging trends in online psychotherapy through a comprehensive bibliometric analysis. Ahuja's research examines the role of digital tools in expanding access to mental health services, particularly during the COVID-19 pandemic, when online therapeutic interventions became critical. The study highlights the increasing acceptance of digital platforms in mental health care and suggests future directions for enhancing virtual psychotherapeutic practices, emphasizing client-centered approaches and the integration of technology in therapeutic alliances.

The fourth paper, authored by **Akshay Rana**, offers a comprehensive study on alternative fuel options and consumer perceptions. Rana assesses the environmental, economic, and social impacts of various alternative fuels, including electric, hydrogen, and biofuels, compared to traditional fossil fuels. The paper's analysis of governmental policies, consumer attitudes, and the feasibility of large-scale adoption provides a roadmap for advancing sustainable fuel technologies, particularly in the context of global efforts to reduce greenhouse gas emissions and transition to cleaner energy.

Finally, the fifth paper by **Nisha Sharma** presents a bibliometric insight into the digital transformation of human resource management (HRM) for sustainability. Sharma's study investigates the intersection of green HR practices and digital innovation, using bibliometric analysis to track trends and key contributors in the field. The findings highlight the growing importance of integrating digital technologies with sustainable HRM practices, offering valuable implications for organizations seeking to align their HR strategies with sustainability goals.

Each of these articles brings unique insights into contemporary management challenges, offering solutions that are both innovative and grounded in empirical research. We are confident that the contributions made in this issue will spark further discussions and inspire future research in these critical areas.

We extend our gratitude to all the authors for their valuable contributions, and to our reviewers and editorial board members for their diligent work in ensuring the quality of the journal. We look forward to your continued support and engagement with the Journal of IMS Group as we continue to explore cutting-edge research in management and related disciplines.

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Impact of Financial Performance on Capital Structure: Investigation of Indian Automobile Sector

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ABSTRACT

Our study aims to analyse the impact by profitability, asset size, growth, leverage and liquidity on the capital structure of a firm. To empirically examine the impact, top 5 leading automobile companies listed on NSE/BSE. To analyse the impact, study has applied ordinary least square (OLS) regression to evaluate the impact of identified variables on capital structure of selected financial variables. The models are diagnosed for autocorrelation, multicollinearity, homogeneity and normality of standard residuals. The selected companies showed that their explanatory variables are explaining the variances of dependent variables above 80 percent and the model were significant at 5 percent level of significance using F test. For M&M, the variables NP/TA, Gro and LIQ have positive relation whereas LN-TA has negative relation dependent variables. All variable, except Gro have significant relation with capital structure. For Force Mo, the variables NP/TA, Gro, NDTS have positive relation whereas LN-TA and LIQ have negative relation dependent variables. All variables had insignificant relation with capital structure.

Keywords: Capital Structure, Liquidity, Asset Size, Leverage, Profit

1. Introduction

A firm can achieve its objective of shareholders' wealth maximization by applying right financial management strategies. The three main function of financial management of a firm are investing, financing and short-term asset management. Financing functions are related to decisions on selecting right capital instrument and proportion of the same, McInnes, J. M., & Carleton, W. J. (1982); Anand, M. (2002).The portfolio of long-term financing alternatives is popularly known as capital structure. There are various capital structure theories proposed which have tried to describe how a firm can select optimal capital structure along with determination of cost and benefit of using leverage for investor and financers.Net income approach (Durand, 1952) explained that the value of firm is affected inversely by cost of capital with an assumption of cost of debt constant and cheaper that cost of equity. The value of firm will increase as more debt is used ignoring that increased financial risk due to increase in amount of debt. If the financial risk is increased using more amount of debt or leverage, the expected return of equity holders will increase and thus total cost of capital would remain constant and hence the value of firm will not be affected by cost of capital and will only depend on the financial performance (Durand, 1957). Traditional approach (Solomon, 1963) suggested that the value of firm will increase as it will use as debt is increased up to certain amount. But eventually the increase of debt would increase cost of debt along with cost of equity and hence the cost of capital will increase.

Modigliani and Miller (1958) hypothesis proposed that the value of the firm will not be dependent on the proportion of debt and equity as firm capital. Modigliani and Miller (1963) But, if tax is considered, that use of more proportion of debt will help to gain benefit in short run. Pecking order theory (Myers' 2001) stated that managers use the logic of asymmetric information, available to different investors, in using financing alternatives preferring internal fund or retained earnings, followed by debt fund and issuance of equity as last resort. The asymmetric information makes investors expect higher return for investment opportunities with less information.

Optimal timing theory (Baker and Wulger, 2002) suggested that historical market values and market timings affects that the firms' capital structure decisions. The firms which had high market valuations preferred lower debt and higher equity and firms which had low market valuations preferred higher debt and lower equity. Thus, leverage was found to be strongly negatively related to historical market valuations.

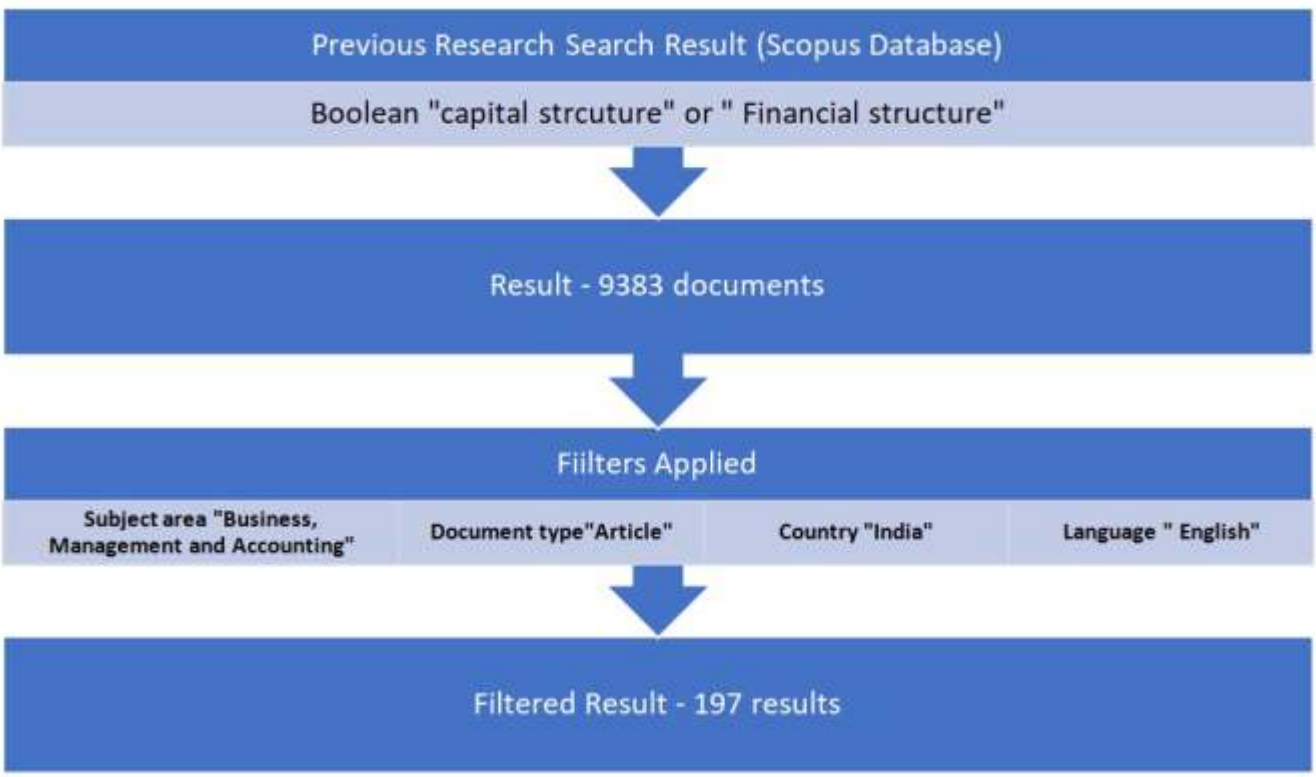
The capital structure decision affect various key performance indicators viz., Net income, required rate of return of equity shareholders, leverage, cost of debt and cost of capital. So before examining the descriptive characteristics and relationships impacts among study variables, we have tried to explore and estimate important performance indicators related to capital structure.

In the study carried on Indian cement industry to identify the relationship between the capital structure, total cost of capital and firms market capitalization or value in market evidenced that there was no association and impact of capital structure on total cost of capital as well as on total market capitalization i.e. market value of the firms in Indian cement industry(Bhayani, 2009).

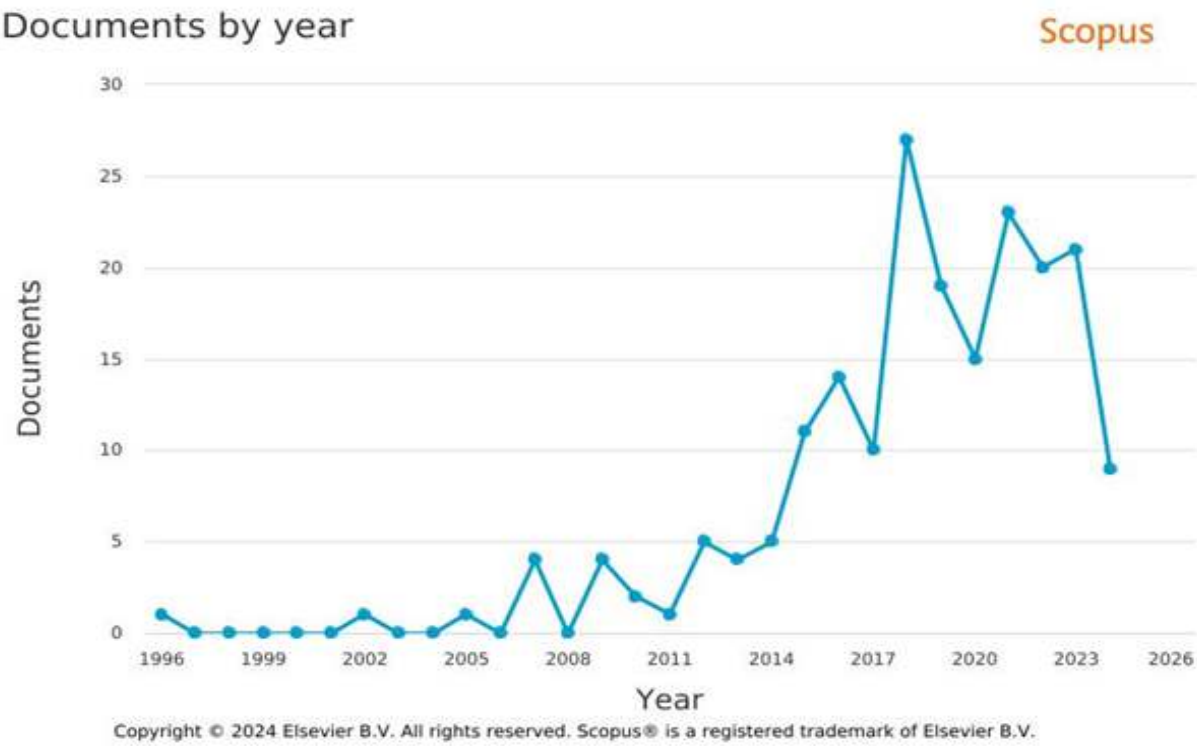
The study on the factors affecting the capital structure decision of SMEs in India using generalised method of moments confirmed the applicability of the pecking order theory for SMEs in India.(Rao et al., 2020). The study on the growth of start-ups aimed to examine whether in Croatia firms shifted from traditional to the newer methods of financing (Čalopa et al., 2014).The cost of equity is also affected by the corporate social responsibility (CSR). The effect of corporate social responsibility on cost of equity has varying results due to the firms' ownership structure and economic conditions. The government firms' showed better CSR and lower cost of equity than non-government firms' in spite of the higher impact of CSR on reducing cost of equity for non-government firms'(Xu et al., 2015).The relationship between financial leverage and determinants of capital structure of four top companies of Indian automobile industry resulted that the liquidity, size, profitability, growth rate, and tangibility were significant for financing decisions(Mittal & Kumari, 2016).The factors affecting the capital structure decisions of small and medium enterprises (SMEs) in India was observed using the sample consisting of 174 non-financial firms and generalised method of moments (GMM) was used and found that the effect of firm's profitability, tangibility, size, age, growth, liquidity, non-debt tax shield, cash flow ratio, and return on equity on the leverage of the firm confirmed the applicability of the pecking order theory for SMEs in India.(Rao et al., 2020).

2. Review of Literature and Hypothesis Development

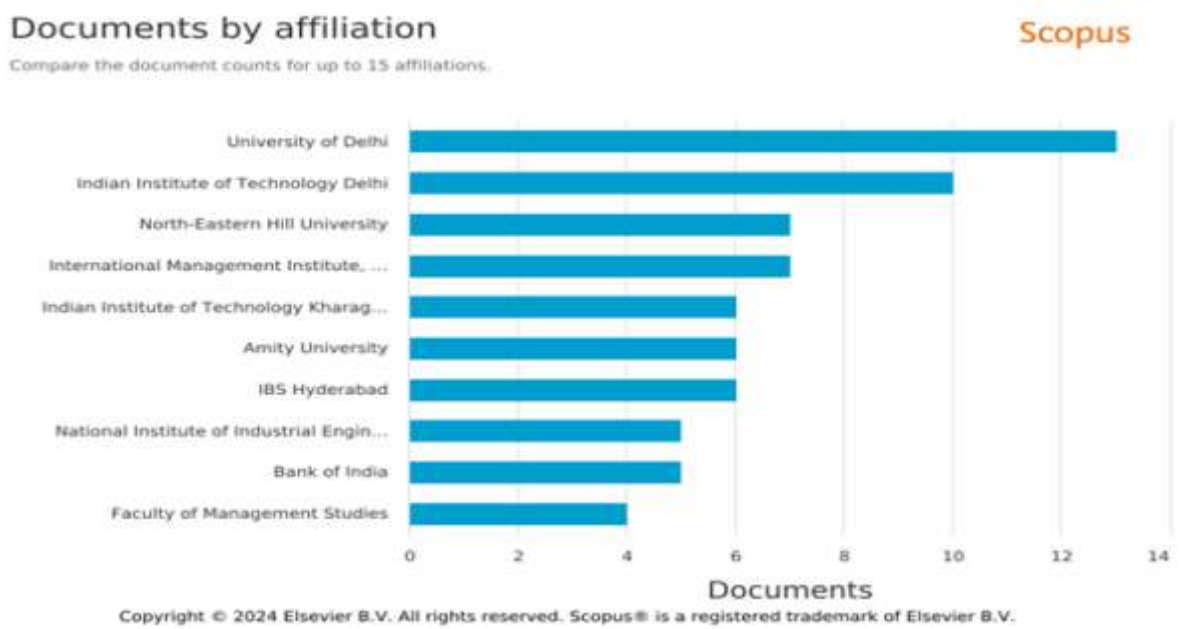
The study is built on specific literature on capital structure or financial structure study conducted on automobile sector. The search flowchart are below:



The authors have analyse the filtered result and tried to understand the relevant research studies conducted on capital structure in automobile in India.



The y-o-y publication is not very high , maximum article published is 27 in year 2018. If we see in last 10 year period, from 2014 to 2023, the Average Annual Growth in publication of related studies in scopus indexed journal is 18.04%, with just 04 documents in 2014 to 21 documents in 2023.



From the above figure, we can the top institutions or organisations contribution in related studies. University of Delhi is at top with 13 documents, followed by Indian Institute of Technology Delhi with 10 documents. We have Bank of India as only one non educational organisation in the top 10 list.

From the figure above, we can see the topic 10 authors contributing to the literature of capital structure studies in India. We also noticed out top 10 authors, 4 authors are from Non-top 10 publishing institution/ organisations, e.g., Panda, A.K (NITIE Mumbai, Kumar S (IIM Nagpur), Mundi, H.S, (IMT Ghaziabad) and Agarwal, Y (Bharati Vidyapeeth (Deemed to be University), Pune.We have also tried to see the top source publishing the related articles. The y-o-y trends are depicted below.

In total, the top 5 journals and their total related articles are

Journal	Publisher	No. of Articles
Global Business Review	SAGE	15
Managerial Finance	Emerald Publishing	11
Vision	SAGE	10
Finance India	Indian Institute of Finance	8
Journal of Advances in Management Research	Emerald Publishing	7

Source: Tabulated by Authors.

The firms' management prefers borrowing loan than any other means of financing and capital components, but beyond certain level of borrowing loan, the financial risk increases and lead to increase in cost of capital.

2.1. Capital structure on Profitability

The interrelationship among the capital structure and profitability is paradoxical and result varies between the sectors as well within a particular sector. A study conducted on construction sector indicated that the capital gearing ratio having negative relationship with profitability. The gearing ratio was higher among the contractors and developers, whereas the borrowings were much higher among developers, Yat Hung, C., Ping Chuen Albert, C., & Chi Man Eddie, H. (2002). The capital structure studies in real estate companies in UK contradicted the literature and resulted that borrowings has constructive effect on profitability firms size adversely effected on fluctuation on income and return on assets (Westgaard et al., 2008). The firms' size effect on profitability was not discovered in Australian firms. The well-established puzzle that leverage is adversely associated with profitability steps was revisited. Cross-sectional association between profitability and leverage is positive at times when companies are at or near to their optimum level of leverage. It is always pessimistic. In the quarters prior to rebalancing events, the time series of market leverage and profitability corresponded to the trends that models forecast(Danis et al., 2014).

H1: There is no significant relationship between capital structure on profitability

2.2. Capital structure on asset size

The profitability of the firm can be measured by return on equity (ROE) or return on investment (ROI) or return on asset (ROA). The analysis of firms' level factors viz., asset size, firm age, debt amount and ownership, on capital structure revealed that the capital structure emerged a significant factor affecting profitability ratios, ROE and ROI, Mahmoud Abu Tapanjeh, A. (2006). The assets tangibility and ratio of debt to asset were positively related to each other whereas business risks measured by unlevered beta of equity were inversely related to ratio of debt to asset. The profitability of leveraged firms are more than unlevered firm but the latter has lower debt ratio(Qiu & La, 2010).

Similarly, the effect of firms' size on profitability of manufacturing firms in Sri-Lanka resulted that there was no relationship between assets size and sales amount on net profitability and return on assets(Niresh & Velnampy, 2014).

The profitability of health care organizationsis affected byfirm level factors viz., ownership, firms' size, geographical area and associations. The firms' profitability can be increased by improving margins, operational efficiency and

capital components proportions, although these variables were non-significant. The health care organisation type has small effects by its associations, geographical locations and teaching facilitation (Turner et al., 2015).A firm value is highly affectedby size of assets. The role of capital structure of firm as intervening variable has no impact on relationship of firm value and asset size, Setiadharma, S., &Machali, M. (2017).

H2: There is no significant relationship between capital structure on asset size

2.3. Capital structure on business growth

In the study of assessing capital structure of a subsidiary companies that is disbursed through a spin-off explored that companies financial structure analyses includes the debt level of the subsidiary with respect to the original capital structure. Mostlyin companies, the debt of the subsidiary was negatively related to growth and positively related to its collateral value. However, unlike most companies, debt was not inversely correlated to profitability and the disparity between the debt levels of the subsidiaries and similar businesses was positively related to the earnings (Dittmar, 2006.).The study on financial variables to analyse the financial position of Maruti Suzuki identified the strength and weakness areas of the company to suggest the appropriate variables to focus to maximize the intrinsic value of the company(Ramya & Kavitha, 2017).

H3: There is no significant relationship between capital structure on business growth

2.4. Capital structure on liquidity

The optimal capital structure helps firms' to better manage risk and its performance thereof. The ability of managing risk in banks is crucial and is evidenced by efficient banks increase cash holdings and reduces risk weighted assets. Also, the increase of capital buffer helps bank to increase their ability in taking higher credit risks. But in banks, there is a problem of non-uniformity of measurement of the capital buffers and risk measures(Ding & Sickles, 2018).

H4: There is no significant relationship between capital structure on liquidity

2.5. Capital structure on leverage

The effect of debt and equity on performance of the company analysed using EBIT –EPS analysis evidenced that increase in level of borrowings and net worth increases the debt equity ratio. Capital structure decision is important for any organisation and it plays an important role for future of any business(Niresh & Velnampy, 2014).

H5: There is no significant relationship between capital structure on leverage

Our study aims to compare the leading Indian automobile companies' capital structure determinants, their characteristics and their impact. The study applies multiple regression analysis along with important diagnostic analysis viz., autocorrelation, multicollinearity, heteroscedasticity and normality.

1. Objectives and Research Methodology

3.1. Objective

To identify the relationship of capital structures with firms' profitability, asset size, leverage, business growth and liquidity.

3.3. Sample and period of study

A comparative study of capital structure and its determinants is carried on major Indian automobile companies i.e., Maruti Suzuki Ltd, Tata Motors, Ashok Leyland, Mahindra & Mahindra and Force Motors. The study is carried on data or 10 years from the period of 2010-11 to 2019-20 and the data is collected from annual reports and Bombay Stock Exchange, India.

Based on e-contents available on research libraries and databases like EBSCO, SSRN, Sage publications, Research gate, etc. the study which focused on capital structure of Indian automobiles companies are not carried extensively in recent year (after 2010).

3.4. Variables of study

- DER: Debt equity ratio (Durand 1952, 57), (Modigliani and Miller, 1963), (Myers' 2001), (Danis et al., 2014), (Čalopa et al., 2014), (Rao et al., 2020)
- NP/TA: Return on Asset (ROA) Profitability ratio measured by Net profit to Total assets (Mittal & Kumari, 2016), (Mittal & Kumari, 2016), (Rao et al., 2020)
- LN-TA: Size of firm measured by Log of Total assets (Mittal & Kumari, 2016), (Mittal & Kumari, 2016), (Rao et al., 2020)
- Gro: Growth rate of sales (Mittal & Kumari, 2016), (Mittal & Kumari, 2016), (Rao et al., 2020)
- NDTS: NonDebt tax shield measured by Depreciation to Total Assets (Mittal & Kumari, 2016), (Mittal & Kumari, 2016), (Rao et al., 2020)
- Liq: Liquidity measured by current asset to current liability (Mittal & Kumari, 2016), (Mittal & Kumari, 2016), (Rao et al., 2020)

3.5. Statistical Techniques

The multivariate regression analysis is extended form to simple linear or bivariate regression with more than one explanatory variables. The general multivariate regression model can be represented as below;

$$Yi = \beta_0 + \beta_1 X_1, i + \beta_k X_k, \underline{i} + \varepsilon_i$$

Where, Y_i, X_{1i},…X_{ki} represent the ith observations of each variables Y, X_1….X_k respectively, are fixed parameters and b_0 b_1..... b_k are fixed parameters and e_i is a random variable that is normally distributed with mean equal to zero and have a constant variance s^2_e

Along with assumptions of bi-variate regression, multivariate regression has other assumptions for robust modelling (Judge et al., 1988).

a) The explanatory variables X_1….$X_k$are not correlatedwith each other i.e. multicollinearity should not exists. Correlation matrix is used to test the same.

b) The explanatory variable X_1….$X_k$should not beautocorrelated with its own lag values. Auto Correlation Factor (ACF) is estimated to test the same

c) The explanatory variables X_1….X_k take the random numbers and the error terms of variables are uncorrelated with each other. Residual plots are used to identify the same.

d) The residual terms should have same variance i.e., heteroscedasticity should not exist. Q-Q plot is used to check the normality.

Although the above assumptions violation does not affect much on coefficients and the impact result of explanatory variables on dependent variable, the coefficients of determination and model usage for prediction can result insignificant result.

The descriptive analysis using Mean, Std Deviation, Skewness and Kurtosis is performed followed by estimation of impact of relationship between dependent variable, ordinary least square (OLS) regression analysis was conducted using below equation;

$$\mathbf{DER_{it}} = b_0 + b_1 \mathbf{NP/TA_{it}} + b_2 \mathbf{LN\text{-}TA_{it}} + b_3 \mathbf{Gro_{it}} + b_4 \mathbf{NDTS_{it}} + b_5 \mathbf{LIQ_{it}} + e_{it}$$

Where,

DER is Debt equity ratio

NP/TA is Profitability ratio measured by Net profit to Total assets

LN-TA is Size of firm measured by Log of Total assets

Gro is Growth rate measured sales growth

NDTS is NonDebt tax shield measured by Depreciation to Total Assets

LIQ is Liquidity measured by current asset to current liability

e_i is the error term of variables

1. Data Analysis

1.1. Descriptive statistics

Table 1 depicts the outcome of descriptive statistics of all the variables company wise for the study period. The DER mean highest value is of Tata motors at 0.732 and lowest value is of Maruti Suzuki at 0.051 among all the selected companies. The NP/TA mean highest value is of Maruti Suzuki at 0.116 and lowest value is of Tata Motors at -0.001. The LN-TA mean highest value is of Tata Motors at 10.89 and lowest value is of Force Motors at 7.5. The Growth mean highest value at 0.156 which is equal among Force motors, Ashok Leyland and Tata Motors whereas M&M has lowest value of 0.119. The NDTS mean highest value is of Maruti Suzuki at 0.058 and lowest value is of M&M at 0.029. The Liquidity mean highest value is of Force Motors and Tata Motors at 1.622 whereas lowest value is of Force Motors at 0.975.

Table 1: Descriptive Statistics

		DER	NP/TA	LN-TA	Gro	NDTS	LIQ
M&M	Mean	0.199	0.109	10.335	0.119	0.029	1.166
	Std Dev	0.093	0.018	0.373	0.126	0.005	0.118
	Kurt	-0.852	-1.876	-0.610	-0.438	-0.505	1.071
	Skew	0.425	0.165	-0.294	0.668	0.427	-0.928
Force Mo	Mean	0.138	0.098	7.500	**0.156**	0.045	**1.622**
	Std Dev	0.164	0.141	0.394	0.189	0.006	0.457
	Kurt	2.304	9.499	0.190	0.464	-1.123	2.100
	Skew	1.787	3.048	-0.947	1.110	0.217	0.503
Ashok Ley	Mean	0.535	0.054	9.480	**0.156**	0.031	0.975
	Std Dev	0.263	0.035	0.201	0.214	0.005	0.163
	Kurt	-1.392	-0.872	0.160	-0.613	-0.377	4.283
	Skew	-0.602	0.375	0.138	0.041	-0.339	1.903
Tata Mo	Mean	**0.732**	-0.001	**10.899**	**0.156**	0.040	**1.622**
	Std Dev	0.145	0.042	0.073	0.189	0.012	0.457
	Kurt	-0.047	1.910	-1.189	0.464	-1.330	2.100
	Skew	0.711	-1.358	0.508	1.110	-0.523	0.503
MrSki	Mean	0.051	**0.116**	10.401	0.133	**0.058**	1.211
	Std Dev	0.014	0.025	0.476	0.116	0.010	0.614
	Kurt	-0.391	-0.710	-1.331	-1.570	-1.868	-0.446
	Skew	0.769	-0.374	-0.022	-0.186	0.424	0.774

M&M

From the table of descriptive statistic of M&M, average value of NP/TA is highest and NDTS is lowest of all the study variables. The std deviation value of LN-TA is highest and NDTS is lowest. All variables, except LIQ has negative kurtosis value. All variable except LN-TA, have positive skewness value. The NP/TA with 0.16 skewness is least skewed. Based on results, it is very to conclude distribution of any variables to be close to normal.

Force Motors

From the table of descriptive statistic of force motors, average value of NP/TA is highest and NDTS is lowest of all the study variables. The std deviation value of LIQ is highest and NDTS is lowest. NP/TA has highest kurtosis value whereas NDTS has lowest value, but the variable which has kurtosis value close to 3 is DER followed by LIQ. All variable except LN-TA, have positive skewness value. The NDTS with 0.21 skewness is least skewed. So, out of all the variables, NDTS is most close to represent a normal distribution.

Ashok leyand

From the table of descriptive statistic of Ashok leyland Ltd., average value of LN-TA is highest and NDTS is lowest of all the study variables. The std deviation value of DER is highest and NDTS is lowest. All variables, except LN-TA and LIQ has positive kurtosis value. All variable except DER and NDTS, have negative skewness value. The Gro with 0.0408 skewness is least skewed. Based on results, it cannot be concluded that distribution of any variables not normal.

Tata Motors

From the table of descriptive statistic of Tata Mo, average value of LN-TA is highest and NP/TA is lowest of all the study variables. The std deviation value of LIQ is highest and NDTS is lowest. DER, LN-TA and NDTS have negative kurtosis value whereas NP/TA, GRO and LIQ have positive kurtosis values. All variable except NP/TA and NDTS, have positive skewness value.

Maruti Suzuki

From the table of descriptive statistic of Maruti Suzuki ltd., average value of LN-TA is highest and DER is lowest of all the study variables. The std deviation value of LIQ is highest and NDTS is lowest. All variables have negative kurtosis value. NP/TA, LN-TA and GRO, have negative skewness value whereas DER, NDTS and LIQ have positive skewness.

1.1. Multi-Collinearity

The multi-collinearity is analysed by using correlation matrix for all the variables respectively for all selected companies.

M&M

The NDTS has high corelation with NP/TA and LN-TA i.e. higher than 0.80. Hence for conducting regression analysis, the NTDS is removed to avoid the problem of multi-collinearity problem.

Force Motors

Allthe independent variables are regression with dependent variable as no correlation value is higher than 0.80. Through correlation matrix, it was found that there is no collinearity between independent variables as no correlation value is higher than 0.80 Hence all the independent variables are regress able with dependent variable.

Ashokleyand

There was no collinearity between independent variables. Hence all the independent variables are regression with dependent variable as no correlation value is higher than 0.80.

Tata Motors

There is no collinearity between independent variables. Hence all the independent variables are regression with dependent variable as no correlation value is higher than 0.80.

Maruti Suzuki

There is no collinearity between independent variables. Hence all the independent variables are regression with dependent variable as no correlation value is higher than 0.80.

1.2. Regression Analysis

Table 2: Regression Model Fit

	R Square	Sig F
M&M	0.957	0.001
Force Mo	0.914	0.029
Ashok Ley	0.995	0.000
Tata Mo	0.603	0.437
MrSki	0.151	0.972

M&M

From the above table, we observe that the Multiple R and R square both are very high with value above 95 percent. The Adj R square at 0.9227 signifies that the independent variables selected have very high impact on the variation of Debt Equity ratio. This infers the explanatory variables are explaining the variances of dependent variables by approx above 92 percent.

Force Motors

Fromregression table, R square is high with value above 90. This infers the explanatory variables are explaining the variances of dependent variables by approx. 80 percent. The multi-regression model is significant at 5% level of significance using F test.

Ashok Leyland

From regression table, we observe R square is very high with value above 99. This infers the explanatory variables are explaining the variances of dependent variables by approx. 99 percent. The multi-regression model is significant at 5% level of significance using F test.

Tata Motors

From regression table, we observe that the R square ismoderately high with value above 60 percent. This infers the explanatory variables are explaining the variances of dependent variables by approx. 60 percent. The multi-regression model is not significant at 5% level of significance using F test.

Maruti Suzuki

From the above regression output table, we observe that the R square value is just 15 percent. This infers the explanatory variables are explaining the variances of dependent variables by approx. 15 percent. The multi-regression model is not significant at 5% level of significance using F test.

Table 3: Regression Coefficients

	M&M	Force Mo	Ashok Ley	Tata Mo	MrSki
Intercept	**1.242**	1.284	**6.667**	-7.333	-0.013
NP/TA	**2.836**	0.105	**-3.769**	-3.713	-0.309
LN-TA	**-0.171**	-0.180	**-0.499**	0.807	0.009
Gro	0.049	0.427	0.013	-0.176	0.049
NDTS	--	7.127	**-22.210**	-11.616	0.002
LIQ	**0.347**	-0.120	**-0.529**	-0.147	0.001

M&M

The independent variables, except Gro, are significantat 10% level of significance. The variables NP/TA, Gro and LIQ have positive relation with dependent variables, D-E ratio, with values 2.8364, 0.0491, 0.3471 per unit respectively. In contrast, LN-TA has negative relation dependent variables, D-E ratio, with values 0.170 per unit.

Force Motors

The independent variables are not significant at 10% level of significance. The variables NP/TA, Gro, NDTS have positive relation with dependent variables, D-E ratio, with values 0.1049, 0.4272, 7.127 per unit respectively. In contrast LN-TA and LIQ have negative relation dependent variables, D-E ratio, with values 0.1797 and 0.1198 per unit respectively.

Ashok leyand

The independent variables are significant at 10% level of significance, except Gro. The variables Gro have positive relation whereas NP/TA, LN-TA, NDTS and LIQ have negative relationship with dependent variable DER. The coefficient of NDTS with -22.21 and NP/TA with -3.79 are having very high negative as well as significant impact.

Tata Motors

All the independent variables are not significant at 10% level of significance. All variables except LN-TA have negative relationship with dependent variables, DER. The coefficient of NDTS with -11.62 and NP/TA with -3.7 are having very high negative, but not significant impact.

Maruti Suzuki

Theindependent variables are not significant at 10% level of significance. The variables LNTA, Gro, NDTS and LIQ have positive relation whereas NP/TA with negative relation with dependent variables, DER. It is also an exception in Maruti Suzuki that no variables have shown impact higher than coefficient of 0.5, with insignificant results.

1.1. Homogeneity of Variance of Residuals

The residuals plot of independent variable is used to verify the presence of homogeneity of variance of residuals.

M&M

All independent variables, except NP/TA and LIQ, residuals seem to have absence of homogeneity of variance as the residuals are equally on both positive and negative quadrants.Also, there is no visible trend or pattern in the plot. Hence, we can infer that the residuals are normally distributed.

Force Motors Ltd

All independent variables, except NP/TA and NDTS, residuals seem to have absence of homogeneity of variance as the residuals are equally on both positive and negative quadrants.Also, there is no visible trend or pattern in the plot. Hence, we can infer that the residuals are normally distributed.

Ashok leyand

All independent variables, except LIQ, residuals seem to have absence of homogeneity of variance as the residuals are equally on both positive and negative quadrants.Also, there is no visible trend or pattern in the plot. Hence, we can infer that the residuals are normally distributed.

Tata Motors

All independent variables, except NP/TA and Gro, residuals seem to have absence of homogeneity of variance as the residuals are equally on both positive and negative quadrants. Also, there is no visible trend or pattern in the plot. Hence, we can infer that the residuals are normallydistributed.

Maruti Suzuki

All independent variables residuals seem to have absence of homogeneity of variance as the residuals are equally on both positive and negative quadrants. Also, there is no visible trend or pattern in the plot. Hence, we can infer that the residuals are normally distributed.

5. Conclusion

The current study has examined the impact of financial performance on capital structure of Indian Automobile firms over 10 years. the study has used multivariate regression (OLS) model. Based on the data analysed and another diagnostics test, we can summarize the as below

Table 4: Relationship Summary

Variables	M&M	Force Mo	Ashok Ley	Tata Mo	MrSki	+ve/-ve
Profitability	**Highly Positive**	**Low Positive**	High Negative	High Negative	Low Negative	2/2
Asset Size	Low Negative	Low Negative	Low Negative	**Low Positive**	**Low Positive**	3/2
Business Growth	**Low Positive**	**Low Positive**	**Low Positive**	Low Negative	**Low Positive**	4/1
Leverage	--	**High Positive**	High Negative	High Negative	**Low Positive**	2/2
Liquidity	**Low Positive**	Low Negative	Low Negative	Low Negative	**Low Positive**	2/3

Variables	M&M	Force Mo	Ashok Ley	Tata Mo	MrSki	Sig/Not Sig
Profitability	Sig	Not Sig	Sig	Not Sig	Not Sig	2/3
Asset Size	Sig	Not Sig	Sig	Not Sig	Not Sig	2/3
Business Growth	Not Sig	Not Sig	Not Sig	Not Sig	Not Sig	0/5
Leverage		Not Sig	Sig	Not Sig	Not Sig	1/3
Liquidity	Sig	Not Sig	Sig	Not Sig	Not Sig	2/3

The descriptive analysis of the study variables results that M&M variable NDTS is most close to represent a normal distribution, whereas Force Mo variable has no clear variable close to normal distribution.

For M&M, the explanatory variables are explaining the variances of dependent variables by approx. 92 percent and the model is significant at 5% % level of significance using F test. The variables NP/TA, Gro and LIQ have positive relation with dependent variables, D-E ratio. In contrast, LN-TA has negative relation dependent variables. All variable, except Gro have significant impact. The variable showed no autocorrelation but NDTS showed correlation with NP/TA and LN-TA variables. The variables NP/TA and LIQ are showing the problem of heteroscedasticity characteristics.For Force Motors, the explanatory variables are explaining the variances of dependent variables by approx. 80 percent and model is significant at 5% level of significance using F test. The variables NP/TA, Gro, NDTS have positive relation with dependent variables, D-E ratio. In contrast LN-TA and LIQ have negative relation dependent variables, D-E ratio. The variables showed no multicollinearity, but the impact of explanatory variables is insignificant. The variables NP/TA and LIQ are showing the problem of heteroscedasticity characteristics.

Hence, there is no uniform result for any explanatory variables i.e., profitability, asset size, business growth, leverage and liquidity, in regard of direction of relationship and significance across the selected companies. It is only business growth rate that have shown maximum uniformity with 4 companies, except Tata Motors, low positive relationship with DER of the respective company.

Limitation:

The study has used data for ten-year recent years, so the regression analysis is not meeting certain assumption viz., normality and homogeneity. For robust analysis of capital structure determinants, external factors can also be included, which is under the scope of this study. Also, due to the focus of study only two major players of Indian automobile sector so, the interpretations cannot be generalised.

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Achieving sustainability goals by exploiting the market for refurbished Electronics: A study of select cases from India

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Abstract: Investing in the refurbished electronics has multifold benefits ranging from reducing electronic waste by enhancing the shelf life of the products to conserving and re-using the Earth's precious natural resources thereby making this industry a more sustainable viable option both for the producers as well as consumers. According to the estimates by a report of United Nations in 2021, each individual may generate up to 7.6 kg of electronic waste over his lifetime. According to Transparency market research this market is to grow at a compounded annual growth rate (CAGR) of 12.1 percent from 2022 to 2031 from U.S $85.42 to U.S $ 272.91 globally. This promising market has gathered many players in the last decade like Amazon renewed, HyperXchange, Cashify etc. which are catering to the needs of various demographics at a much lesser price. The current paper aims to emphasize on the various strategies adopted by the various major refurbished players in the Indian market to grab the opportunity arising out of this sustainable market and to fulfill this demand supply gap of this market. The brands are aiming at creating a lesser digital pollution as well reducing the electronic waste. Despite the numerous strategies adopted by the companies such as warranty schemes, free returns, various payment options and most important the various quality checks which removes all the defects of the electronics etc., major chunk of the Indian consumers are reluctant to buy refurbished electronics with their notion of refurbished goods as second hand or used products. From sellers' side, this industry provides them the huge margin as well higher chances of sale if they follow innovative marketing campaigns to encourage this market.

Keywords : *Electronic waste, Electronics, Refurbished, Production, Sustainable*

1. Introduction:

The rising trends of electronic waste have called for sustainable business practices by the marketers. One such green practice that is being utilized is refurbishing the electronic goods Refurbishing is the "process of disassembling, cleaning, inspecting, repairing, replacing, and reassembling the components of a part or product to like new condition" (Thorn & Rogerson, 2002). Under E-Waste (Management) Rules, 2022, "Refurbisher means any person or entity repairing or assembling used electrical and electronic equipment as listed in Schedule-I for extending its working life over its originally intended life and for same use as originally intended, and selling the same in the market".

According to the estimates by Statista, "The global refurbished and used mobile phone market size is forecast to grow from 50.5 US billion $ to 172 US billion $ at a CAGR of 11.9 percent", Refurbished electronics category is not limited only to smart phones but it covers a vast range of products such as laptops, headphones, Game consoles and accessories, smart watches, television etc. Over the past decade many players have entered this market with the scope of good margins and the potential of this market due to price sensitive Indian market. Increase in the e waste collection and recycling by the refurbishers, recyclers, affordability and increase in awareness for refurbished goods have fuelled the market of refurbished electronics. Selling and buying refurbished electronics is a win win game for both the sellers and the buyers.

Refurbished goods helps in the conservation and re-using of the precious natural resources in the form of metals such as gold, silver, silicon, lithium etc. by speeding the reconsumption process, making it a more sustainable alternate to buying new electronic gadget.

The refurbished products not only enable the consumers to buy the pocket friendly electronic gadgets but also add to the SDG Goal 12 which is responsible consumption and production. With the increasing digital pollution, continued work from home, extra gadgets are needed thereby making this industry an attractive alternative to the new gadgets.

The current paper aims at providing the in-depth and analytical study of the practices being carried out by the dominant players which are playing an important role in creative the sustainable market ecosystem by creating the organized market. The study offers the comparative analysis of the various strategies taken up by them to create a competitive business environment in this new and emerging market which can be used up by the businesses and the policymakers for the better future growth prospects.

2. Review of Literature:

Although recent researches have captured the influence of various factors relating to Theory of Planned Behavior (TPB), Theory of Reasoned Action (TRA), EKB Model given by Engel et al. and the impact of price on the purchase intention of the consumers to buy ref. products (Pisitsankkharn and Vassanadumrongdee 2020 ; Chen et al., 2020 ; Hamzaoui-Essoussi and Linton ,2014).,very less attention has been paid to the innovative marketing practices that can help the marketers to explore this potential market specially in Indian context where there exists a demographic dividend and where the market is very price sensitive, therefore the current paper aims at shedding the light on the innovative sustainable practices used by the sellers or distributors of refurbished electronics in India with a major focus on select companies such as Amazon renewed, cashify, Asus etc. "Refurbished goods can originate from different sources, including consumer returns and canceled orders, damaged items, overstocked inventory, and products that have been featured in stores for demonstration, shows, and fairs"(Esmaeilian et al., 2021). Mugge et al. (2017);Abbey et al. (2015) have highlighted the impact of incentives and building the awareness level of the consumers for creating their purchase willingness towards refurbished electronics, less emphasis has been given regarding how the information on the refurbished goods can be portrayed so that the consumers are motivated to purchase these green products. As per White Paper by Cashify 2022, approximately 45 percent of people gave the reason "suits my pocket" as the most important factor to buy refurbished device which was followed by "it was a wiser choice" in 2021.

3. Research Methodology:

The current paper is descriptive and analytical in nature which is based on secondary sources such as reports and the websites of leading sellers of refurbished electronic gadgets. Research papers, articles, e-newspapers, leading blogs and reports have been used for the study for the comprehensive study. The companies selected in the paper are major sellers of refurbished electronics in India and they include Cashify, Amazon renewed, HyperXchange, Asus and Refit Global. Also the in-depth comparative analysis is done between the players of refurbished electronics market by the deep study of the company's' websites, social handles like LinkedIn etc.

4. Analysis and Results :

4.1 Leading Sellers of refurbished electronic gadgets:

a) Cashify:

With the principle "Somebody's waste is someone else's resource" and the promise "Adding right way to business for the planet and the people who live on it", the company Cashify has extended its operations to 200+ stores across 70+ cities. It was founded in 2009 asReglobe by the founders Mandeep Manocha, Nakul Kumar, Siddhant Dhingra and Amit Sethi with the headquarters in Gurgaon.

According to Cashify by reusing just one phone "You save 909 liters of water and save people from staying thirsty for 100 years". In addition "You save 258 Kg of raw material from landing in landfill". Being India's market leader in selling refurbished electronics, the company was able to make the revenue of INR 815.9 Cr in FY 2023 whereas in FY 2022 the revenue was 497.7 Cr.

b) Amazon Renewed:

With the mantra "We want to reduce waste throughout our value chain", Amazon started its new vertical as "Amazon Renewed" program in 2017 to give a kick start to sustainability in its operations. According to Amazon "customers can choose from 20,000 refurbished products through Pre-Owned Certified, a new certification recognizing products that are inspected, cleaned, and repaired to excellent functional standards". The company aims at creating the value by extending the products' life cycle and reducing the electronic waste and raw material extraction by selling the

preowned certified product through their online channel. Amazon Renewed focuses on giving their customers the access to high quality preowned certified refurbished electronics.

c) HyperXchange:

A Kolkata based startup which was founded by Dipanjan Purkayastha, Asish Chakraborty, Dwijo Chatterjee, Satanik Royin 2016 to provide an excellent alternate to the costly electronics in the form of refurbished products. In 2002 the company announced its collaboration with the United Nations Global Compact (UNGC) to work together towards sustainable development initiative and taking actions towards achieving Sustainable development goals.With the initiatives such as introducing the Global Reforestation Initiative with the UNSDG's initiative on sustainable management of forest by planting the trees to preserve the nature in 2021.

d) Refit Global:

The company with its focus on "awareness and trust, refurbishment, reshaping, quality, sustainability,innovation and affordability "started its operations in 2017. The company was founded by Saket Saurav and Avneet Singh as its founders. The company unveiled refitglobal.com in 2023 which was featured in Forbes DGEMS 2023 as one of the top 200 companies with Global business potential as its highest achievement. In 2022-23, the company expanded its operations to 50,000+ outlets across 70+ CITIES. The company is credited with the strong app with 47 checkpoints.

e) Asus:

With the green initiatives such as giving the people the sustainable way to dispose off their old electronics at their listed collection centres throughout India, Asus initiated selling the refurbished products specifically Asus laptops through online and offline mode. The Taiwanese giant marked the first mover advantage in the offline refurbished goods category by opening its first offline "Asus Select" store in Nehru Place in 2023 where the customers get comfortable experience in buying refurbished PCs with 1 year warranty.

4.2. Comparative analysis of strategies:

As per White paper by Cashify in 2023, the demand for refurbished phones has seen an upward trend on account of 5G technology, tools of artificial technology, betterment in the functionalities of phones such as camera etc. As per Cashify's statistics "2 out of 5 Indians have a phone of age 2 years or less that needs repair". Since the charges for phone repairing are very high, the people instead buy new phone altogether which leads to the unsustainable consumption. Purchasing a refurbished electronic gadget is a sustainable and cost effective alternate to buying a new device too regularly. The players in this evolving market can also learn the strategies adopted by the sellers in foreign countries such as eco certification which can motivate the consumers for buying refurbished electronics and build the trust factor in them to go for these categories of products.

Table 1: Comparative Analysis of the various strategies adopted by major sellers of refurbished products

Strategy	Cashify	Amazon Renewed	hyperXchange	Refit Global	Asus
Product category	Laptop,mobiles, smartwatch,speaker,headphone, monitor	Laptop,mobiles,smartwatch,speaker,headphone, monitor	workstations,laptops, smartphones,tablets,accessories	Refurbished mobiles	refurbished laptops
Presence	online+offline (200+stores)	Online	online+offline	Online	online+offline
Warranty	6 months	upto 1 year	12 months	Assured warranty of upto 6 months	12 month Limited India Repair service warranty

Payment options	COD,EMI,Debit, Credit card, Netbanking, Wallet, Split payment	COD,no cost EMI,Debit,Credit card, Netbanking, Wallet	COD,Debit,Credit card, Netbanking, Wallet	COD, Credit/Debit cards, UPI	COD,Debit, Credit card, Netbanking, Wallet,no cost EMI
Returns	upto 15 days refund (100%)	10 days returnable/refund (digital watches)	7 days return	3 days return	7 days
quality check	32 checks	No mention	diagnostic AI (Faraday)	upto 47 checks	no info.
Certification	Yes	Yes	Yes	Yes	Yes
Conditions	fair, good, superb	Excellent, good and acceptable	Unboxed,excellent, good, fair, D	Superb,Very good, Good	No mention
Replacement	upto 15 days refund	7 days servicecenter replacement	12 month service warranty	3 days replacement policy/Return	12 month Limited India Repair service warranty
other offers	3% flat off- UPI, 2% flat off- Cards, REFER AND EARN, dedicated relationship manager	-	-	-	Onsite support

The table 1. shows the various strategies by the key market players to attract the customers by creative the demand for the refurbished electronics. After the careful analysis of the table following key points should be noted:

- The major segment that are catered by the companies is the electronics due to the surge in the digital payments, social media usage and the utilization of websites for online shopping.(ET, 2024)
- The companies are focusing on tapping the market from brick and click models also. Majorly Cashify and Asus have online as well as offline presence of this segment to create a better and customer friendly experience and to manage easy sales initiatives. Cashify having the highest number of offline outlets with over 200+ stores in India
- Since the customers have trust issues over the refurbished electronics. Therefore to build the trust among the customers, all the companies are providing the warranty services ranging from 6 months by Cashify to up to 1 year by Refit Global and Amazon Renewed.
- The market players are providing flexible payment options to the customers like no cost EMI method, Cash on delivery(COD), Net banking, Wallet payments etc. The innovative practice that is started by Cashify is the split payment option that involves payment through multiple payment options.
- The market for refurbished goods is undergoing the urgent need for the quality checks and certifications by the skilled professionals. To reduce the rates of return or replacements the companies are focusing on the stringent quality checks with the help of the specialized softwares and internal quality check mechanisms. For this reason, the companies are making customers aware about the better quality of their products through their quality checks. For example Cashify uses 32 point quality check system whereas refit Global uses up to 47 quality check systems in their business model.

- All the major players are providing certifications to their products. Unless and until the products specially the electronic gadgets are not certified by the professionals, the customers have the trust as well safety and security issues while buying the products.
- Regarding the categorization of the products on the basis of the conditions (particularly physical), each company has laid its own categories. HyperXchange has the categories of Unboxed, excellent, good, fair, D and the prices of the products vary on the basis of these categories. Likewise Amazon Renewed has classified the refurbished products as Excellent, good and acceptable on the basis of its appearance and quality.
- To boost the sales, the competitors in this industry are following a varied replacement policy. Ranging from up to 15 days refund by Cashify to 12 month Limited India Repair service warranty by Asus. Amazon Renewed provides 7 days service center replacement.
- For sales promotion, Cashify beats the expectations as it offers exclusive offers on daily and weekly basis. For example the instant flat discounts and cash backs on the UPI/ wallet payments/credit card/ debit cards whereas the other companies should also make the innovative moves to promote the sales.

In totality from the above although the companies are making their own strategies which are flexible and competitive, it is imperative that there is still a very huge scope in exploiting this market to the fullest by laying down the transparency with respect to the source of the products, compulsory certifications and stringent quality checks. Also the government can also play a dominant role in moving this market by laying down the norms for eco-certifications for these goods which will enable the customers to reach for the refurbished goods by creating a sense of green behavior in them.

1. Practical Implications:

The current research article has numerous practical implications. The companies can leverage the price sensitive customer oriented Indian market as well as the high margin industry by scanning the diverse demographics and catering to their needs. It also provides the insights to the new refurbishers regarding the strategies which are adopted by the existing market players paving a way for adopting more innovative practices. The companies can make a strategic market move by analyzing their competitors' strengths and weaknesses by adaptation of new technological integration such as Artificial intelligence and augmented reality in their business processes such as marketing, certifications, data analytics, quality checks systems etc. Also the paper helps the consumers in better perceiving the refurbished electronics and in increasing their awareness levels. The policymakers can also get the guidance for developing policies regarding promotion of these products which will not only support the market for the refurbished electronics but also helps in achieving the goal of “Responsible Consumption and Production” by bridging the demand and supply gap of the refurbished products.

2. Conclusion:

To summarize, various strategies by the leading brands and companies are being adopted by them to create a positive image of the refurbished products such as certification, no cost EMI options for payment, several cash backs and referral benefits, easy returns etc. but the huge gap has been seen in the awareness level of the consumers as the companies are not able to portray this market to the masses. Also there is a strong need to grow this market by the initiatives such as subsidies, proper infrastructure by the government in order to achieve the sustainability goals with reference to managing electronic waste through refurbishment. Since India has the advantage of demographic dividend this market can give boost to India's service sector and allied industries and provides a huge opportunity of employment. Earlier researches have confirmed that people reluctant to buy refurbished goods. There is a pressing need to motivate the buyers to explore this market as well the government initiatives can also play a major role in reducing the electronic waste by creating a more sustainable ecosystem for the service providers as well for the consumers.

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Digital Transformation of HR for Sustainability: A Bibliometric Insight on Green Practices in HRM

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Abstract

Purpose

In an organization, it is vital to integrate the digital transformation approach with green human resource management practices to promote sustainability and environmental responsibility in institutions.The objective of the article is to conduct a bibliometric analysis toinvestigate, significantauthors,keywords, and trends inthe adoption of green HR practices with digital transformation in different organizations.

Design/Methodology

The study undergoes a comprehensive search for important databases such as Web of Science and Scopus by using the most vital keywords like "sustainability", "digital transformation", and "Green HRM". The two major sources for extensive bibliometric analysis and research evaluation are the Web of Science and the Scopus database. The data was collected from the Public and Perish database tool for the study and retrieved and converted for bibliometric analysis via the VOS viewer software tool.

Findings

The findings of this study will provide useful insights and practical consequences for HR people, administrators, and policymakers looking to use digital HR transformation to execute long-term HRM strategies in different organizational settings.

Research Limitations

The study aims to provide a clear idea about current knowledge gaps and intriguing research questions at the intersection of HRM practices, Sustainability, and digital innovation in the education sector.By examining the bibliometric landscape of green HR practices in organizational settings, we want to lay the foundation for future interdisciplinary studies on this important topic and provide a thorough assessment of current research trends.

Originality/Value-

By providing academic literature via a bibliometric lens, this project will help us better understand how public and private organizations might use digital technology to drive sustainable HRM practices and create an environmental responsibility culture.

Keywords *: Bibliometric Analysis, Digital Transformation, Sustainability, Green HR Practices, Vosviewer.*

Introduction

In recent years the notion of being sustainable has become a conviction/important principle in the constantly evolving field of human resource management (HRM), pushing businesses in the direction of social responsibility along with long-term profitability. The subject is "green human resource management" which evolved to focus on the green side of organizational operations and human resources in environmentally sustainable practices(Fachada et al., 2022).The reason for linking HRM with higher education institutions is to make institutions more responsible to encourage the young generation to participate in activities that can ensure sustained environmental performance throughout time(Khan & Muktar, 2020). According to Renwick et al. (2013), Green HRM's actual work focuses on environmental

or ecological problems and this is how Green HRM can increase the credibility of companies (Akhtar et al., 2023).HR professionals may streamline processes, and use automation, artificial intelligence, and data analytics. In the realm of higher education, the integration of sustainability principles with Human Resource Management (HRM) practices has become more important. As companies strive to educate students for leadership roles in a range of business practices, the integration of sustainability within HRM education has emerged as a crucial topic of focus.Green HRM (Green Human Resource Management) is rapidly becoming recognized as the current industrial revolution. GHRM plays a major role in the creation of strategies for attaining organizational sustainability. Therefore, to obtain a competitive advantage and attain sustainability, firms are consistently using such techniques(Khan & Faisal, 2023). Beyond academic boundaries, the creation of sustainable HRM practices in higher education encompasses a wide variety of disciplines, such as organizational studies, management, and business. Universities and colleges aim to give students theknowledge, skills, and moral perspectives necessary to address contemporary organizational challenges while advancing social and environmental objectives.A void was discovered in the literature about the contribution of digitalization to the development of civic universities while examining the traditional tripartite purpose of Higher Education Institutions. A new taxonomy of hybrid civic universities is put forth based on bibliometric analysis. According to this taxonomy, universities may become more civic-oriented by enhancing their capacity to absorb information thanks to advancements in digitization and open research and innovation. (Leitão et al., 2023). This paradigm shift underlines the requirement for businesses to adapt and thrive in the age of the digital revolution in addition to social responsibility and environmental sustainability(Coll-Ramis et al., 2023). In this context, a new age of organizational resilience and innovation is ushered in by the intersection of sustainability and digital transformation in HRM.HRM may promote sustainable practices from hiring to retirement by leveraging digital technologies.Through bibliometric analysis one can analyze publications, citations, co-authorship, and bibliometric coupling, therefore, it evaluates the whole idea of academic literature (Tiwari et al., 2022).Through bibliometric analysis one can analyze publications, citations, co-authorship, and bibliometric coupling therefore it evaluates the whole idea of academic literature(Mehta, 2023).Through bibliometric analysis one can analyze publications, citations, co-authorship, and bibliometric coupling therefore it evaluates the whole idea of academic literature(Kozar & Sulich, 2023). This bibliometric analysis investigates the development of related literature in the Scopus database that addresses the following research questions (RQs):

1. Who are the most prominent authors and how they are connected?
2. What are the different keywords and how are forming a cluster of relationships?
3. What potential research directions are there?

Table 1 Most popular authors and prominent keywords from Scopus database and authors (2022-2023)

Author	Keywords	Year	Citation	Source
Dghan et al.	Organisational culture, Sustainability, Green HRM, Green Innovation	2022	19	Scopus
Abbas Z et al.	Green HRM, Higher Education	2022	23	Scopus
Tennova C et all	Geen HRM, Service Industries	2022	61	Scopus
Piwowar et al.	Green HR Strategy, Manufacturing Industry	2022	27	Scopus
Yong. J.Y et al	Green Capital, Sustainability, Green HRM,	2023	32	Scopus
Tuan.L.T	Sustainability, Green HRM, Hospitality Industry	2022	38	Scopus
Zhao W et al.	Green Transformational leadership, green innovation Sustainability, Green HRM	2022	25	Scopus
Lu u T. T	GHRM, Leadership	2023	26	Scopus
Ercantan O et.al.	Perception, Green HRM	2022	44	Scopus
Saeidi P et al.	Sustainability, GHRM	2022	46	Scopus

Methodology

Figure 1 presents the semanticillustration of the methodology used. This figure represents that the methodology consists of four stages: Data collection, data analysis, data visualization, and interpretation.

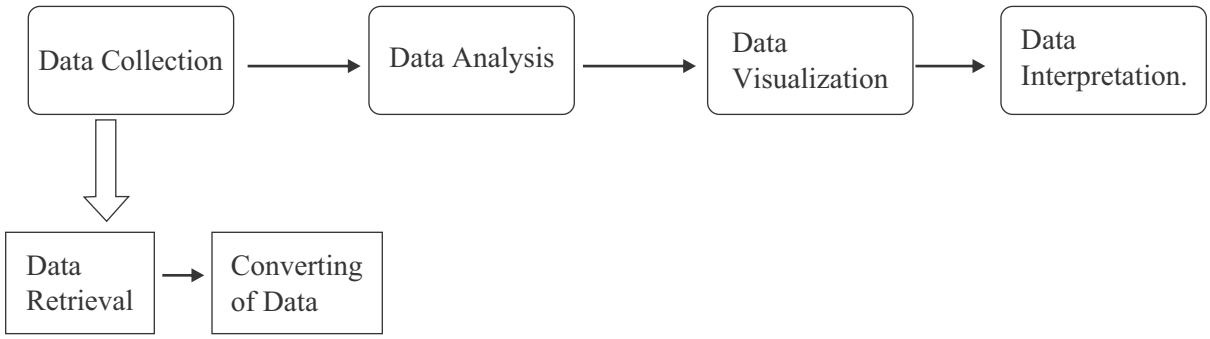

Figure : 1 Methodology Illustration

Selection of Database and Data Collection

Search Criteria (keywords)-

Based on existing literature on digital sustainability in human resource management practices in institutions and insights from policy HR managers and leaders from public and private sectors, "Digital Transformation", "Sustainability", "Green HR Practices" and"Human resource management", are the terms that were used in the database search.

Converting Data

The two major sources for extensive bibliometric analysis and research evaluation process are the Scopus database source.The datawas collected from the Public and Perish database tool for the study and retrieved and converted for data analysis.VOSviewer software tool was used to run the bibliometric analysis to analyze the data collected from the database after extraction of data from the public and Perish Software tool.

DataAnalysis

The result of the Descriptive analysis (See Table1) includes the 10 articles,the growth patterns by year, the most popular database Scopus, and citation of the source.The methodology has been applied toa total of 415 research**articles**,from different authors published in English Language from 2000-2023.

Visualization of Clusters -the data analysis gives a picture of the authors' and co-authors' relationship in the figures below.Figure 1 represents author's and co-authors contribution in the same field. Figure 2 creates a visualization of keywords occurrence networks giving an insight of maximum and minimum occurrence of a word.Figure 3 Visualize the clear picture of the overlay presentation of authors contribution year wise and progress of yearly publication. Figure 4 represents density visualization of the different keywords.

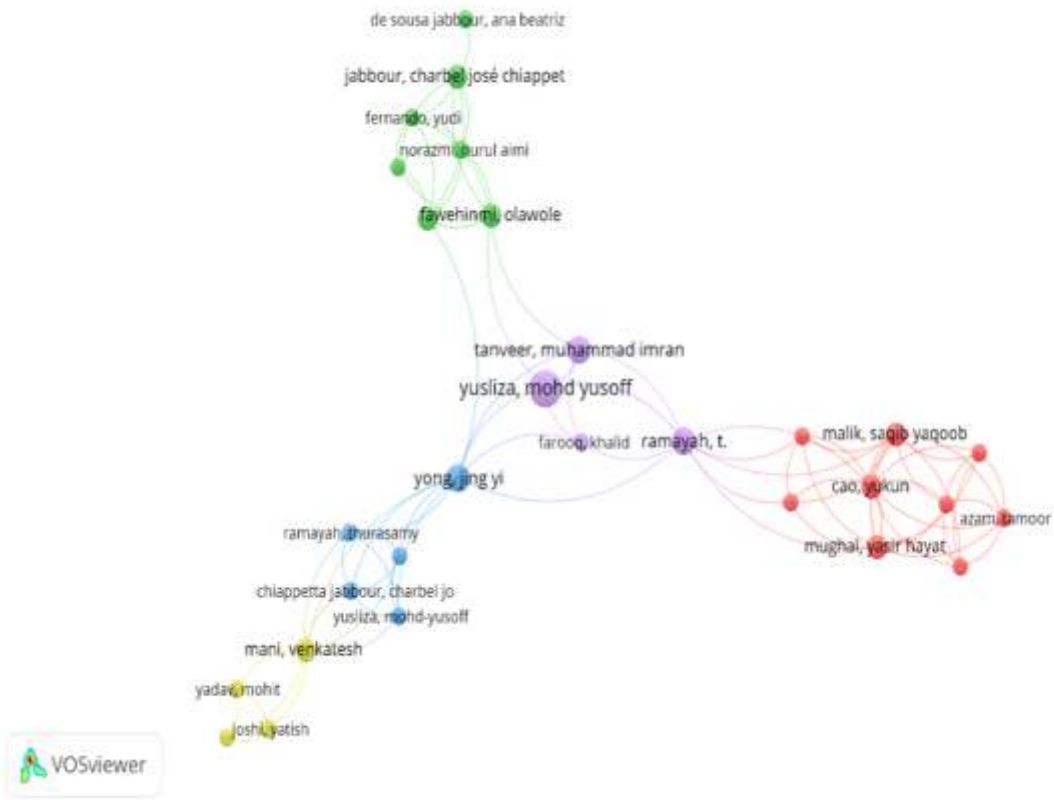

Figure 1 Networks of Authors and co-authors **Source:** Authors, based on Scopus database; Created using VOSviewer software

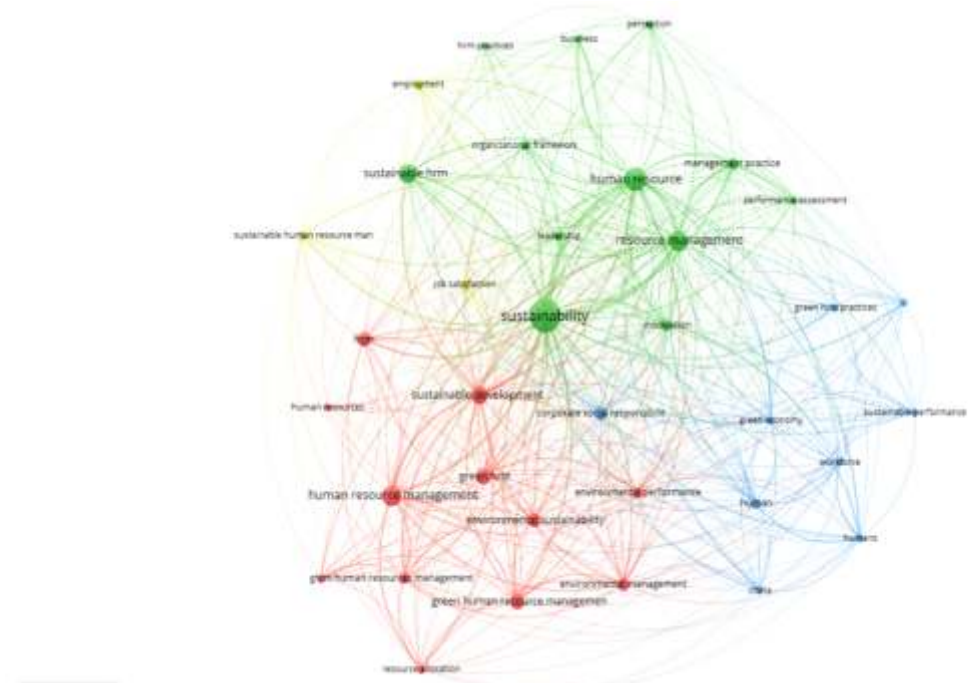

Figure 2. Network of co-occurrence of keywords based on the Scopus database; Created using VOSviewer software.

Figure 3: Overlay Visualization of keywords occurrence of Scopus database using VOSviewer software.

Overlay representation shows a connection between differentkeywords associated with the main key search and creates a network according to emerging growth in preceding years.

Table 2: Keywords associated with the Key Search

S.No	Year	Keyword	Total Strength	links
1	2020	Sustainability in HRM	422	18
2	2021	Green HRM	516	19
3	2022	GHRM Practices	612	29

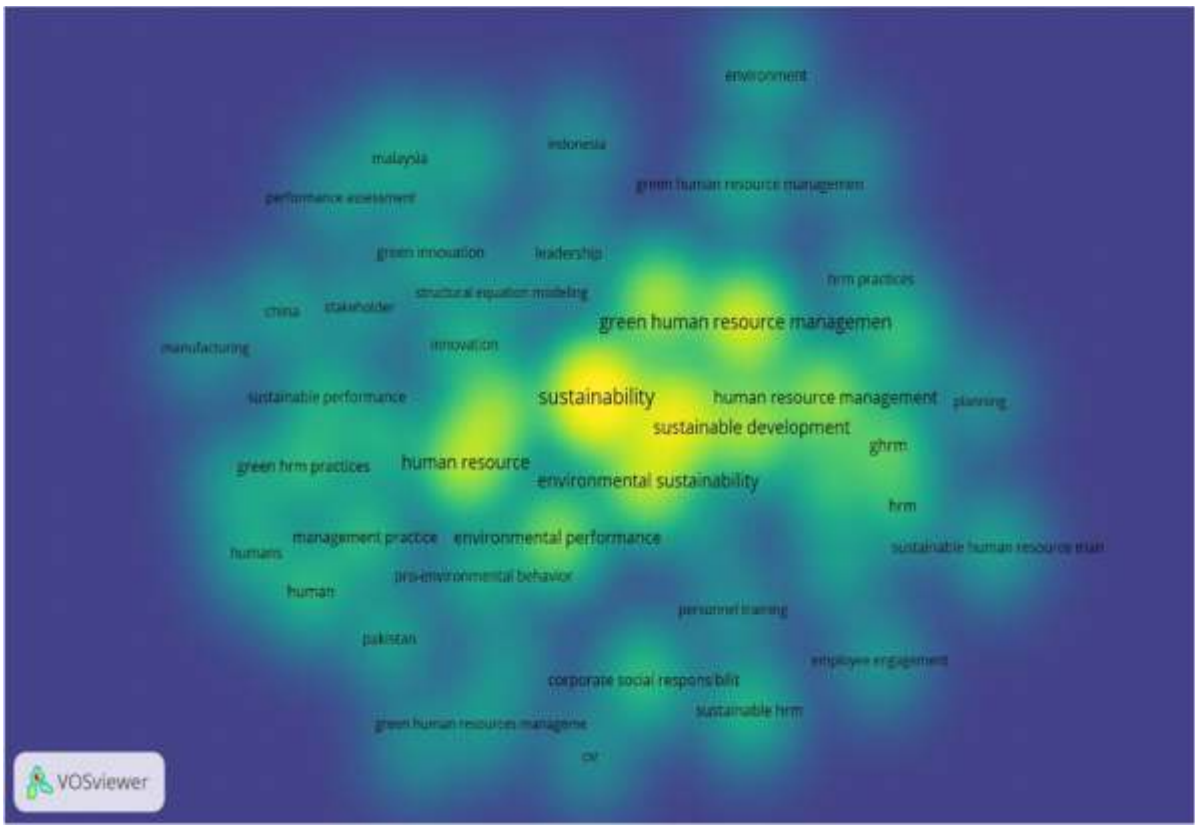

Figure 5: Density visualization of keywords using Vosviwer software

Interpretation of Result

A uthors and Co-A uthors L inkage -

The result states that it has a full countinganalysis of the minimum no of documents of an author set 4 to give a clear understanding and in which the selected 10 authorsmade two clusters.Cluster 1 has link 2,cluster 1 link 2, and the total strength of clusters 1 and 2 was 2 and 4 respectively. It shows they are barely connected in the respective domain.

Key Words

Cluster 1: It has a total number of 12 itemsthat are connectedhowever the keyword Human Resource Management is highly connected and has a maximum occurrencei.e.69.

Cluster 2 -Cluster 2 has a total no of 12 items out of which sustainability has a total strength of 166 and created a link of 29 between others and showing a maximum occurrence after analysis.

Cluster 3 -It shows a total of nine items the maximum occurrence shows the item green economy.

Cluster 4 -Cluster 4 has 3 items linking sustainable human resources with job satisfaction and employment together having a strength of 1896.

Contribution

By providing composite data on the most influential writers, maximum cited papers,and emerging keywordsclusters for sustainable HRM and digital transformation in business educational institutions offering fresh and plausible avenues for future investigations. A qualitative study to comprehend the organizations' chosen strategic approachto create and put into practice sustainable or green HRM and digital transformation tactics in educational institutions. Empirical research emphasizes the importance of it.Still, more studies that provide insight into the methods used by organizations to develop and apply different plans will surely advance the area.

Implications

The current study has limitationswhile doing thorough literature it was observed that this assessment is not exhaustive. The WOS database is used in this investigation. Future study is advised to use databases such as Pubmed and others for a comparative and thorough examination. Secondly, dissertations, book chapters, and novels were not included in the analysis; instead, we only included papers that were research articles.

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Analyzing the Impacts of Alternative fuel options for future & Consumer Perception: A Comprehensive Study

Akshay Rana

ABSTRACT

This study focuses on comprehensively analyse the impacts of alternative fuel options on the future while investigating consumer perceptions. Through a mix of quantitative and qualitative methodologies, the study will assess environmental, economic, and social aspects of various alternative fuels (such as electric, hydrogen, and biofuels) compared to traditional fossil fuels. This includes evaluating their environmental footprint, economic feasibility, and the role of government policies. Evaluate the environmental impact of various alternative fuel options (e.g., electric, hydrogen, biofuels) compared to traditional fossil fuels. Assess the economic viability and feasibility of implementing alternative fuel technologies on a wide scale. Investigate consumer perceptions and attitudes towards different alternative fuel options through surveys, interviews, or focus groups. Analyse governmental policies and incentives influencing the adoption of alternative fuels in different regions or countries. Additionally, the project will delve into consumer perceptions and attitudes towards these alternative fuels, aiming to uncover motivations, barriers, and preferences. Ultimately, the report intends to provide insights and recommendations beneficial for policymakers, industries, and consumers to promote the adoption of sustainable fuel alternatives for a greener future.

Key words: Consumer Perception, Attitudes, Environment, Carbon footprints.

Introduction:

Fossil fuels were the primary energy source for more than 130 years prior to the invention of modern automobiles. Since then, for a variety of reasons, researchers and entrepreneurs have attempted to replace fossil fuels with some restricted AFs, including ethanol. However, because of the less advanced technology at their disposal and the lack of significant air pollution and greenhouse gas (GHG) emissions, they did not have much success.

It is acknowledged that emissions of greenhouse gases (GHGs) are the primary cause of climate change. The European Union wants to cut greenhouse gas emissions from transport by 60% by 2050 and boost the market share of alternative (renewable) fuels to 10% by building more infrastructure in this area. This suggests that new, alternative fuels that emit far less greenhouse gas than fossil fuels are required. Pollutant emissions must be decreased concurrently, especially those of NOx and soot. In addition to having the potential to reduce greenhouse gas and pollutant emissions, biomass-based biofuels, electricity-based fuels (e- fuels, made from CO2, water, and renewable electricity), and the combination of these approaches (referred to as biohybrid fuels) can solve the range problems that electric vehicles (EVs) have when used for long-distance transportation.

As an illustration, when compared to petrol, the alternative fuels methanol and methane can individually lower NOx emissions by 30–50% and total hydrocarbon emissions by 15–30%. Additionally, as compared to diesel fuel, certain alternative fuels for compression ignition engines can significantly lower particulate matter (PM) emissions. For example, dimethyl ether (DME) can cut PM emissions by more than 95%. Certain alternative fuels don't even need to have the infrastructure, cars, or engines modified in order to be utilised in traditional vehicles. Pollutant emissions from personal transportation have a significant negative influence on the environment and may soon change how we drive: India is now considering prospective driving bans for diesel-powered automobiles in severely polluted urban areas as a result of the "Dieselgate" scandal to decrease urban air pollution. The necessity for alternate energy is further reinforced by these conversations.

Environmental, legal, economic, and technical factors do

not dictate the market adoption of alternative fuels. Drivers of automobiles can choose which gasoline to use, especially if they want to utilise an alternative fuel. The consumer boycott of the ethanol-blend fuel E10 (10% ethanol, 90% petrol) demonstrated how this affects the commercial viability of new fuels.

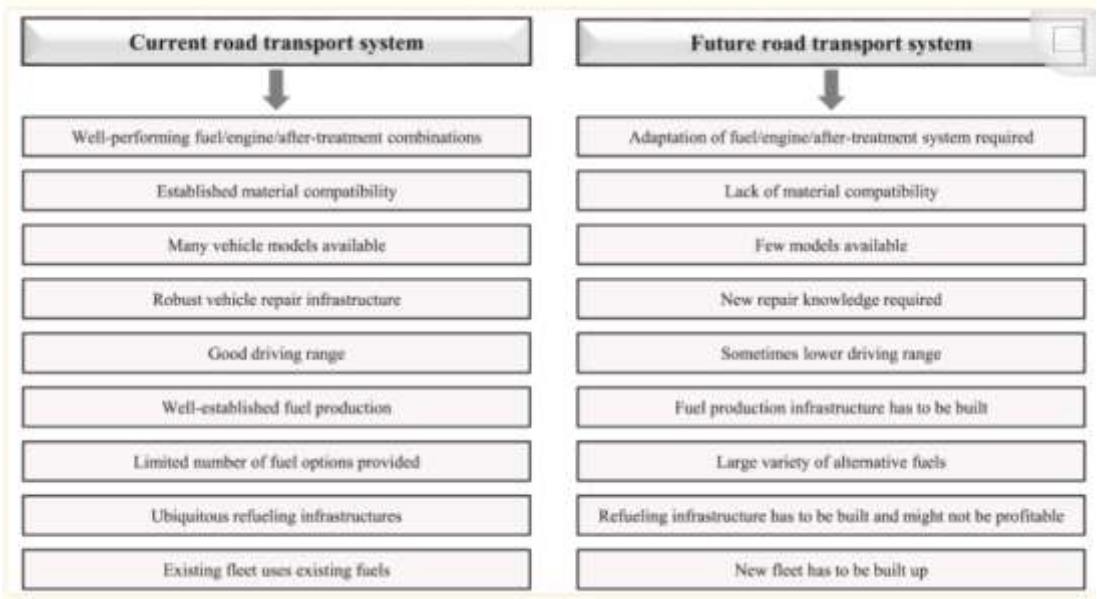
Technical advances frequently fail to take customers' needs and wants into account, which might lead to creative

goods that are discarded as soon as they hit the market (as research on

biofuels and climate-smart agriculture technologies have shown). This emphasises how crucial it is to incorporate drivers' perspectives into the early phases of fuel design in order to improve the techno-economic and ecological perspectives on alternative fuels.

Despite extensive study on alternative fuels and their technological viability, there are still some unanswered problems, such as those about societal acceptance. First, earlier research on consumer preferences for alternative fuels (e.g., did not only focus on the alternative fuel candidate and its acceptance-relevant characteristics, but also mostly examined alternative fuel vehicles as a whole, including the propulsion technology, fueling/loading infrastructure, etc. This results in an additional knowledge gap: While many alternative fuels can only be utilized in traditional CI or SI engines with a minimal engine upgrade or without modifications, certain alternative propulsion systems (like electric cars and fuel cells) need the purchase of a new vehicle. The impression of these retrofit/no-adjustment instances by consumers is not well addressed by AFV research.

However, for a sustainable and socially acceptable fuel design as well as a successful market adoption, knowing which parameters and configurations are associated with preferences for alternative fuels is extremely useful.



The acceptability of alternative fuels in society for transportation

Any gaseous or liquid transportation fuel for light-duty vehicles other than gasoline or diesel is referred to as alternative fuels. Therefore, fuels derived from oil (such as liquefied petroleum gas, or LPG) or natural gas (such as compressed natural gas, or DME), as well as biofuels (such as ethanol), e-fuels (such as methane created from water, CO2, and electricity), and biohybrids, are considered alternative fuels. These alternative fuels might differ greatly in terms of their raw ingredients and production methods, how they are handled throughout gasoline distribution and filling, and how well they operate in vehicles.

Several alternative fuels have been the subject of extensive research in recent decades, taking into account both the engines and the manufacturing processes.

The potential for alternative fuels to lower greenhouse gas emissions—either by using renewable raw materials and energy sources, reducing carbon content (e.g., CNG), or improving engine efficiency—is one of its main selling points. The latter choice also takes into account the finite supply of fossil fuels. Furthermore, as compared to gasoline and diesel, a number of alternative fuels have the ability to significantly lower the production of pollutants such nitrogen oxides (NOx), soot, carbon monoxide, and unburned hydrocarbons.

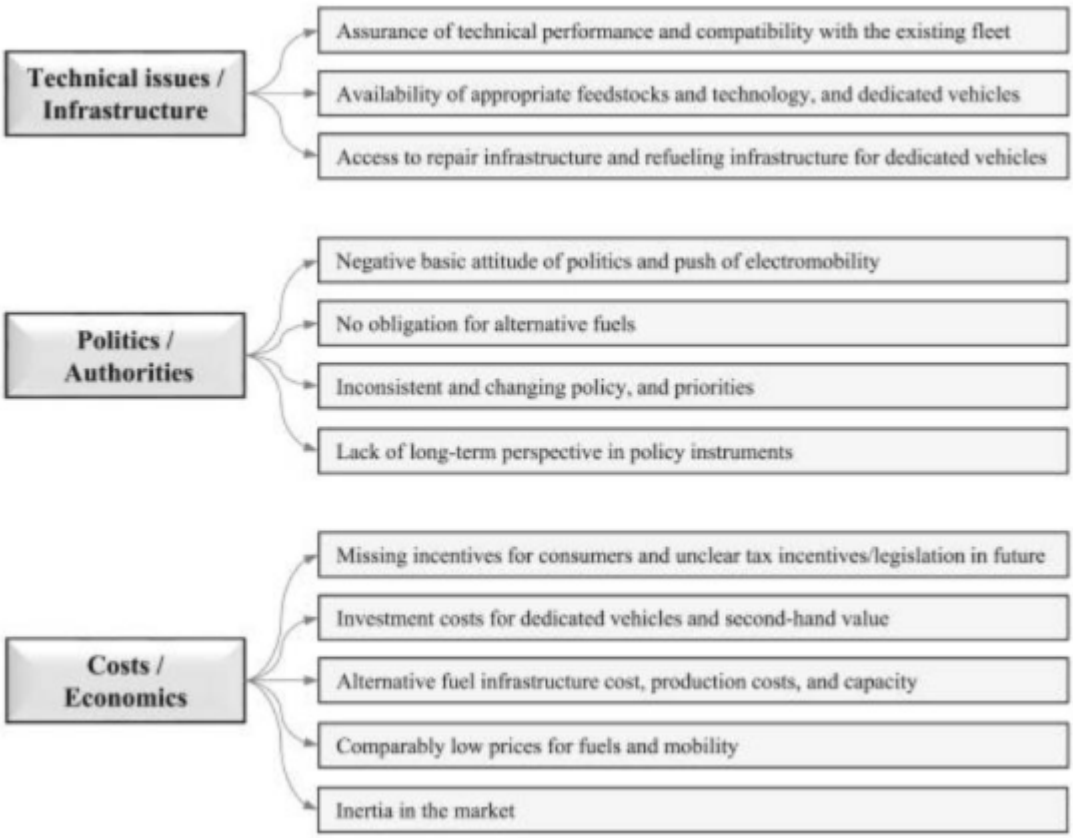
The cost competitiveness of alternative fuels with respect to gasoline and diesel is a significant obstacle to their development and implementation. Because of their relatively cheap production costs and lower fuel taxes, fossil fuel-based alternative fuels like CNG or LPG are now available in India at lower prices (on an energy basis) than gasoline or diesel. On the other hand, the cost of manufacturing and overall cost of e-fuels and biofuels have typically been greater than those of conventional fuels thus far. The fact that the majority of alternative fuels are incompatible with the infrastructure for gasoline distribution and fuelling as well as the current fleet of vehicles presents another obstacle. Changes within these systems would therefore be necessary for their infiltration.

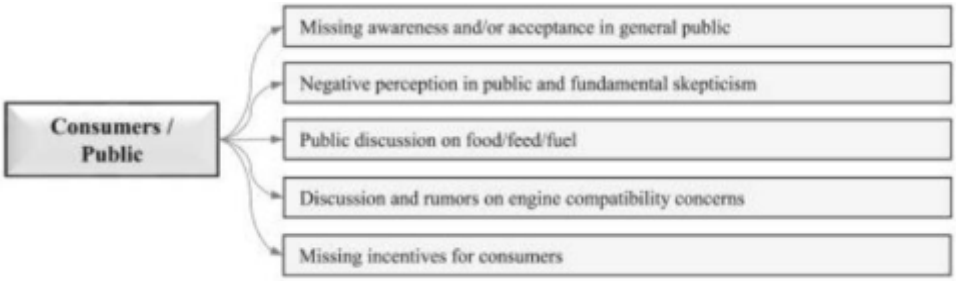
Lastly, because many alternative fuels (like ethanol) are oxygenated or gaseous under practical storage conditions (like CNG), they have lower volumetric energy densities than gasoline and diesel.

DME is mostly used in conjunction with LPG as a fuel for cooking and heating. It has also been regarded as an alternative diesel fuel since the 1990s, and fleet testing of heavy-duty vehicles running on bio-based DME have been conducted [19]. While DME is a gas at roomtemperature, it may be treated similarly to LPG by liquifying at moderate pressures. Because there are no carbon-carbon bonds, it has a significant reduction in the creation of soot, making it an excellent substitute for diesel fuel. By adjusting engine calibration, this reduction in NOx is also possible.

DME (dimethyl ether) is now made from methanol, which is produced from coal or natural gas. In contrast to previous fuel possibilities, different production methods have been proposed that allow DME production as biofuels or e-fuels with good efficiency.

The use of oxymethylene dimethyl ethers (OMEs) as blend components or substitute diesel fuels has garnered attention. Significant reductions in pollution emissions are made possible by OMEs, even when combined with fossil fuel. OMEs have an advantage over DME in that they may be used as neat fuel or as a blend component because they are liquid at room temperature and miscible with regular diesel fuel. Since interest in OMEs has just lately grown in comparison to DME, there is less experience with OMEs in automobile applications. OMEs are now mostly made in China using complicated procedures from coal- based methanol.





On the other hand, a number of innovative production techniques have been created to increase productivity and lower production costs. Moreover, OMEs may be converted into biofuels or e-fuels by using other methanol sources. In this instance, their carbon impact may be more beneficial than that of traditional diesel.

Numerous criteria may be taken into account when evaluating alternative fuels from a technological standpoint, even before consumer acceptability is taken into account. When it comes to fuel production, the most common performance metrics are connected to economic (like production cost per fuel energy) and environmental (like greenhouse gas emissions) factors, as well as conversion efficiencies (like raw material consumption or energy efficiency). In addition, different fuels may require different kinds of raw materials to produce them. Fuels are frequently evaluated for use in vehicles based on the noise, pollution, and engine efficiency that they produce. tailpipe CO2, specifications for gasoline pumps, tanks, or exhaust gas treatment systems, among many other technical issues. In conclusion, when it comes to handling, alternative fuels are evaluated based on how they perform in ambient settings and how well they work with the infrastructure that has already been put in place.

Acceptance of alternative fuels by society

A positive reception of alternative fuels and associated refueling infrastructure is a key component for the market adoption of alternative fuels, as demonstrated by the unsuccessful market launch of E10 and the hesitant market adoption of CNG in India. A positive attitude toward technology is one aspect of social acceptability, as is conduct connected to the technology (either the active usage and/or passive tolerance of this technology).

Three (interdependent) aspects of societal acceptability in the context of renewable energy have been identified as having an impact on the effective adoption of energy technologies:

Three types of acceptance are identified:

1) Socio-political acceptance, which is the public's and political and industrial actors' general acceptance of energy technologies and strategies

2) Community acceptance, which is the local public's and municipal authorities' acceptance of particular energy infrastructure projects (like wind farms or biorefineries)

3) Market acceptance, which includes the market adoption of innovative energy technologies by consumers and investors. When it comes to small-scale energy or product solutions that require direct user involvement, such home photovoltaic systems, smart grid technology, or alternative fuels, market acceptability is very important.

The investigation of consumer demand for alternative fuels and the emphasis on the aspect of commercial adoption. Unlike the economic standpoint, we employ the term "consumer" from the perspective of social acceptance: While customer needs are taken into account in economic analysis as a necessary condition for valuable, economically viable innovations (as a component of supply and demand), acceptance research seeks to define the parameters of a socially acceptable innovation and to provide novices with the opportunity to engage in the innovation process. Drivers of automobiles must make the decision to acquire and consume alternative fuels in order for the market to embrace them favorably. Alternative fuels cannot be produced profitably and will therefore not succeed in a free market if drivers are unwilling to buy them, creating a low demand.

Study Purpose

The purpose of the study is to analyze the impacts of alternative fuel options for the future and to examine consumer perceptions regarding these options. The study aims to provide insights into the potential benefits, challenges, and consumer attitudes towards alternative fuels in the context of evolving energy needs and environmental concerns.

Objective of Study

- To assess the environmental Impacts of alternative fuel options.
- To evaluate economic feasibility and viability
- To examine technological advancement in alternate fuel option
- To Understand Consumer perception about others fuel option .

Literature Review

(Landälv I, Gebart R 2014) Actually, in the 1980s, a modest American entrepreneur named Stanley Meyers created an automobile that could operate on water while searching for a fuel substitute to prevent rising gasoline costs in the US. Meyers claimed that this vehicle could travel 180 kilometers on 4 liters of water. However, as soon as Meyers shared this concept with the public, several oil firms began to threaten him.

(karan Rao H, Kaimeson J 2018) A group of Indian engineering students from Nagpur actually filled a Maruti 800 with water. In essence, they combined water and calcium carbide in the Maruti 800's fuel tank.

Additionally, they employed a chemical process to drive the vehicle on combustible acetylene gas. These are only a few of the numerous variations of water engines that exist. However, there were some basic issues with each of them.

(Bunch DS, Bradley M 2013) While non-fossil sources like biomass and water may also provide hydrogen through electrolysis, fossil fuels like oil and natural gas are now the main source of hydrogen generation. It may be utilized as a fuel source for automobiles, such as fuel cell and internal combustion engine (ICE) cars. Because of their higher

efficiency and zero exhaust emissions, fuel cell vehicles are now far more suitable for using hydrogen as an energy source than internal combustion engines (ICEs).

(Kitamura R, Occhiuzzo GP 2011) It is important to note that a higher adoption rate of AFVs can arise from paying more attention to the impact of auto salesmen on the selling side. Because most individuals buy their cars from auto shops, the advice of the salesperson can have a big impact on what they decide to buy. For instance, a recent study released by Nature Energy in 2018 collected data from 126 mystery shopping experiences at 82 auto dealerships. It found that most salespeople in Denmark, Finland, Iceland, Norway, and Sweden were dismissive of EVs, misled customers about the vehicles' requirements ignored EVs during the negotiation phase (77% of visits had EVs available in the shops), and even actively urged customers to buy gasoline/diesel vehicles.

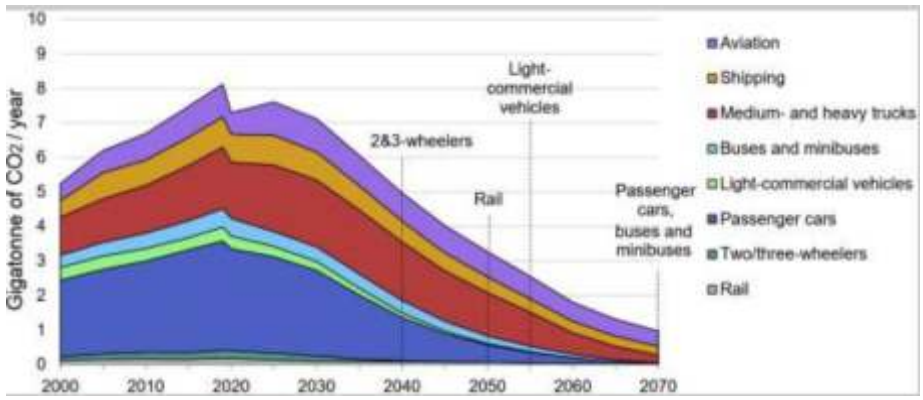
(Traut M, Kesieme U 2017) The majority of these obstacles are connected to technological and financial issues, which can only be resolved by yearly advancements in technology; but, some of these issues, which are also highly significant, can be resolved by the technologies in use now. These include the general public's perception, awareness, and acceptance of alternative fuels. For instance, when AFVs were first being adopted in Austria, the introduction of E10 vehicles was halted several weeks before they were supposed to go on sale. This was mostly because of the public debate over engine compatibility and food/feed vs. gasoline, even though E10 vehicles were equipped with technology that was appropriate for them.

(Brown K, Marshall N 2013) Electric motors or traction motors are used by EVs to drive them forward. EVs and ICEs can also be blended. Battery electric cars (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs) are the three main varieties of EVs that are typically offered on the market. While the worldwide vehicle company is currently approximately 1.2 billion, the EV fleet is currently estimated to be about 8.5 million (more than 500 thousand electrically powered buses, more than 400 million. Electricity delivery vans and trucks, and the remainder counted for people vehicles) in 2019– 2020. By 2030, it is expected to reach approximately 116 million (or EV sales reach 23 million and the stock will be more than 130 million, excluding two/three-wheelers according to the IEA New Policies Scenario.

(Yilmaz N, Atmanli A 2017) It is noteworthy that projections indicate that by 2050, natural gas and propane will rank as the third most popular fuels for transportation worldwide, behind gasoline and diesel. At the moment, there are about 23 million natural gas-powered vehicles on the road. These advantages are attributed to their availability, clean burning characteristics, high energy density, and relative affordability for many developing nations.

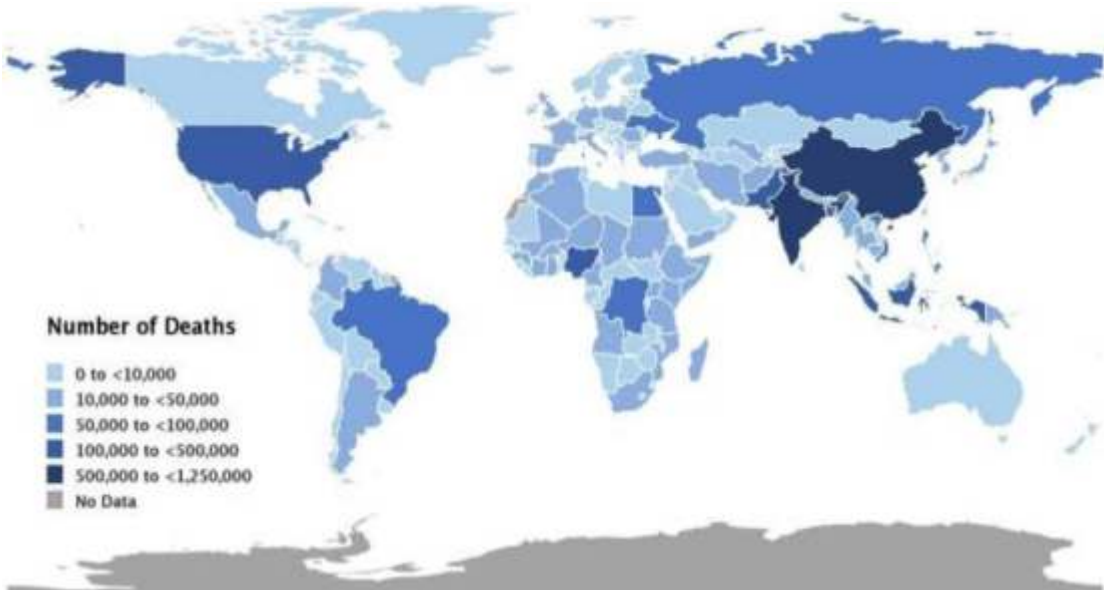
(van Heek J, Ziefle M 2018) While there has been a dedicated plan to promote the use of AFs for some time now (e.g., the Clean Air Act of 1970, which is an important piece of domestic environmental legislation, and the Energy Policy Act of 1992 (EPAct 1992), which establishes automating activities that are both voluntary and mandatory for promoting the use of AFs, only 6% of the world's transportation energy has been switched to AFs as of yet.

However, the vast majority of studies that have been completed and published in journals utilizing AFs for cars indicate investigators are becoming more and more aware of this technique on a yearly basis.



(McCarthy C, Basu A 2017) Large-scale global prices for gasoline and diesel jumped by roughly 20% between 2010 and 2012, then mostly stayed unaffected until 2014, and then decreased by roughly 30% in 2016. This pattern is nearly identical to the pattern of crude oil prices during the same time period, albeit with different magnitudes (that the time had a huge price change over the last few years)

(Bae C, Crookes R 2019) As of right now, air pollution is killing people faster than traffic deaths (roughly five times as many in 2016), shortening people's lives by 20 months on average. It is also one of the major risk factors for global mortality, accounting for 14% of all deaths worldwide in 2016 and ranking fifth in both 2016 and 2017. However, the WHO data indicates that, as a result of increased greenhouse gas emissions, climate change affects global human mortality. Between 2030 and 2050, it is predicted that, as a result of heat stress, malaria, malnutrition, and diarrhea, an additional 250,000 deaths annually will result from climate change.



Research Methodology

Research Method

Research is a collection and analysis of data gathered from a sample of individuals relating to their characteristics, behavior, attitudes or opinions further defines research as, "systemtic investigation to establish facts or principles or to collect information on the subject", suggests that existing literature will benefit primary research and work as a framework for analysis; likewise research carried out will constantly review, modify and challenge the theoretical details.

Data Source

- Questionnaire
- Database of companies and Governmen
- Article Online and Book Resources

Research Design

The choice-based conjoint research (CBC) in India [Delhi NCR] to look at the alternative fuel choices and decision-making processes of drivers. The following outlines the fundamentals of conjoint methodology, as well as the experimental setup and empirical process idea that were employed.

Conjoint analysis

Conjoint analysis (CA) is a well-researched technique in the fields of social, environmental, and health care that enables the modeling of choices for innovative items or situations, trade- off analysis, and individual preference assessment. When it comes to survey methodologies, CA is superior because it is an experimental approach with a high level of external validity. This is because specific elements that have been verified in previous research are used, and it is possible to precisely specify how the above variables interact and contribute to the total preference rating.

Additionally, because respondents assess entire situations rather than individual aspects, CA closely resembles real-life judgments where several attributes impact the ultimate decision. Assuming that each individual preference assessment (the "utility") is linearly additive from partial utility values, the CA technique of preference assessment is decompositional. This makes it possible to ascertain how much each aspect contributes in relation to the evaluation as a whole. More specifically, we use CBC (choice-based conjoint), a unique kind of CA in which participants choose the option they find most appealing out of several options.

Selected attributes and experimental design

Based on conversations with both beginners and specialists in the field of fuel design, the relevant impact factors were chosen for the CBC study into the preferences of automobile drivers for alternative fuels. subsequently requested that participants in the conjoint study assess several alternative fuels exhibiting notable variations in each of the following five attributes: range of driving, price of fuel, availability of gasoline at regular petrol stations, consumption specifications, and emission rates for pollutants.

Permitted three values for each attribute, taking into account the characteristics of the current alternative fuels. Figure provides an overview of the levels and qualities as well as the description of the attributes.

Attributes and levels used in the conjoint study.

Attribute	Definition	Number of levels	Levels
Usage requirements	car adjustments required for alternative fuel use	3	no requirements, retrofitting, purchase
Pollutant emissions	pollutant emission reductions compared to diesel	3	-10%, -30%, -60% compared to diesel
Fuel availability	share of conventional filling stations in the near vicinity offering the alternative fuel	3	10%, 50%, 100% of filling stations
Fuel costs[2]	extra charge compared to diesel price	3	+0, +10, + 20 euro cents/liter compared to diesel
Driving range	driving range reached by a tank filling of the alternative fuel (reference: range is 1000 km for a tank filling of diesel)	3	400 km, 700 km, 1000 km

Data Interpretation & Analysis

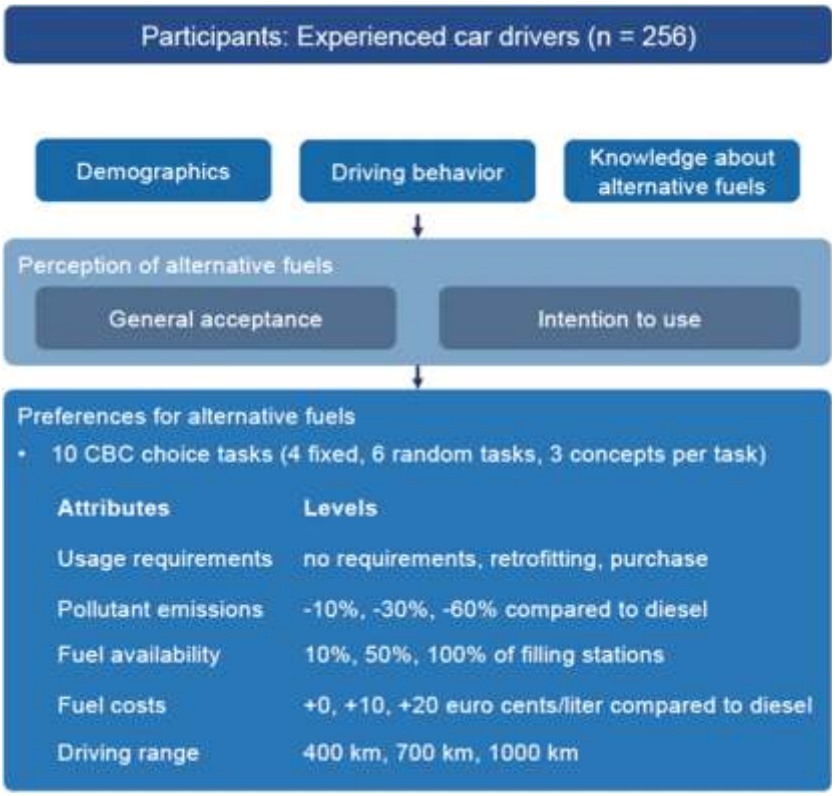
Data was gathered via an online survey [Google Form], with the goal of selecting a sample that was representative of the age, gender, and educational attainment of the people living in the Delhi NCR.

336 people with driver's licenses in all took part in the survey. Only individuals with a minimum of driving experience were included in our analysis to guarantee that true claims about the subject of the study were recorded. We also eliminated respondents who provided incorrect responses on the survey's attention tests, speeders (those whose reaction times were less than 65% of the median), and incomplete data sets. There were 256 data sets produced by this process.

Demographic Characteristic		Percentage of Sample
Gender	Female	43.8%
	Male	56.3%
Age	Young (18 -35) years	26.6%
	Middle (36 - 55) years	56.6%
	Old (56 - 58) years	16.8%
Educational Level	University Degree	29.3%
	12th	44.1%
	10th	21.1%
Region	Gurugram	26.6%
	Palwal - Rewari	21.1%
	Meerut - Muzaffarnagar	12.8%
	Delhi	30.5%
	Alwar	9.05
Area of Living	City Centers [Scoiety]	21.5%
	City Outskirts	38.7%
	Rural Area	39.8%
Car engine type	Petrol	68.0%
	Diesel	27.0%
	Hybrid	2.7%
	Gas	2.0%
	Electric	0.4%
Driving Frequency	Every day	58.2%
	Several time per week	37.9%
	Several time per month	3.5%
	Several time per year	0.4%
Annual mileage	5000 - 10000 km	34.8%
	10001 – 15000 km	27.0%
	15001 – 20000 km	19.5%
	More than 20000 km	18.8%

The sample under analysis comprised 56.3% men and 43.8% women from Delhi NCR (see information regarding the sample's driving behavior and demographics).The age range was 18–78 years old, with a mean of 44.2 years (SD = 13.0). The sample felt fairly ignorant about this issue, according to ratings on self-assessed knowledge on alternative fuels (min = 1, max

= 6; M = 2.9, SD = 1.3). 32.4% of respondents felt (somewhat) knowledgeable about alternative fuels in transportation, compared to 67.6% who reported having (rather) little knowledge (score < 3.5).



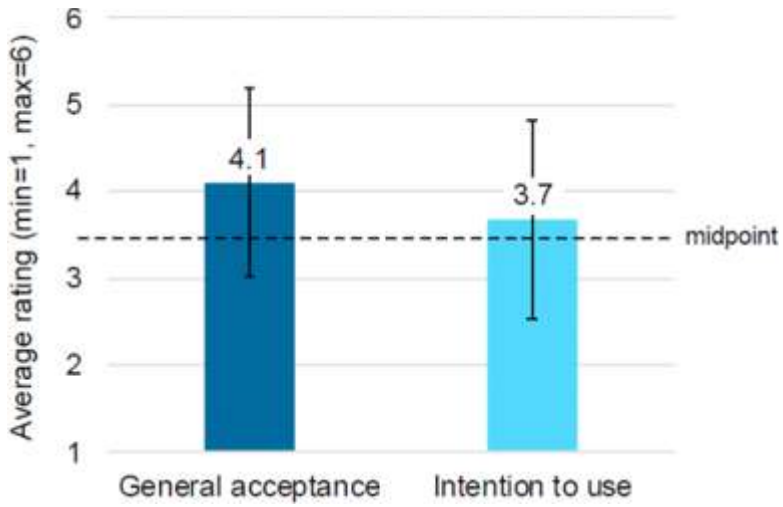
Using the relative range between the highest and lowest part-worth-utility of the attribute levels, we were able to determine the relative relevance score of each attribute. It acts as a gauge for how much a characteristic adds to a scenario's overall preference. More precisely, an attribute is more engaged in the choice decision for a scenario the higher its relative relevance score (the greater the range between part-worth utilities of the attribute levels).

One drawback of conjoint analysis is that because "part-worths are scaled to an arbitrary additive constant within each attribute," it is only possible to assess part-worth utility values within a single attribute, not across distinct characteristics. Similarly, because the relative relevance score is determined in relation to the other qualities taken into consideration, it is specific to the set of attributes examined in the research and is unable to be applied to other categories of attributes.

Furthermore, we used the Sawtooth Choice Simulator to perform preference simulations based on the conjoint judgments of the respondents. It is possible to define imaginary products using the Choice Simulator and then pit them against one another in an imaginary market. Shares of preference are the output of this market simulation. Because the market scenarios utilized in the simulation are always restricted to the set of features taken into consideration, preference percentages are not equal to realistic market penetration. Sensitivity simulations illustrate how changes in some attribute levels within a product scenario affect consumers' preference shares while maintaining constants in all other attributes. More specifically, the choice simulator may be used to assess the performance of a new product in comparison to existing items on the market.

General acceptance and intention to use alternative fuels

We computed mean scores for both measures in order to assess the sample's overall acceptance of and intention to utilize alternative fuels . The sample found that although there was a widespread acceptance of alternative fuels (M = 4.1, SD = 1.1), there was a lower and more neutral desire to utilize them (M = 3.7, SD = 1.1). A statistically significant difference was seen between usage intention and acceptability (t(255) = 5.97, p < 0.001, 2 =.12).

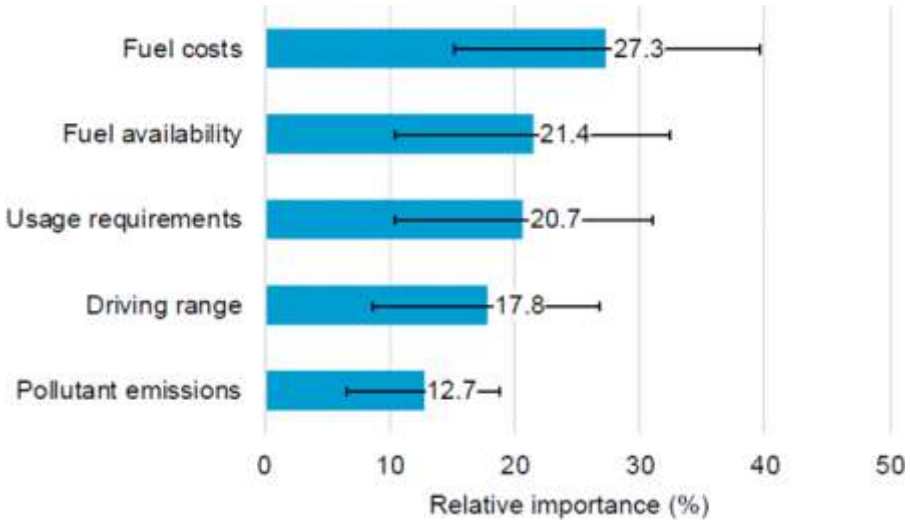


[Alternative fuel acceptance ratings (n = 256). Error bars show standard deviations, while mean values are displayed above the bars.]

Decision criteria and preferences for alternative fuels

The fuel availability and costs were found to have the greatest impact on preferences for alternative fuels, according to the importance scores. The extra cost associated with using alternative fuels received the highest importance score (27.3%), followed by the availability of the fuel at nearby conventional filling stations (21.4%). Among the five qualities, use needs have a medium level of value (20.7%). The least significant decision-relevant factors were driving range (17.8%) and pollutant emissions (12.7%).

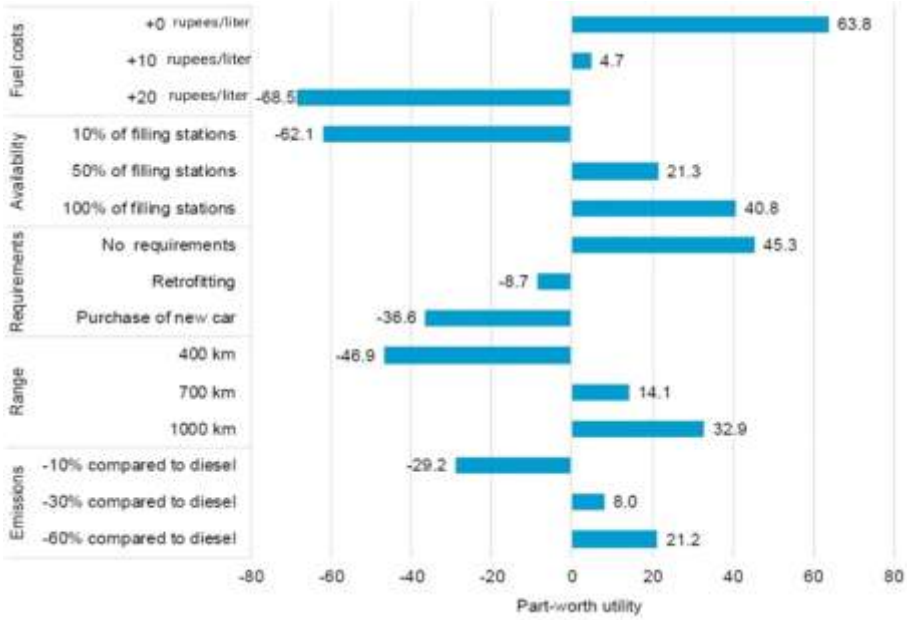
[Scores of relative relevance for traits related to alternative fuels (n = 256). Error bars show standard deviations, while mean values are displayed above the bars.]



The intermediate levels of fuel availability

It shows the part-worth utilities on average for each attribute level. The best performance on each fuel feature combined with the least amount of customer effort was selected by respondents: Maximum availability (at 100% of typical filling stations), maximum feasible range of 1000 km, and maximum emission reductions (-60% compared to diesel) were shown to have the highest part-worth utilities. Simultaneously, participants chose a fuel that doesn't cost more than diesel and can be utilized in their present vehicle without any modifications.

On the other hand, the most common reasons for rejection were the greatest fuel costs (+20 rupees/liter), lowest availability (10%), shortest driving range (400 km), smallest pollution reductions (-10%), and the need to buy a new automobile.

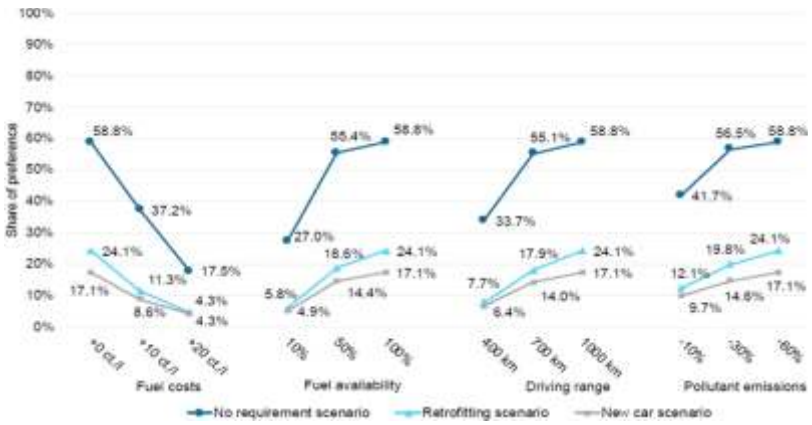


[Values of part-worth utility (zero-centered diffs) for qualities related to alternative fuels and their corresponding levels (n = 256)]

Sensitivity simulations for alternative fuel design scenarios

Used the Randomized First Choice model (RFC) to compute preference shares in order to simulate the sensitivity. This is predicated on the idea that each participant chooses the fuel option with the greatest utility and also takes into consideration the degree of inaccuracy that comes with decision-making because of random factors, such a fuel alternative becoming momentarily unavailable on the market . Since certain alternative fuels are compatible with current engines while others are not, we looked at changes in preferences under various usage requirement circumstances (no need vs. retrofitting vs. buying a new automobile) in the scenario "alternative fuel usage requirements."

demonstrates that, for every characteristic, preference declines were always smaller between the most and least desired levels than between the middle and least liked levels (as seen by the variations in trend line slopes). The gasoline cost characteristic was the sole outlier, with preferences falling even further between the most desired level (+0 cents/liter) and the intermediate level (+10 cents/liter). Furthermore, the fuel cost attribute had the largest variation between the greatest and lowest preference shares for each consumption need scenario, reflecting the significant relative relevance of costs.



[Sensitivity analysis with requirements for continuous consumption (n = 256).]

Analyzing preferences for CI fuels (diesel, DME, and OEM-diesel blend) in order to simulate the fuel market

Although they are still in the research and development stages and their potential acceptance by the general public is uncertain, OME and DME are two interesting alternative fuels for CI engines. We created product scenarios that closely matched the characteristics of the three fuel types, the DME scenario, and the diesel scenario in order to simulate their market demand in relation to conventional diesel (within the parameters of the five qualities). We always used the level that most closely matched each fuel, even if it wasn't always 100% right, because the attribute levels were set in the conjoint research and could not be changed after the fact.

Fuel scenarios used in the market simulator.[a]

Fuel type	Usage requirements	Pollutant emissions	Fuel availability	Fuel costs	Driving range
O35 (OME)	retrofitting	-60%	10%	+20 rs./liter	1000 km
DME	retrofitting	-60%	10%	+20 rs./liter	700 km
Diesel	no requirements	-10%	100%	+0 rs./liter	1000 km

[a] As the attribute levels were predefined, we always took the level that matched best (even if not 100% accurate).

The diesel scenario calls for no modifications to the vehicle, has no decrease in pollutant emissions by definition (thus the lowest level, -10%), perfect fuel availability in Delhi NCR, no definitional difference in fuel costs, and the maximum range. We believed that upgrading diesel automobiles was both feasible and required for both DME and O35. While 035 could need new seals and potentially the tank system, DME will get both a pressurized tank and a changed injection mechanism

Level variation in the sensitivity analysis for CI fuels.

Fuel type	Usage requirements	Pollutant emissions	Fuel availability	Fuel costs	Driving range
O35 (OME)	freely varied[a] (base case: retrofitting)	-60%(X)[b]	freely varied (base case: 10%)	freely varied (base case: +20 ct./liter)	1000 km(X)
DME	varied between retrofitting and purchase[c] (base case: retrofitting)	-60%(X)	freely varied (base case: 10%)	freely varied (base case: +20 ct./liter)	700 km(X)
Diesel	no requirements(X)	-10%(X)	100%(X)	+0 ct./liter(X)	1000 km(X)

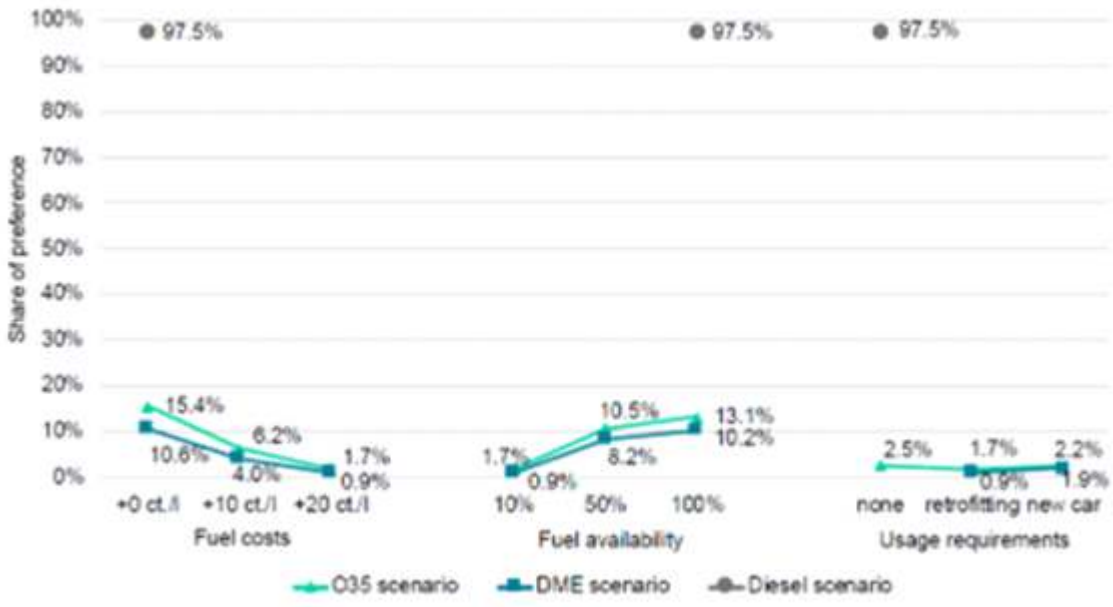
[a] "Freely varied" means all three levels were varied in the sensitivity analysis starting from the given base case (see Table 4).
[b] An (X) behind a level means that the level was kept fixed and was not varied in the sensitivity analysis.
[c] For DME, only retrofitting and purchase were varied as "no requirements" was not considered technically feasible.

We maintained the values for diesel because it is a well-known fuel with a large market share (using diesel as a benchmark for comparison with the DME and 035 choices). We adjusted the 035 and DIME level based on what is currently known about their technological viability in science. As the baseline (beginning point) for the simulation, we used the original scenario descriptions. We changed the 035 use guidelines since, as far as we are aware, there is still disagreement on how much OME-diesel combines.

Sensitivity results

To examine the effects of cost saving innovations In fuel manufacturing progresses, we changed fuel costs over the whole spectrum. Since driving rang is directly related to the energy density of the fuels, which is practically set, we did not modify it. Additionally, we did not consider worse performance because the stated reductions in pollutant emissions are so significant.

The sensitivity findings in the figure below show that preference shares for DME and 035 varied very little in response to the various circumstances. Diesel performed much better than 035 and DME for every fuel configuration. In comparison to diesel the (relatively) largest preference shares were achieved for DME (10_6%) and 035 (15A%) in the event of no additional fee. additionally, the following figure demonstrates that preference shares were negligible and barely varied for each of the three consumption requirement situations, suggesting that preferences for 035 and DME were little impacted by usage needs.



[Sensitivity analysis of diesel (n = 256), DME, and O35 (OME mix).]

Findings

Customer demand, evaluation standards, and acceptance of alternative fuels

- The two factors that affected alternative fuel preferences the most were cost and availability. This confirms results from earlier studies on alternative fuel cars.
- However, use needs like modifications vs. buying a new automobile also affected the assessment of alternative fuels, in addition to prices and availability.
- This element has not garnered much attention thus far since previous research has mostly focused on preferences for alternative fuel vehicles (AFVs) and less on the fuel itself.

- Some people would prefer buy a new automobile or refit their existing car than use fuel that is compatible with their present vehicle, even if all other attributes were the same.
- This result might be explained by the impact of random elements that were taken into account in the simulation model that was employed, such as the fact that one fuel alternative is not currently available on the market.
- Another reason, though, could be that some respondents believed that switching to an alternative fuel in their existing vehicle would be less efficient or detrimental to the engine than switching to a vehicle built or modified especially to run on an alternative fuel.
- It is important to acknowledge that the specified ranges (400-1000 km) were already rather high in comparison to other propulsion systems, including battery electric cars.
- Pollutant emissions have relatively little decision-making significance for drivers of automobiles, despite being extremely important for researchers working on innovative fuels and engines and from the standpoint of public health.
- Consumer preferences for both alternative fuel alternatives were extremely low, according to the market simulation of the OME-diesel mix O35 and DME against regular diesel, suggesting a low level of market demand for alternative fuels.
- This supports previous research findings that showed AFVs were not preferred over regular vehicles. However, it was shown that accessibility and cost might be good places to start when it comes to influencing people's adoption of alternative fuels. However, this can't make up for all the negative effects of using alternative fuels.
- As a result, it is even more crucial to comprehend how to lower adoption barriers for alternative fuels and to create suitable action plans to ease the transition to more socially acceptable alternative fuels for transportation.

Implications for fuel design and policy

- One of the main goals in the design of innovative fuel production systems is to minimize gasoline costs, as evidenced by the significant relevance of fuel costs to fuel customers. Indeed, the results also imply that consumers won't be prepared to pay more for cleaner gasoline, especially in light of the low relative significance of pollutant emissions discovered in the current study.
- Although filling station availability is naturally low for newly introduced fuels, their high relative importance indicates that it is worthwhile to prioritize the search for fuels that are compatible with current infrastructure or facilitate rapid expansion (e.g., by requiring minimal modifications).
- For fuel developers, who have mostly been concentrating on environmental factors, the low preference shares for DME and O35 in the market simulation as well as the low relative relevance of pollutant production may appear frightening.
- However, it should be noted that we limited the analysis to contaminants and excluded CO2 emissions (and, consequently, the explicit use of renewable energy sources and raw materials).
- The goal of alternative fuel information and communication strategies should be to give the public thorough, unbiased information so they may make an informed choice about which fuel to use when driving a car. Different parties, including the government and the fuel business (fuel companies, filling station owners, etc.), as well as research, should offer information.

Conclusion

- The goal of this study was to develop suggestions for an acceptance-optimized fuel design by examining the choice criteria and preferences of automobile drivers about alternative fuels. gasoline prices were the most important factor when it came to automobile drivers' judgments on petrol, followed by fuel availability and usage specifications.

- It's interesting to note that, although playing a major role in fuel design, pollutant emissions had a little impact on preferences for alternative fuels.
- Discovered that the decline in preferences brought on by increased gasoline prices could not be countered by increases in fuel supply and driving range or reductions in consumption restrictions.
- This emphasizes how fuel prices are the primary deterrent to the widespread use of alternative fuels. The outcomes of a market simulation using O35, an OME-diesel mix containing 35 vol% OME, as an alternative fuel

Recommendation/Suggestion

- Since automobile drivers tend to be more prepared to suffer drawbacks in range than in availability, research and development of alternative fuels should concentrate more on fuels that can be conveniently offered at a bigger number of (conventional) filling stations rather than on optimizing driving range.
- Since there is a limited number of drivers who are prepared to refit their cars or purchase new vehicles to use alternative fuels, alternative fuels ought to work with current engines.
- To reduce the likelihood of alternative fuels failing on the market too soon, future research should determine ways to directly include societal acceptance as an objective function in the screening of potential fuel candidates or even in the optimization- based fuel design.
- Many long-distance applications have range problems for battery electric solutions and that these industries have substantial outputs of greenhouse gases and pollutants. Future research should thus look at how well-received alternative fuels are in diverse applications in order to determine the needs of stakeholders and policies for the various transportation sectors.

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Exploring Emerging Trends in Online Psychotherapy in the Mental Health Sector: A Bibliometric Analysis

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Abstract

With increased awareness and acceptance, there has been a tremendous change in the mental-health sector. With the fast-paced life and advanced technology, individuals are more open to seeking professional help online and inculcate healthy habits. The changing and advanced transitions have encouraged mental-health practitioners to enhance their technological as well as psychotherapeutic skills and reach the masses. This purpose of the paper was to examine the changing trends in psychotherapy domain with respect to the therapeutic interventions and progress in the mental-health domain. Understanding the current scenario and implement better strategies for future growth. For this purpose, 1054 publications were examined related to online psychological counselling in the Scopus database. The results were discussed in context of country wise advancement, trending keywords and current research publication, network analysis of keywords and psychotherapeutic trends.

Keywords : *Client-centered approaches, Digital tools, Mental health practitioners, Online counseling, Therapy.*

Introduction

The mental-health sector has undergone significant changes due to technological advancements and increased awareness among the public. Individuals are seeking convenient services to help balance their routines amidst the fast-paced life, recognizing the importance of addressing common mental-health issues promptly. According to Moghimi et al. (2022), anxiety stemming from routine imbalance and decreased quality of life is prevalent. Psychotherapy, introduced in the early 2000s, revolutionized the understanding of mental-health and psychology (Childress, 2002). This led to the adoption of therapy both offline and online, catering to diverse preferences. Mental-health professionals observed substantial growth in the sector, with clients increasingly open to seeking professional help for their concerns. However, therapists noted the challenge of engaging clients who were reluctant to share their concerns actively (Feng, Meeten, & Hirsch, 2020). The online therapeutic process aims to reach a broader audience and raise awareness about mental-health. Despite the growing awareness of the need for counselling, the pandemic caused a decline in counselling sessions due to the absence of offline options.

Therapists noted that some clients were uncomfortable with online sessions, citing the lack of physical proximity and changes in therapeutic approach (Knight, 2020). However, during the pandemic, a new group of individuals began seeking therapy online. This prompted psychotherapists to transition from offline to digital-based therapy sessions to accommodate the increased demand (Knight, 2020). During the pandemic, counsellors observed a surge in online counselling sessions, noting that clients were more comfortable expressing themselves via screens (Reis, Matthews, & Grenyer, 2020). Before the pandemic, virtual psychotherapy faced acceptance issues due to privacy concerns and stigma (Fite et al., 2021). However, during the pandemic, perceptions shifted positively towards psychotherapy, with individuals becoming more aware of mental-health's impact (Kaiser, 2018). This led to increased-initiation of therapy sessions, driving significant development in the mental health sector. The pandemic highlighted a preference for phone-based counselling over video-based therapy, prompting therapists to recognize various-factors contributing to the rise of online psychotherapy methods.

The shift to online counselling provided clients with the flexibility to schedule sessions and control over their therapy environment (Battles & Berman, 2012). This sense of freedom and control reduced stigma and enhanced comfort-levels (Crisp et al., 2014). Therapists had to adapt digitally to meet the demand for virtual counselling (McDonald, 2020), reflecting a significant trend in mental health care delivery. Initially challenging, therapists adapted to online counselling, establishing rapport over time (Weinberg, 2021). This method facilitated understanding of counselling trends and preferences (Drozd, 2013). Clients found online sessions reduced mental-health stigma and offered a sense of control (Sasseville, 2023). While therapists faced challenges in digital adaptation, research found no significant difference in therapeutic alliance between online and in-person counselling (Sasseville, 2023). Initial sessions using traditional approaches like CBT were deemed mundane, impacting therapeutic alliance (Weinberg, 2021). Therapists adapted by integrating digital-tools with counselling approaches to improve user-friendliness and enhance therapeutic alliance (Juhos & Mészáros, 2019).

Clients preferred telephone sessions over video conferencing, finding it easier to express concerns and stay focused (Juhos & Mészáros, 2019). Online counselling proved effective, with clients more comfortable addressing difficulties on screen than in person (Juhos & Mészáros, 2019). Initial sessions faced technical challenges and difficulty forming therapeutic alliance in online chat-mediated counselling (Juhos & Mészáros, 2019). Therapists emphasized rapport-building and client motivation as key to successful therapy sessions. Mental-health practitioners emphasized the importance of skills like active listening and self-efficacy for effective therapy (Borsutzky, Moritz, & Hottenrott, 2023). Tailored approaches and digitization increased trust and empathy between therapists and clients, enhancing therapeutic interventions (Borsutzky et al., 2023). Counsellors found that their determination and healthy skills facilitated client adoption of healthy habits (Borsutzky et al., 2023). Initially, basic therapeutic methods were used, but clients preferred technology-driven assessments (Borsutzky et al., 2023). Therapists adapted by incorporating traditional methods with digital tools to meet client preferences for self-sufficiency in problem-solving (Borsutzky et al., 2023).

Mental-health practitioners have come to understand that establishing an emotional connection and a sense of physical presence between therapist and client is crucial for effective therapy (Carrasco, 2023). This realization has led therapists to adopt more personalized and client-centred approaches to strengthen therapeutic relationships. They are incorporating various applications into therapy sessions, allowing clients to engage in reflective exercises and challenges that promote self-exploration (Carrasco, 2023). This utilization of digital-tools not only enhances therapy but also improves therapists' listening, writing, and attentiveness skills (Rosmalen, 2020). The adoption of tailor-based and flexible approaches in therapy led to notable changes in clients' personalities from one session to another. Therapists noted that virtual counselling reduced geographical barriers, increasing accessibility to a larger number of individuals. Clients who were initially hesitant to express themselves became more interested in online counselling, finding a greater sense of control and self-insight. The methodology section outlines the systematic approach used to study the research objectives, ensuring the rigor and reliability of the study's conclusions.

Methodology

Aim of the study:

The study's objective was to investigate how the field of psychotherapy is evolving in relation to therapeutic interventions and advancements in the field of mental health. The primary goals are to understand how these changing patterns are affecting psychotherapy practice and to look into potential directions for further research and growth in this field.

Objectives of the study:

The study's goals were to: (1) identify popular search terms and recently published research on psychotherapy; (2) analyze keywords through a network analysis to understand their relevance and relationships within the field; and (3) assess how shifting societal perspectives and technological advancements have impacted the acceptance of seeking online professional assistance.

The study delves into understanding the evolving landscape of psychotherapy by compiling and synthesizing data from various articles, employing quantitative research techniques like network analysis, data mining, and content analysis.

It focuses on bibliometric analysis, a quantitative method offering insights into publications within a specific field. This approach aids in measuring progress, exploring conceptual relationships, and identifying current trends.

Divided into performance and mapping analysis, it involves numerical calculations such as publication and citation counts across countries and research areas, as well as examining frequently used terms (Hernández-Torrano et al., 2020).

Description of the tool and analysis:

VOS Viewer and the Bibliometric R Package, like bibliophagy 4.0.0, are potent tools for bibliometric analysis (Liu et al., 2022; Jingili et al., 2023). VOS Viewer creates and visualizes bibliometric maps, revealing insights across academic fields, while the Bibliometric R Package, especially bibliophagy 4.0.0, enables quantitative analysis of previous research, including citation analysis and trend tracking (Liu et al., 2022; Jingili et al., 2023). Researchers can combine these tools to gain comprehensive insights into academic literature, evaluate publication impact, and assess researcher performance. A comprehensive search was conducted in the Scopus Database using the search term "Online Psychotherapy" within the title, abstract, and/or keywords, resulting in the detection of 1,735 articles, encompassing both articles and review papers across all publication years. After extraction into a CSV Database, bibliometric software was utilized to evaluate 1,054 articles. Subsequently, a further refinement process involved filtering based on abstract and title content, resulting in the removal of 681 articles containing references to "children," "substance abuse," and "cancer."

Results and Discussion

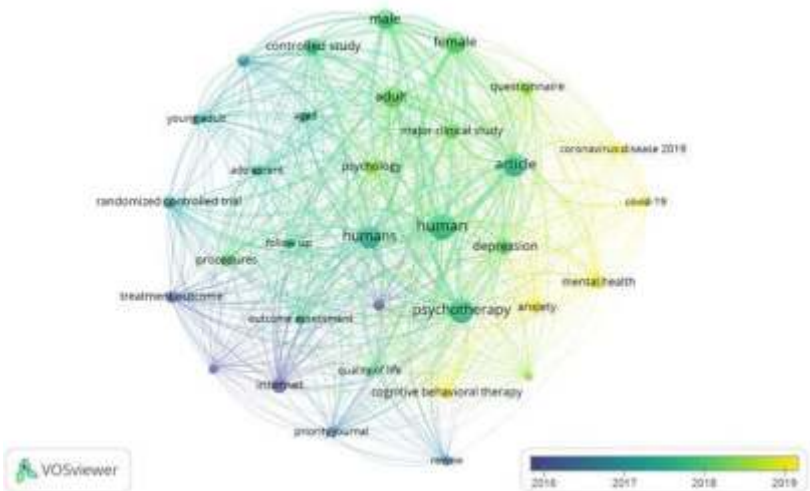
The aim of the study was to examine the changing trends in psychotherapy domain with respect to the therapeutic interventions and progress in the mental health domain. The main objective is to comprehend the ways in which these evolving patterns are influencing psychotherapy practice and to investigate possible avenues for future development in this area.

The objectives of the study were (1) to determine popular search terms and recently released research on online psychological counseling and psychotherapy, (2) to carry out a network analysis of keywords to comprehend their relevance and relationships within the area, (3) to evaluate the ways in which changing societal views and technological developments have affected the acceptance of getting professional assistance online.

The search in the Scopus data showed a total of 1735 publications related to online psychotherapy. After extracting keywords like "children, substance abuse and cancer" the publications achieved were 1054. Based on the current trend it is believed that pandemic played a major role in technological advancement with relation to online therapeutic services (McDonald A, Eccles J.A, Fallahkhair S., 2020). Several trends have evolved in the ever-changing environment of psychotherapy, altering how mental health is treated, understood, and addressed.

Figure 1

Co-occurrence of keywords on publication of online psychotherapy



With the help of Figure 1 it can be observed that the selected terms, which appear at least 100 times, are divided into three clusters indicating thematic relationships.

Keywords in Cluster 1 such as "anxiety", "anxiety disorder", "cognitive behavioral therapy", "coronavirus disease 2019", "covid-19", "depression", "human", "humans", "mental health", "psychotherapy" and "review" were mostly included in the publications on Online psychotherapy until 2018 and 2021.

The concepts in Cluster 2 such as "adolescent", "adult", "aged", "article", "female" "major clinical study", "male", "middle aged", "psychology", "questionnaire "and "young adult" were mostly included in publications on Online psychotherapy until 2017.

Concepts in Cluster 3 such as "cognitive-therapy", "controlled study trial", "follow-up", "internet", "online system", "outcome assessment", "priority journal", "procedures", "quality of life", "randomized controlled trial" and "treatment outcome" were mostly included in publications on Online psychotherapy until 2016.

The most common concepts in publications on psychotherapy were classified with three colored clusters based on the co-occurrence analysis of commonly used terms in publications. Exploring mental health and the COVID-19 pandemic, Cluster 1 (highlighted in yellow) places a strong emphasis on individual experiences and treatment approaches. Important subjects like anxiety and cognitive behavioural therapy highlight how much society is focusing on mental health awareness. Discussions on COVID-19 and its psychological impacts demonstrate the pandemic's impact, and reviews' critical assessments show that the body of research has been thoroughly examined.

Cluster 2 (green) emphasizes inclusion and evidence-based procedures in psychology research while concentrating on methodological and demographic issues. Discussions concerning adults, women, and men represent gender balance, and terminology like questionnaire and psychology draw attention to methodological variation. Comprehensive clinical investigations and diverse age cohorts are also examined, augmenting comprehensive psychological dialogues.

Cluster 3 (blue) focuses on methodological rigor and controlled experimental designs when examining treatment modalities and evaluation techniques. A methodological focus on randomized controlled trials and treatment results is emphasized, along with the growing use of technology and online platforms in research. Notable features of this cluster include an emphasis on significant research published in priority journals, as well as evaluation of the effectiveness of interventions and their long-term impacts.

Figure 2 : Trends in online psychotherapy

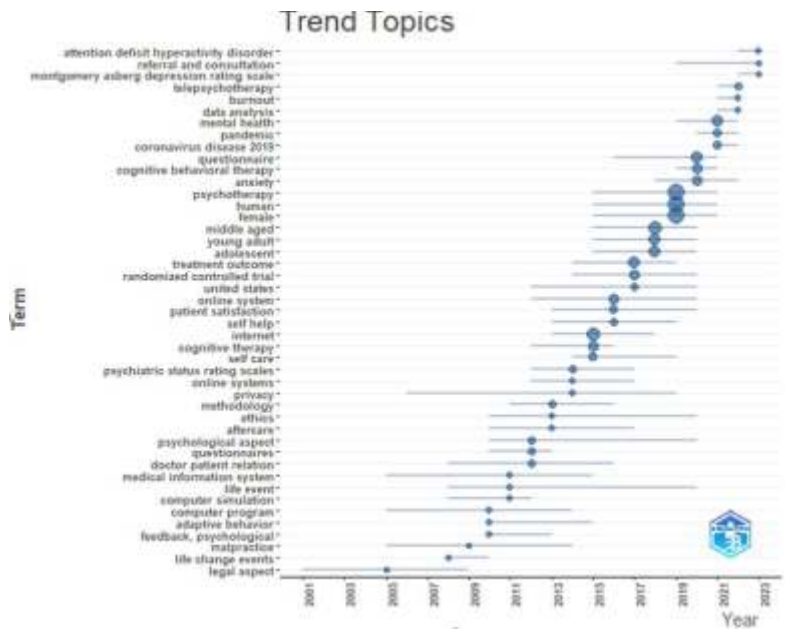


Table 1 : Trends identified year wise

Theme 1: Ethics Till 2010	Prior to 2010, psychotherapy literature predominantly focused on ethical considerations, addressing various ethical issues (Knyahnytska et al., 2022; Smith et al., 2022; Kingsley et al., 2017). The early 2000s witnessed the emergence of internet counselling, aiming to provide mental health treatments to individuals with severe problems, although privacy concerns arose due to limited technology expertise and access to WIFI (Knyahnytska et al., 2022; Smith et al., 2022; Kingsley et al., 2017). By 2010, mental health advocates recognized the need to enhance services and technology preparedness to deliver effective therapy treatments, with technological advancements improving accessibility and strengthening therapist-client connections (Barakat & Maguire, 2022). Furthermore, practitioners emphasized the importance of confidentiality and patient privacy, addressing feedback and malpractice issues while highlighting ethical behaviour in consultations (Wilcoxon, 1988). Legal issues surrounding psychotherapy consultations were also discussed, providing insights into ethical decision-making during referrals and consultations (Rebecca et al., 2007; Wood and Wood, 1990).
Theme 2: Therapeutic process 2010- 2015	From 2010 to 2015, psychotherapy literature focused on the therapeutic process and the efficacy of self-help programs in reducing depressive symptoms among individuals with medical conditions (Bartholomew et al., 2023; Siwiec et al., 2023). During this period, there was significant progress in implementing digital-based treatments, particularly with cognitive behavioural therapy (CBT) emerging as a popular approach (Bartholomew et al., 2023; Siwiec et al., 2023). Studies have shown that CBT effectively treats anxiety disorders and improves quality of life (Hans et al., 2013; Kaczkurkin et al., 2015). Acceptance and Commitment Therapy (ACT)-guided self-help programs have also been effective in reducing depressive symptoms (Fledderus et al., 2012). Additionally, research indicates the impact of anxiety disorders on quality of life and the effectiveness of pharmacological or psychotherapy interventions in improving it (Baraniak & Sheffield, 2011). Despite challenges such as personnel shortages and leadership development issues, employment prospects in the mental health field have increased significantly (Walcott et al., 2015), underscoring the importance of addressing workforce challenges to enhance psychological services. In recent years, there has been a significant increase in the acceptability of therapy, including internet therapy, due to its convenience and cost-effectiveness (Boselie et al., 2023). However, some clients still prefer offline treatment for perceived trustworthiness (Feng et al., 2020). The COVID-19 pandemic further accelerated the adoption of technology-based psychological treatment, driven by the need to cope with unexpected changes and effects on well-being (Chen, 2020). Limited resources during the pandemic led to a preference for internet therapeutic services (Romeu et al., 2020). Therapists had to adapt to the digital environment and incorporate various therapy approaches for better results (Blackshaw et al., 2023). Advances in diagnostic criteria, such as tests and surveys, have improved the treatment process and contributed to greater acceptance of therapies and research development in mental health. The COVID-19 pandemic has significantly impacted mental health, leading to increased rates of depression and exhaustion, particularly among healthcare staff (Mendes-Santos et al., 2020). To address these challenges, comprehensive digital mental health strategies are essential, focusing on research, teaching, implementation, and quality evaluation activities (Mendes-Santos et al., 2020).

Theme 2: Therapeutic process 2010- 2015	Online platforms play a crucial role in delivering mental health assistance, especially during the pandemic, fostering therapeutic connections (Marie et al., 2021). Prioritizing healthcare professionals' well-being is vital, with individualized treatments, self-care practices, and peer support being emphasized (Nukala et al., 2021). Online counselling has gained prominence since the early 1990s, with a majority preferring its ease and flexibility, indicating the increasing acceptability and use of technology-based treatment (Crump & LaChapelle, 2023). Online counsellors are adapting to the digital realm, providing personalized therapy interventions, enhancing the therapeutic process for clients (Millard et al., 2014). The emerging therapeutic culture promotes self-care interventions and fosters a positive attitude towards treatment.

The use of technology for mental health treatments began in the early 2000s, but concerns over technological restrictions and legal issues arose initially. Mental health advocates started leveraging digital technologies around 2010, leading to improvements in treatment delivery. Internet treatment's simplicity and flexibility enhanced therapist-client interactions, with privacy improvements by 2013. Clients emphasized self-care and wellness practices, while established therapeutic approaches like cognitive behavioral therapy gained acceptance by 2015. The mid-2000s saw a trend towards self-help strategies, emphasizing self-sufficiency and personal satisfaction. By 2017, people of all ages were accessing treatment services, leading to the emergence of hybrid therapy models to accommodate diverse client preferences and schedules.

Despite the growing popularity of internet therapy, some clients still prefer offline treatment due to perceived lack of personalization online. The years 2019-2020 saw a significant increase in technology-based treatment, especially during the pandemic, as people sought help to cope with life changes and stress. The surge in therapy needs highlighted the importance of online services, despite resource constraints. Therapists adapted by combining various therapy approaches to address mental health issues like anxiety, burnout, and OCD. Alternative therapies such as positive psychotherapy and art-based therapy have emerged as viable options for online treatment. These insights will be further explored in subsequent sections, discussing the implications and future directions of online therapy services.

Implications and recommendations

Since the early 2000s, there has been a shift towards using technology in therapy, initially limited by technological constraints but increasingly adopted, especially during the COVID-19 pandemic (Crump & LaChapelle, 2023). This transition underscores the importance of therapists' technological literacy and adaptability, emphasizing client-centred approaches (Crump & LaChapelle, 2023). Cultural competence training, as highlighted by Mendes-Santos et al. (2020), is crucial for creating inclusive therapy environments. Additionally, therapists must continually educate themselves on various therapeutic modalities to meet individual client needs (Mendes-Santos et al., 2020). Research on digital treatments like cognitive behavioural therapy has helped boost the profile and acceptance of psychotherapy (Crump & LaChapelle, 2023).

The evolving treatment landscape underscores the importance of embracing new technologies, personalized therapeutic methods, and cultural diversity in mental health care (Mendes-Santos et al., 2020). Therapists are encouraged to incorporate holistic approaches such as mindfulness and somatic therapy, recognizing the mind-body connection. Preventative strategies, including education and early intervention programs, are gaining momentum, advocating for a comprehensive mental health approach. To ensure evidence-based practice, therapists should integrate outcome indicators and continuous monitoring, utilizing data-driven strategies to enhance therapeutic efficacy (Mendes-Santos et al., 2020). The rise of remote treatments highlights the need for evidence-based self-help tools to improve access and effectiveness in mental health care. Positive psychology elements like resilience and personal growth are also integrated into therapeutic interventions to promote overall well-being.

Continuous professional development is crucial for therapists, who should stay updated on emerging trends and evidence-based approaches through seminars, training programs, and supervision. Multidisciplinary training and collaborative practices encourage cooperation across healthcare fields, while keyword cluster analysis in psychological research informs practical tactics and treatments. Mental health practitioners must incorporate evidence-based therapeutic approaches into their work and stay abreast of psychotherapeutic advancements. This underscores the need for accessible and effective mental health care, especially given global mental health concerns. Key concepts such as cognitive therapy and treatment

outcomes gained prominence in 2016, with a focus on issues like the internet and questionnaire use for adults and teenagers increasing in 2017

Since 2018, there's been a focus on therapy outcomes, quality of life, and the integration of the metaverse into treatment. The online counseling industry has grown, highlighting the importance of client-therapist connection research and addressing anxiety and depression prevalence. The increasing emphasis on the internet's role in mental health underscores the merging of technology and well-being. Mental health practitioners are urged to explore teletherapy and digital therapies, while policymakers must prioritize tech's impact on mental health. Research should prioritize holistic approaches, considering not just symptom reduction but also overall well-being and social factors. International collaboration in psychological research is vital for culturally sensitive policies.

Limitations

In the present study, there were the following limitations:

Incomplete Data Selection: The study's main limitation lies in the challenge of including all relevant papers due to the vast number of publications on online psychotherapy, potentially leading to the omission of significant studies and distorting results.

Limited Research on Online Psychological Counselling: The scarcity of studies in this area restricts the depth and scope of investigation, hindering the derivation of thorough and reliable findings.

Publication Bias within the Scopus Database: Certain studies with encouraging findings may have a higher likelihood of being published and included in the analysis, potentially skewing the results and overrepresenting certain research categories.

Generalizability: The focus on specific populations or locations may limit the applicability of the study's findings to diverse contexts, such as different cultural or demographic groups.

Disparities in Digital Accessibility: The shift to digital platforms in therapy may exacerbate existing technology access disparities, posing challenges for individuals with limited technology resources to access online therapies effectively.

Adaptation Challenges for Practitioners: Resistance from experienced therapists to adopting new therapeutic techniques may hinder the integration of emerging trends, limiting exposure to potentially beneficial therapy modalities.

Concerns about Data Security & Ignoring Contextual Factors: Increased reliance on digital platforms raises concerns about data security and privacy, while overlooking broader structural and environmental factors impacting mental health.

Inadequate Training Opportunities & Misapplication of Technology: Limited comprehensive training programs for therapists in emerging modalities may hinder their ability to adapt to evolving trends, potentially leading to the misuse of technology in therapy.

Limitations of Keyword Cluster Analysis: While providing valuable insights, keyword cluster analysis is predominantly quantitative and lacks qualitative assessment, potentially oversimplifying issues and hindering appropriate comparisons across clusters.

Lack of Specific Numerical Data and Temporal Examination: The approach lacks specific numerical data to gauge the frequency and intensity of variables, as well as an examination of temporal components to understand shifting research trends and historical impacts.

Bias towards Major Contributors and Cultural Emphasis: Focusing on major contributors like the United States may bias results and obscure contributions from emerging research centres in other regions, while limited cultural emphasis may restrict the global application of the findings.

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