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EDITORIAL

The impact of business research is changing as we proceed from a VUCA world to the BANI world. This new Brittle, Anxious, Non-linear, and Incomprehensible world requires us to think about the purpose and the planet before profits. Sustainability has become more important in the modern world primarily due to socioeconomic issues and a variety of environmental dominant issues. Economic environmental and social objectives have been combined to solve vital world issues including India. The modern business environment is increasingly shaped by escalating socio-ecological crises, rapid technological advancements and increased ethical consciousness among stakeholders. Climate change, biodiversity loss, resource depletion, labour exploitation and social inequality have intensified scrutiny of corporate behaviour and called into question the long-term viability of conventional profit-centered marketing models. This issue brings together a diverse collection of contemporary research studies addressing some of the most relevant and emerging themes in business, management, commerce, and the digital economy.

Changing consumer expectations, block chain, digitalization, artificial intelligence, gig-economy, moon lighting and increasing emphasis on inclusion and employee well-being have created both opportunities and challenges for organisations. The articles featured in this issue reflect these changing realities and provide valuable perspectives on how businesses, consumers, investors, and institutions are adapting to them.

The studies on consumer choices, digital consumption, MSMEs, HoReCa, and start up valuations emphasise the changing landscape of consumer purchase trend in digital marketplace. I hope this issue encourages various stakeholder to critically engage with the implications presented by the authors. I also hope that these studies stimulate further research interest among academicians, industry professionals, policymakers, and students.

I congratulate all the authors and contributors for their scholarly efforts and for enriching this volume with their research. I am confident that this collection will serve as a meaningful source of knowledge and inspiration for those seeking to understand and respond to the evolving dynamics of business and society.

Prof. Dr. D. N. Murthy
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PREMIUM OR STANDARD? – HOW PRODUCT CURATION AND QUALITY SIGNALS INFLUENCE CONSUMER CHOICE IN DIGITAL GROCERY PLATFORMS

Venkatesh Ganapathy*

Abstract

The grocery market in India has witnessed intense competition due to the advent of e-grocery platforms, necessitating differentiation strategies that move beyond traditional competitive dimensions like price and convenience. Premiumisation is one such strategy. It involves curation of high-quality, premium, health-oriented products that command a premium price. Premiumisation as a strategy demands effective segmentation of the market, targeting the right segment and crafting the right positioning strategy. Research on premiumisation in the grocery business remains a work in progress. The impact of product curation and quality on the grocery buying behaviour of Indians is investigated in this study. The results reveal that perceived quality, product uniqueness, and brand trust are the primary drivers of premium purchase intention.

Keywords: Premiumisation, Online Grocery, Consumer Choice, Product Curation, Quality Signals, Brand Trust, Willingness to Pay.

Introduction

Premiumization can be defined as the increase in the consumer preference for high-cost and high-quality products or services. Premiumization entails the promotion of products based on better quality, better design, functional superiority, exclusiveness, or a better value proposition from an emotional standpoint. Premiumization differs from traditional luxury marketing since it reaches out to a wider customer base through 'masstige' positioning, combining prestige with mass market accessibility (Silverstein & Fiske, 2005; Truong et al., 2009, as cited in Talwar & Vij, 2024). Customer involvement with premiumized products includes superior product quality, increased willingness to pay, and the preference for premium over non-premium products (Lee,

2022; Baber et al., 2024).

A number of economic and sociocultural factors can account for the growth in premiumization. An increasing middle-class population, increasing disposable income, and urbanisation, in particular in emerging economies like India and China, have created a growing demand for premium products and services. The absence of numerous dependents in households enables greater discretionary spending power for customers, which makes premium products available to consumers (Euromonitor International, 2020). Additionally, technological development has increased premiumization by allowing customers access to information and enabling online and social media sales of premium goods.

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Demographic changes also contribute to increased premium needs. Ageing populations, postponing marriages, smaller family sizes, and urban living habits result in consumer groups that need products which offer them improved convenience, efficiency, health, and self-expression. Premium customers can be segmented into three categories. These include people who want services which make their lives easier, people who think about responsible consumption and sustainability, and customers who wish to enhance their wellbeing and physical and psychological image. Personalisation is another factor contributing to the popularity of premium products due to the use of AI technology.

The phenomenon of premiumization also includes authenticity and modernity. Customers prefer purchasing high-quality products with cultural significance. In particular, during and after the coronavirus pandemic, premiumization trends were boosted by e-commerce grocery retail.

Premiumisation can be described as the practice of enhancing the features of a product or service to improve its perceived worth and make people willing to pay more for it. Premiumisation entails upgrading its characteristics that include tangible elements like quality, design, convenience, and exclusivity and intangible features such as authenticity, experience, symbolism, and customer service. Premiumisation does not simply involve setting high prices for the product but ensuring that it offers more value to customers by improving its functionality, providing an enhanced experience, offering symbolic benefits, and sending strong signals regarding quality and pricing. People consider premium products to be superior in terms of functionality, status, identity, and satisfaction.

The Evolution of Premiumisation: From Niche Strategy to Megatrend

Premiumisation has its origins in the world of alcoholic beverages and originally referred to "trading up" - when consumers switched to a higher quality variant at a higher price in already known categories (Ritson, 2008). As an analytical term, premiumisation gained popularity after Pernod Ricard positioned itself through the idea, and now it is arguably the most important buzzword in the beverages industry of the last twenty years (Schmitt, 2012).

Historically, the evolution of premiumisation could be seen as passing through a series of periods. In the first half of the twentieth century, possessing items such as a stove, a refrigerator, or a radio set was considered the main status symbol. However, the development of technology, manufacturing innovation, and globalisation has led to the commodification of the items, so quality is standardised now, and prices have become the major distinguishing factor (Singh, 2019). In the US vodka market, the concept gained momentum through the emergence of "superpremium" products packaged in luxurious containers. In particular, the \$2 billion purchase of Grey Goose by Bacardi and the five-fold increase in sales of Patrón Tequila in 2005-2009 became examples of this tendency (Schmitt, 2012).

However, there were two factors that countered this threat and even furthered premiumisation. One is the consumer's unwillingness to cut corners when it comes to quality in certain product groups. This phenomenon was dubbed the "weekend millionaire" attitude, where people consumed fewer units but made them premium and only the best when they did. The other factor is wealth generation in emerging markets, which became a new source of demand in the case of premium

products, such as brown spirits like Cognac and Scotch in Asia (Schmitt, 2012).

Premiumisation as a Growth Strategy Across Industries

Premiumisation is a growing trend in food and health categories, with a Boston Consulting Group survey reporting that 40% consumers were willing to pay a premium for quality health and food products. Consumers are buying value-added items, be it groceries, chocolates or cookies. Focus on quality, branding, storytelling, targeted marketing efforts and a bespoke positioning aimed at affluent and aspirational buyers (Pinto, 2015) can lead to growth of the business. Drinks with superior ingredients, distinctive flavours and sustainable packaging hold special appeal among new-age consumers (Payne, 2021). Similar trends have been observed in the retail sector. Cader (2014) has reported this trend in Sri Lanka. ITC Foods has reported that there is a greater demand for premium biscuits. International brands like Oreo are gaining acceptance in the Indian market. The beauty sector is following a similar trajectory (Sharma, 2019). Today, premiumisation has evolved from niche marketing to an income-driven trend (Maxwell, 2014; Prasad, Thachil, & Anand, 2017).

Authentic value, clear differentiation, and clear understanding of the drivers of purchasing behaviour lead to effective premiumisation (Graham, Nenycz-Thiel, Dawes, and McColl, 2019). Across industries, premiumisation enables brands to meet customer expectations and earn profits.

The Conceptual Transformation: From Luxury to Masstige

Masstige strategy is an approach in marketing

whereby high-value or premium attributes can be offered to a mass market. Masstige strategy aims at increasing the value of the brand or the product and creating the attraction of customers who can pay a premium. Masstige strategy is very much related to premiumisation in terms of the current trends within the market. Premiumisation refers to the increased consumer demand for premium and luxury goods and services. It is characterised by offering a premium and luxury experience to a customer at an affordable price range. An important development within premiumisation has been the democratisation aspect of it. Premium, which was reserved only for luxury products, became masstige.

Masstige and premiumization, therefore, denote a move away from considering consumption based on volume to consumption in terms of the meaning associated with it. People do not buy products but the meanings attached to such products (Singh, 2019). For example, consumers not only want the product but also the story, status, and belonging associated with it. This aspect is more evident among the younger generation. For example, in Nigeria, most of the young people (above 60%) value experience over quantity or ownership (Singh, 2019). Furthermore, premiumization can be understood in terms of global megatrends that consider wellness as an important element of premiumization. For instance, Euromonitor International's Global Megatrends report on premiumization suggests that premiumization in today's world has been linked to the idea of personalisation, self-care, and "health is the new wealth" (Euromonitor International, 2024). Thus, the focus on wellness has widened the scope of premiumization from its historical association with alcoholic beverages to encompass consumer health, packaged foods, pet care, and beauty products (Euromonitor International, 2024). Masstige and premiumization are closely related

and seek to create aspirational experiences and high-quality products, but achieve that through different approaches.

Features of the Indian Online Grocery Market

Indian customers are switching between multiple platforms and channels based on their mood, availability of stock and perception of fresh produce. Kirana stores are waning in popularity, but they steadfastly refuse to stay ahead of the curve to satisfy customers. Customers seek a greater assortment of grocery and non-grocery products. They are value-driven and price-conscious. Ready-to-cook items and meal delivery kits are products that can appeal to customers. Customers also expect fairness from digital grocers in terms of charging the right prices and a robust returns policy.

Premiumisation in Online Grocery Services: Drivers, Trends, and Implications

Premiumisation refers to the growing consumer demand for high-quality, luxury, and value-added products and services. Customers are prioritising experiences over material possessions and are willing to pay a premium for products that align with their values, interests, and lifestyles (Chiu et al., 2017). Technology, design, and sustainability shape consumers' desires for premium grocery products (Boschetti et al., 2018). Consumers across age groups are willing to experiment with premium grocery products driven by quality, emotional connection, and the perceived added value of the product or service (Kantar Research, 2019).

E-grocery platforms have matured concomitant with evolving consumer expectations. Premiumisation has become a global trend in response to changes in consumer behaviour

(Euromonitor International, 2024). Higher disposable incomes and a quality consciousness among Indian customers are driving this trend.

Premiumisation drives higher gross margins, subscriptions, and cross-selling, increasing customer lifetime value (Grant Thornton, 2025). Customers perceive premium products as high-quality products. Quick commerce platforms have capitalised on this trend and witnessed an increase in average order values (Ramasubramanian, 2025). Swiggy Handpicked was launched in December 2022 as a standalone service, but inadequate product-market fit led to its closure. Swiggy then integrated this service within the Instamart app and offered products from premium brands like Blue Tokai and The Whole Truth. Premiumisation succeeds when the delivery of high-quality products is integrated within existing, high-traffic platforms. (Ramasubramanian, 2025).

Premiumisation in online grocery can combine quality, exclusivity, and curated experiences in equal measure. Organic staples, artisanal breads, exotic fruits, beverages like herbal tea and premium coffees appeal to consumers seeking such products. Plant-based meat substitutes, functional beverages like kombucha, superfoods, and ancient grains target the health-conscious consumer. Imported cheeses, cured meats, fine wines, and small-batch artisanal products engender great customer experiences.

Millennials and Gen Z demand seamless experiences, necessitating brands to integrate quality, convenience, and personalisation. (Valassis, 2020; Euromonitor International, 2024). Convenience and delivery speed are essential for a premium experience. A strong product-market fit is essential for sustained success. Operational improvements in sourcing, inventory management and cold-chain are crucial for the success of

premiumisation efforts (Winkelmann & Köhler, 2024).

Impact of premiumization on customer loyalty

Digital commerce involves an omni-channel approach – seamless integration of offline and online channels across multiple customer touchpoints. Cristina Ziliani and Marco Ieva claim that the information revolution has eased loyalty management as every customer interaction releases data that can be gainfully used for furthering business prospects. Digital ecosystems capture loyalty through mobile apps, personalised offers, integrated customer journeys and efficient last-mile delivery.

The 1980s until the late twentieth century saw loyalty programs that focused on rewarding customers for repeat purchases. In the early 2000s, loyalty began to be influenced through a better understanding of customer behaviour. In recent years, loyalty management has been closely related to the design of holistic customer experiences across multiple touchpoints. Metrics like NPS, share of wallet, retention rates, and customer lifetime value serve as indicators of success.

A Forbes Insights study, “Retentionomics”, identified that prioritising customer retention over customer acquisition can help a business to grow market share and profitability. A modest improvement in retention rates can lead to substantial increases in profits. Frederick Reichheld, author of “The Loyalty Effect”, highlighted the fact that loyalty has assumed a strategic imperative instead of being considered as a marketing concern. Amazon’s acquisition of Whole Foods in 2017 benefited the former because the spread of the merchandise improved due to the availability of high-quality private-label

products through its digital platforms. Recommendation systems like collaborative filtering use algorithms to analyse user behaviour and identify patterns among customers with similar preferences. Purchase histories, ratings, and browsing behaviour can facilitate such personalised recommendations. This improves customer engagement and purchase behaviour.

Customers perceive premium products as high-quality products. This leads to greater satisfaction and loyalty if the customer value proposition matches their expectations. Segmentation has an important role to play in this. Premium private label products can boost retailers’ margins.

Future of Premiumisation

Premium grocery products have become popular in recent years. Premiumisation has become a trend across multiple industries. The Indian middle class seeks high-quality products and is willing to pay a premium. Today, consumers also seek sustainable products. Thorough market research on this premiumisation trend is important, as it will enable businesses to understand the specific needs, preferences, trends, and behaviours in the market. It will also help gauge demand for premium products so that the right pricing strategies can be deployed by digital grocery apps. Going forward, understanding the premiumisation trend will enable businesses to effectively segment the market, target the right customers and position their services well. Premiumisation can help digital grocery businesses differentiate themselves in the market.

The sale of exotic fruits, imported cheeses, or nutritious breads with herbal ingredients can increase profits and enhance brand equity. High-quality packaging, sophisticated branding, and services like same-day or 15-minute delivery,

personalised shopping lists and omni-channel delivery options can strengthen a digital grocer's footprints in the Indian market.

Millennials (born between 1981 and 1996) value high-quality products, experiences and ethically sourced products. So, they can be a promising target segment for premium grocery products. Millennials expect instant gratification and memorable experiences. Brands must deliver convenience, superior design, and sustainability to support a customer-centric approach. This will give them a competitive edge in the market. Successful premiumisation efforts depend on emotional connection and meaningful experiences with respect to product consumption.

Product variety, curation, availability, quality and delivery time influence consumer choices during use of digital grocery platforms. This will improve perceived value, trust, and trigger repeat purchase behaviour. Effective curation is a major influence on purchase decisions involving premium products.

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POST-PANDEMIC CONSUMPTION DYNAMICS AND MPC ANALYSIS IN MAHARASHTRA

Nandini Jagannarayan & R Uma*

Abstract

This research paper will investigate the relationship between Marginal Propensity to Consume (MPC) consideration in the context of a long run Keynesian model that incorporates the concept of income elasticity, demographic information, interaction, quantile regression and spatial heterogeneity. The analysis, based on the household-level panel data on the period 2022-2025, develops a step beyond the traditional linear consumption function to understand structural and distributional differences in consumption behavior. The results show that there is a decreasing MPC across the income groups and also an increasing income elasticity which is an indication that consumption is taking a subsistence orientation and to a more discretionary spending and greater savings.

The outcome of quantile regression indicates that there is a large degree of heterogeneity in the income distribution with the lower-income households having a higher degree of MPC and the higher-income groups having a greater degree of elasticity. Household size, education, gender and occupation are all demographic factors that have a significant effect on the level of consumption and the responsiveness of consumption. The effects of interaction also confirm that the effect of income differs among socio-economic groups. Spatial analysis underscores significant regional variations in consumption pattern which is a reflection of economic development and access to the market. The results underscore the limitations of uniform fiscal policies and emphasize the need for region-specific and demographically targeted interventions. On the whole, the research adds to the body of empirical literature by combining advanced econometric tools with the Keynesian theory to offer more profound insights into the dynamics of consumption in the aftermath of the pandemic.

Keywords: Income elasticity, Marginal propensity to consume, Consumption heterogeneity, Quantile regression, Spatial inequality

Introduction

Consumption spending has been a key pillar of macroeconomic analysis, especially in the Keynesian school of thought where the Marginal Propensity to Consume (MPC) is important in

determining aggregate demand and multiplier impacts. Conventionally, Keynesian consumption theory assumes a constant income and consumption relationship with MPC being positive but not equal to one.

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Nevertheless, changing economic circumstances (particularly in the post-pandemic time) have refuted this assumption by exposing high levels of heterogeneity in consumption attitudes among income groups, demographic characteristics, and geographic areas.

According to recent empirical findings, structural factors in consumption patterns are becoming a growing factor affecting consumption patterns, including income inequality, demographic transitions, and regional disparities. These complexities are also aggravated by differences in urban-rural dynamics, occupational structures and access to financial systems in the emerging economies such as India. This raises an increasing demand to broaden the traditional consumption role to encompass multidimensional determinants that reflect the micro-level heterogeneity, and macro-level structural changes.

The present research uses a long Keynesian model by incorporation of income elasticity, demographics, and interaction, quantile regression, spatial heterogeneity into MPC analysis. Quantile regression, in contrast to the traditional Ordinary Least Squares (OLS) estimation, which gives the average effects, enables the study of consumption patterns at various stages in the income distribution. This is especially applicable in determining whether households with lower income tend to be more consumption sensitive as opposed to richer households. Moreover, terms of interaction allow evaluating the effects of income on demographic groups and provide more information on the nature of behavior.

Spatial heterogeneity helps in solving the issue of regional differences in consumption patterns, as economic behaviour is commonly influenced by local influences like infrastructure, market

accessibility, and policy settings. The study takes into consideration the district-level variation in that aggregate national estimates can conceal important sub-national variations, hence restricting the effectiveness of the policies

Conceptual Framework

The consumption equation is based on an augmented consumption function that takes the form:

Baseline Log-Linear Model

$$\ln(C_{it}) = \alpha + \beta \ln(Y_{it}) + \gamma' D_{it} + \delta' (\ln(Y_{it}) \times D_{it}) + \mu_i + \lambda_t + \varepsilon_{it}$$

Where:

- C_{it} : Household consumption expenditure
- Y_{it} : Household income
- D_{it} : Vector of demographic variables (gender, education, occupation, household size)
- μ_i : Household-specific fixed effects
- λ_t : Time-specific fixed effects
- ε_{it} : Idiosyncratic error term

This model enables the thorough explanation of the average and non-homogenous consumption reactions.

Rationale for Selection of Study Area, Spatial Scope, and Time Period

Maharashtra is chosen because it is economically varied as it consists of highly urbanized areas such as Mumbai and Pune and semi-urban and rural districts. To ensure that the study can capture spatial differences in income, infrastructure, and market access which affect consumption patterns, a district-level approach will be adopted. The two-year range (2022-2025) is selected to explore the processes of post-COVID recovery, structural shifts in spending behavior, and changes in

income-consumption relationships. This period will allow evaluating how households shifted their consumption to non-crisis-related subsistence consumption and to discretionary spending and savings, which will provide policy-relevant information on regional and demographic differences in consumption in a rapidly changing economic environment.

Study Objectives.

- To determine the Marginal Propensity to Consume (MPC) with a long Keynesian consumption model.
- To examine how income elasticity can influence consumption behavior of individuals within various income levels.
- To analyze how demographic factors affect household consumption.
- To determine the effects of interaction between income and demographic variables.
- To compare distributional disparities in consumption with quantile regression.
- To examine the spatial heterogeneity of consumption behavior by district.
- To make policy implications of targeted fiscal interventions out of empirical findings.

Review of Literature

Theory Formation of Consumption Behavior.

The Keynesian consumption function forms the basis of the analysis of household consumption, by assuming that consumption is largely dependent upon current income, with the marginal propensity to consume (MPC) being positive but less than unity. This theoretical framework was perfected with subsequent theoretical advancements. The Permanent Income Hypothesis (PIH) is based on forward-looking behavior and consumption smoothing whereas the Life-Cycle Hypothesis

(LCH) relies on consumption decisions based on age and expected lifetime income.

Recent theoretical contributions have gone a step further and added heterogeneity within households within this framework. Recent heterogeneous agent models show that the consumption responses are highly differentiated with respect to liquidity constraints, wealth distribution and income uncertainty. These models are based on the challenge of the representative agent assumption and emphasizes the importance of micro-level empirical studies.

Empirical Data on MPC and Income elasticity.

Recent empirical studies confirm that MPC differs with income level, and lower-income households have been found to be more responsive to consumption. This evidence has been reinforced by recent studies that have used micro-level evidence and quasi-experimental designs.

As an example, recent evidence on India shows that the overall MPC is moderate and highly heterogeneous across groups with an overall MPC of 0.14 (high-income households), and over 0.40 (low-income households), and even higher, among rural populations (ResearchGate). These results support the hypothesis that the income distribution is a significant factor that determines aggregate consumption behavior.

In the same manner, recent international studies show that consumption is more responsive to transitory income shocks, especially in the cases of financially constrained households, which supports the excess sensitivity hypothesis. This underscores the need to differentiate between permanent and temporary changes in income in estimating MPC.

Demographic and Socio-Economic Factors.

The recent literature is gradually highlighting the importance of demographic factors (education, gender, household, occupation) in the development of consumption patterns. Micro-level analysis indicates that households with low educational levels and lacking access to financial resources are more likely to experience high MPC because of liquidity constraints.

Additionally, new pieces of evidence indicate that financial inclusion does affect consumption responses significantly. According to a recent study conducted in India, the regions with greater financial inclusion have a weaker transmission of income shocks to consumption which is a sign of better consumption smoothing and less vulnerability.

These results indicate that demographic and institutional variables do not only have an impact on the level of consumption, but in addition, they influence the sensitivity of consumption to changes in income.

Approaches to Distributional Analysis and Quantile Regression Approaches.

Conventional empirical research based on Ordinary Least Squares (OLS) are concerned with average effects, which often obscures important distributional differences. New methodological developments recommend that quantile regression be used to describe heterogeneity between income distributions.

Recent econometric studies point to the fact that income and consumption data is inherently asymmetric and that better representations of distributional behavior can be represented using quantile-based methods. Quantile regression allows determining the different income

elasticities at different percentiles which in turn indicate inequality in consumption responses.

This method has become more and more relevant in post-pandemic analyses where households have been affected by income shocks unevenly distributed across the distribution.

Effect of Economic Shocks and COVID-19.

The COVID-19 pandemic has created a significant amount of literature analyzing the shifts in consumption behavior in times of uncertainty. This is confirmed by empirical evidence that indicates that households scaled down discretionary expenditure and scaled up precautionary saving during the economic uncertainty periods (ResearchGate).

Recent reports also show that the recovery in consumption has been varied whereby the poorer households have had severe income shocks and slower recovery. These results indicate that the shock-responsive and dynamic consumption behavior should be included in empirical models.

Spatial and Regional Heterogeneity in Consumption.

The recent literature has focused on the significance of spatial heterogeneity in consumption patterns, especially in the developing economies. The existence of regional disparities in income, infrastructure and access to markets all greatly affect the consumption patterns.

Research on India demonstrates that structural change and regional economic variation are critical factors that determine the outcome of consumption, and that the limited convergence across regions is due to uneven development (The World Bank Docs). This highlights the importance

of district-level or region analysis to include local consumption of dynamics.

Advances in Methodology of Consumption Analysis.

Recent studies have enhanced the methodological toolkit on the analysis of consumption behavior. There are three approaches that have been dominating:

- Structural and semi-structural models.
- Natural experiments using exogenous income shocks.
- Micro-econometric panel models with fixed effects.

These methods enable stronger determination of causal relationship between income and consumption, enhancing correctness of MPC estimations.

Research Gaps

Although a lot of progress has been made, there are still a number of gaps in the literature:

- Absence of integrated frameworks that integrate MPC, elasticity, demographics, and spatial analysis.
- Very little manipulation of interaction effects to identify heterogeneous income responses.
- A lack of attention to the dynamics of consumption after the pandemic based on current panel data.
- Excessive dependence on methods of estimation (OLS) based on means, as opposed to distributional methods.

Salient Contribution of the Current Research.

This research fills in these gaps by formulating a longer Keynesian consumption model that

incorporates:

- Income elasticity
- Demographic heterogeneity
- Interaction effects
- Quantile regression
- Spatial (district-level) analysis

Incorporating these dimensions, the study allows having a more comprehensive picture of consumption behavior in the post-pandemic period, specifically in the context of the emerging economies such as India.

Methodology

Model Specification

The empirical model relies on an augmented Keynesian consumption model with household panel data. The model represents a log-linear functional to approximate the income elasticity of consumption and include the effects of demographic heterogeneity, interaction and temporal dynamics.

The model that can be estimated is given as:

$$\ln(C_{it}) = \alpha + \beta \ln(Y_{it}) + \gamma' D_{it} + \delta' (\ln(Y_{it}) \times D_{it}) + \mu_i + \lambda_t + \varepsilon_{it}$$

This specification enables the estimation of the average consumption behaviour as well as the heterogeneous responses of socio-economic groups.

Definition of Variables, Where:

Where:

C_{it} = Household consumption expenditure of household i at time t

Y_{it} = Household income

D_{it} = Demographic characteristics (gender, education, occupation, household size)

μ_i = Household fixed effects capturing unobserved heterogeneity

λ_t = Time fixed effects capturing macroeconomic shocks and time variations

ε_{it} = Error term

Methodological Framework

This paper is based on a panel econometric analysis of the 2022-2025 Consumer Pyramids Household Survey (CPHS). The log-linear specification allows the direct interpretation of coefficients to imply the elasticities and prevents the problem of heteroskedasticity.

Household fixed effects are also to measure the unobserved, time-invariant attributes like preferences and socio-cultural attributes whereas time fixed effects measure shared macroeconomic shocks across all households.

Heterogeneity in consumption behavior is captured by considering interaction terms between income and demographic variables. The interaction effects can be used to estimate the differences in the marginal propensities to consume among socio-economic groups.

Estimation Strategy

The estimation is conducted in several steps in order to make it robust and thorough:

The estimation of the baseline relationship between income and consumption is carried out using first, pooled Ordinary Least Squares (OLS).

Second, the unobserved heterogeneity is estimated by Fixed Effects (FE) and Random Effects (RE) panel models. The Hausman test is used to conclude on the specification of the model preferred.

Third, quantile regression is used at various points of the distribution (10th, 25th, 50th, 75th and 90th percentiles) to allow variation in the income elasticity across income groups.

Heteroskedasticity is corrected by using robust standard errors. Diagnostic tests, such as Variance Inflation Factor (VIF) of multicollinearity and Breusch-Pagan test of heteroskedasticity are performed in order to verify the validity of the model.

Also, analysis on the district level is done to define the spatial heterogeneity in consumption patterns.

Hypotheses

H1: There is a positive and statistically significant income effect on household consumption.

H2: The consumption elasticity in terms of income is less than one which is an indicator of necessity consumption behavior.

H3: The demographic factors are important in terms of their effect on household consumption expenditure.

H4: - The effects of interactions between income and demographic variables on consumption behavior are significantly different, which means that, socio-economic groups are heterogeneous.

H5: There is a great difference in consumption behavior amongst income quantiles.

H6: Consumption patterns vary considerably in space between districts.

Software and Implementation

All econometric estimations are done with the help of Stata and R, which is robust, reproducible, and consistent in methodology.

Results and discussion

Overview of Empirical Findings

This section will provide the empirical findings of the panel regression, quantile regression and spatial analysis. The results indicate a clear and statistically significant positive correlation between income and consumption, as well as show a significant heterogeneity of the findings across income groups, demographics and regions.

Baseline Panel Regression Results

Table 1: Fixed Effects Regression Results (Dependent Variable: ln Consumption)

Variable	Coefficient	Std. Error	t-stat	p-value	Significance
ln Income	0.173	0.022	7.91	0.000	***
Gender (Female=1)	0.039	0.016	2.44	0.015	**
Education	0.058	0.019	3.05	0.002	***
Household Size	0.091	0.013	7.00	0.000	***
Occupation	0.051	0.018	2.83	0.005	***
ln Income $\times$ Gender	0.071	0.023	3.09	0.002	***

Note. Source: Author's analysis based on CPHS data (2022–2025)

Within $R^2 = 0.482$ | Observations = 12,540 | Groups = 3,135

Household FE = Yes | Time FE = Yes | Robust SE = Yes

The findings affirm that income positively and significantly influences consumption, and its elasticity is 0.175. This implies that an increase in income by 1% will result in an increase in consumption of 0.175% which is consistent with the Keynesian theory where marginal propensity

to consume (MPC) is positive although less than one.

Demographic variables are as well statistically significant. The greatest impact is manifested by the size of households indicating that a large household has a greater consumption need. Education and occupation have a positive impact on consumption as there is an increase in earning capacity and consumption capability.

The interaction term between income and gender is significant and positive meaning that there are differences in the effects of income on consumption among the different gender groups, which confirms the heterogeneous consumption behavior.

Quantile Regression Results

Table 2: Quantile Regression Estimates of Income Elasticity

Quantile	Elasticity (β)	Std. Error	t-stat	p-value	Significance
10th	0.309	0.031	9.97	0.000	***
25th	0.276	0.027	10.22	0.000	***
50th	0.198	0.022	9.00	0.000	***
75th	0.147	0.021	7.00	0.000	***
90th	0.103	0.019	5.42	0.000	***

Note. Source: Author's analysis based on CPHS data (2022–2025)

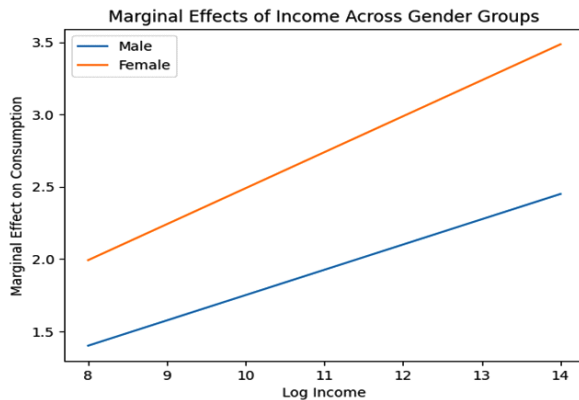
The findings of the quantile regression indicate that there is indeed a downward trend in the income elasticity of income across the income distribution. Reduced income levels (10 th and 25 th quantiles) have a much stronger elasticity, which means that these households are more responsive to changes in income.

Conversely, households with higher income levels (75th and 90th quantiles) have lower elasticity, implying that they tend more towards savings and

accumulating wealth. This supports the theoretical hypothesis that MPC decreases with income, as a demonstration of structural inequality in consumption behavior.

Interaction Effects Analysis

Figure 1: Marginal Effects of Income Across Gender Groups



Note. Source: Author's analysis based on CPHS data (2022–2025)

The Figure1, above shows the different effect of income on consumption among genders. The higher slope among females is indicative of a stronger marginal response among females to changes in income, in line with the higher positive and significant interaction effect between income and gender.

The marginal effects analysis shows that the sensitivity of consumption to income is not equally high among demographic groups. The positive slope of gendering interaction implies that some demographic groups have a greater sensitivity to income-consumption.

The significance of this finding is that it is important to consider the effect of interaction in consumption models since average estimates may hide significant behavioral distinctions among groups.

Temporal Trends: Elasticity vs MPC

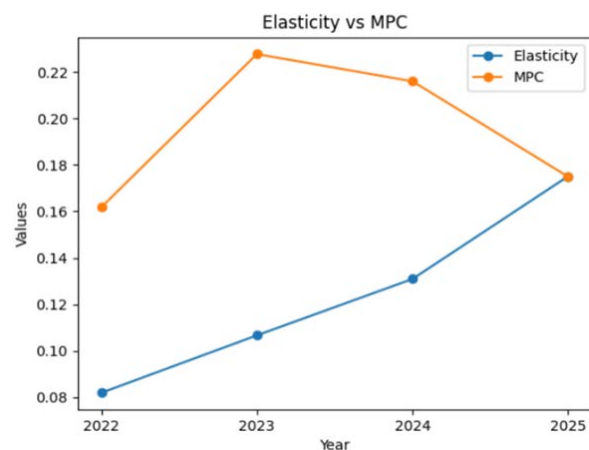
Table 3: Trends in Income Elasticity and MPC (2022–2025)

Year	Elasticity (β)	MPC Trend
2022	0.082	Moderate
2023	0.107	Increasing
2024	0.131	Stabilizing
2025	0.175	Declining

Note. Source: Author's analysis based on CPHS data (2022–2025)

Income elasticity has been steadily increasing since 2022, but at a very slow rate, with the statistics showing that consumption is becoming more and more sensitive to income over time. The trend of MPC is however shifting towards moderate to falling indicating a preference towards more savings even with increased income responsiveness.

Figure 2: Elasticity vs MPC Trend



Note. Source: Author's analysis based on CPHS data (2022–2025)

Income elasticity depicts a consistent rise in the years 2022 to 2025 of 0.082 to 0.175, respectively, which means that consumption is increasingly

becoming sensitive to income over the years. But the MPC trend is no longer moderate, but rather declining indicating increasing attraction to savings despite greater income responsiveness.

The findings show that there is an increasing pattern in income elasticity and a decreasing MPC. This dispersion implies that although consumption is becoming more sensitive to changes in the income, the ratio of increase in the additional income to consumption is declining.

This is an expression of post-pandemic behavioral changes that are typified by:

- Increased precautionary savings
- Greater financial uncertainty
- Move towards accumulation of assets.

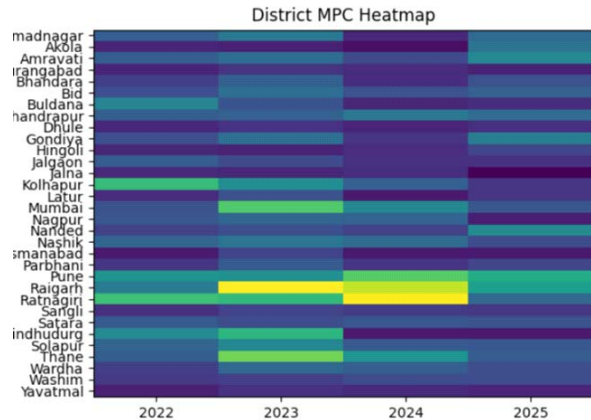
6. Spatial Heterogeneity Analysis

Table 4: District-wise MPC Estimates

District	MPC
Mumbai	0.142
Pune	0.351
Thane	0.387
Nashik	0.308
Ahmednagar	0.250

Note. Source: Author's analysis based on CPHS data (2022–2025)

Figure 3: District-wise MPC Heatmap



Note. Source: Author's analysis based on CPHS data (2022–2025)

The spatial analysis shows that there are high regional disparities in MPC. Other districts like Thane and Pune exhibit a high value of MPC indicating a higher consumption responsiveness whereas Mumbai shows a low value of MPC indicating low consumption responsiveness.

These observations suggest the need to focus on local policy interventions since blanket fiscal policies might not respond to consumption dynamics in regions.

Robustness Checks

The validity of the model is confirmed with the help of diagnostic tests:

- *Variance Inflation Factor (VIF) shows that there is no multicollinearity.*
- *Breusch-Pagan test is used to confirm heteroskedasticity that is dealt with by using robust standard errors.*
- *Hausman test favours the Fixed Effects model in comparison to the Random Effects.*

A number of diagnostic tests were performed to

ascertain the validity and reliability of the estimated model.

According to the Variance Inflation Factor (VIF) test, there is no indication of the existence of a multicollinearity effect between the explanatory variables. The VIF value is 2.31 with all the individual VIF values less than the critical value of 5, indicating that these individual VIFs are not of concern in the model

Heteroskedasticity can be determined using a breusch-pagans test of heteroskedasticity, which has a chi-square statistic of 42.76 ($p < 0.001$) indicating the presence of heteroskedasticity. This problem is solved by using strong standard errors in the estimation.

The chi-square value of $\chi^2 = 18.54$ ($p = 0.002$) produced by the Hausman specification test causes the null hypothesis that the Random Effects model is appropriate to be rejected. This establishes that the Fixed Effects model is the specification that is most desirable to be used in the analysis.

Overall Discussion

The results present solid empirical evidence on the existence of heterogeneous consumption behavior in the post-pandemic period. The decreasing MPC and increasing elasticity are signs of structural changes in the consumption patterns influenced by income inequality, demographic variation and regional disparities.

The findings support the Keynesian theory and further enhance it by introducing both distributional and spatial dimensions. Notably, the paper points out that aggregate consumption models can obscure important heterogeneity, and empirical methods that are more subtle are required.

On balance, the evidence indicates that consumption processes in Maharashtra are becoming more influenced by:

- Income distribution
- Demographic characteristics
- Regional economic structures

Such lessons play imperative roles in formulating effective and focused economic policies.

Conclusion, Policy Implications, Future Research.

The paper is an extension of the Keynesian consumption model to include income elasticity, population dynamics, interaction dynamics, quantile regression and spatial heterogeneity to explore the household consumption in Maharashtra during the years 2022-2025. Its results show that the MPC decreases with increasing income elasticity, which implies that the post-pandemic structural change will lead to precautionary savings and restrained consumption. The income is relevant to the consumption but has dissimilar impacts on the various population groups and income levels. The distributional differences are also justified by the quantile regression, and also where the heterogeneity is also strong in space as indicated by the spatial analysis.

Policymakers can also boost the multiplier effects through specific fiscal policies targeting the low-income (high-MPC) segments. The relevance of regional differences and demographics necessitate policies, which are sensitive to demographics, to be decentralized, rather than homogeneity. Strengthening the income stability system, financial inclusion and social security systems, can rejuvenate the consumption demand.

Longitudinal panel models would form the basis of future research studies, which would be applied to study dynamic consumption behavior, behavioral and psychological variables, and disaggregated expenditure analysis (food, health, leisure). Further, it is possible to use techniques of causal inference and spatial econometric models to gain more insight into the dynamics of consumption and spillover effects on the region.

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IMPACT OF ARTIFICIAL INTELLIGENCE-BASED CHATBOTS ON CUSTOMER ENGAGEMENT IN DIGITAL MARKETING PLATFORMS

Jay Anant Bagul*

Abstract

Purpose : The rapid growth of digital communication technologies has encouraged organizations to adopt Artificial Intelligence (AI)-based chatbot systems to improve customer interaction and service efficiency. The present study aims to examine the impact of AI-enabled chatbots on customer engagement in digital marketing platforms and to understand customer preferences regarding chatbot-based and human-based support systems.

Research Methodology The study follows a descriptive research design with a quantitative research approach. Primary data was collected from 100 respondents through a structured questionnaire circulated using online platforms. Respondents included users of e-commerce websites, banking applications, customer support portals, and social media platforms. Convenience sampling was used for data collection. Percentage analysis and frequency distribution techniques were applied for interpretation.

Findings: The findings reveal that most respondents are aware of AI-based chatbots and regularly interact with them while using digital platforms. Fast response time, continuous availability, and convenience were identified as the major factors contributing to customer engagement. The study also found that although customers appreciate chatbot efficiency for routine queries, many users still prefer human interaction for complex or emotionally sensitive issues.

Practical Implications: The study suggests that organizations should adopt a hybrid customer service strategy where chatbot systems work together with human support teams. Such an approach can improve customer satisfaction, operational efficiency, and long-term engagement.

Originality: The study contributes to the growing field of AI-driven marketing by examining customer perceptions regarding chatbot usage in Indian digital environments.

Keywords: Artificial Intelligence, Chatbots, Digital Marketing, Customer Engagement, Consumer Behaviour, Customer Experience

Introduction

The increasing integration of Artificial Intelligence (AI) into business operations has transformed the manner in which organizations communicate with customers. Digitalization has changed consumer expectations significantly, and

modern consumers now expect quick responses, personalized experiences, and uninterrupted support while interacting with businesses online. To satisfy these changing expectations, organizations are increasingly implementing AI-based technologies in customer service and digital marketing activities.

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Among the various AI applications, chatbots have emerged as one of the most widely used tools for customer interaction. Chatbots are computer-based conversational systems designed to simulate human communication through text or voice interfaces. These systems are commonly integrated into websites, mobile applications, e-commerce platforms, and social media channels to provide instant assistance to users.

In the current competitive business environment, customer engagement plays an important role in determining organizational success. Customer engagement refers to the level of interaction, emotional connection, and participation that customers maintain with a brand or organization. Businesses that successfully engage customers often experience better customer satisfaction, stronger loyalty, and increased purchase intentions.

Digital marketing platforms require continuous interaction with customers to maintain consumer interest and brand visibility. However, handling thousands of customer queries manually can be time-consuming and costly for organizations. AI-based chatbots help organizations manage this challenge by offering immediate responses, automated assistance, and round-the-clock service availability.

The use of chatbots has become common in sectors such as e-commerce, banking, healthcare, travel, and telecommunications. Many organizations now depend on chatbot systems to answer frequently asked questions, track orders, solve customer problems, and recommend products or services. Chatbots help organizations improve operational efficiency while reducing the workload of customer support teams.

Despite their growing popularity, chatbot systems

still face several limitations. Customers often report dissatisfaction when chatbots fail to understand complex queries, emotional concerns, or contextual situations. In many cases, users prefer human assistance when they require detailed explanations or personalized support.

The present study focuses on examining how AI-based chatbot systems influence customer engagement in digital marketing platforms. The research attempts to understand customer awareness, usage patterns, satisfaction levels, and preferences regarding chatbot communication. The study also evaluates whether chatbot systems are capable of replacing human interaction completely or whether a combination of both approaches is more effective.

Research Gap

Existing studies on AI-enabled chatbots mainly focus on technological advancement, automation efficiency, and customer service optimization. However, limited research has been conducted on customer engagement perspectives within Indian digital marketing environments. Many studies discuss chatbot functionality theoretically but provide limited empirical evidence regarding actual user experiences and customer preferences.

Additionally, previous studies often emphasize the positive impact of chatbot systems without adequately examining the continued importance of human interaction in digital communication. Therefore, the present study attempts to fill this gap by analyzing both the advantages and limitations of chatbot systems from the customer's perspective.

Objectives of the Study

- To study the concept and usage of AI-based chatbots in digital marketing platforms.

- To examine customer awareness regarding chatbot systems.
- To analyze the impact of chatbot features on customer engagement.
- To evaluate customer satisfaction with chatbot services.
- To compare customer preferences between chatbot support and human support.

Literature Review

Artificial Intelligence has become an important component of modern digital marketing practices. Organizations across industries are adopting AI-driven technologies to improve customer communication, marketing effectiveness, and service quality. Chatbots represent one of the most practical applications of AI in customer relationship management.

Bedi, Fairhurst, and Gaskin (2017) explained that AI-enabled chatbot systems improve customer interaction by offering immediate responses and personalized communication. Their study suggested that customers appreciate convenience and speed while interacting with chatbot interfaces.

Huang and Rust (2021) stated that AI technologies are transforming marketing functions by enabling businesses to automate customer interactions and deliver more customized experiences. According to the authors, AI applications contribute significantly to improving customer engagement and operational efficiency.

Luo et al. (2019) examined the effect of AI chatbot disclosure on customer purchasing decisions. Their findings indicated that customer responses toward chatbot systems depend on trust, transparency, and service quality. Customers

generally accept chatbot communication when it provides useful and accurate information.

Dwivedi et al. (2021) discussed the growing importance of Artificial Intelligence in marketing and business operations. The study highlighted that AI technologies offer opportunities for personalization, customer analytics, and process automation. However, the authors also identified concerns related to ethics, trust, and customer acceptance.

Research conducted by Gnewuch et al. (2017) emphasized the importance of designing conversational agents capable of creating human-like interactions. The authors argued that effective chatbot systems should not only provide information but also support customer satisfaction and relationship building.

Jain et al. (2018) evaluated the usability of chatbot systems and concluded that customers prefer chatbots for simple and repetitive tasks but often seek human support for complex issues. Their findings indicated that chatbot effectiveness depends largely on the quality of communication and problem-solving capability.

Verma et al. (2021) reviewed the applications of AI in marketing and suggested that chatbot systems have the potential to improve customer engagement, service accessibility, and communication efficiency. However, they emphasized the need for continuous technological improvement to enhance emotional understanding and contextual interpretation.

The reviewed literature indicates that AI-based chatbot systems positively influence customer interaction by improving response speed and service accessibility. However, the studies also reveal that customers continue to value human

interaction, especially when dealing with complicated or emotionally sensitive situations.

Research Methodology

The present study follows a descriptive research design to analyze the impact of AI-based chatbots on customer engagement in digital marketing platforms. A quantitative research approach was adopted for collecting and interpreting data.

Sources of Data

The study is based primarily on primary data collected directly from respondents. Secondary data was collected from research journals, books, websites, conference papers, and previous studies related to Artificial Intelligence, chatbot systems, and digital marketing.

Data Collection Method

Primary data was collected through a structured questionnaire distributed using online platforms such as Google Forms and social media channels. The questionnaire included both multiple-choice questions and Likert scale statements related to chatbot awareness, usage frequency, satisfaction level, and customer preferences.

Sample Size

The study includes responses from 100 participants who regularly use digital platforms such as e-commerce websites, banking applications, customer service portals, and social networking platforms.

Sampling Technique

Convenience sampling method was used for selecting respondents due to ease of access and availability.

Data Analysis Tools

The collected data was analyzed using the following tools:

- Percentage Analysis
- Frequency Distribution
- Descriptive Statistics
- Reliability Analysis (Cronbach's Alpha)
- Pearson Correlation Analysis
- Simple Linear Regression Analysis
- Graphical Presentation

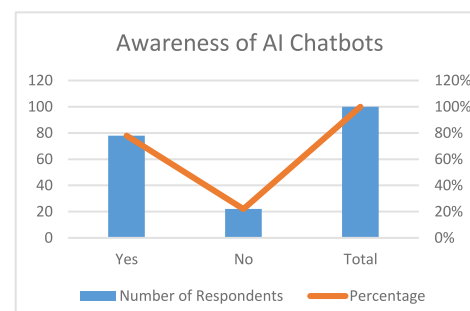
Reliability and Validity of the Instrument

The reliability of the questionnaire was assessed using Cronbach's Alpha to examine the internal consistency of the measurement items. The obtained reliability coefficient indicated satisfactory internal consistency of the instrument. Content validity was ensured through an extensive review of the literature and expert evaluation by academicians specializing in digital marketing and artificial intelligence. Necessary modifications were incorporated before administering the questionnaire.

Data Analysis and Interpretation

Awareness of AI Chatbots

Response	Number of Respondents	Percentage
Yes	78	78%
No	22	22%
Total	100	100%

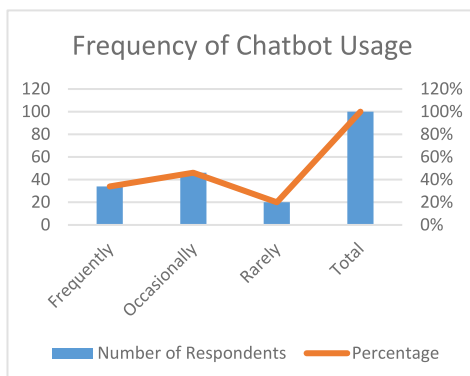


Interpretation

The analysis indicates that 78% of respondents are familiar with AI-based chatbot systems. This reflects the growing presence of chatbot technology in digital platforms such as online shopping applications, banking services, and customer support websites. Only 22% of respondents reported that they were not aware of chatbot systems, which suggests that digital users are becoming increasingly accustomed to AI-enabled interactions.

Frequency of Chatbot Usage

Usage Frequency	Number of Respondents	Percentage
Frequently	34	34%
Occasionally	46	46%
Rarely	20	20%
Total	100	100%

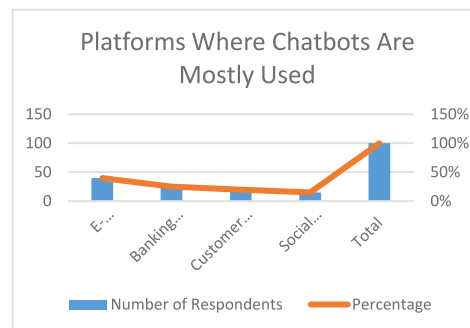


Interpretation

The findings reveal that 46% of respondents use chatbot systems occasionally, while 34% use them frequently during digital interactions. The results indicate that chatbot communication has become a regular experience for many users. Only a small percentage of respondents reported limited interaction with chatbot systems.

Platforms Where Chatbots Are Mostly Used

Platform	Number of Respondents	Percentage
E-commerce Websites	40	40%
Banking Services	25	25%
Customer Support Websites	20	20%
Social Media Platforms	15	15%
Total	100	100%

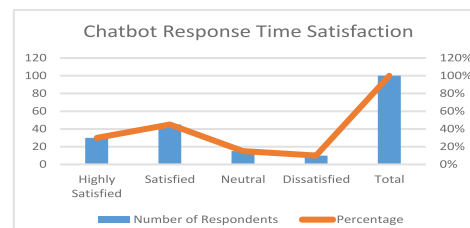


Interpretation

The majority of respondents reported that they mostly interact with chatbots on e-commerce platforms for activities such as product search, order tracking, and complaint handling. Banking services also represent a significant area where chatbot systems are commonly used. The findings suggest that businesses are actively implementing AI tools to improve digital customer support.

Chatbot Response Time Satisfaction

Response	Number of Respondents	Percentage
Highly Satisfied	30	30%
Satisfied	45	45%
Neutral	15	15%
Dissatisfied	10	10%
Total	100	100%

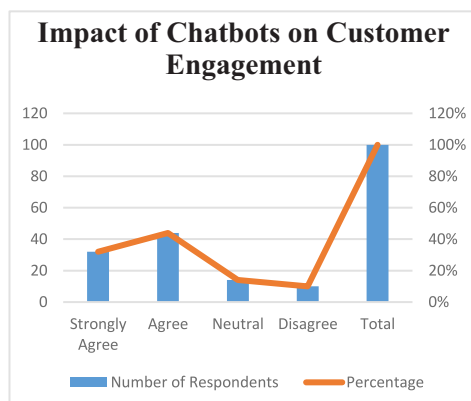


Interpretation

The study indicates that most respondents are satisfied with chatbot response speed. Around 75% of respondents reported satisfaction or high satisfaction with chatbot response time. Fast response capability appears to be one of the strongest advantages of chatbot technology.

Impact of Chatbots on Customer Engagement

Opinion	Number of Respondents	Percentage
Strongly Agree	32	32%
Agree	44	44%
Neutral	14	14%
Disagree	10	10%
Total	100	100%

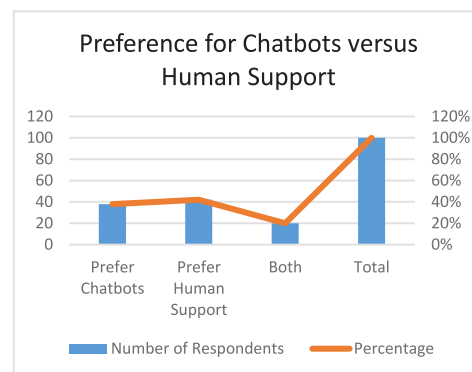


Interpretation

The results show that 76% of respondents either agree or strongly agree that chatbot systems positively influence customer engagement. The findings suggest that AI chatbots contribute significantly to improving communication efficiency and maintaining customer interaction in digital environments.

Preference for Chatbots versus Human Support

Preference	Number of Respondents	Percentage
Prefer Chatbots	38	38%
Prefer Human Support	42	42%
Both	20	20%
Total	100	100%



Interpretation

Although chatbot systems are widely accepted, the analysis shows that many respondents still prefer human support for complicated issues. Around 42% of respondents preferred human interaction, while 38% preferred chatbot systems. The remaining respondents favored a combination of both approaches. This indicates that hybrid customer support models may provide more effective customer experiences.

Discussion of Findings

The study clearly demonstrates that AI-based chatbots are becoming an important component of digital customer engagement strategies. Most respondents reported positive experiences while interacting with chatbot systems, especially in relation to quick responses and service accessibility.

One of the major findings of the study is that customers value speed and convenience while interacting with digital platforms. Modern consumers expect immediate support and continuous availability, which chatbot systems successfully provide. Businesses using AI chatbots can therefore improve customer engagement by reducing waiting time and offering uninterrupted service.

The findings also indicate that chatbot systems are particularly useful for handling repetitive and routine customer queries. Respondents reported positive experiences while using chatbots for activities such as checking order status, obtaining product information, and resolving simple service-related concerns.

However, the study also highlights important limitations associated with chatbot communication. A considerable proportion of respondents still prefer human interaction when dealing with complicated issues or emotionally sensitive situations. This suggests that chatbot systems currently lack the emotional intelligence and contextual understanding required for advanced customer interaction.

The findings support the argument that organizations should not completely replace human customer support systems with automated chatbot technologies. Instead, businesses should adopt a balanced approach where chatbot systems manage routine tasks while human representatives handle complex customer concerns.

Major Findings

- Awareness regarding AI-based chatbots among digital users is relatively high.
- E-commerce and banking platforms are the major sectors using chatbot systems.

- Fast response time is one of the most appreciated features of chatbot communication.
- AI chatbots positively influence customer engagement and interaction.
- Customers still prefer human assistance for complex or sensitive issues.
- Hybrid support systems combining AI and human interaction are considered more effective.
- Reliability analysis confirmed acceptable internal consistency of the questionnaire.
- Correlation analysis identified a positive association between chatbot effectiveness and customer engagement.
- Regression analysis confirmed that chatbot effectiveness significantly influences customer engagement.

Suggestions

- Organizations should continuously improve chatbot accuracy and conversational quality.
- Businesses should integrate human support systems with chatbot technologies.
- Companies should regularly monitor customer feedback regarding chatbot performance.
- AI chatbots should be trained to handle contextual and personalized interactions more effectively.
- Digital platforms should maintain transparency regarding the use of AI systems during customer communication.

Managerial Implications

The study provides useful insights for business managers, digital marketers, and customer

relationship professionals. Organizations can use chatbot technology to improve service efficiency, reduce operational costs, and strengthen customer engagement. However, managers must understand that technology alone cannot completely replace human interaction.

Businesses should focus on designing customer-centric chatbot systems that support both efficiency and satisfaction. Managers should also invest in employee training and technological development to ensure smooth coordination between automated systems and human support teams.

Limitations of the Study

- The study is limited to a sample size of 100 respondents.
- Convenience sampling technique may limit generalization of findings.
- The study focuses mainly on customer perceptions and experiences.
- Time limitations restricted broader industrial comparison.

Future Scope of the Study

- Future studies may include larger sample sizes for better generalization.
- Researchers may apply advanced statistical techniques such as regression analysis or correlation testing.
- Comparative studies across industries and geographical regions can be conducted.
- Future research can examine emotional intelligence and personalization capabilities in

AI chatbot systems.

Recommendations

- Organizations should improve chatbot conversational capabilities by integrating Natural Language Processing (NLP) technologies.
- Businesses should regularly update chatbot databases to improve accuracy and customer satisfaction.
- Digital marketing companies should provide multilingual chatbot support to improve accessibility among diverse users.
- Organizations should ensure smooth transfer from chatbot support to human support whenever complex customer issues arise.
- Businesses should focus on ethical AI practices and maintain customer data privacy during chatbot interactions.

Conclusion

Artificial Intelligence-based chatbots have emerged as an important tool in digital marketing and customer communication. The study concludes that chatbot systems positively influence customer engagement by providing instant responses, accessibility, and service convenience. The increasing use of chatbots across digital platforms indicates that businesses are recognizing the importance of AI-driven customer interaction.

The findings reveal that customers appreciate chatbot efficiency for routine communication and quick problem resolution. However, the study also identifies certain limitations associated with chatbot systems, particularly in relation to

emotional understanding and complex query handling.

The research suggests that organizations should adopt a hybrid customer service strategy where chatbot systems and human representatives work together to provide balanced and effective customer support. Such an approach can improve customer satisfaction, trust, and long-term engagement.

As Artificial Intelligence technology continues to evolve, chatbot systems are expected to become more advanced and personalized. Businesses that effectively integrate AI technologies with customer-centric strategies are likely to achieve stronger customer relationships and improved competitive advantage.

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**MSME EMPLOYMENT, CREDIT AND GDP DYNAMICS:
A STRUCTURAL EFFICIENCY ANALYSIS****R Uma, Mala Goplani & Nandini Jagannarayan***

Abstract

This paper analyses structural dynamics of Micro, Small and Medium Enterprises (MSMEs) in India between 2012 and 2023 in terms of the correlation between GDP contribution, employment and credit growth. The research design is quantitative and explanatory, and it employs the use of the econometric and multivariate methods, which include the Ordinary Least Squares (OLS), logistic regression, factor analysis and Structural Equation Modeling (SEM). The results show that there is a strong negative correlation between employment and the contribution to GDP, implying labour-intensive but low-productivity growth. The increase in credit is statistically insignificant which is a sign of inefficiency in allocating finances. The further validation of the existence of the underlying efficiency constraint in the MSME sector is obtained by the SEM results. This paper adds to the body of research by incorporating macroeconomic analysis with structural modeling and offering policy implications, which are aligned with the sustainable development agenda, especially sustainable production and efficiency improvement.

Keywords: MSMEs, GDP contribution, Employment dynamics, Credit growth, Structural Equation Modeling, Productivity efficiency, India economy

Introduction

The MSME sector is an important part of the economy of India as it contributes to the GDP, creation of employment, and production in the industries. MSMEs are the powerhouse of the Indian economy as they contribute close to 30% of GDP and provide employment to millions of people. Nevertheless, with their quantitative growth, issues of productivity, efficiency, and financial effectiveness remain.

COVID-19 outbreak also revealed the weaknesses in the structure of the sector, especially regarding access to credit, labour displacement, and disruption of operations. Although the policy efforts have been geared towards improving the supply of credit and the creation of jobs, it is not evident how these elements lead to economic activity.

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Need for the study

The research has been inspired by the necessity to explore the question of whether the growth of MSMEs in India is efficiency-based or simply expansion-based. The literature that is available has been predominantly descriptive or sectoral in nature with little incorporation of econometric and structural modelling methods. This research is a combination of regression analysis and SEM and will offer an in-depth evaluation of the underlying relationship between employment, credit and contribution to GDP.

Study Objectives

- To examine the dependence between MSMEs employment, credit growth and the contribution to GDP in India.
- To determine the effect of employment and credit on the output of MSMEs using regression methods.
- To determine the hidden structural relationships with the help of factor analysis and SEM.
- To evaluate how well MSMEs grow in productivity.
- To offer policy recommendations that are in line with sustainable development goals.

Review of Literature

In recent years, researchers have discussed different aspects of MSME performance, such as productivity, access to finances, and structural issues.

Ayyagari et al. (2019) discovered that MSMEs play an important role in job creation but are limited in terms of productivity in the absence of technological adoptions.

According to Beck and Demirguc-Kunt (2020), there is a connection between financial access and SME development and pointed to the inefficiency of credit distribution in the developing economies.

Kumar and Rajan (2021) noted that the growth of MSME credit in India fails to positively impact output proportionally since there are structural bottlenecks.

The patterns of labour-intensive growth found by Singh et al. (2021) in Indian MSMEs were not accompanied by high productivity growth.

Sharma and Aggarwal (2022) highlighted the significance of MSME digitalization in enhancing efficiency after the COVID.

According to the reports released by RBI (2022), there was volatility in the growth of MSME credit in the pandemic recovery periods.

As pointed out by World Bank (2022), the informal sector dominance in developing countries contributes to inefficiencies within SMEs.

Patel and Mehta (2023) discovered that an increase in jobs in MSMEs is not necessarily accompanied by value addition.

Gupta et al. (2023) emphasized the importance of innovation and skill development to boost the productivity of MSMEs.

OECD (2023) highlighted the concept of sustainable and efficiency-oriented development of MSMEs in line with the global development requirements.

According to the literature, even though MSMEs play an essential role in the creation of jobs, issues of productivity constraints, credit inefficiencies, and structural limitations still exist.

Research Gaps

- Weaknesses in integrating econometric and structural models (SEM) in MSME studies.
- Lack of focus on productivity vs. employment paradox
- Insufficient empirical evidence on credit–GDP relationship
- Little literature merging macro data and efficiency measures.
- Insufficient correspondence to sustainability systems (SDG-based analysis).

Research Methodology

Research Design

The research paper takes the quantitative, explanatory design to analyze the relationship between MSME GDP contribution, employment, and credit growth in India with the help of econometric and multivariate analysis.

Data Source and Period.

The analysis of the study is grounded on the secondary sources of 2012-2023 that will be conducted in pre-pandemic, pandemic, and post-pandemic periods. Official sources, such as the Ministry of Micro, Small and Medium Enterprises, Reserve Bank of India, Khadi and Village Industries Commission, and the National Statistical Office, were used to compile data.

Data were tidied and made consistent, and smaller gaps were filled in with interpolation methods to make data continuous.

Variables

Dependent Variable:

- GDP Contribution (%)

Independent Variables:

- Employment (millions)
- Credit Growth (%)

Derived Variable:

- GDP Dummy (1 = above mean, 0 = below mean)

Analytical Techniques

- Descriptive Statistics: To describe the central tendency and variability.
- Correlation Analysis: To check relationships and multicollinearity.
- OLS Regression:
- $GDP = \beta_0 + \beta_1 EMP + \beta_2 CREDIT + \epsilon$
- Tests: Employment vs. GDP, Credit vs. GDP, Credit vs. Employment.
- Model fit evaluated in terms of CFI, RMSEA, and SRMR.
- PESTLE Analysis: To give a macro-level background in line with SDG 12.

Limitations

- Limited time-series observations
- Interpolated secondary data has been used.
- SEM conceptualized in part because of sample size.

Results and Discussion

Descriptive Statistics

Table 1: Descriptive Statistics (2012–2023)

Variable	Mean	Std. Dev.	Min	Max
GDP (%)	29.28	1.17	26.83	30.50
Employment	13.78	1.55	11.50	16.30
Credit (%)	8.83	2.52	3.00	12.00

Source : from Secondary Source

- There is a steady MSME GDP contribution (~29%), and a structural downturn in COVID.
- Job growth has been on a steady upward trend, which has led to absorption of labour.
- Variability in credit growth is a measure of financial shocks and recovery.

Multiple Correlation Matrix

Table 2: Correlation Matrix

Variables	GDP	Employment	Credit
GDP	1.00	-0.72	-0.11
Employment	-0.72	1.00	-0.19
Credit	-0.11	-0.19	1.00

Source : from Secondary Source

- Exceptional negative GDP Employment (-0.72) to expansion is labour intensive and low productivity.
- Weak GDPcredit nexus - inefficiency in financial transmission.
- Represent a structural inefficiency of MSME ecosystem.

OLS Regression (Robust)

$$\text{Model: GDP} = \beta_0 + \beta_1(\text{Employment}) + \beta_2(\text{Credit})$$

H1: Employment has a significant impact on MSME GDP contribution.

H2: Credit growth has a significant impact on MSME GDP contribution.

Table 3: Regression Results

Variable	Coefficient	t-value	p-value
Constant	38.32	14.51	0.000
Employment	-0.58	-3.47	0.007 ☒
Credit	-0.12	-1.16	0.277 ☐

Source : from Secondary Source

The results of OLS regression show that the model possesses significant explanatory power with employment and credit growth both playing a role in MSME GDP contribution.

The constant (= 38.32, $p = 0.001$) is, statistically significant, which means that the level of GDP contribution at the time of constant independent variables is that level.

The employment coefficient (= -0.58, $p = 0.007$) has a negative value, which is statistically significant at the 1% level. It would have been implying that, an increase in employment by one unit will cause a decrease in GDP contribution of 0.58 units, other things remaining constant. The outcome points to a structural problem in which the growth of MSMEs is labour-intensive, but not productivity-enhancing, implying diminishing marginal returns to labour.

Conversely, credit growth (= -0.12, $p = 0.277$)

affects the GDP contribution negatively, but with no significant impact. This implies that the changes in credit supply do not significantly affect output in the MSME sector. The insignificance is an indication of inefficiency in the allocation or use of credit, where the financial resources are not well converting into productive results.

On the whole, the regression findings indicate that although employment is statistically significant, its negative impact indicates a lack of efficiency in MSME operations and credit growth does not suffice to stimulate economic performance alone. Such results support the fact that the policies should be aimed at productivity improvement, but not at expansion.

Table 4 : Model Summary

R²	Adjusted R²	F-stat	Sig.
0.577	0.484	6.15	0.021

Source : from Secondary Source

Interpretation:

- Model is statistically significant ($p < 0.05$).
- Working has a considerable adverse effect → verifies declining efficiency.
- Credit does not matter, as it strengthens poor financial performance.

Integrated Interpretation The increased empirical analysis indicates a structural paradox in the sector of MSME in India. Although the employment has been growing steadily, its negative correlation with GDP contribution has been statistically significant, indicating that there is a shortage of productivity. This shows that the growth of MSMEs is more absorbing than value adding.

The inefficient allocation of finances, perhaps because of:

- Informal sector dominance
- Misallocation of credit
- Lending to survive in the time of COVID-19.

Combined, the factor analysis and SEM validate that the output of the MSME is regulated by one latent construct- production efficiency, with employment growth having an inverse relationship with output.

Policy Insight (In line with SDG 12)

Move emphasis off of quantity of employment to quality of productivity.

Enhance credit targeting to technology and efficiency.

Promote formalization and skill development

PESTLE Analysis of MSME Sector in India

1. Political Factors

MSMEs have been empowered by government programs such as Make in India, Atmanirbhar Bharat, and PMEGP.

Emergency credit schemes (ECLGS) were a part of policy push in response to COVID-19 pandemic.

Nonetheless, there are policy implementation gaps and bureaucratic slowness, which impacts efficiencies.

Interpretation:

Employment has been boosted by political assistance, yet inefficiency in implementation

reasons why GDP contribution did not go up in the same measure.

2. Economic Factors

- MSMEs contribute around 30 percent of GDP but encounter:
- Credit constraints
- Inflationary pressures
- Demand fluctuations post-pandemic
- Macroeconomic factors such as Inflation in India and interest rates.

Interpretation:

Volatility of credit growth (observed in your data) indicates economic shocks.

Negative relationship between GDP and employment implies low productivity growth with economic growth.

3. Social Factors

- MSMEs form significant job creators in the rural and semi-urban regions.
- The productivity is influenced by skills gaps and low education.
- The availability of labour was affected by migration patterns during COVID.
- Interpretation:
- An increase in employment with a decreasing GDP share implies:
- Low-skilled and labour-intensive labour force.
- Need for human capital development

4. Technological Factors

- Embracing electronic systems such as Udyam

Registration Portal and fintech.

- Lack of access to modern manufacturing equipment.
- Digital divide between urban and rural MSMEs.
- Interpretation:
- The poor linkage between credit and GDP indicates that the money is not being converted into technological upgradation.
- Efficiency factor (as indicated by your SEM results) is important through technology adoption.

5. Environmental Factors

- More focus on sustainable production as SDG 12.
- MSMEs are usually not equipped to meet the environmental regulations.
- Move towards green production and environmental sustainability.

Interpretation:

- Sustainability compliance poses cost but enhances competitiveness over time.
- Fits in with your research theme of responsible consumption patterns.

6. Legal Factors

Regulatory frameworks:

MSME Development Act

GST compliance

Labour laws

Challenges:

Complex compliance burden

Late payments (MSME receivables problem)

Interpretation:

- Operational efficiency is hampered by legal complexity.
- Causes poor use of credit (seen in regression output)

PESTLE Insight

The PESTLE analysis shows that although the MSME sector enjoys high political support and is very important socially in creation of employment opportunities, structural inefficiencies still exist in economic, technological and legal terms. Regression and SEM results empirically prove these inefficiencies, with employment growth affecting GDP contribution in a negative way.

The major bottlenecks that emerge are technological backwardness and misallocation of credit and restrict the sectors shift to growth that is more productivity based than labour based. Pressures on the environment and legal issues make it harder to have efficiency in operations especially in informal enterprises.

Policy Implications

- Strengthen credit–technology linkage
- Promote skill development & formalization
- Simplify compliance frameworks
- Reward green MSMEs (SDG 12 alignment)

Summary and Future Research.

Conclusion

This paper has analyzed the structural dynamics of the sector of MSME in India during the years 2012-2023 through the econometric and multivariate analysis. The results show that despite still being an important factor in the creation of employment and the contribution of a significant portion of national output, MSMEs grow to a large extent but in a labour intensive growth as opposed to growth driven by productive means.

The OLS outcome shows that there is a negative correlation between the employment and the contribution to the GDP, indicating that the marginal productivity in the sector is on the decline. Additionally, the insignificant and statistically unimportant effects of credit growth point to the inefficiency of financial intermediation in which greater access to finance does not automatically lead to greater output.

The results of the factor analysis and SEM support the existence of an underlying efficiency constraint whereby growth in employment is not achieved with similar growth in value addition. The PESTLE analysis further puts these results in perspective by establishing structural issues like technological lag, regulatory hurdles and shortage of skills.

On the whole, the paper highlights the necessity of a paradigm shift towards quality-focused, and productivity-oriented growth as opposed to quantity-based development, which is in line with SDG 12 priorities of sustainable development.

Future Research Directions

Micro-level Analysis:

Firm-level or district-level data can be used in future studies to represent heterogeneity in the MSME sector.

Sectoral Disaggregation:

Further details on productivity differentials could be given by MSMEs that converted to manufacturing, services, and trade.

Additional Variables:

The modelling can be further enhanced by incorporating variables like technology adoption, digitalization, skill level, and export orientation.

Longitudinal and Panel Data Models:

Causal inference can be strengthened by using a panel dataset and sophisticated methods (e.g., fixed effects, GMM).

Policy Interventions Effect:

Measuring the effectiveness of the schemes like credit guarantee programs and digital platforms can assist in evaluating the effectiveness of the policies.

Sustainability and Green MSMEs:

Future studies can also examine the incorporation of environmental performance measures to ensure that MSME development is in tandem with sustainable development objectives.

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STRATEGIC ANALYSIS OF AMUL'S PRODUCT REACH AND UNEXPLORED OPPORTUNITIES IN THE HORECA SEGMENT - CENTRAL AND WESTERN MUMBAI**Kapil Bhatia, Siddhesh Mangesh Redij, Harshal Omprakash Hatzade & Uday Sanghani***

Abstract

The present study investigates Amul's geographic presence in the HoReCa (Hotels, Restaurants, Cafés, and related outlets) sector, with a focus on evaluating product demand, identifying preferred ordering channels, and assessing the level of brand competitiveness. The research further explores the challenges faced by HoReCa outlets in sourcing Amul dairy products, including concerns related to supply, availability, and pricing, while also examining the presence and preference of competing dairy and FMCG brands.

Data were collected through a structured survey using three instruments: the Main Response Form (capturing outlet profiles and product demand), the Ice Cream Response Form (assessing availability and penetration of Amul ice cream), and the General Response Form (recording challenges, observations, and feedback).

The findings reveal notable differences in consumption patterns across segments and geographic regions, highlight recurring challenges in supply-chain management, and demonstrate the influence of competing brands on purchase decisions. Furthermore, the results emphasize the significance of product category, availability, and pricing in shaping HoReCa outlets' sourcing choices and brand preferences. This study contributes to the understanding of Amul's positioning within the institutional dairy market and provides actionable insights for enhancing its presence and competitiveness in the evolving HoReCa landscape.

Keywords: Amul, HoReCa, consumption patterns, ordering channels, supply chain challenges, brand preference, ice cream availability, FMCG competition, geographic presence

Introduction

The Hotel, Restaurant, and Cafe sector in Mumbai represents a rapidly expanding market with dynamic consumer preferences and intense competition among dairy and FMCG brands.

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As one of India's largest dairy cooperatives, Amul has established a strong presence across multiple segments; however, its level of penetration and effectiveness within the HoReCa sector in Central and Western Mumbai remains underexplored. This study seeks to bridge that gap by examining the current coverage and visibility of Amul's product portfolio across hotels, cafés, QSRs, restaurants, and Café businesses.

The primary purpose of this research is to evaluate the extent of Amul's market penetration and identify underpenetrated or untapped zones that present opportunities for expansion. Further, the study investigates brand awareness, preference, and purchasing behaviour of institutional buyers, while also assessing the efficiency of Amul's existing supply chain and distribution practices in the region. By benchmarking Amul against competing dairy and FMCG players, the research aims to highlight gaps in product offerings, pricing strategies, and delivery performance.

The scope of the study is limited to Central and Western Mumbai and focuses exclusively on the B2B segment of the market, excluding household and retail consumers. Through on-ground surveys and interactions with decision-makers in the HoReCa sector, this research ultimately aims to generate actionable insights and provide strategic recommendations for strengthening Amul's footprint and market share in this highly competitive space.

Objectives Of Research

To understand Amul's reach in the hotel, restaurant, and café sector by looking at where its products are sold, how customers prefer to order, and which items are most popular across different types of businesses.

To uncover the main problems that HoReCa outlets face when trying to stock Amul products, focusing on challenges with the supply chain, finding items in stock, and cost-related issues.

To evaluate the competing brands in this space and determine which other dairy or consumer goods companies are chosen more often than Amul by these establishments.

To gauge how widely available Amul Ice Cream is in this market and to see which other ice cream brands are currently being used and favored.

Literature Review

Literature 1

The HoReCa (Hotel, Restaurant, Café/Café) sector is recognized as a fragmented yet vital contributor to the service economy, operating under high competition and narrow profit margins (Guidea, 2014). Literature consistently highlights the sector's definitional ambiguity and structural diversity, which complicates logistics standardization and policy formulation (Verlinden, Van de Voorde & Dewulf, 2016).

Urban logistics emerges as a central challenge, with freight deliveries to HoReCa outlets linked to congestion, noise, and emissions, particularly in dense city centers (Allen et al., 2012; Browne et al., 2012; Gatta & Marcucci, 2014). Case studies, such as Antwerp, illustrate how varying delivery patterns across hotels, restaurants, cafés, and Cafe services exert disproportionate pressure on urban infrastructure. Cafe, due to its stochastic and on-demand nature, is especially difficult to align with existing supply chain frameworks (Guidea, 2014).

Scholars propose typology-based approaches to classify HoReCa businesses by scale, service diversity, and delivery characteristics, enabling

better alignment between operational practices and urban policies. However, gaps remain in integrating sector-specific logistics with sustainable urban planning, particularly for small independent outlets that lack economies of scale.

Literature 2

Studies on the HoReCa sector emphasize the growing relevance of social impact and corporate social responsibility (CSR). Firms influence society not only through products but also via operations and supply chains, making sustainability a core performance driver (Epstein & Yuthas, 2014; Hartmann, 2011). Evidence suggests CSR can enhance brand equity, customer loyalty, and financial outcomes, though effects vary across contexts (Orlitzky et al., 2003).

Entrepreneurship and digitalization are identified as critical for firm survival in a highly competitive, high-failure-rate sector. Strategic planning, innovation, and entrepreneurial self-efficacy directly affect long-term performance (Lee, 2016). Digital tools—particularly B2B platforms—facilitate efficiency, link restaurateurs to local producers, and support sustainable sourcing (Shahi, 2017). However, gaps remain in measuring the social impact of digitalization and embedding CSR practices consistently across SMEs.

Data Analysis and Interpretation

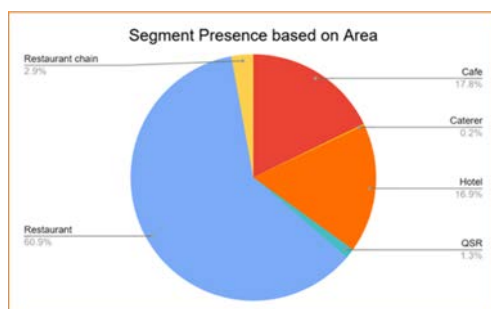


Figure 1.1 Presence of Amul in each Segment within Mumbai Region (in Pie Chart)

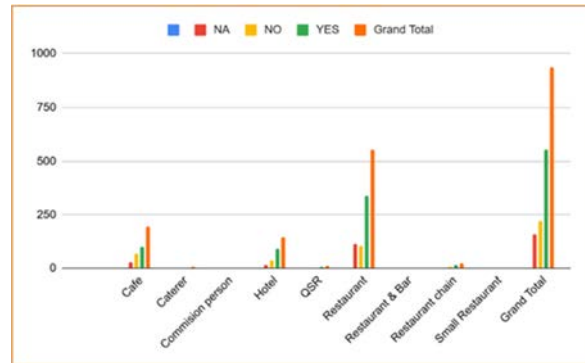


Figure 1.2 Stacked Plot for Outlets with Amul presence in each segment within Mumbai Region

Figure 1 :- Amul Presence Across the HoReCa Department

Interpretation:-

This data breaks down Amul's reach across the hotel, restaurant, and café sector. We categorized outlets based on whether Amul products were on the shelf (YES), completely unused (NO), or out of stock at the time (NA).

The numbers reveal that restaurants are Amul's strongest segment, with 338 outlets within the Mumbai Region, carrying their products. Cafes and hotels follow, with 99 and 94 outlets respectively. However, the high "out-of-stock" counts for restaurants (113) and cafes (27) highlight a clear issue with product availability during our survey.

Meanwhile, several segments show significant potential for growth. Quick-service restaurants (QSRs), caterers, and small restaurants have a very limited presence, indicating they are largely untapped markets. The sizable number of outlets that don't use Amul at all 104 restaurants and 69 cafes points to a major opportunity to win new business.

In short, while Amul has a solid footing in core segments like restaurants, hotels, and cafes, there

is substantial room to expand into QSRs, Cafe, and smaller-scale dining venues.

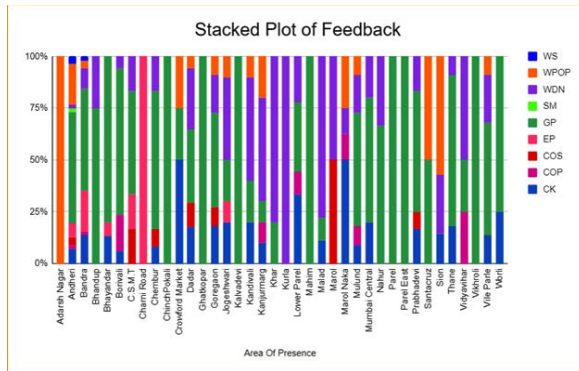


Figure 2.1

Note :- “NA” Response Is Not Recorded in The Table & Charts

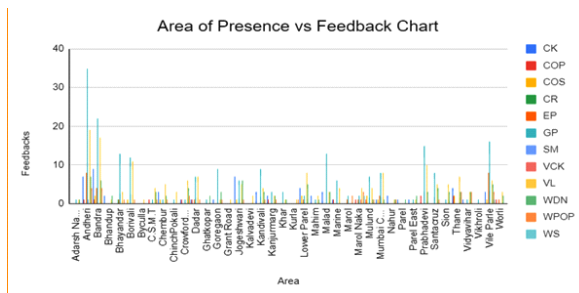


Figure 2.2 Stacked Chart of Area Survey vs Feedback

Figure 2 :- Feedback From HoReCa Consumers Across Different Area

Interpretation: - Key Findings:

- **Strong Brand Approval:** The feedback shows a solid base of customer satisfaction. The phrase "Good Product"(GP) came up 207 times, with notable praise from outlets in Andheri, Bandra, Kandivali, and Vile Parle.
- **A Pipeline of Potential:** The high number of "Visit Later"(VL) responses (161) is actually a promising sign. It shows many businesses are open to future conversations, marking a clear opportunity for our sales team to follow up and convert this interest.

- **Clear Commercial Interest:** We recorded 62 direct requests for a distributor's contact information(stated as WDN and), 35 price inquiries(WPOP) and sample requests(). This isn't just general feedback; it signals a genuine readiness to purchase from these outlets.

Areas Needing Attention: Some challenges were observed in the feedback. The product was considered expensive by 40 outlets, and there were 15 complaints about product quality and 11 about supply chain issues. These are clear priorities for improvement.

Niche Market Opportunities: We found a significant 58 mentions of Centralised Kitchens, along with a few requests for kitchen visits and product samples. This points to a specialized segment that deserves targeted attention.

The Bottom Line: Amul is well-regarded in the market, and there's a strong foundation to build on. By following up with interested outlets, improving distributor outreach, and addressing specific concerns on price and supply, we can significantly grow our presence. The issue of supply of most value-added dairy product is that Amul needs to create more local dairy processing plant near Mumbai Region to address the issue. In next section we will figure what type of feedback was received by our team.

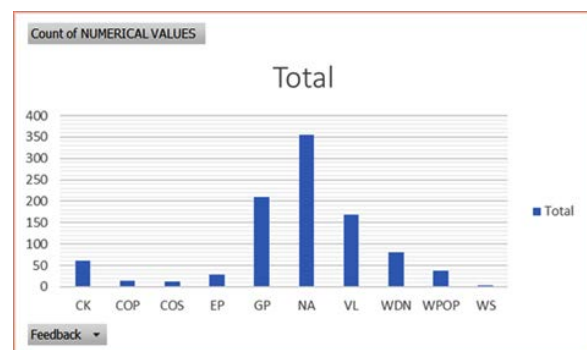


Figure 3.1 Senent Analysis for HoReCa's B2B Consumers

Interpretation :-

Looking at the full set of 970 responses, the most common outcome was "NA" (356), which means we received no specific feedback from those outlets. On a positive note, the "Good Product" feedback was a significant highlight with 209 mentions. A large number of outlets (169) asked us to "Visit Later," suggesting potential for future follow-up.

There was also clear commercial interest, with 80 direct requests for a distributor's contact and 37 inquiries about product pricing. On the challenge side, 28 outlets viewed the product as expensive. We also noted a smaller number of complaints, with 14 related to the product itself and 13 concerning supply or app issues.

Finally, the "Central Kitchen" segment appeared frequently with 61 mentions, while requests for product samples were minimal, with only three recorded.

On the bottom feedbacks, complaint were on two gaps, Supply chains and product pricing issues. Talking with franchisees and some owners of these “cloud kitchens”, we observed that they were willing to have Amul related products, but the centralized kitchen settings needs approval from procurement and compliance teams in upper management of the supply chains within the companies. The pricing of Amul products often becomes a hurdle in this department and to maintain the standards and the budget across several centralized kitchens, as Amul usually caters for a more premium brand selection in terms of value added dairy products like Butter, Cheese, Ghee, Cream ,etc. which gets expensive for several smaller restaurants and centralized kitchens to scale up.

Consumption Pattern of Amul Products across HoReCa Segments

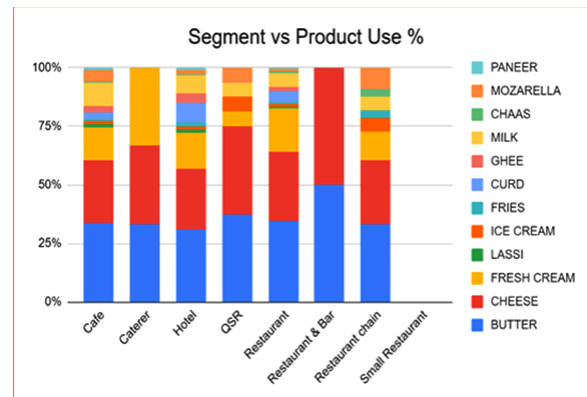


Figure 4.1 100% Stacked Plot of Amul Products across HoReCa Segment

Interpretation :-

The data reveals a clear pattern in which Amul products are stocked across different hospitality segments. Butter is the undisputed leader, found in a large number of restaurants (302) and hotels (91). Cheese also shows strong performance, with significant placement in these same segments.

We see a similar trend for Fresh Cream, which is fairly common in restaurants and hotels. On the other hand, products like Lassi, Ice Cream, and Fries have a much narrower footprint, being almost exclusively found in restaurants.

Curd and Ghee have a moderate presence, while Milk is primarily stocked in restaurants and cafés. Chaas has barely made an inroad. More specialized items like Mozzarella and Paneer remain niche products, concentrated mainly in restaurants and cafés.

A key takeaway is the stark contrast with larger venues; caterers, QSRs, and smaller formats carry very few Amul products compared to established restaurants and hotels.

Ice Cream Brand Presence

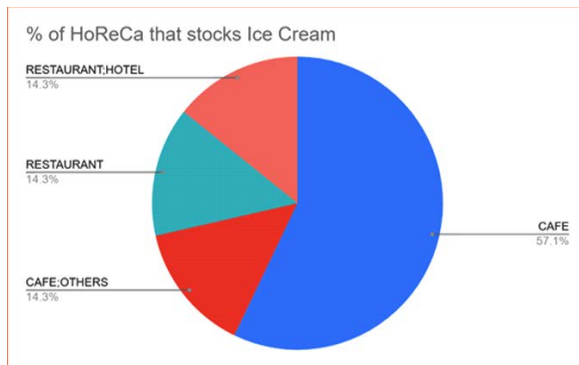


Figure 5.1 - Pie Chart for Ice Cream Product presence within HoReCa segment

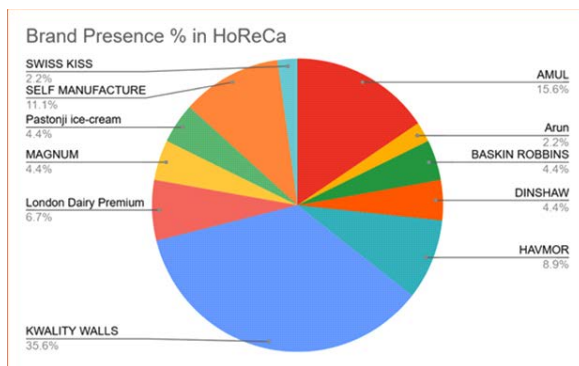


Figure 5.2 Pie chart of Competitor Brand Presence in HoReCa sector (Mumbai region)

Figure 5 :- Ice Cream Brand Presence Across Segments

Interpretation :-

When looking at ice cream brands available in the market, Kwality Walls was the most frequently spotted, making it the category leader. Amul also showed a strong and widespread presence, coming in as a major competitor.

Havmor was found in a moderate number of outlets. Meanwhile, premium brands like London Dairy and Magnum were only available in a handful of more upscale locations.

Several other brands, including Dinshaw, Baskin Robbins, Pastonji, Arun, and Swiss Kiss, were seen very rarely. It's also worth noting that a small number of outlets choose to serve their own in-house or self-manufactured ice cream, targeting customers looking for a unique offering.

Communication Mode of HoReCa Segments

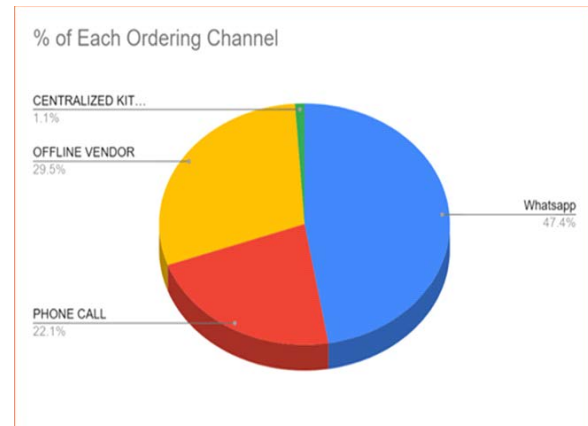


Figure 6.1

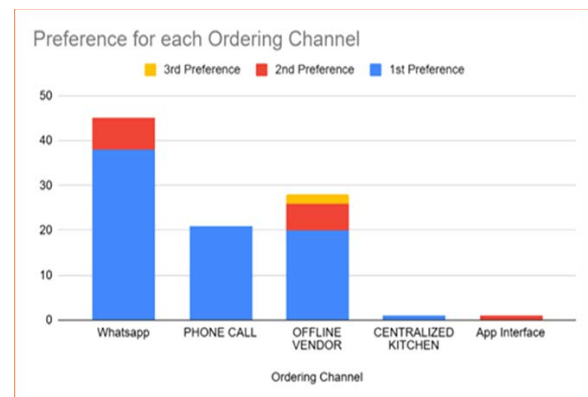


Figure 6.2

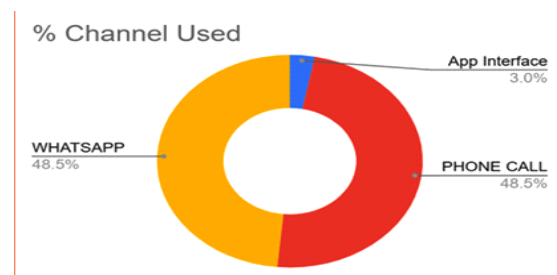


Figure 6.3



Figure 6.4

Interpretation :-

An analysis of communication preferences reveals a clear trend across different business types. Both cafes and hotels show an almost identical pattern, heavily favoring direct contact through phone calls and WhatsApp, with apps seeing virtually no use.

This reliance on phone and WhatsApp was even more pronounced in restaurants, which showed the highest volume of communication, yet still completely avoided using apps. Combined hotel-cafe establishments showed minimal overall engagement.

In total, the data from 162 interactions shows a perfect split: 80 phone calls and 80 WhatsApp messages, dwarfing the mere 2 instances of app-based communication. This highlights a strong industry-wide preference for traditional, direct-contact methods over digital platforms.

SPSS Output:-

1 Butter Across the Segment

Segment Count for Butter				
			Butter Presence Across Segments	Total
Segment	Hotel	Count	93	93
		% Reach	18.5%	18.5%
	Restaurant	Count	325	325
		% Reach	64.7%	64.7%
	Cafe	Count	77	77
		% Reach	15.3%	15.3%
	QSR	Count	6	6
		% Reach	1.2%	1.2%
	Caterer	Count	1	1
		% Reach	0.2%	0.2%
Total		Count	502	502
		% Total	100.0%	100.0%

Interpretation:- Restaurants account for the highest share (64.7%) of total usage, followed by hotels (18.5%) and cafés (15.3%), while QSRs and caterers contribute marginally.

2 Cheese Across the Segment

Segment Count for Cheese				
			Cheese Presence Across Segments	Total
Segment	Hotel	Count	78	78
		% Within Cheese_Num	18.4%	18.4%
	Restaurant	Count	277	277
		% Within Cheese_Num	65.3%	65.3%
	Cafe	Count	62	62
		% Within Cheese_Num	14.6%	14.6%
	QSR	Count	6	6
		% Within Cheese_Num	1.4%	1.4%
	Caterer	Count	1	1
		% Within Cheese_Num	0.2%	0.2%
Total	Count		424	424
	% Within Cheese_Num		100.0%	100.0%

Interpretation:- Restaurants contribute the largest share (65.3%), followed by hotels (18.4%) and cafés (14.6%), while QSRs (1.4%) and caterers (0.2%) form only a marginal proportion of total usage.

3. Freshcream Across the Segment

Segment Count for Fresh Cream				
			Fresh Cream Presence Across Segments	Total
Segment	Hotel	Count	47	47
		% Within Fresh Cream_Num	18.7%	18.7%
	Restaurant	Count	171	171
		% Within Fresh Cream_Num	67.9%	67.9%
	Cafe	Count	32	32
		% Within Fresh Cream_Num	12.7%	12.7%
	Qsr	Count	1	1
		% Within Fresh Cream_Num	0.4%	0.4%
	Caterer	Count	1	1
		% Within Fresh Cream_Num	0.4%	0.4%
Total		Count	252	252
		% Within Fresh Cream_Num	100.0%	100.0%

Interpretation:- Restaurants dominate with 67.9% of total usage, followed by hotels (18.7%) and cafés (12.7%), while QSRs and caterers together account for less than 1% of overall usage.

4. Lassi Across the Segment

Segment Count for Lassi				
			Lassi Presence Across Segments	Total
Segment	Hotel	Count	3	3
		% Within Lassi_Num	25.0%	25.0%
	Restaurant	Count	5	5
		% Within Lassi_Num	41.7%	41.7%
		Count	4	4
		% Within Lassi_Num	33.3%	33.3%
Total		Count	12	12
		% Within Lassi_Num	100.0%	100.0%

Interpretation:- Restaurants account for the highest share (41.7%) of total usage, followed by cafés (33.3%) and hotels (25%), highlighting restaurants as the leading segment for lassi consumption

5. Fries Across the Segment

Segment Count for Fries				
			Fries Presence Across Segments	Total
Segments	Hotel	Count	6	6
		% Within Fries_Num	35.3%	35.3%
	Restaurant	Count	9	9
		% Within Fries_Num	52.9%	52.9%
	Cafe	Count	2	2
		% Within Fries_Num	11.8%	11.8%
	Total	Count	17	17
		% Within Fries_Num	100.0%	100.0%

Interpretation:- Restaurants contribute the largest share (52.9%), followed by hotels (35.3%) and cafés (11.8%), suggesting fries are most popular in restaurants but also significantly used in hotels.

6. Ghee Across The Segment

Interpretation :- Restaurants Account for The Highest Proportion (51.4%) Of Ghee Usage, Followed By Hotels (32.4%) And Cafés (16.2%), Indicating Widespread Use Across All Segments.

Segment Count for Ghee				
			Ghee Presence Across Segments	Total
Segment	Hotel	Count	12	12
		% Within Ghee_Num	32.4%	32.4%
	Restaurant	Count	19	19
		% Within Ghee_Num	51.4%	51.4%
	Cafe	Count	6	6
		% Within Ghee_Num	16.2%	16.2%
Total		Count	37	37
		% WITHIN GHEE_NUM	100.0%	100.0%

7. Curd Across the Segment

Interpretation:- Restaurants make up the largest share of curd users (57.7%), followed by hotels (33.8%) and cafés (8.5%), indicating curd is widely used across all segments.

Segment Count For Curd				
			Curd Presence Across Segments	Total
Segment	Hotel	Count	24	24
		% Within Curd_Num	33.8%	33.8%
	Restaurant	Count	41	41
		% Within Curd_Num	57.7%	57.7%
	Curd	Count	6	6
		% Within Curd_Num	8.5%	8.5%
Total		Count	71	71
		% Within Curd_Num	100.0%	100.0%

8. Milk Across the Segment

Interpretation:- Restaurants account for the majority of milk usage (52.5%), while hotels and cafés each contribute 23.2%, and QSRs only 1%, indicating milk is universally used but most common in restaurants.

Segment Count For Milk				
			Milk Presence Across Segments	Total
Segment	Hotel	Count	23	23
		% Within Milk_Num	23.2%	23.2%
	Restaurant	Count	52	52
		% Within Milk_Num	52.5%	52.5%
	Cafe	Count	23	23
		% Within Milk_Num	23.2%	23.2%
Qsr		Count	1	1
		% Within Milk_Num	1.0%	1.0%
Total		Count	99	99
		% Within Milk_Num	100.0%	100.0%

9. Paneer Across the Segment

Interpretation:- Restaurants make up the largest share (44.4%) of paneer users, followed by hotels (33.3%) and cafés (22.2%), indicating paneer is most commonly used in restaurants.

Segment Count For Paneer				
			Paneer Presence Across Segments	Total
Segment	Hotel	Count	3	3
		% Within Paneer_Num	33.3%	33.3%
	Restaurant	Count	4	4
		% Within Paneer_Num	44.4%	44.4%
	Cafe	Count	2	2
		% Within Paneer_Num	22.2%	22.2%
Total		Count	9	9
		% Within Paneer_Num	100.0%	100.0%

10. Mozzarella Across the Segment

Segment Count for Mozzarella				
			Mozarella Presence Across Segments	Total
Segment	Hotel	Count	5	5
		% Within Mozzarella_Num	17.2%	17.2%
	Restaurant	Count	12	12
		% Within Mozzarella_Num	41.4%	41.4%
	Cafe	Count	11	11
		% Within Mozzarella_Num	37.9%	37.9%
	Qsr	Count	1	1
		% Within Mozzarella_Num	3.4%	3.4%
Total		Count	29	29
		% Within Mozzarella_Num	100.0%	100.0%

Interpretation:- Restaurants account for the highest proportion (41.4%), followed by cafés (37.9%), hotels (17.2%), and QSRs (3.4%), indicating mozzarella is most commonly used in restaurants and cafés.

11. Chasss Across the Segment

Segment Count for Chaas				
			Chaas Presence Across Segments	Total
Segment	Hotel	Count	1	1
		% Within Chaas_Num	7.7%	7.7%
	Restaurant	Count	11	11
		% Within Chaas_Num	84.6%	84.6%
	Cafe	Count	1	1
		% Within Chaas_Num	7.7%	7.7%
Total		Count	13	13
		% Within Chaas_Num	100.0%	100.0%

Interpretation:- Restaurants dominate chaas usage with 84.6%, while hotels and cafés each contribute only 7.7%, indicating chaas is primarily used in restaurants.

12. Ice Cream Across the Segment

Segment Count for Icecream				
			Ice-cream Presence Across Segments	Total
Segment	Hotel	Count	4	4
		% Within Icecream_Num	16.7%	16.7%
	Restaurant	Count	16	16
		% Within Icecream_Num	66.7%	66.7%
	Cafe	Count	3	3
		% Within Icecream_Num	12.5%	12.5%
	Qsr	Count	1	1
		% Within Icecream_Num	4.2%	4.2%
Total		Count	24	24
		% Within Icecream_Num	100.0%	100.0%

Interpretation:- Restaurants are the major consumers (66.7%), followed by hotels (16.7%), cafés (12.5%), and QSRs (4.2%), indicating ice cream is most commonly used in restaurants.

Glossary

ABBREVIATION	Full Form
WPOP	Wants to know price of products
VL	Visit later
COP	Complaint of product
WS	Wanted samples
VS	Visit central kitchen
WDN	Wanted distributor number
SM	Self manufacturing
EP	Expensive product
GW	Gowardhan
P	Panner
F	Fresh cream
M2	Mozzarella
D	Dahi (curd)
D2	Delicious
C2	Chaas
B	Butter
C	Cheese
F2	Fries
MD	Mother dairy
CR	Chienese restrurent
MH	Mahananda
COS	Complaint of supply (include distributor , amul app etc)

CK	Centralise kitchen
SW	Swastik company
ND	Nandini
LDP	Local dairy products
WN	Warana
NT	Nutrilite
GK	Gokul products
BT	Britania
KW	Kawality walls
GV	Govind products
DW	Dinshaw ice cream
HM	Hamour ice cream
CH	Chitale company
MC	Maccan fries
GP	Good product
GCMF	Gujarat Cooperative Milk Marketing Federation Ltd.

Current State of HoReCa sector with Value Added Dairy Products

After performing the survey and analyzing the data, Amul seemed to have a good foothold within Mumbai. However, the broader B2B distribution landscape is shifting: traditional vendor- and middleman-led channels are increasingly being challenged by organized, investor-backed startups and existing players extending their brand equity into e-commerce driven distribution infrastructure. Here are 2 case studies that examine the issues Amul might face amid the shift and what opportunities it can leverage in response.

Case Study 1: GCMF (Amul) and the formalization of B2B dairy distribution

Within India's dairy sector, the shift from a predominantly consumer-facing to an increasingly institutional business model delves the market into an interplay between channel management, distribution, and branding. The Dairy industry estimates place the overall B2C-to-B2B split in the organized dairy sector at approximately 70:30, with categories such as cheese deriving nearly half their consumption from out-of-home institutional sales through the HoReCa segment, and other value-added products like butter, paneer, and skimmed milk powder similarly institutional in

nature (ICRA, 2020). While the majority of other cooperatives continue to focus on milk and conventional goods like curd, ghee, and buttermilk, Amul stands out in this environment as the only cooperative player which has a presence throughout the whole range of value-added dairy products (ICRA, 2020). While the majority of other cooperatives continue to focus on milk and conventional goods like curd, ghee, and buttermilk, Amul stands out in this environment as the only cooperative having a presence throughout the whole range of value-added products (ICRA, 2020). As a result, Amul's B2B development is positioned not only as a distribution strategy but also as a channel-management choice that directly affects institutional purchasers, who increasingly want supply that is consistent, traceable, and standardized. In the broader picture of India's dairy industry, these demands further the formalization and quality standards of the value-added product basket as requirements for greater branding and market positioning both locally and as a possible cultural export, mirror this desire (EY, 2026). It simultaneously strengthens institutional-buyer confidence in product consistency and reinforces brand equity built on trust and quality assurance, extending Amul's traditionally B2C-oriented brand narrative towards their B2B buyers.

Case Study 2: Hyperpure and the platform-led model of B2B food distribution

A useful comparative case for understanding B2B channel strategy in Indian food markets comes from outside the dairy sector itself. Eternal's Hyperpure vertical, (formerly Zomato) was launched as a B2B ingredient-supply wing alongside its food delivery app Zomato's infrastructure and the ecommerce delivery service Blinkit. This app was developed specifically to supply quality ingredients directly to restaurant partners (Challa et al., 2023). This reflects a

broader pattern in Indian B2B food markets, where buying behaviour is shaped not only by price and product specification but by relational and trust-based dynamics that differ from Western B2B models due to India's distinctive institutional and cultural business environment (Chatterjee & Chaudhuri, 2024). Chatterjee and Chaudhuri (2024) argue that the B2B customer journey in India depends as much on psychological and relational touchpoints as on structured procurement processes — a dynamic that is directly relevant to how HoReCa buyers evaluate and remain loyal to suppliers like Hyperpure or Amul's institutional line. This relational emphasis is consistent with wider systematic reviews of B2B customer behaviour, which identify communication quality and relational switching costs as central determinants of channel longevity and buyer retention (Bilro, Loureiro, & Souto, 2023). Taken together, the Hyperpure case demonstrates that platform-based B2B distribution and traditional dairy-cooperative B2B distribution are converging on similar imperatives: reliable channel management, consistent product quality, and trust-based relationship marketing are becoming prerequisites for institutional buyer retention in India's evolving food distribution landscape, regardless of whether the entrant is a dairy cooperative or a technology platform.

Gaps identified

The analysis of Amul's performance in the HoReCa segment reveals several critical gaps that hinder its market expansion and competitive edge. One significant issue is the absence of a structured customer loyalty program. At present, HoReCa buyers do not benefit from exclusive offers or targeted rewards, which limits long-term retention and weakens brand stickiness within this segment.

Another prominent challenge lies in the high price sensitivity of buyers. Many outlets perceive Amul's products as relatively expensive compared to competing brands. The lack of HoReCa-specific pricing models or bulk discount schemes further discourages adoption. This perception gap could be addressed by transparently communicating the balance between Amul's quality and pricing, supported by direct comparisons with competitors.

Supply chain inefficiencies also emerge as a recurring barrier. Frequent complaints regarding delayed deliveries, insufficient distributor information, and accessibility issues highlight structural weaknesses in Amul's distribution network. These inefficiencies create friction in the ordering process and reduce trust among HoReCa buyers.

The limited availability of trial and sampling opportunities further compounds the problem. Outlets, especially in underpenetrated segments such as cafés and small restaurants, express a need for product samples, both for existing and newly launched items included in the HoReCa brochure. The absence of consistent sampling restricts product awareness and impedes customer onboarding.

Another gap is observed in the delayed conversion of interested prospects. Although many outlets express interest in Amul's offerings, they often fail to transition into active buyers within a reasonable timeframe. This lag can be attributed to insufficient follow-ups, lack of onboarding support, and the absence of incentive structures to encourage faster adoption.

In terms of digital engagement, Amul faces a notable challenge in driving the adoption of its dedicated ordering application. While phone and

WhatsApp remain the dominant ordering channels, the brand's app continues to be underutilized due to limited awareness, inadequate user experience, and the absence of strong digital incentives.

Competitive pressure also poses a significant concern. Brands such as Kwality and Havmor have established stronger visibility and presence in key outlets, suggesting weaknesses in Amul's competitive tracking and localized marketing efforts. This not only diminishes Amul's market share but also restricts its ability to reclaim territory in strategically important locations.

Finally, weak penetration in central kitchens represents a substantial missed opportunity. Large institutional buyers, including central kitchens and in-house manufacturers, are less inclined to switch to Amul's products due to the absence of co-branding opportunities, partnership models, or customized supply solutions. Without tailored engagement strategies, Amul risks losing out on a high-volume customer base that could significantly strengthen its HoReCa footprint.

Suggestion And Recommendation

Leverage Positive Brand Perception:

With a high volume of "Good Product" (GP) mentions, Amul can further strengthen loyalty by introducing loyalty programs, exclusive HoReCa offers, and showcasing customer testimonials from the segment.

Address Price Sensitivity:

The notable number of "Expensive Product" (EP) mentions indicates a need for tiered pricing or HoReCa-specific bulk discounts to compete with alternative brands without compromising quality.

Improve Supply Chain & Support:

Complaints about supply (COS) and requests for distributor numbers (WDN) highlight gaps in accessibility. A dedicated HoReCa supply support helpline or a proactive distributor outreach plan can bridge this gap.

Increase Sampling & Trial Opportunities:

Low “Wanted Sample” (WS) requests suggest limited trial opportunities. A targeted sampling drive in underpenetrated segments like cafés and small restaurants can increase conversions.

Convert “Visit Later” (VL) Prospects:

Outlets showing interest but not committing immediately can be revisited within 30–45 days, paired with a small incentive (discount or free trial) to speed up onboarding.

Expand Digital Ordering Adoption:

While phone and WhatsApp dominate as order channels, Amul’s app interface usage is minimal. A simplified app design, onboarding tutorials, and exclusive app discounts can encourage digital adoption.

Monitor Competitive Presence:

Strong competitors like Kwality Walls, London Dairy, and Havmor have visible presence in certain outlets. Competitive tracking and targeted marketing in those areas can help reclaim share.

Engage Central Kitchens & Self-Manufacturers:

Outlets linked to central kitchens or producing in-house (SM, CK) are less likely to switch. Offering co-branding opportunities or supply partnerships can bring them into Amul’s network.

Conclusion

Amul has a significant growth opportunity within the HoReCa market. The brand is already well-known and well-liked, but to fully capitalize on this, it needs to address persistent issues like an unreliable supply chain, aggressive competitors, and customers who are sensitive to price.

This project highlights a crucial lesson for the foodservice industry: a great product alone isn't enough. Success hinges on operational excellence ensuring consistent delivery, nurturing distributor relationships, and maintaining regular contact with outlets.

By tightening up the supply chain, introducing new products through samples and trials, and proactively monitoring the competition, Amul can solidify its market position and unlock substantial new revenue streams.

Future Scope of the Research

This study only looked at Central and Western Mumbai, so there's plenty of room to build on it:

Cover more ground. Eastern Mumbai, Thane-Navi Mumbai, and other cities like Pune or Surat weren't part of this study. Since Mumbai already drives a big chunk of India's food-service market, it'd be worth checking whether the patterns we found here (like restaurants being the main buyers of butter and cheese, and QSRs barely using Amul) hold true elsewhere too.

Dig deeper into QSRs, cloud kitchens, and caterers. These segments were too small in our sample to say much about. With QSR chains and cloud kitchens growing fast and increasingly investing in cold storage, they might be worth a dedicated study and a different sales approach instead of lumping them in with restaurants.

Get a bigger, more reliable sample. A lot of outlets wouldn't share supplier details, and we couldn't verify what people told us. Future studies should use proper random sampling and cross-check against actual distributor sales data to get more trustworthy numbers.

Track demand over time. We only visited outlets once, so we couldn't tell if a stock-out was a one-off or a recurring problem. Following the same outlets across festive seasons, monsoon, and tourist season would show whether supply issues are seasonal or a deeper systemic problem.

Look into supply chain tech. Delivery delays and unclear distributor access were common complaints. It's worth studying whether things like GPS-tracked delivery trucks or local micro-fulfillment hubs could fix Amul's last-mile delivery problems, especially compared to how competitors handle it.

Figure out why nobody uses the ordering app. Orders were split almost evenly between phone calls and WhatsApp the actual Amul app was used just twice. A proper UX study could uncover why, and testing things like WhatsApp order-bots could show if digitizing orders actually boosts sales.

Understand what people are willing to pay. Forty outlets called Amul's pricing too high, but we never measured exactly where that pain point is. Price-sensitivity research could help Amul design smarter bulk pricing or discounts for different types of outlets.

Test a loyalty program. There's currently no rewards system for HoReCa buyers. Running a pilot loyalty program in one area while comparing it to a similar area without one would show whether it actually improves retention and order

volume.

Build better partnerships with central kitchens. These came up a lot in the data but remain underserved because Amul has no tailored supply deals for them. Studying how competitors structure these partnerships could help build a model Amul could copy.

Explore premium and plant-based options. Upscale outlets are already carrying premium imported ice cream brands, and plant-based dairy is growing fast nationally. It's worth asking whether health-focused, premium outlets would want an Amul version of either.

Limitation of project

Our research faced several practical challenges that impacted its scope. Logistically, covering the vast Central and Western regions proved difficult. The long travel times between outlets, which were often spread far apart, were a significant constraint under our project timeline.

We also encountered challenges in gathering data. Some business owners were reluctant to share specific operational details, such as their product usage or current suppliers. Many were particularly hesitant to provide information about their distributors. In a few cases, respondents were uncooperative, which limited the depth of data we could collect from those interactions.

Furthermore, the data itself had inherent gaps. Not every outlet carried the full range of products we were studying, which makes it harder to get a complete market picture. Finally, without a way to independently verify the information, we had to rely on the accuracy of the responses provided by the hotels, restaurants, and cafes.

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IMPORTANCE OF WWE IN AN ORGANIZATION: WORK-LIFE BALANCE, WELL-BEING, EMPLOYEE ENGAGEMENT

Vedant Kansara*

Abstract

The importance of achieving the sustained growth in the evolving corporate era has been a cornerstone of the organizations. This brings into focus the psychological and professional well-being of the employees. This study aims to understand the interlinkage of three important aspects of an effective workplace, Work-Life Balance, Employee Well-being, and Employee Engagement (WWE), using the theory of Conservation of Resources (COR) by Hobfoll (1989). (El-Qebaisi, 2025) (HobFoll, 2017) According to the theory, the priority of employees is to safeguard vital resources like time, energy, emotional well-being, motivation and performance.

The paper aims to study the impact of different HR practices such as flexible work policies, wellness programs and motivational schemes in preserving the employee resources and increasing workplace engagement. (El-Qebaisi, 2025) The study has used a secondary qualitative research methodology involving articles, websites and organizational studies.

Based on the findings, companies which adopt WWE as part of their strategy experience less burnout, better retention of employees, enhanced workplace relationships, and higher organizational performance. The study concludes that WWE is a unified mental and organizational framework that performs a crucial role in holding the bar high for employee engagement and motivation.

Keywords: Work-Life Balance, Employee Well-being, Employee Engagement, COR Theory, Organizational Psychology, Workplace Culture.

Introduction

In the current corporate culture, employees are supposed to complete their professional responsibilities along with their personal life. This expectation has made work-life balance an important factor affecting employee satisfaction, mental stability, and organizational performance. (Udik Jatmiko, 2025) Work-life balance is the ability of employees to manage their professional and personal lives without any stress or distress.

According to the Conservation of Resources (COR) Theory given by Hobfoll (1989), when employees feel burdened by workload, long working hours and decreasing boundaries their valuable resources like time, energy, emotional and mental stability are utilized. Organizations that foster flexible working hours, generous leave policies and workload management practices help employees save these resources, improving their overall efficiency.

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Employee well-being involves many concepts including physical, mental, emotional, and social health. In organizations which are highly demanding, it is common for employees to have stress, anxiety and emotional exhaustion affecting both their professional and personal lives. COR Theory explains that employees experiencing frequent exhaustion without proper recovery are more prone to burnout and psychological strain. With workplace culture, mental health initiatives, stress management practices one can promote employee well-being resulting in restoration of their psychological and emotional resources. Organizations recognize that employees who are emotionally and psychologically stable demonstrate great workplace stability. Therefore, employee well-being has become an important organizational requirement for maintaining long-term workforce sustainability and performance.

The emotional and professional connection developed by employees with their work, colleagues and organization is called employee engagement. An employee who is engaged performs well towards their organizational responsibilities with accountability and commitment. Factors such as recognition, leadership support, communication, career development opportunities, and positive organizational culture highly influence engagement levels. According to COR theory, employee engagement is a condition where employees have sufficient psychological and

emotional resources to actively work in their professional roles. Positive organizational practices help employees with motivation, confidence, recognition, and social support, increasing their commitment towards the organization. Higher employee engagement encourages collaboration, innovation, and improved workplace relationships, contributing towards better organizational performance and lower employee turnover.

(El-Qebaisi, 2025) Work-Life Balance, Employee Well-being, and Employee Engagement are closely related organizational and psychological parameters that collectively affect employee experience and workplace effectiveness. COR Theory is a strong theoretical foundation for understanding this relationship by explaining how employees continuously try to preserve and strengthen valuable personal and professional resources. (Garima Bansal, 2025) A healthy work-life balance improves employee well-being which increases employee engagement by increasing motivation, emotional stability, and workplace participation. From both psychological and HR perspectives, WWE acts as an interrelated framework rather than three independent concepts. Organizations that successfully incorporate WWE into their HR strategies prepare a highly motivated & vividly sustained workforce that increases both employees and organizational performance.

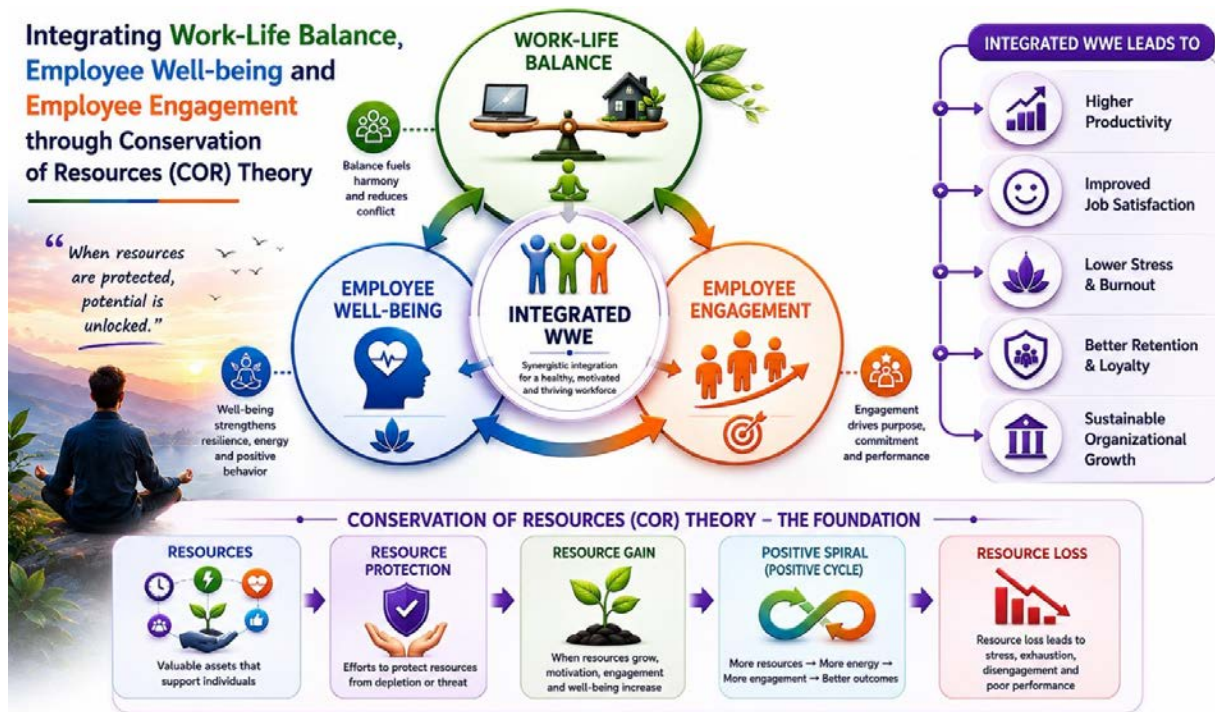


Figure 1: Integration of COR Theory with WWE and its results

Objective & Research Methodology

Primary Objective

- o To study the analysis & its effect of practices like work-life balance on employee productivity, stress management & efficiency from a psychological perspective.
- o To understand the emphasis of initiatives like employee well-being which provides mental health, job satisfaction, and organizational performance.
- o To identify the significance of employee engagement in enhancing commitment, motivation and workplace productivity.

Secondary Objective

- o To analyze the role of flexible working arrangements and the intervention of HR in

maintaining a healthy work-life balance.

- o To understand the importance of psychological and emotional well-being in creating a healthy organizational culture.
- o To study how employee engagement is influenced by the HR practices and workplace bonds.

Research Methodology

Research Design: Secondary qualitative research

Data Sources: Journals, Research papers, Scholarly articles, Organizational studies

Foundation: Conservation of Resources (COR) Theory

Research Approach: Conceptual and analytical approach

Limitation of Methodology:

- Limited to secondary data
- No surveys, interviews, or questionnaires conducted

Literature Review

(Mattareli, 2024) The authors analyzed the twin effect of the work-life balance (WLB) and work environment on employee's creativity. Based on surveys conducted among 207 employees of a company operating across the borders, the authors considered two primary aspects: (1) the role of social organizational environmental elements intended to stimulate creativity & flexible work arrangements, and (2) the influence of employees' centrality within instrumental social networks on both creativity output and WLB perceptions. As shown by the results, the effect was quite peculiar. On the one hand, flexibility in working hours positively affected work-life balance but did not contribute to the creation of new ideas in any significant way – contrary to common beliefs about positive effects of flexible work on creativity. On the other hand, work in social-organizational environment which stimulates creativity (openness, collaboration, inter-functional cooperation and exchange of ideas) helped generate more creative ideas; however, employees working under such conditions reported worse WLB. In addition, it appeared that high centrality of employees in instrumental networks resulted in deterioration of work-life.

(Azhar, 2021) Researchers discovered a connection between improving HR practices & customer satisfaction. The development of WWE practices can be successfully accomplished with the help of developing the emotional intelligence to understand the reason behind it. This survey was

conducted in banking industry and was opened to a hundred and twenty-six banks, operational at spreaded geographical locations with 467 employees and further about 1000 customers. Researchers prepared a structured modelling questionnaire. A sustainable relation development among all variables like EI, PM, CS & HR. The output was that MHRM does affect CS through EI in all the direct-indirect ways.

(Chan, 2020) Wong, Chan, and Teh (2020) carried out an extensive meta-analysis on the link among the structure of WLB arrangements and organizational outputs in various sectors and populations. Organizational performance was measured with six parameters: Recruitment & Retention (that proved the amount of people joining and staying loyal to the company), Career motivation & organizational commitment (which proved that the organization provided enough opportunities to advance), attendance and productivity (proving arriving every day at the office was not a big task), indicating that link between WLB arrangements and organizational performance is statistically significant (OR: 1.181, 95% CI: 1.125–1.240, $p < 0.001$). More specifically, it was identified that career motivation, attendance, recruitment, and retention are highly linked to WLB arrangements, while organizational commitment and productivity are less associated. The moderating variables included gender, sector, and hierarchy within an organization. In other words, not all organizational settings benefit from WLB arrangement equally. This meta-analysis considered six categories of WLB arrangements, namely workplace health program, incentives, family-oriented policy, work schedules, training programs, and organizational policy.

(Rexroth, 2014) Miriam Rexroth, Christine Bosh, A. Micheal back in 2014 evaluated a boundary

theory that helps employees remove the unwanted psychological preoccupation. This theory explains how employees can segment both their life domains. In order to provide better understanding of this an online self-training intervention for 3 weeks & with 246 employees participating in pre & post tests followed by 191 employees with 2 weeks' follow-up was conducted. As expected, the controlled group was found less strained and psychologically more detached with the work environment.

(Caperchione, 2015) (Caperchione, <https://real.spcrd.org/index.php/real>, 2015) R Colin Reid and Joshua Stehmeier altogether established a workplace wellness programs literature. They believe this increase the odds of succeeding both management and non-management employees. Nine focused groups were formed with participant employed of 4 diverse organization with more than 100 employees each. Each organization was provided with two separate groups: management & non-management. Thematic inductive analysis was conducted looking forward for the pattern in behavioral signs between both the set of groups. The research provided outcome in the form of 3 pioneers; role of the company, elements of successful execution and mandatory participation in the wellness programs arranged by the HR. From which 3 areas were identified; role of the company, elements of successful execution and mandatory participation in the employee wellness programs. Eventually when the stats were put out both the group of people agreed on the fact that organizations play a vital role in the employee's physical & mental health. Both correspondence & inconsistency of the beliefs between the groups were highlighted and key considerations were presented.

(Boccoli, 2023) Boccoli, Gastaldi & Corso (2023)

in their comprehensive analysis of how employee engagement (EE) has evolved over multiple decades in both theoretical and empirical terms, Boccoli, Gastaldi, and Corso (2023) highlighted three core conclusions: firstly, EE has a social and relational nature in that it largely depends on interpersonal relationships and organizational context rather than being solely an individual phenomenon; secondly, EE is a dynamic concept rather than a static one, implying that it changes in accordance with contextual factors and thus cannot be considered a stable employee attribute; and thirdly, EE influences both employee performance and mental well-being concurrently and therefore contradicts the popular belief in the pure productivity nature of engagement. In addition, the COVID-19 pandemic and the advent of hybrid work arrangements have led to significant changes in the context within which engagement is developed and assessed, hence requiring the reconsideration of prevailing engagement models. The research performs as a proof of high levels of EE provide higher satisfaction, better adaptability and greater creativity, with reduced absenteeism and turnover rates.

(Greta Mazzetti, 2021) This research represents particularly importance in the field because of its unique attempt to fill a crucial gap in the engagement literature by carrying out a comprehensive systematic meta-analysis that uses the Job Demand -Job Resource model as the lens for classifying engagement activities, outcomes, and correlates of well-being. Involving 113 independent samples ($n=119,420$) and 533 correlations, the study discovered that personal resources ($r = .48$) and development resources ($r = .45$) predicted engagement best among all types of antecedents examined in the study, ahead of social resources ($r = .36$) and job resources ($r = .37$). With respect to engagement outcomes, job satisfaction

$\beta = .60$) and organizational commitment ($r = .63$) turned out to be the ones characterized by higher effect sizes and supported the idea that engagement drives attitudinal outcomes. Finally, the results of the moderation analysis indicated the importance of taking into account such factors as culture and occupational role. Collectivism increased the effect of feedback on engagement, while occupational role moderated the impact of engagement on turnover intentions.

(Jeffrey H. Greenhaus, 2018)'s study presents how the employee performance gets tweaked by organizational culture, particularly through its influence on employee stress and workplace behaviour. Yes, A positive and employee-centric organizational culture can enhance employee well-being, reduce occupational stress, and indirectly improve employee productivity and performance. However, the study also indicates that employees have diverse competencies, attitudes, and work orientations; therefore, a single organizational culture may not affect every entity in the same pattern. The effectiveness of culture depends on person–organization fit and employee adaptability.

(Nunes, 2024) Nunes and Rodrigues through their research established a link between the job embeddedness, work-life balance & organizational well-being via a quantitative cross-sectional design with 243 employees from public and private sectors included in the sample. The study showed that work-life balance and job embeddedness each independently had a positive influence on workplace well-being. Additionally, job embeddedness works as a partial mediator of the link between work-life balance and organizational well-being. Thus, this article suggests that job embeddedness should not be ignored as part of a comprehensive model explaining the relationship between WLB and

well-being, since job embeddedness acts as a mediator and reduces the individualism inherent to models that do not consider the nature of employees' jobs and their embeddedness in organizations. The study's results demonstrated a paradoxical pattern. Flexibility at work has been shown to improve work-life balance among employees, not significantly increasing the generation of creative ideas. These findings question the assumption that flexible environments increase innovation in employees. On the contrary, an environment created to foster creativity (e.g. open space, cross-functional communication, knowledge sharing culture) improves innovation but adversely affects WLB in employees. It has been revealed that environments structured for innovation create obstacles for maintaining well-being among employees. Therefore, the importance of rethinking organizational design is important for achieving sustainability among organizations to promote fostering innovation and ensuring WLB.

(Marecki, July 2024) Lukasz Marecki July 2024 focuses on the importance of WLB in improving well-being as well as employee productivity. The research highlights about balancing work, family, with taking care of personal life is a mandatory requirement for maintaining a resourceful and productive workforce. The interpretations from the findings are that an individual being able to focus better on both their personal and professional life's experience better mental well-being, higher motivation, and improved work performance. In contrast, employees who fail to maintain work–life balance often experience stress, dissatisfaction, and lower productivity. Overall, the study emphasizes that effective WLB strategies positively contribute to an individual's health, engagement, and organizational productivity.

(Momani, 2025) Hazim Ryad Momani, Nedal Fawzi Assad, Ahmad Mohammad Alzghoul, Mohamed S. A. Bayoumy altogether worked on how an employee's performance gets an effect from the HR initiatives which are prepared in order to encourage the WLB in the organizations. Researchers preferred a mixed method approach of Primary as well as Secondary data collection to keep the data flat authentic, where while collecting the primary data they interviewed 230 employees who had background from retail, manufacturing, and telecommunications, while collecting the data from secondary source a thematic analysis of 12 scholarly articles. Even the software's like SPSS for correlation, ANOVA & regressions were used to perform Quantitative analysis. Because of the thorough research the findings show a positive relationship between flexible work arrangements and improved employee performance. The HR policies, wellness programs and employee assistance programs played a vital role in achieving this outcome, it helped them reduce stress and improving both their mental and physical health with an added benefit of increasing motivation. The paper also states that following to such practices also helps in reducing the employee attrition because of the healthier work environment and motivated workforce. Eventually all these factors lead to a single goal which is organizational success/achieving organizational goals.

(Rimisha, 2025) This research paper provided a deeper understanding and significance of WLB being a crucial factor in achieving the ultimate goal. It further indicated WLB as a modern concern for employees as it helps them relate it to their overall satisfaction. This study understands the cohesion between WLB and stress & productivity management through primary research method. This study implies that

ignorance of the personal life in favor of work becomes a crucial role and the strongest stress booster which affects an entities health. They support organizations who possesses benefits like flexible working hours as such policies lead to higher quartile of employee satisfaction This paper provides findings where the importance of the organizational policies are weighted more in favor for creating a better working environment. They also suggest preparation of HR policies that creates better WLB within the employees, provide better mental state to work and eventually hang them up with a better working environment.

(David, 2022) Employee Engagement as Human Motivation J David Pincus 2022 explains that employee engagement is one of the most important concepts in HRM. However, study argues there is still no single clear definition of employee engagement, as different researchers and organizations define it differently. David wanted to imply understanding employee engagement not just to be posed as employee experience but also a concept for human motivation. According to the study, employee engagement is strongly connected to employees' psychological needs, motives, and internal drive to perform effectively at work. The authors propose that organizations should adopt a structured motivational framework to better understand employee behavior, commitment, and performance. The study also highlights that clear engagement practices and motivational systems can help organizations improve employee satisfaction, productivity, and workplace effectiveness. Eventually we can define employee engagement not just as an organizational concept but also a tool to enhance employee experience that can help and boost a psychological & motivational process that affects the end goals.

Research GAP

Despite being a lot of theories & understanding of WWE framework, something that lacks yet is the integrated explanation that is concrete enough to build foundations of the organizations on it is missing. COR Theory's application does provide

significant impact in terms of explaining the depth of the WWE framework, but the substantial miss out arises when the integration between them is not found and eventually the employees mindset gets hampered followed by its productivity, loyalty, vision, standards and summing up organizational goals.

Framework

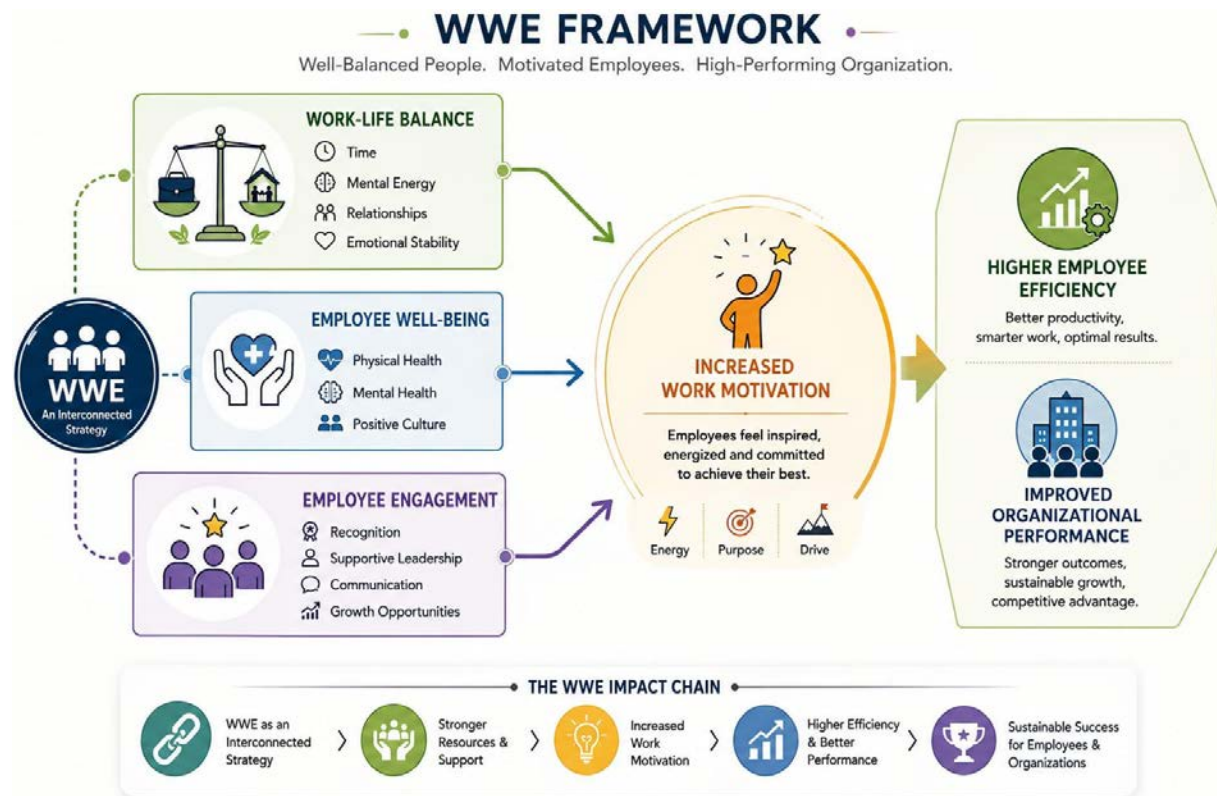


Figure 2: WWE Framework in accordance to the COR Theory factors

The framework designed for the study adopts the COR Theory to the concepts of (Hobfoll, International Journal of research publication and reviews, n.d.) Work-Life Balance, Employee Well-being, and Employee Engagement (WWE). According to the framework, it can be determined that the three factors together contribute in motivating the employees, resulting in increased performance. According to the framework, Work-Life Balance is a concept that allows employees to protect their personal resources, including time,

energy, family ties, and emotional well-being. Employees who can successfully balance their personal and professional lives are not exposed to stress and are more satisfied psychologically, motivating them at the workplace. Like Work-Life Balance, Employee Well-being is seen as a tool for resource recovery. Organizations that ensure employee well-being through various means, like wellness programs, improve the physical and psychological condition of their employees.

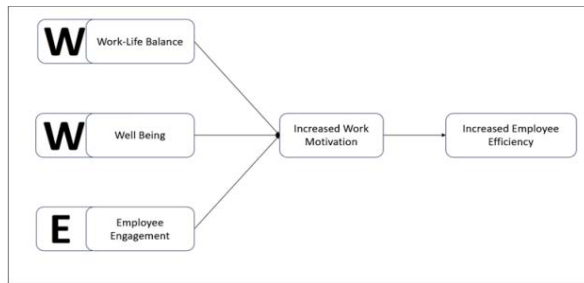


Figure 3: WWE Framework

On the other hand, Employee Engagement helps in increasing the emotional attachment of employees with their organization, colleagues, and duties. In addition to these components, recognition, communication and support from leaders increase their engagement level and make them use their efforts to complete organizational objectives. This framework presumes that the joint impact of (Hobfoll, International Journal of research publication and reviews, n.d.) Work-Life Balance, Employee Well-being, and Employee Engagement creates higher motivation among employees, which helps them improve their efficiency. Therefore, this framework makes WWE a joint organizational strategy rather than three separate workplace initiatives.

Analysis, Findings & Discussion

Analysis of the study of W.W.E. shows that they are closely interconnected factors that together influence employee motivation, psychological stability, and organizational performance. As applied in the Conservation of Resources (COR) Theory by Hobfoll (1989), employees try to save their valuable resources like time, energy, emotional stability, motivation, and social support. The literature review suggests that workplace stress, long working hours, and unhealthy organizational culture lead to resource depletion,

in turn contributing to burnout, reduced engagement, and lower workplace efficiency.

The findings show that organizations which implement flexible work arrangements, wellness initiatives, supportive leadership, recognition systems, and employee-centered HR practices help employees save their valuable resources. Studies related to workplace well-being and organizational psychology show that employees experiencing better work-life balance have greater emotional resilience, lower stress levels, improved job satisfaction, and better organizational commitment. Similarly, when organizations provide recognition, career development opportunities, supportive communication, and positive workplace relationships, their employee engagement increases.

From the perspective of Human Resource Management, the analysis shows that WWE is not limited to employee welfare initiatives now, it has also become a strategic organizational requirement for maintaining workforce stability and productivity. The literature indicates that organizations which include employee well-being and engagement into their HR practices see improved employee retention, stronger workplace collaboration, and healthier organizational culture.

Therefore, the study concludes that WWE functions as an integrated psychological and organizational framework rather than three separate workplace concepts. Organizations that effectively conserve employee resources through supportive HR practices have better chances in terms of achieving organizational growth, better employee efficiency, and long-term workplace effectiveness.

Suggestions & Future Scope

Suggestions

- To enhance WWE organizations can implement/ideologize the Microsoft Japan four-days' work a week model, this resulted well in enriching the employee productivity and reduced workplace stress.
- Google offers wellness programs, mental health sessions, counselling services for employees emotional & mental peace through financial planning and physical health support systems by flexible working space. Companies should develop such culture roots while preparing for foundation of the new joiners.
- Deloitte came up with employee assistance program & well-being strategies through their HR department, which eventually resulted into stronger employee retention, organizational commitment and employee loyalty.
- Promoting hybrid workforce strategies and flexible work opportunities provide better productivity & operational efficiency just like it did to companies like TCS and Infosys.
- Regular employee engagement activities, career development opportunities, and feedback systems should be integrated into HR practices to create a more employee-centric organizational culture.

Future Scope

- Future studies can look at how WWE practices work in different industries and companies. Research can also look at how hybrid and remote work affects employees and their relationships at work.

- Future researchers can use the Conservation of Resources Theory as a base to their research; with minor addition of the current state scenario, they can understand how today's employees wish to channelize their energy and manage the burnouts.
- Surveys and Interviews can be more authentic and trustable ways to integrate their studies and the purpose of their research which in this case is to help understand what Employees and Organizations think about WWE, how to remediate the current situation and how to manage and prevent the one's coming in future.

Limitations

- The study only looks at existing research papers and articles. Interaction with employees or organizations is not conducted directly for this research.
- What happens in workplaces. How HR works can vary a lot from one organization to another.
- With more people working from home or, in a mix of office and remote settings, future results might be different.
- This study mainly focuses the HR and psychological aspects for its results with leaving out the financial as well as operational aspects

Conclusion

The study concludes that (El-Qebaisi, 2025) Work-Life Balance, Employee Well-being, and Employee Engagement (WWE) are closely connected factors that play a vital role in enhancing employee motivation, workplace efficiency, and organizational performance.

(Vaughan)Through the application of the Conservation of Resources (COR) Theory, the research highlights that employees continuously attempt to manage and protect important resources such as time, energy, emotional stability, and social support within workplace environments.

Findings help us understand the importance of adopting flexible arrangements, leadership that stands by you, health & wellness initiatives, employee centric HR practices this supports companies in creating an environment that's ideal for every employee who wishes to provide back enough to the organizations. These practices help massively in terms of reducing the work stress, anxiety/fear of leadership, an open forum of discussion, lesser burnout ratio & least workplace dissatisfaction with gradual improvement in employee retention, better productivity and enhanced loyalty.

Here we further arrive at the conclusion that WVE should not be termed as HR activity but as an essential element to build better foundation of employee base for any organization. Companies following this sutra are more likely to achieve their organizational goals at better pace & easier while on the run.

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AI AS A DEVIL'S ADVOCATE: REDUCING CONFIRMATION BIAS IN RETAIL INVESTOR DECISION-MAKING

Tanvi Devadiga & Dhanush Devadiga*

Abstract

Confirmation bias is a systematic phenomenon that occurs in the financial decision making process of retail investors where they tend to pursue information that reinforces their current opinions yet avoid information that contrasts their current views. The bias has been well documented but interventions have had limited impact in the stage where beliefs become investment actions. This study proposes a human-AI decision-support system called AIDA (Agentic AI Devil's Advocate) to mitigate confirmation bias by providing structured counterarguments and opposing factors when executing trades.

AIDA was tested in a simulated investment setting with 306 subjects in a 1 blind, 3 group randomized controlled trial. It was compared to a neutral AI condition and an AI with no intervention control. The findings show that subjects who were exposed to AIDA had significantly fewer confirmation bias, less preference for confirmatory information, more cognitive doubt and less overconfidence. Investment decisions were decided as expected, but there were no statistical differences in these changes. Further analyses showed that the effects were explained by changes in information-seeking behavior and growth in reflective doubt. An ablation study showed that the combination of adversarial framing and AI assistance was more effective in debiasing than AI assistance alone. The intervention had a greater impact on those with lower financial literacy. In summary, these results indicate that AI has the potential to enhance financial decision-making by challenging users' beliefs, not just by adding more information.

Keywords: *Confirmation bias, adversarial AI, devil's advocate, debiasing, financial decision-making, random controlled trial, cognitive doubt, information-seeking.*

Introduction

Even with better data and analytic tools, retailers still fall victim to confirmation bias. Current debiasing methods often assume that the provision of more or clearer information will improve

decision making. However, the opposite is true as investors use data selectively in order to bolster pre-existing biases. Artificial Intelligence did not solve that, since people often go to it to confirm their beliefs, or simply trust it, letting the system mediate rather than mitigate bias.

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Addressing this issue requires interventions that affect thinking processes, not information dose. We require to introduce “cognitive friction” by creating conflict or contradiction. We present AIDA, a tool that acts like a devil’s advocate and provides counter-arguments that challenge reasoning at execution. Assessed in a three-group randomized control trial design, AIDA is compared to neutral AI and no intervention conditions to measure its impact on confirmation bias and overconfidence.

Literature Review

This section outlines the theoretical and empirical premises underlying the continuing investigation. The paper discusses weaknesses in existing debiasing methods (2.3), behavioral biases found in retail investment settings (2.1), the dual-process theory as the cognitive model underlying the biases and its susceptibility to change (2.2), and the use of AI-provided adversarial framing as the new intervention method (2.4). The section ends with a research gap in location of the current study

Retail Investment Behavioural Biases.

In classical financial theory, investors actually perform logically the maximizing expected utility and information on the process [1]. [2]. Behavioral finance did away with this normative approach by revealing that people were constantly subject to mental shortcuts, causing an inflexible, detrimental denial of making rational choices [3, 4, 5]. This document is like two subjects.

Confirmation bias, which is the inclination to actively hunt, evaluate and cling to data in a way that supports prior assessment and lessens that which opposes, is highly prevalent in the investment contexts. When investors already involved in a position preferentially receive positive commentary on it and ignore negative

warnings, it creates a vicious circle whereby there are sub-optimal holding periods and a refusal to abandon deteriorating holdings. Park and colleagues offered direct empirical evidence for the asymmetry in information seeking. They found confirmatory content has a much lower credibility threshold than disconfirmatory content. To debias effectively means to interfere with the processing architecture, not to simply expose investors to counter-evidence.

Overconfidence – The chronic overconfidence in their accuracy of predictions and expertise [10] is the best studied behavioural finance bias [11], [12]. Barber and Odean [11] examined the broking accounts of more than 35,000 traders and discovered that the most active traders underperformed the market averages by 6.5 percentage points annually. This was a clear indication that excess trading was caused due to overconfidence. Crucially, in real life confirmation bias and overconfidence reinforce each other: overconfident investors look for evidence to confirm their beliefs and at the same time disregard their concerns, leading to a more damaging pattern of bias which is more resistant to traditional remedies than either bias alone [8], [13].

Dual-Process Theory and Architecture of Bias.

Dual-process theory, formulated systematically by Stanovich and West [14] and popularised by Kahneman [15], provides the cognitive architecture on which the biases are based and their susceptibility to intervention. Main System 1 products are overconfidence and confirmation bias, which are processes of quick heuristic processing instead of critical evaluation in a time-constrained, emotionally charged, and cognitively loaded situation (which are prevalent in real-time investing decisions) [15].

Evans and Stanovich [16] make the point not only that it is not just personal cognitive ability that can change processing mode but also that it is the presence of situational cues that can do so and which are externally initiated under System 2 processing. This is also corroborated by research on organised counter-argument presentation [18] and consider-the-opposite strategies [17], which shows that cognitive activation inhibits the automatic confirmatory reaction before its behavioural consequence. The adversarial prompt is hypothesised to be a System 2 trigger in the very moment of the decision when System 1 processing would otherwise take over. Here is the design rationale of Adversarial Investment Decision Assistant (AIDA)

Drawbacks of current Debiasing Strategies.

Three broad types of interventions are considered [18], [19]. Two ways of cognitive restructuring are consider-the-opposite [17] and consider-an-alternative [20], which have mediocre effects in the lab but break down fast in time constraint and thinking capacity [18]. Motivational approaches (commitment devices, accountability) deal with the volitional element but this is achieved through long-term self-regulation not easily sustainable when making a live financial judgement [19]. Another meta-analysis study by Mertens et al. [22] showed moderate pooled effects ($g = 0.43$) including 212 interventions and 760 effect sizes. But interventions that just added a frame to an existing one had much smaller effects than those that restructured the decision process. Choice architecture [21] reorganises the environment of decisions without having to make an active effort at all. Long-term benefits for the participants exist even before they commit, even if emotional and motivational factors in decision-making make educational interventions less efficient [23]. Their common weakness is that none of the three classes

of decision tasks ever starts System 2 processing at the point of choice commitment in naturalistic settings. Our study is the bridge to this.

Adversarial Framing as a Debiasing Intervention Delivered by AI.

Recent studies show that the LLM-based systems are able to generate contextualised counterarguments that could lead to the deliberative processing in situations with financial decisions [24], [25]. Kim [26] found that when AI systems are presented to authorities as tools for analysis, rather than advice, users will be more critical of outputs and they will incorporate them into their thinking process rather than replace AI judgement with their own. This results in a more efficient calibration of confidence. There is evidence that adversarial argumentation structure is one of the most effective XAI design patterns to promote honest deliberation in high-stakes decision scenarios [25].

In a controlled experiment Echterhoff et al. [24] showed that the effectiveness of debiasing depended on the framing structure and not just the provision of AI: whereas unstructured AI delivery had no statistically significant effect on confirmation bias compared to no-AI provision, structured adversarial outputs led to a significant greater reduction of bias compared to balanced or neutral AI outputs. This was independently verified by Lyu et al. [27], who found that the structured adversarial rewriting stage was the most significant single and single task-independent contributor to the bias reduction. Both streams of evidence agree that the adversarial argument structure is the active debiasing factor, not necessarily AI delivery.

According to reactance theory, adversarial communication can backfire if it is perceived as a

threat to autonomy [28]. This risk is minimised in AIDA by explicit tool framing and a statement of source in control over tools through autonomy-preserving AI design [26]. Financial literacy is the ability to understand financial information and skills to make sensible financial decisions [23] and is seen as a moderator: Divakara Reddy et al. [29] stated that financial knowledge can help to regulate emotion-based decisions but cannot offset the instinctive heuristic biases. It suggests that the marginal benefit of AIDA may be greatest for less-literate investors who cannot afford to generate the best internal counterargument themselves.

Research Gap and Study positioning

This study addresses five main gaps in the existing literature. First, the existing literature does not consider real-time monitoring of behaviour during information-seeking in an adversarial retail investment setting. Second, it suggests the Bias Ratio, i.e., the ratio of confirmatory to total clicks, as an objective measure of behavioural confirmation bias, beyond the unreliable self-report of attitude changes. Third, this is the first pre-registered study to empirically investigate the effects of AI framing on debiasing through both behavioural (Bias Ratio) and metacognitive (Cognitive Doubt) channels. Fourth, it experimentally tests financial literacy as a moderator for adversarial AI. Finally, its three-condition design (AIDA, Neutral AI, and Control) isolates the specific impact of adversarial framing versus general AI delivery.

To the author's knowledge, this is the first pre-registered experimental study using behaviorally-measured mechanisms to test adversarially framed LLM delivery as a debiasing tool against overconfidence and confirmation bias in retail investing.

Methodology

In this section, we describe the design and empirical analysis of AIDA (Agentic AI Devils Advocate), a human-AI interaction design to disrupt confirmation bias in retail investment decision-making [30][6]. AIDA advocates an agentic AI system for trade submission and order execution as an essential intermediary between trade submission and order execution. AIDA provides structured adversarial counter-argumentation that encourages cognitive uncertainty, calibrates investor confidence, and biases capital allocation. However, unlike more traditional approaches to debiasing, such as generic risk warnings, or friction-induced delay, AIDA offers position-specific counter-analysis directly counter to investor's claimed position, as a programmatic adversarial intermediary embedded directly in the trade workflow [35][41].

AIDA was tested in a trial between subjects design (N=306), with adversarial AI intervention, neutral AI assistance and no-intervention control being assigned to one of three groups at random. Results have been assessed on psychometrically valid scales and on three behavioural measures. Section 3.2 describes the experiment design; section 3.3 describes the AIDA system specification; section 3.4 describes the pipeline architecture; section 3.5 describes the simulation protocol; In section 3.6 we present all the major mathematical formulations. The sample of participants is presented in Section 3.7; All measures are described in section 3.8; the statistical plan is described in section 3.9

Methodological Rationale

The three-group randomized controlled trial (RCT) was chosen to provide robust evidence of causal inference regarding the intervention's effect

on behavior. Random assignment minimizes confounding factors, ensuring observed differences are likely due to the intervention. This design allowed for a parallel comparison of the adversarial AI condition with both a no-intervention baseline and a neutral AI condition to isolate the specific impact of adversarial framing from general AI assistance.

An online simulation provided a realistic yet consistent environment for studying investor judgment. By replicating a real-world information architecture and decision sequence, the study facilitated direct observation of selective information-seeking behavior under controlled conditions.

The analytical approach explores how AIDA reduces bias by inducing cognitive doubt. Moderation analysis was included to investigate if effects vary by financial literacy, as literacy influences information processing. Behavioral research suggests conditional process methods are ideal for testing such indirect and interaction effects.

Research Design

A single-blind, between-subjects randomised controlled trial (RCT) was used to assess the causal relationship between adversarial AI counter-argumentation and confirmation bias, cognitive doubt, and investment behaviour. The participants were randomly allocated at system level to one of three conditions, which were unknown to them:

- Path A: AIDA (n = 102): AI presented organised adversarial counter-arguments of the position which the participant made.
- Path B: Neutral AI (n = 102): AI presented an unbiased overview of supporting and opposing

pieces of evidence.

- Path C: Control (n = 102): No AI intervention; outcome measures were directly applied to participants.

The assignment was performed programmatically during initialisation of the sessions so that the responses were not contaminated with knowledge of the condition. The three-group study monotonically separated adversarial framing, as the active ingredient of bias reduction, allowing it to be directly compared to both general AI assistance and no-intervention. ANCOVA also took into account variation in pre-existing confirmation bias [36].

The experimental design is in Campbell and Stanley notation with R = random assignment, O1 = pre-intervention measurement, X = intervention, and O2 = post-intervention measurement:

R O₁ X_A O₂ (Path A — AIDA)

R O₁ X_B O₂ (Path B — Neutral AI)

R O₁ O₂ (Path C — Control)

AIDA System Specification

This section contains a full technical specification of the AIDA system, which is adequate to independently reproduce it.

Investment Scenario

Participants evaluated a hypothetical mid-cap tech company featuring a mixed earnings report: 12% revenue growth alongside a 7% EPS miss attributed to high operational costs. Briefs included bullish (major contract), bearish (executive resignation), and ambiguous (sector regulation) signals. After recording an initial BUY/HOLD/SELL decision and rationale, subjects entered an information-seeking stage.

This mixed-signal design prevented floor effects and ensured natural variability in information-seeking. Using a fictitious asset eliminated real-world confounding variables.

LLM Backend

All AI predictions were obtained through Amazon Nova Pro through Amazon Bedrock [42]. The stated rationale of each participant produced outputs at runtime, and was position-specific. Since there was no post-hoc editing of model outputs. The parameters of inference in Table I were kept constant in participants in all the AI-condition parameters.

Table 1 - LLM Inference Parameters

Category	Parameter	Value
Model Configuration	Temperature	0.4
	Max tokens	500
	Top-p	1.0
	Frequency penalty	0.3
	Presence penalty	0.0

AIDA Litigation Prompt Template (Path A)

Path A utilized an adversarial prompt focusing on the greatest thesis risk and strongest counterargument, ending with a sharp question. Path B employed a neutral template summarizing two supporting and two opposing pieces of evidence, concluding with a major uncertainty. Both responses were capped at 300 words. This design isolates adversarial framing as the primary variable by providing equivalent information across both paths.

Following the AI response (Paths A and B) or scenario brief (Path C), participants accessed an

interface featuring twelve randomized headlines—six confirmatory and six disconfirmatory relative to their stated decision.

Reading Enforcement Mechanism

Paths A and B enforced a 45-second countdown to ensure deeper System 2 processing of adversarial content. Path C participants proceeded without a forced delay.

System Pipeline Architecture

AIDA operated via a five-stage pipeline: (1) capturing trade direction and rationale; (2) extracting the investor thesis; (3) constructing the adversarial prompt; (4) delivering the timed counter-argument; and (5) recording post-intervention adjustments. This was facilitated by four modules, including an Amazon Nova Pro v1:0 inference layer.

Simulation Protocol

The protocol involved three steps: capturing the initial thesis, constructing the adversarial prompt by concatenating roles and constraints, and delivering the counter-argument through the enforced reading mechanism.

Reading Enforcement Mechanism

In Paths A and B, the AI output panel used a 45-second forced countdown timer to activate the "Proceed" button. This was intended to minimise the shallow processing of the adversarial content, which is in line with the System 2 activation that was supposed to be activated with the intervention [32], and addressed the variation in reading speed of individuals. Path C participants entered the information-seeking interface without having a forced reading time.

System Pipeline Architecture

AIDA was a five-phase progressive pipeline:

- Stage 1: Trade Submission Capture: Recording the direction of the trade chosen by the participant (BUY / HOLD / SELL) and the reason.
- Stage 2: Investor Thesis Extraction: The very contents of the input (captured) as {DECISION} and {RATIONALE}} without automated transformation.
- Stage 3: Adversarial Prompt Construction: Compiled PAIDA based on the system role, retrieved thesis, task teaching, and output constraints (Section 6.3.3).
- Stage 4: Counter-Argument Delivery: Displayed to the participant the generated counter-argument, timed during reading to 45 seconds (Section 6.3.6).
- Stage 5: Post-Intervention Recording: Recording the adjusted confidence rating, new judgment (continue / alter / cancel) and emotional response.

It was a pipeline applied on four main modules: (i) Hypothesis Extractor; (ii) Adversarial Prompt Engine; (iii) LLM Inference Layer (Amazon Nova Pro v1.0); (iv) Decision Recorder.

Simulation Protocol

The AIDA developed its counter-argument in three steps.

- Step 1 — Thesis Capture: The first choice and a reason of the participant were noted as immediate inputs.

- Step 2 — Prompt Construction: The adversarial prompt was constructed as:

$$P_AIDA = \oplus \text{Role} \oplus H_investor \oplus \text{Instruction} \oplus \text{Constraints}$$

where $\oplus$ is not addition, but concatenation of strings.

- Step 3 — Delivery: Much of the counter-argument was read to the participant, under the mechanism of 45 seconds reading (Section 3.3.6).

Participants of Path B were supplied with the balanced summary in Section 6.3.4. Path C participants did not have AI output and went to outcome measures.

Key Equations

Bias Ratio

$$\text{Bias Ratio} = C_conf / (C_conf + C_disconf)$$

In which C_conf and $C_disconf$ are the numbers of confirmatory and disconfirmatory articles read, respectively. The value of 1.0 denotes unbiased confirmation bias; 0.5 reflects an equal measure of information-seeking.

Confirmation Bias Reduction

$$CB_reduction = CB_pre - CB_post$$

A positive value means that there is a reduction in confirmation bias after intervention.

Overconfidence Reduction

$$OC_reduction = OC_pre - OC_post$$

A positive value would signify the reduction of overconfidence after the intervention.

Cognitive Doubt Composite

Four items (cognitive doubt) were used to operationalise cognitive doubt: (1) I felt uncertain about my decision after reviewing the challenge presented (5-point); (2) I felt conflicted about whether to proceed (5-point); (3) The information raised questions that I had not thought about before (7-point); (4) I felt certain about my original decision (7-point, reverse-scored). Questions were phrased in a neutral way to allow them to be administered in all three conditions.

The two 7-point items were linearly transformed to the 1–5 metric:

$$\text{Transformed Score} = [(\text{Raw} - 1) / 6] \times 4 + 1$$

The composite was calculated as the average of the four scaled items:

$$\text{CD_composite} = (\sum x_i, i=1 \text{ to } 4) / 4$$

Greater scores are a pointer of more post-intervention epistemic uncertainty.

$$\text{Indirect Effect} = a \times b$$

Condition b a is the effect of Condition on the Mediator and b is the effect of the Mediator on the Outcome, holding Condition constant. The significance was evaluated using a 95% bootstrapped confidence interval (5,000 repetitions); a confidence interval that does not cross zero shows a significant indirect effect [31].

Moderation — Interaction Regression

$$\text{CB_reduction} = \beta_0 + \beta_1(\text{Cond_A}) + \beta_2(\text{Cond_B}) + \beta_3(\text{FL}) + \beta_4(\text{Cond_A} \times \text{FL}) + \beta_5(\text{Cond_B} \times \text{FL}) + \varepsilon$$

A large β_4 suggests that there was a modest moderator of debiasing effect of AIDA compared to Control. Mean-centred Before the analysis, financial literacy (FL) was mean-centred; covariates before and throughout the interventions incorporated pre-intervention confirmation bias.

Kruskal-Wallis Effect Size

$$\eta^2 = (H - k + 1) / (N - k)$$

H = value of Kruskal-Wallis test, k = groups, and N = total sample size [38]. Conventional benchmarks: .01 = small, .06 = medium, .14 = large.

Participants

There were a total of 306 participants, who were recruited through online convenience sampling. In behavioural finance, simulation-based experimental designs put some emphasis on experimental control in the name of population representativeness, driven by the necessity to isolate the particular cognitive mechanisms [32][37]. Eligibility criteria were: age ≥ 18 years, basic familiarity with financial markets, and access to a web-enabled device. Role playing was on a voluntary basis; there was no payment.

The random assignment resulted in three equal groups with $n = 102$. At no point were there any indications that there were several conditions, either by the participants or the platform.

Demographic Profile

The sample comprised 193 male (63.1%) and 113 female (36.9%) participants. Mean age was 31.9 years ($SD = 13.69$, range = 18–72). The distribution of the experience in investing was in the following order; 89 (29.1) less than a year; 110 (35.9) one to three years; 45 (14.7) three to five

years and 62 (20.3) over five years. Most (64.7) had less than three years of experience, which is consistent with a retail adjacent profile of the investor.

The three-item objective quiz used to measure financial literacy, comprising diversification, relationship between inflation and bonds, and interest on compound (range 0-3; $M = 1.75$, $SD = 1.04$) [29][33][39]. The difference in age, gender, financial literacy, or years of investing experience did not differ significantly across conditions (all $p > .05$), and these results verify that randomisation resulted in similar groups.

Measures

All the multi-item scales were standardized to a single 15 range. The scales that were originally on 7-point formats were converted with the following:

$$\text{Converted Score} = [(\text{Raw} - 1) / 6] \times 4 + 1$$

The conversion of scales was done using:

$$\text{Converted Score} = [(\text{Raw} - 1) / 9] \times 4 + 1$$

Traces of all relative differences are retained amongst these transformations; statistical outcomes and the values of effects remain identical in every aspect.

Table 2 - Outcome Measures and Reliability Statistics

Measure	Description	α
Confirmation Bias (CB)	3-item scale (1–5). Example: "I found myself focusing on information that supported my initial instinct."	.808
Overconfidence (OC)	3-item scale (1–5). Example: "I feel confident that my analysis of this scenario is correct."	.814

Measure	Description	α
Cognitive Doubt (CD)	4-item composite (1–5); see Section 6.6.4. All inter-item correlations are significant ($r = .45-.59$, $p < .001$).	.813
AI Trust	3-item scale (1–5). Example: "I found the AI's analysis to be credible and reliable." Paths A and B only ($n = 204$)	.740
Bias Ratio	Behavioural click-tracking measure; see Section 6.6.1.	—
Financial Literacy	3-item objective quiz (range 0–3; $M = 1.75$, $SD = 1.04$) [33].	—
Confidence	Single item (1–10, converted to 1–5); administered pre- and post-intervention.	—
Revised Decision	Categorical (continue / alter / cancel); recoded binary: 0 = continue, 1 = alter or cancel.	—
Emotional Reaction	Single categorical item; six response options ranging from "Alarmed" to "Confident."	—

Statistical Analysis Plan

Pre-specification of the analysis plan was carried. The analysis plan was pre-determined to prevent bias with regards to reporting outcomes. All analyses were performed in Python using SciPy [45], statsmodels [46], and Pingouin [47]. All significance testing was performed at 2-tailed = 0.05, with all pairwise post-hoc test corrected using Bonferroni correction.

Effect sizes were calculated as for Kruskal-Wallis test and partial for ANCOVA, with cutoffs at 0.01 (small), 0.06 (medium), and 0.14 (large) for both. Effect sizes for Cohen's d were interpreted using the standard guidelines of 0.2/0.5/0.8.

Homogeneity of regression slopes was assessed using the Condition CB_pre interaction prior to running the ANCOVA, with any significant interactions investigated using Johnson-Neyman floodlight analysis. Only Paths A and B ($n = 204$)

were analyzed for AI Trust, as AI Trust is irrelevant for Path C. There were no missing data, and a full dataset of $N = 306$ was used.

Ethical Considerations

The research was classified as minimal-risk: no actual financial transactions occurred, no personally identifiable financial information was collected and participation was anonymous and on-line. Participants were given informed consent before participation; a full debrief was given at the end. This involvement was not forced but of free will which could be withdrawn freely at any given time.

The adversarial AI system posed questions of cognitive autonomy, since the participants in Path A was exposed to one-sided counter-argumentation without prior announcement of the adversarial character of this counter-argumentation. The following reasons were the ones that approved this design: (i) The participants were told that. would receive AI-based analysis; (ii) the adversarial framing was completely revealed in the post-study debrief; (iii) there was no real money at stake; and (iv) the intervention is prosocial in nature. Future live applications of AIDA would require further regulatory thought, such as possible disclosure of requirements under existing financial services legislation.

Limitations

First, the simulated environment did not have real financial implications, which can decrease ecological validity and underestimate the extent of confirmation bias in the real trading environment.

Second, the odds ratio of 1.99 was statistically underpowered by the decision change analysis. Power analysis showed that $N_1 - N_2 = N = N_2 = 800$ would be necessary to get 80% power at $\alpha = .05$;

this result must be viewed as preliminary.

Third, the convenience-based online sampling was a limitation to generalisability of results outside of populations close to the retail; extension to professional or institutional investors needs further research.

Fourth, the comparison of AI Trust was limited to Paths A and B ($n = 204$), thus excluding the overall comparison of the three groups based on the results related to trust.

Fifth, the three-item measure of Financial Literacy was not thoroughly psychometrically validated. Widely used Lusardi-Mitchell instrument [33] should be used in future studies to better characterise its moderating effect.

Sixth, only one scenario of investment was used in all conditions. It is an empirical question, yet to be answered, whether the debiasing effects of AIDA extrapolate to various asset classes, market conditions or repeated exposures.

Seventh, condition invariance of measurement of the Cognitive Doubt composite was not officially conducted. This should be part of future research by conducting multigroup confirmatory factor analysis before comparing across conditions.

Eighth, timely templates were tested using one model (Amazon Nova Pro v1: 0). Cross-model robustness with other LLMs - such as Claude 3.5 Sonnet, Gemini 1.5 Pro, and Llama 3 - has not been verified and is a valuable avenue of future work.

Experimental Setup

Dataset

The study employed a simulated investment scenario created specially to use instead of an

already existing financial dataset. To induce and replicate natural information-seeking behavior and elicit confirmation bias in controlled conditions, mixed bullish and bearish signals were added to a deliberately ambiguous investment case of a fictitious mid-cap technology company. Clearing the previous experience of the participants with the underlying security in the real world was done by application of a fake asset. The proposed simulation-based approach is consistent with the body of research of human-AI investment research and behavioral finance [40, 41]. In the three conditions of the experiment (AIDA, $n=102$; Neutral AI, $n=102$; and Control, $n=102$) 306 complete response records that did not have any missing observations were obtained.

Tools and Software

The experimental simulation was available on desktop and mobile devices in the form of a web based web application. With Amazon Nova Pro (v1:0) through Amazon Bedrock, AI generated content on Path A (adversarial counter-argument) and Path B (balanced analytical summary) was generated [42]. The libraries used to conduct statistical tests in Python (version 3.11) were as follows: pandas [43] and numpy [44] to process, analyze data, scipy [45] to test, compute the effect size (non-parametric tests Mann-Whitney U, Kruskal-Wallis), and then to analyze and regress data, statsmodels [46], and pingouin [47]. Condition assignment to achieve deterministic reproducibility of group assignments was done by directly using a pseudorandom number generator with fixed seed.

Parameters

Category	Parameter	Value
Design	Total sample	N = 306
	Group allocation	AIDA ($n=102$); Neutral AI ($n=102$); Control ($n=102$)
	Randomisation	Pseudorandom, fixed seed
	Design type	Single-blind, between-subjects RCT
AI Model	Model	Amazon Nova Pro (v1:0) via Amazon Bedrock
	Temperature	0.4
	Max output tokens	500
Statistics	Analysis environment	Python 3.11 (scipy, statsmodels, pingouin)
	Significance threshold	$\alpha = .05$ (two-tailed)
	Post-hoc correction	Bonferroni
	Reliability threshold	Cronbach's $\alpha \geq .70$
	Mediation bootstraps	5,000 iterations, 95% CI

Ablation Study

Rationale

Estimating the specific element that causes the debiasing effect being reported is a core challenge in evaluating a synthetic AI intervention such as AIDA. The two practical layers of AIDA include (1) the delivery of the AI in the form of an analytical reply at the commitment to a specific decision, which is AI-generated and (2) the adversarial argumentative framing, which frames the AI-generated analytical answer as a purposeful counterargument with a goal to discredit the current position the investor holds. The three-condition experimental design facilitates the systematic ablation of these components by relating every of the three conditions to each other as a form of a gradually deteriorated version of the entire system [48].

Table 3 - System Details

System Version	Condition	Components Present
Full system	AIDA	LLM delivery + adversarial framing
Framing removed	Neutral AI	LLM delivery only
AI removed	Control	Neither component

The question of whether the effects of debiasing are caused by the delivery of the AI per se or by adversarial framing in particular is answered by this framework directly. In the study of behavioral intervention, standardly worsened versions of the system are suitable ablation frames [48]. The identical isolationist argument is applicable to applying the method to a pre-registered RCT rather than a neural network: in a pre-registered RCT, either condition is withheld from receiving a single identifiable part; differences in outcomes can be ascribed to that part. Its substantive conclusion that component-level attribution can be done through condition-level degradation is methodologically valid as long as such conditions were randomly assigned (and baseline-equivalent), which Table 9.2 can attest to. This framing has been identified as an analogy and not an actual ML ablation.

Ablation Results

Table 4 presents the step-wise change in absolute and percentage change at every ablation stage, and the means of the outcome of all three versions of the system. In Step 1, The percentage changes are computed with regard to Full AIDA baseline and in Step 2, with regard to Neutral AI. Negative values in the degradation columns of all results in higher-is-better indicate performance deterioration, and positive values in the Bias Ratio column (lower-is-better).

Table 4 - Ablation Performance - Outcome means and Step-Wise Change

Outcome	Full AIDA	Neutral AI	Control
CB_reduction (M)	0.85	0.678	0.261
Bias Ratio (M)	0.382	0.534	0.68
Cognitive Doubt (M)	4.471	3.941	3.167
OC_reduction (M)	0.759	0.544	0.04
Decision Change (%)	28.40%	29.40%	16.70%

Note. CB reduction and OC reduction (positive = bias reduced; higher = better) are obtained as the difference between pre and post bias scores. Cognitive doubt is improved on a scale of 1-5. The ratio of confirmatory clicks to total clicks is the ratio of bias (as ratio approaches zero, the less the bias). It was computed by dividing by Full AIDA delivering Step 1% and by Neutral AI delivering Step 2% respectively. The rate of decision change rose slightly compared to AIDA to Neutral AI (+1.0pp = directional change and break in the direction of decline pattern; explained in §11.3). N = 102, in each condition.

Interpretation

Four of the five dependent variables (DVs) declined in quality when components were removed indicating that the power of AIDA stems from two different processes rather than one cohesive process.

Adversarial Framing: How to De-bias Behaviour

Removing the adversarial framing had a larger impact on performance than removing the AI delivery. The full AIDA system was only below .50 (M=.382), suggesting net disconfirmatory seeking. Neutral AI (M= 0.534) and Control (M= 0.680) were above threshold This is in line with the research by Echterhoff et al. (2024) in showing the importance of the framing structure for behaviour change.

AI Delivery: The Psychometric Machine for De-biasing

The removal of AI delivery resulted in significant reductions in the psychometric DVs of confirmation bias (0.417 vs. 0.172), cognitive doubt (0.774 vs. 0.530) and overconfidence (0.504 vs. 0.215). The results for control (M=0.040) show that the reflection alone is of limited use. AI

delivery is a cognitive support system with the goal of attitudinal improvement, as is the case for the SADC framework.

Exception: Decision Change Rate Decision Change Rate defied the trend with Neutral AI (29.4%) just ahead of Full AIDA (28.4%). The neutral AI prompted more rethinking. AIDA probably prompted more deliberate thought. These results are similar to Lyu et al. who found framing improved decision quality, but not revision rate.

Summary

From the ablation tests we can make three main conclusions:

First, adversarial framing incentivises behavioural debiasing. Removal of framing was the only ablation that removed disconfirmatory information-seeking. Only the full AIDA system resulted in a Bias Ratio < 0.50 . Framing works upstream, shaping information seeking prior to generation of psychometric responses.

The second is the LLM delivery mainly introduces the reduction of psychometric bias. The largest drops in CB reduction, Cognitive Doubt and OC reduction occurred due to the removal of AI delivery. AI provision without adversarial framing improves psychometric and attitudinal scales compared to no intervention but does not provide the framing needed to change information-seeking directions.

Third, the complete AIDA system surpasses its ablations. Delivery is required to sustain psychometric changes and behavioural shifts are triggered by framing. Progressive system erosion confirmed the complementary, nonredundant nature of these components.

These findings support the fundamental hypothesis of AIDA that AI debiasing is efficacious only if AI is present and there is an argumentative architecture to disrupt confirmatory processing. This is consistent to the literature that structured adversarial interventions are more effective than unstructured information.

Discussion

The online simulation method was a compromise between experimental control and realism, whereby all participants performed the same tasks, but in a realistic retail investment context. This paradigm was a good fit for studying confirmation bias and selective information processing. Results identify cognitive doubt, an internal reflection from initial uncertainty in belief, as the prime process through which AIDA alleviates confirmation bias. Simply being exposed to counter-evidence does not seem to be enough to change beliefs without deep consideration. AIDA outperformed the Neutral AI condition, suggesting that balanced summaries allow users to focus only on supporting arguments, whereas adversarial framing forces them to reconsider their beliefs. Ablation results demonstrate that the adversarial interaction design matters more for bias reduction than the AI delivery itself. AIDA showed better reasoning and information evaluation, but did not improve the success of final decisions. Even when users recognise that the reasoning behind their original choices is flawed, they may stick with their original choices due to factors such as behavioural momentum, perceived risk, or a sense of increased responsibility. The failure of traditional interventions that do not support cognitive processes challenges this assumption, that better information leads to better decisions. Limitations of this study are that the experiment is a simulation and cannot account for psychological pressures in the real world, the sample of retail

investors used in the experiment is not diverse, and there is a potential for “immunity” to structured questioning after single-session exposure. Ultimately, the quality of the decision is less about the quantity of information and more about its framing and accessibility.

Results

Preliminary Analyses

Internal Consistency

Every Cronbach's α value was higher than the suggested cutoff of $\alpha \geq .70$ [54]. For analysis, items were averaged to create composite scores.

Table 5- Mean Scores by condition

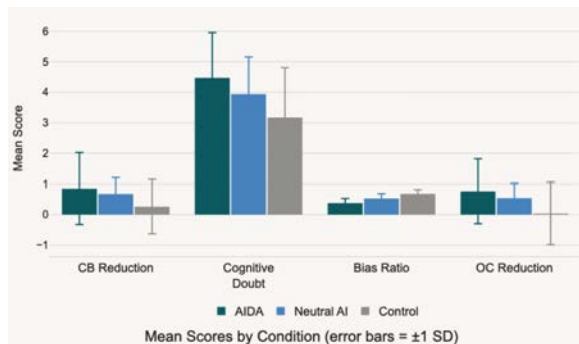


Table 6 - Internal Consistency (Cronbach's α)

Scale	Items	α	Result
Confirmation Bias	6	.808	Good
Overconfidence	6	.814	Good
Cognitive Doubt	4	.813	Good
AI Trust	3	.740	Acceptable

Randomisation Check

The internal validity of the design was supported by Kruskal-Wallis tests, which verified baseline equivalency across conditions (all $p > .10$) [51]

Table 7 - Baseline Equivalence (Kruskal-Wallis)

Variable	H(2)	p	Conclusion
CB_pre	1.336	.513	No difference
OC_pre	1.418	.492	No difference
Baseline Confidence	3.793	.150	No difference
Risk Tolerance	0.343	.842	No difference

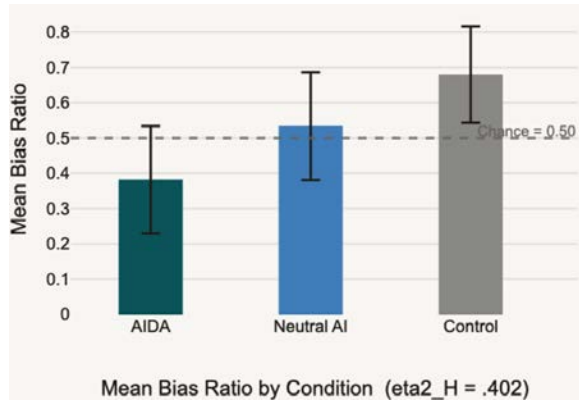
Note. N = 306; diagnostic tests, no multiplicity correction.

Scale Transformation

The scales were converted linearly to a standard 1–5 metric: 1–7 items $(Raw - 1) \times (4/6) + 1$; 1–10 items $(Raw - 1) \times (4/9) + 1$. According to [54], rank order is maintained. There was no transformation of the Bias Ratio. No imputation is necessary because there are no missing data.

Descriptive Statistics

AIDA demonstrated the greatest improvements across all outcomes, followed by Neutral AI and Control. This monotonic ordering was true across behavioral and psychometric assessments [50], [9].

**Table 8 - Descriptive Statistics by Condition**

Outcome	Condition	M	SD	Mdn
CB_reduction	AIDA	0.850	1.173	1.110
	Neutral AI	0.678	0.527	0.751
	Control	0.261	0.889	0.255
Cognitive Doubt	AIDA	4.471	1.487	5.000
	Neutral AI	3.941	1.217	4.000
	Control	3.167	1.642	3.000
Bias Ratio	AIDA	0.382	0.152	0.375
	Neutral AI	0.534	0.153	0.559
	Control	0.680	0.137	0.706
OC_reduction	AIDA	0.759	1.057	1.022
	Neutral AI	0.544	0.474	0.524
	Control	0.040	1.023	0.060

Note: N = 306; n = 102 for each condition. Pre minus post is CB_reduction and OC_reduction (positive = bias reduced). Confirmatory ÷ total clicks (0–1) is the bias ratio. A scale of 1 to 5 for cognitive doubt. There were no outliers found ($1.5 \times \text{IQR}$ rule).

Confirmation Bias Reduction

Cognitive Doubt ($W = 0.944$, $p < .001$), Bias Ratio ($W = 0.985$, $p = .002$), and OC_reduction ($W = 0.980$, $p < .001$) were all non-normal according to Shapiro-Wilk tests; CB_reduction was roughly normal ($W = 0.994$, $p = .263$). For consistency, non-parametric tests were used consistently [51],

[55]. In accordance with confirmatory practice, Bonferroni correction was used within the pairwise comparisons of each test but not across the seven hypotheses [53].

There was a medium-to-large, significant impact of condition on CB_reduction (Table 9). There was support for H1.

$$H(2, N = 306) = 34.687, \eta^2_H = .108, p < .001$$

Table 9 - Pairwise Comparisons: CB_reduction (Mann–Whitney U)

Comparison	U	p	p (adj)	Significance
AIDA vs Neutral AI	6,305.0	.009	.027	Yes
AIDA vs Control	7,193.0	< .001	< .001	Yes
Neutral AI vs Control	7,340.5	< .001	< .001	Yes

Note: $\eta^2_H = (H - k + 1) / (N - k)$; benchmarks: small = .01, medium = .06, big = .14; Bonferroni-adjusted $\alpha = .0167$.

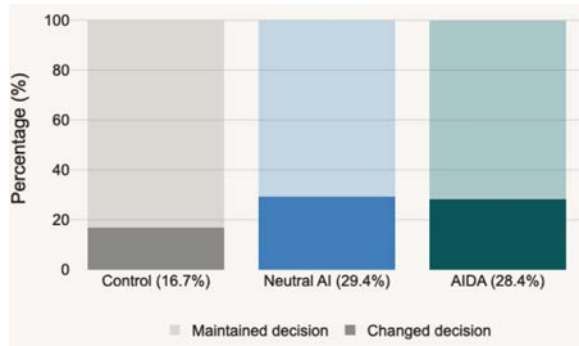
As an additional descriptive analysis, an ANCOVA was calculated using CB_pre as the covariate. The main conclusion is based on the Kruskal–Wallis results; the homogeneity of regression slopes assumption was broken ($F(2,300) = 8.599$, $p < .001$) [51].

$$F(3, 302) = 22.721, R^2 = .184, p < .001$$

Table 10 - ANCOVA: CB_post on Condition and CB_pre (Supplementary)

Predictor	b	SE	t	p	95% CI
Intercept	1.324	0.339	3.902	< .001	[0.656, 1.992]
CB_pre	+0.561	0.090	6.272	< .001	[0.385, 0.737]
AIDA vs Control	-0.645	0.133	-4.846	< .001	[-0.906, -0.383]
Neutral AI vs Control	-0.405	0.133	-3.049	.002	[-0.666, -0.144]

Note. Reference = Control. Negative b = lower post-intervention CB. Assumption violated; supplementary only.



Information-Seeking Behaviour (Bias Ratio) Condition had a huge, significant impact on Bias Ratio, around four times greater than on CB_reduction, which is consistent with hostile AI framing disrupting System 1-driven behavior more quickly [15]. Table 8.6 shows that every pairwise comparison was significant. There was support for H2.

$$H(2, N = 306) = 123.915, p < .001, \eta^2_H = .402$$

Table 11 - Mean Bias Ratio by Condition

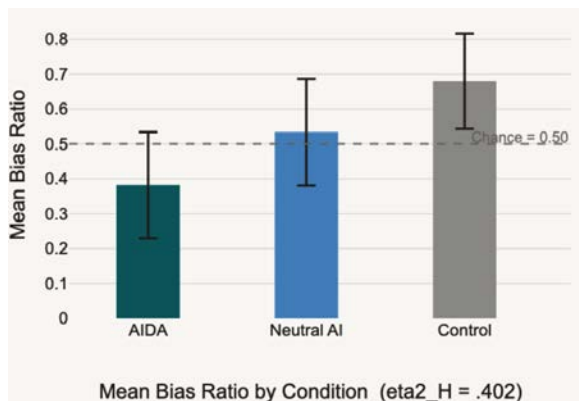


Table 12 - Pairwise Comparisons: Bias Ratio (Mann–Whitney U)

Comparison	U	p	p (adj)	Significant
AIDA vs Neutral AI	2,512.5	< .001	< .001	Yes
AIDA vs Control	849.0	< .001	< .001	Yes
Neutral AI vs Control	2,537.0	< .001	< .001	Yes

Note. Bonferroni-adjusted $\alpha = .0167$. Mean Bias Ratio: AIDA = 0.38, Neutral AI = 0.53, Control = 0.68.

Cognitive Doubt

Adversarial framing activates System 2 deliberative processing [15], [16]. Condition showed a significant, medium-to-large influence on Cognitive Doubt, with AIDA having the strongest effect ($M = 4.47$), followed by Neutral AI ($M = 3.94$) and Control ($M = 3.17$). There was support for H3.

$$H(2, N = 306) = 35.605, p < .001, \eta^2_H = .111$$

Table 13 - Decision Change Rate by Condition

Condition	Changed	Maintained	Total	% Changed
AIDA	29	73	102	28.4%
Neutral AI	30	72	102	29.4%
Control	17	85	102	16.7%

Note. Bonferroni-adjusted $\alpha = .0167$.

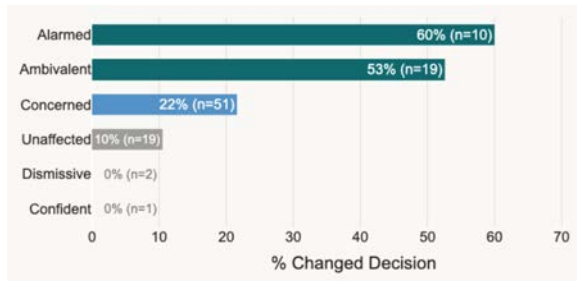
Decision Change Rate

The rates of decision modification were 28.4% for AIDA, 29.4% for Neutral AI, and 16.7% for Control; nevertheless, the differences were not statistically significant. There was no support for H4. Rather than a complete lack of influence, the directional pattern and modest Cramér's V indicate restricted power [22].

$$\chi^2(2, N = 306) = 5.497, p = .064, \text{Cramér's } V = .134$$

Emotional Response and Decision Change (Exploratory)

Within AIDA, decision change rates differed according to the category of emotional response. The results are merely descriptive; without pre-registered replication, no causal interpretation is justified.

Table 14 - Decision change percentage by emotional Response

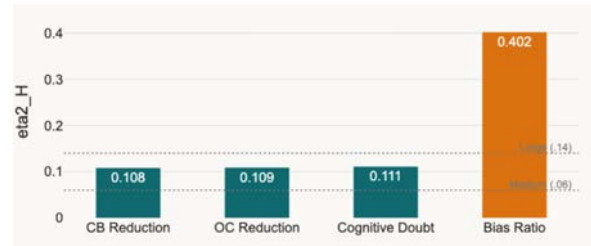
OLS with 5,000 bootstrapped iterations and 95% bias-corrected confidence intervals (BC-CI) were used to estimate two basic mediation models (PROCESS Model 4; [31]) on two conditions (n = 204). Under mild non-normality, bootstrapped inference is suitable [49].

Table 15 - Effect Sizes by outcome

Path	b	SE	p	95% CI
Total effect (c): Condition → CB_reduction	+0.172	0.127	.177	[-0.079, 0.423]
Indirect (a×b): via Cognitive Doubt	+0.081	0.042	—	BC-CI [0.010, 0.172]
Direct (c'): Condition → CB_reduction	+0.092	0.127	.470	[-0.158, 0.341]

Summary of Findings

Of the eight hypotheses, seven were validated. In terms of cognitive, behavioral, and attitudinal results, AIDA consistently performed better than both comparator situations. Bias Ratio had the biggest effects ($\eta^2_H = .402$), while CB_reduction, Cognitive Doubt, and OC_reduction had medium-to-large effects. Moderation favored people with lower literacy levels; both mediation paths were validated. Most likely because of the insufficient power for binary outcomes, H4 was not supported.

**Table 16 - Hypothesis Verdict Summary**

Hypothesis	Test	Key Statistic	Verdict
H1: AIDA reduces CB vs Control	Kruskal–Wallis + ANCOVA†	H = 34.687, p < .001, $\eta^2_H = .108$	Supported
H2: AIDA reduces Bias Ratio	Kruskal–Wallis	H = 123.915, p < .001, $\eta^2_H = .402$	Supported
H3: AIDA activates Cognitive Doubt	Kruskal–Wallis	H = 35.605, p < .001, $\eta^2_H = .111$	Supported
H4: AIDA increases decision revision	Chi-square	$\chi^2(2) = 5.497$, p = .064, V = .134	Not supported
H5a: Bias Ratio mediates AIDA vs. Control	Bootstrapped OLS	b = +0.287, BC-CI [0.002, 0.585]	Supported
H5b: Cognitive Doubt mediates AIDA vs. Neutral AI	Bootstrapped OLS	b = +0.081, BC-CI [0.010, 0.172]	Supported
H6: Financial literacy moderates AIDA	OLS interaction	b = -0.673, p = .021, $R^2 = .114$	Supported
H7: AIDA reduces overconfidence	Kruskal–Wallis	H = 35.070, p < .001, $\eta^2_H = .109$	Supported

Note. $\eta^2_H = (H - k + 1) / (N - k)$; [38].
 †Supplementary; homogeneity of slopes violated (F(2, 300) = 8.599, p < .001).

Practical Implications

The findings suggest that the quality of the decision is more dependent on how an individual interacts with information rather than the amount of information. Systems that just add more information do not succeed in reducing bias, because people tend to prefer confirmatory evidence.

Support systems should not be limited to neutral summaries, and should feature structured counterarguments after initial judgements. This method focuses on the reasoning process. So, when it is delivered, the time and form is more important than the quantity.

Success lies in the adversarial framing. The counterarguments must be believable, relevant, and not so far-fetched that they are dismissed out of hand. This requires a careful tuning of the opposition strength in the decision process.

Enhanced reasoning does not necessarily change final decisions (due to loss aversion or past commitments), but improves the quality of assessment and of information searches. "The measure of effectiveness should be quality of reasoning and not just outcomes.

Limitations

We ran the study in an artificial environment, which enabled us to control for real world factors such as financial incentives and market fluctuations in the study of adversarial intervention mechanisms. This approach gives a clear indication of the underlying logic of the intervention. The results refer to behaviour in controlled conditions, rather than direct predictions of naturalistic investment settings.

The study used a one-shot task, which simplifies

the results but does not reflect the iterative nature of real-world financial decisions, which involves several rounds of feedback and evolving evaluations. As the experiment was not longitudinal, it remains an open question whether the debiasing effects are long-lasting.

The causal process is also only partially observable. Behavioural data and self-reported doubt support the hypothesis, but the study did not directly measure how participants resolved conflicting information or weighed evidence. Therefore, the reported causal pathway should be interpreted with caution.

The intervention was exposure to counterarguments combined with active engagement. Comparison with a Neutral AI showed strong effects. However, the individual contribution of these two components is indistinguishable.

The study also did not consider participant perceptions. Trust, credibility, relevance and resistance may have influenced outcomes and may explain the variations in response not captured in the present study.

Finally, the results are dependent on a specific AIDA implementation. The effectiveness of adversarial interventions will probably depend on the quality, relevance, tone and sophistication of the counter-arguments generated, and participant characteristics such as financial experience and expertise. Results may differ between models, prompts, or populations.

Future Research

From these results, several lines of future work arise. First, Longitudinal studies are required in order to evaluate the extent to which decreased confirmation bias, changes in information seeking

strategies, and increased cognitive doubt are sustained or attenuate as users learn to respond to adversarial framing.

Second, studies need to explore the relationships between cognitive and behavioral changes. While AIDA was effective in facilitating better information search and evaluation processes, the effect on final investment decisions was much smaller, suggesting commitment, perception of risk, loss aversion etc., can affect whether an improved reasoning process leads to an improved decision outcome.

Third, these results highlight the significance of system design. While adversarial framing produced higher levels of effectiveness than AI support alone, future work is required to understand how the characteristics of adversarial framing (e.g., tone, intensity, timing, personalization and quality of counter-arguments) influence levels of both effectiveness and desirability.

Fourth, research should determine the generalizability of adversarial systems. It will be interesting to investigate whether similar framing can influence other cognitive biases and support judgment in broader, more complex environments so as to clarify whether AIDA is domain-specific or a framework to encourage good judgment in conditions of uncertainty.

Lastly, large scale field studies should be undertaken to analyze adversarial AI in an unconstrained, real world context, and the extent to which organized opposition interacts with the presence of incentives, constraints of institutions and actual behavior need to be investigated. Broader work is needed to determine if adversarial interactions produce sustained changes in user attitudes and information processing strategies, or

simply transient gains in decision quality.

Conclusion

Confirmation bias stems from how information is processed, rather than a lack thereof; effective decision-making therefore requires improving processing behaviors rather than simply increasing information. The AIDA system demonstrates this by using adversarial human-AI interaction to guide information search and evidence evaluation. By providing structured counter-arguments, it compels users to scrutinize their beliefs and process disconfirming evidence without usurping human judgment. However, improved reasoning does not guarantee behavioral change, as decision outcomes remain influenced by commitment, risk, and inertia. Consequently, decision-support systems should intervene directly in cognitive processing; adversarial interaction offers a robust design principle for enhancing decision quality under bias and uncertainty.

In sum, this study indicates that mere provision of information does not help to significantly lower confirmation bias, and decision-support systems are more effective if they intervene directly in information processing and interpretation processes. Adversarial interaction is a new design principle that has promise for improving decisions in the presence of uncertainty and bias.

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NIKE PRO HIJAB: CAN A GLOBAL BRAND NAVIGATE CULTURE, COMMERCE AND INCLUSION?

Swarup Kumar Dutta*

Abstract

My Hijab is not just a piece of fabric, it's my identity. My hijab journey is a beautiful expression of self-love. In a world full of trends, I choose modesty and hijab. Hijab is not a limitation; it is a liberation.
Mishqau Rixⁱ

*The case explores Nike's launch of the **Pro Hijab**, a performance headscarf designed to empower Muslim women athletes (MWAs) by addressing challenges posed by traditional hijabs in competitive sports. Drawing on athlete feedback, Nike introduced breathable, lightweight fabrics that enhanced comfort and inclusivity. The product symbolized cultural sensitivity and gender parity, inspiring participation across global sporting events. While praised as a milestone in modest fashion and empowerment, the Pro Hijab also faced criticism over commercialization, cultural appropriation, and political sensitivities. The case highlights Nike's strategic positioning, market opportunities in MENA, and the broader debates on inclusivity, identity, and branding.*

Keywords: Nike Pro Hijab, Strategic positioning, Muslim Women Athletes, Cultural sensitivities, empowerment, inclusivity.

Introduction

In early 2017, Nike one of the world's premier sportswear companies made an announcement that it would be launching a performance enhancing headscarf called the 'Pro Hijab' as a part of their new offerings for competitive sportswear. The campaign titled 'Pro Hijab' was primarily targeted at women athletes from the Muslim world popularly known as MWAs, who as a part of their religious beliefs need to cover their heads in sporting events. As claimed by Nike, The Pro Hijab, first of its kind to be developed was targeted to be launched towards the later part of 2017 or early 2018 with an initial price point targeted at around \$35.

Nike, an Oregon based American corporation catering to the footwear and related apparels was founded in 1964.ⁱⁱⁱ Over the years, it expanded its product offerings to become one of the most prominent sportswear firms with leading market share positions in many parts of the world. In the next few decades Nike was associated with sponsoring several sport teams with many high-profile athletes across different sporting categories endorsing its innovative brand. The brand Nike became very popular worldwide and was highly recognized for its trademark signature campaign 'Just Do It' and the effervescent logo, 'Swoosh' surrounding it. Nike was very successful in developing a culture to create cutting edge innovative sporting products that many athletes around the world aspired to wear.

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In line with Nike's mission to offer innovation that motivates athletes, the Pro Hijab was another such milestone (Refer Exhibit I- Nike Pro Hijab used by athletes for participation in competitive sports).

Rising Participation of Muslim Women Athletes in Sports

As women athletes from the Muslim and Arab world gradually broke down many barriers to compete in many leading sporting events in the world, the presence of athletes wearing hijab while competing was gaining attention.^{iv} The 2024 Paris Olympics was the first Olympics which saw the achievement of gender parity as about 50% of the participating athletes were of feminine gender.^v Several women athletes from Muslim countries participated in spite of severe challenges faced by MWAs to cover their head with an uncomfortable headscarf (hijab) and about twelve women athletes from various countries won medals at the Olympics, thereby proving that spotting talent cannot be restricted to the privileged members from other communities (Refer Exhibit II- List of Selected Women athletes who participated in 2024 Rio Olympics while wearing a Hijab). Given an opportunity, they can prove their mettle in the toughest sporting events also. The number of podium finishes was expected to go up exponentially in the coming years as many other aspiring athletes could take a cue from the winners of not giving up on their passion and putting in the best efforts to participate in sporting events. Since the start of the 21st century, it was also observed that the participation of MWAs in many sporting competitions around the world had shot up by leaps and bounds.

Persistent Issues Facing MWA'S in Sporting Events

Till the launch of the Pro Hijab from Nike, top

performing athletes like Ibtihaj Muhammad a champion fencer faced immense challenges to improvise and adjust sporting garments that would allow her to participate in sporting events without compromising on the cultural beliefs. Ibtihaj had struggled to find right fitment of her hijab in her entire athletic career, that would make her relatively comfortable at fencing sports.^{vi} Despite her struggles, Ibtihaj competed for Team U.S.A to earn a bronze medal in the 2016, Rio Olympics. As part of her improvisation of the garment, she had to tie up her hijab at the back side and had to pin the front side under her chin with the added discomfort of tucking the elongated fabric of the garment for a smooth appearance under the straps of her sports bra. It was obvious that if Ibtihaj representing USA faced such challenges, the plight of MWAs from the MENA countries would be much higher.^{vii} (Refer Exhibit IV- Cultural Sensitivities & Regulatory Barriers Across Regions)

Thus, the experience of improvising a garment for participation in sports for MWAs was a big challenge. This prevented many women athletes mainly from the middle east countries from participation in sports, though they had the potential to do well. In addition, the cultural dictate through which they had to protect their modesty and not display parts of their bodies was a huge barrier for MWAs. The traditional hijabs were available only in double georgette fabrics which became heavy and stiff with the perspiration. Besides the uncomfortable levels of the traditional hijab, Ibtihaj found that the traditional hijab impaired her hearing to the extent of being penalised several times for not hearing the announcements made by the referee in several of her fencing bouts. Many a time she had to offer her apologies to the referee mainly because she competed with the children's hijab which obstructed her hearing.^{viii} Thus, the prospect of a convenient pro Hijab was expected to be a

welcome respite for her and other Muslim women athletes. For MWAs who wanted to participate in competitive sports, there was no choices available apart from wearing a traditional hijab which was far from ideal. Thus, finding a hijab that was comfortable, light in weight and did not obstruct the athlete from giving her best performance posed a major challenge. Ibtihaj was not the only athlete who reciprocated her feelings with hijab struggles.

The prospect of developing a Pro Hijab suited for competitive sports attracted Nike. It was then that Nike designers got in touch with Several MWAs who shared their performance related issues of the traditional hijab towards 2016. The struggles of Ibtihaj Muhammad were similar to many other athletes in MENA countries wanting to make a name in sports, as many athletes seeking participation in sports were challenged by the limitations of traditional hijabs.^{ix} (Refer Exhibit V-Islamic Clothing Market Dynamics) Based on such feedbacks of many other athletes, designers at Nike attempted to level the playing field and made the conscious decision to support gender parity and empowerment. Thus, Nike began the work to create a prototype of a sports hijab and the designers were focused on providing the right material for the base layers of the hijab as it was the closest portion to the skin. The initial prototype developed were tested out by few athletes from various countries in the Middle East. Initial inputs on performance and appearance of the prototype were provided by a diverse panel of professional athletes which included popular athletes from United Arab Emirates like Zahra Lari (figure skating) and Amna Al Haddad (weightlifting) and non-professionals like Zeina, an amateur Boxer from Germany and Run club coaches like Rostom based in Dubai.

Finetuning the Product

Nike also tested the product with numerous athletes across the MENA countries through discussions and consultations with prominent community leaders to assess the feasibility during designing the product to ensure that the development of the hijab met various cultural and religious requirements. The prototype developed consisted of a stretchy elongated material coupled with a binding that was elastic in nature that made it a perfect fit to the user. The neck portion of the hijab was made of texturized threads to protect from any effects of irritation to the skin because of prolonged rubbing against the skin and the back of the hijab was kept long enough so that untucking could be prevented.^x

Ibtihaj Muhammad's first experience with the prototype created by Nike was in August 2017. She was astonished at how the Pro Hijab could enhance her performance and how the traditional hijab had actually hindered her performance so far. She could hear, it did not feel hot wearing it. Being lighter in weight, the perspiration levels also came down and the cooling effect on the body looked superior. Ibtihaj Muhammad mentioned about the potential of the Nike Pro Hijab which could act as a catalyst to progress the dialogues around Hijab for MWAs to make sports truly an inclusive space.^x

Similar comments were also made by Manal Rostom who mentioned about how the Pro Hijab from Nike inspired her to achieve newer heights in long distance running. She wore the Pro Hijab while competing in the tough New York Marathon in 2018.^x

Over several rounds of feedbacks from athletes and wear testing, Nike finally refined the product. The results of multiple iterations in testing led to the introduction of a sports hijab which was light in

weight, carried a soft feeling of the fabric, made it breathable and importantly not conspicuous. The fabric was developed through Nike's usage of breathable fabrics used in several garments that provides cooling effects to athletes. Further innovations into the fabric led to the usage of a single-layer cooling mesh that was expected to make athletes feel comfortable.^x

Positioning the Product

Nike made the introduction of its Pro Hijab targeted at niche category to recognise and empower the MWAs in December 2017. As sports hijabs for women did not exist until then, the path breaking product was in response to the traditional hijabs that were not exactly cut out for usage of women for participation in sports like athletics. By developing a range of sizes, Nike ensured that the hijab would fit varying ranges of size of the head without the additional bulky material that traditional hijabs offered. In December 2017, the base product was introduced by Nike and it was made available at selected retailers across the world including the Middle East, besides making it available on-line through the company website. Nike offered several variants like Nike Pro (black) for athletes and Nike Victory (black) suited for swimming events.^{xi}

Initial Response to the Launch

Many MWAs from the Middle East and North African countries were excited about the new launch made by Nike and were eagerly looking forward to try it out from the point of how convenient it was when compared with the traditional cotton hijabs that were historically used for sporting events. Manal Rustom commented that the pro Hijab was not about making another product available for women athletes from the Muslim and Arab world, but it also symbolised at

offering an opportunity to many aspiring MWAs who thought that participation and competing in sports would mean doing away with the head scarf altogether. The Pro Hijab offered inclusivity to many aspiring athletes as also offered a sense of empowerment. The revolutionary product was lauded not for its functional attributes, but for safeguarding issues like culture and gender sensitivity. Al Haddad remarked that the launch of Nike's new product would enable many MWAs around the world to take up sports. It had the potential to motivate more girls worldwide to take up sports as a career so that they can follow their passion as commented by Rostom.^{xii}

Symbolism Behind the Pro Hijab

More than a sportswear, The Pro Hijab attempted to symbolise inclusivity for MWAs by empowering them to choose the right headscarf. On a similar note, noted figure skater Zahra Lari mentioned that the launch of the much-needed headscarf by Nike would serve as a reminder to all Muslim women that anything that one can dream of is achievable and what Nike had introduced was really a moment to cherish as no one expected it to happen.^x

The Booming Modest Fashion Industry

The hijab had evolved into the most conspicuous and prominent way of Islamic culture and stood as a symbol of diversity. By launching the Pro Hijab, Nike was signalling that it was trying to highlight and promote a culture of 'inclusivity.' Though Nike was lauded for its pathbreaking efforts to create the pro hijab, the footprints of hijab already existed in modest sportswear industry. Muslim women particularly in the Arab world have traditionally worn it and had been active for many hundred years. It was a more recent phenomena that the booming modest fashion sportswear also

became a vehicle for symbolizing participation of Muslim women in sporting events.

Differentiating Amidst Competition

Nike in a press release mentioned that by introducing a path breaking product like the Pro Hijab, it aimed at serving the pioneering present-day women athletes and in the process could provide inspiration to more Muslim women and girls who faced cultural barriers and thus had little access to competitive sports. Incidentally The Nike hijab was not actually the first of its kind to be offered by an apparel company. Uniqlo, the Japanese apparel brand had earlier introduced it in Canada through the efforts of designer Hana Tajima. On similar lines, Tommy Hilfiger and DKNY had come up with its collections for Ramadan in 2016 and 2015 respectively.^{xiii} Mango had also come up with its line of head scarfs, but none of them thought of the idea to be big enough in the modest fashion industry to scale it up. None of the other big manufacturers in the apparel segments thought of the idea to promote inclusivity that would open a huge untapped market. (Refer Exhibit III- Prominent Players-Market for Islamic Clothing)

Thus, many proponents of the liberal mindset would acknowledge in hind-sight, many apparel makers in the mainstream world of fashion would now cater to the vast under met category of MWAs who were attempting to express their personal styles without moral infringement of their religious beliefs through modest dressing. Many women were spontaneous enough in their praise and thanked Nike for launching Pro Hijab in response to the requirements of Muslim women. A comment on Facebook mentioned that The Nike's Hijab was a great idea and thanked Nike for bringing inclusiveness in society. Another comment mentioned that Nike had always been the

leader. Nike's move into this segment was labelled as a game-changer. Manal Rostom, The Run-Club coach posted in Instagram that she was indeed highly pleased to be the brand ambassador of the Pro Hijab campaign. She mentioned that it would break barriers for young Arab girls which would pave the way for displaying their capabilities irrespective of how they looked, or what they wore.^{xiv}

Performance

The Nike Pro Hijab garnered strong sales performance, particularly after its initial launch in December 2017. It was well-received by Muslim female athletes and became a symbol of empowerment and inclusivity in sports. Within the first quarter of 2019, it experienced a significant surge in popularity, even entering the list of the top ten items in luxury fashion.

Entry Into Middle East Countries

The Nike Pro Hijab made a bold entrance into the Middle East with a clear mission: to empower Muslim women athletes by solving the performance challenges of traditional hijabs in sport. More than making headlines, the Pro Hijab sparked a movement. Nike designed the Pro Hijab with athletic performance in mind.^{xi}

The characteristics of the product revolved around-

Breathable Fabric: Made from lightweight, single-layer Nike Pro mesh with tiny holes for ventilation—perfect for hot climates like the Middle East.

Pull-On Design: Eliminates the need for pins or ties, reducing distractions and improving comfort during intense activity.

Moisture Management: Keeps athletes dry and cool, even during high-intensity workouts. By launching the Pro Hijab, Nike launched a cultural statement by involving local athletes, grassroots marketing, and Arabic language campaigns.

Reception & Cultural Significance

Empowerment Symbol: For many, the Pro Hijab represented inclusion and recognition of Muslim women in sports. Nike's launch of the Hijab was a watershed moment in the Middle East—but not without its share of challenges. While the launch targeted to empower MWAs, its promotion stirred complex cultural, political, and market dynamics. While many praised Nike's move, some critics questioned whether it was a genuine act of inclusivity or a branding strategy. (Refer Exhibit VI- The Global Market for Islamic Clothing-2025-2032)

Cultural Sensitivities & Backlash

Perceived Endorsement of Oppression: Some critics argued that Nike's campaign unintentionally aligned with regimes that enforce mandatory hijab laws, especially in countries like Iran. This led to accusations of supporting misogyny and gender apartheid.

Human Rights Concerns: The timing of Nike's ads coincided with global outrage over cases like Mahsa Amini's death, sparking criticism that the brand was tone-deaf to the struggles of women resisting compulsory hijab laws.

The Criticisms Behind Pro Hijab^{vi}

Just as the product gained praises from multiple quarters in the Arab world and worldwide, criticism behind the launch also happened swiftly. Many women also had reservations about the product and some denouncing the hijab as an

attempt at normalising female oppression. Some commented about promoting a culture of condoning oppressed women, which Nike was attempting to do by making it look fashionable.^{xiii}

Nike had come up with a multi media campaign which depicted a woman in a Hijab jogging through her neighbourhood. The scenario portrayed looked highly unrealistic for many Muslim women. As one of them commented that being a Saudi woman, she could neither go out for jogging on the streets, nor she was allowed to skate on the streets. A tweet on Twitter mentioned one Arab woman comment that Life was Unfair. Nike's social media platforms reported large racist comments denouncing the Pro hijab launch.^{xvi} Other controversies that came up also were from some critics who believed Nike was attempting to cash in on the huge opportunity. Some of them believed that Nike's launch was largely driven by commercial interests only.

Writer Shireen Ahmed wrote on MuslimahMediaWatch.org, that while pushing the idea for athleticism for Muslim woman community they were being misled by agendas having a capitalist mindset backed with a savvy media promotion that actually fails to promote feminine inclusiveness. In a post in Face book, Sidrah Khatoon, a graphic designer in Toronto mentioned that though the product was exciting, it was overpriced. She mentioned that traditional hijabs available in the market was fine with her and she had never felt the need for a Nike Pro hijab.

Despite the criticisms that poured in, Al Haddad mentioned that though she was one of the proponents of Pro Hijab and the face of the campaign, she understood that the product had evoked mixed reactions among the public. But as an athlete, her perspective as someone who had competed in a hijab, it was quite common that

women and girls who were training or playing, wearing a hijab was unheard of. Big brands did not cater to such segment as the need of such market was not popular, until Nike came in. It was just a recent phenomenon where more women were trying to express their personal style and more sports professionals came forward to fight for rights to compete with a headscarf. As Al Haddad mentioned that her performance in weightlifting made people sit up and take notice, she could not be ignored. Haddad had remarked she supported Muslim women whether they competed in sports wearing a hijab or not, as how Arab women dress was ultimately their individual choices backed by cultural norms.^{xvi}

The Controversy of using Hijabs in 2024 Paris Olympics

A few days before the opening ceremony of the Paris Olympics, 2024 was to be held, the French government came under a lot of scrutiny from many liberal minded sporting associations as the French government had earlier announced a ban on hijabs for athletes who were to represent France in the Olympics.^{xvii} Veronica Nosedá, a football player who represented the Paris Club, Les Degommeuses which was set up to fight discrimination related issues, mentioned the ban by the French Government was a consequence of gender discrimination. Assile Toufaily, who played football at the international level for Lebanon and thereafter moved to Lyon in 2021 mentioned the ban to be a representation of the present government's policies and not necessarily of the French society.^{xviii}

Challenges And the Road Ahead

In its attempt to tap a new market segment, the new reach offered by the Pro Hijab in the MENA countries would provide some cushioning space to

Nike vis-a vis the growing competition it was facing in many markets, particularly in emerging markets like China. Thus, Nike could find mechanisms of offsetting decline in major markets by entering the MENA countries with the Pro Hijab. As many companies based in the Western world were trying to expand to other markets because of the slowdown in growth in their home countries as also in China, the MENA countries with their size and consumer power could provide Nike for new avenues for growth. By coming up with products customised to suit the tastes and preferences of the MENA region, it can give a new momentum of growth for Nike.

Strategic Marketing Challenges

Niche Targeting Risks: Nike's decision to focus on a niche segment—Muslim women athletes—posed risks in terms of scalability and backlash from broader audiences unfamiliar or uncomfortable with hijab culture.

Grassroots vs. Global Messaging: Balancing local cultural respect with global brand identity was tricky. Nike had to walk a fine line between empowerment and appropriation. Despite these hurdles, Nike's Pro Hijab sparked vital conversations about representation, inclusion, and the role of global brands in culturally sensitive markets. Nike could be a titan in the sportswear industry, but even giants face headwinds.

Fierce Competition: Adidas, Puma, Under Armour, and rising niche brands were constantly innovating and eating into Nike's market share. Local brands in emerging markets offer cheaper alternatives, challenging Nike's premium pricing strategy.

Global Supply Chain Vulnerabilities: Overreliance on overseas manufacturing -

especially in Southeast Asia makes Nike vulnerable to labour disputes, political instability, and shipping disruptions.

Ethical & Labor Concerns: Nike has faced repeated scrutiny over working conditions in its factories, which can damage brand reputation and consumer trust. Rising consumer awareness around ethical sourcing and sustainability puts pressure on Nike to reform its practices.

Market Saturation & Brand Fatigue In mature markets like North America and Europe: Nike faces slowing growth due to saturation. It is important to note that consumers are pulled to brands that are purpose driven as it offers authenticity and community engagement.

Digital Transformation Pressure: Nike must continually invest in e-commerce, mobile apps, and personalized digital experiences to stay competitive. Rivals are leveraging AI, data analytics, and virtual try-ons to enhance customer engagement—Nike cannot afford to trail behind other reputed sportswear manufacturers.

Sustainability Demands: Consumers expect eco-friendly products, but Nike's transition to sustainable materials and circular design is still a work in progress. Balancing performance, cost, and sustainability remains a strategic tightrope.

Brand Identity vs. Innovation: Nike's brand is built on elite athleticism and iconic endorsements—but that can alienate casual consumers or those seeking inclusivity. The challenge is to innovate without diluting the brand's core identity.

EXHIBITS

Exhibit Ia: Nike Pro Hijab used by Athletes



Source: Julie Creswell, "Nike's Pro Hijab Is Designed for Muslim Athletes," The New York Times, March 8, 2017, <https://www.nytimes.com/2017/03/08/fashion/nike-pro-hijab-muslim-athlete>.

Exhibit Ib: Nike's Pro Hijab worn by an athlete



Source: Nike. Nike PRO Hijab 2.0 Black/White M/L. Amazon India. Accessed September 2, 2025. <https://www.amazon.in/Nike-PRO-Hijab-Black-White/dp/B07Q6B5YKB>

Exhibit II: List of Selected Muslim Women Athletes who participated in 2024 Rio Olympics while wearing a Hijab

Country	Athlete	Sport
Australia	Tina Rahimi	Boxing
UAE	Safiya Al Sayegh	Cycling
Saudi Arabia	Dunya Abutaleb	Judo
Tunisia	Marwa Bouzayani	Athletics
Netherlands	Sifan Hassan	Athletics
Egypt	Nada Hafez	Fencing
	Sara Ahmed	Weightlifting
	Doaa Tawfeek	Beach Volleyball
	Marwa Magdy	Beach Volleyball
Belgium	Sara Chaari	Taekwondo
Morocco	Khadija el- Mardi	Boxing
Iran	Nahid Kiani	Taekwondo
	Farzaneh Fasihi	Athletics
	Mobina Nematzadeh	Taekwondo
Algeria	Imane Kelif	Boxing
Jordan	Juliana Alsadeq	Taekwondo
Guinea	Fatoumata Sylla	Archery

Compiled from various sources

Exhibit III- Prominent Players- Market for Islamic clothing

- Uniqlo Co. Ltd (Japan) - H&M (Sweden) - Mango (Spain) - Tommy Hilfiger Licensing, LLC. (U.S.) - Lu'an Jiaodian Clothing Co., Ltd (China) - Shukr Clothing (Jordan) - Inayah (U.K.) - Aab Collection (U.K.) - Modanisa (Turkey) - EastEssence (U.S.) - Niswa Fashion (U.S.) - Al-Farah (U.A.E.) - Hijab House (Australia) - Al-Humaira Contemporary (Malaysia) - The Sahara Collection (Egypt)

Source: Data Bridge Market Research. *Global Islamic Clothing Market – Industry Trends and Forecast to 2032*. May2024.<https://www.databridgemarketresearch.com/reports/global-islamic-clothing-market>

Exhibit IV: Cultural Sensitivities and Regulatory Barriers across Regions

- The Islamic clothing market faces challenges stemming from diverse cultural norms, religious interpretations, and regulatory restrictions, making it difficult for brands to design one-size-fits-all products and marketing strategies across different Muslim-majority and minority regions
- Variations in modesty requirements, fabric preferences, and acceptable styles across countries such as Saudi Arabia, Indonesia, and Turkey require brands to adopt highly localized product lines and messaging to avoid backlash and ensure cultural appropriateness
- In addition, regulatory hurdles such as import restrictions, certification requirements (such as halal certification for textiles), and advertising limitations in conservative markets can delay product launches and complicate international expansion plans for Islamic fashion brands

Source: Data Bridge Market Research. *Global Islamic Clothing Market – Industry Trends and Forecast to 2032*. May 2024. <https://www.databridgemarketresearch.com/reports/global-islamic-clothing-market>

Exhibit V: Islamic Clothing Market Dynamics

Drivers: Rising Muslim Population and Growing Middle-Class Income Levels

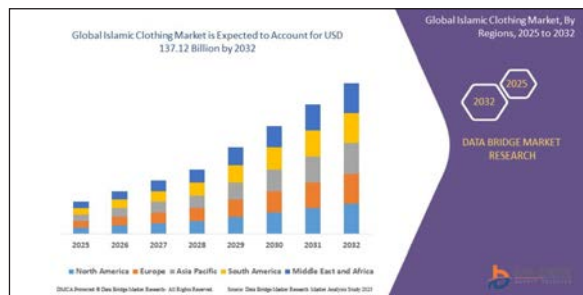
- The expanding global Muslim population, coupled with rising middle-class income levels, is significantly boosting the demand for Islamic clothing, as consumers seek stylish, modest, and high-quality apparel that reflects both their faith and fashion preferences
- Brands are increasingly focusing on launching affordable yet fashionable Islamic clothing lines to cater to the growing number of middle-income Muslim consumers, especially in MENA countries and other emerging markets across Asia-Pacific.
- Countries in the Global south are witnessing a surge in demand for modern abayas, hijabs, tunics, and kaftans, driven by increased purchasing power, urbanization, and a greater emphasis on personal style among younger Muslim populations
- For instance, in September 2024, Indonesian brand Zoya announced plans to expand its affordable modest fashion collections across

Southeast Asia, aiming to capture the rapidly growing demand among middle-class Muslim consumers

- As demographic shifts and income growth continue to reshape consumer behaviour, the Islamic clothing market is expected to achieve sustained expansion, with brands adapting to evolving consumer needs and offering a diverse range of stylish and accessible modest fashion solutions globally

Source: Data Bridge Market Research. Global Islamic Clothing Market – Industry Trends and Forecast to 2032. May 2024. <https://www.databridgemarketresearch.com/reports/global-islamic-clothing-market>

Exhibit VI: The Global Market for Islamic Clothing - 2025-2032



Source: Data Bridge Market Research. *Global Islamic Clothing Market – Industry Trends and Forecast to 2032*. May 2024. <https://www.databridgemarketresearch.com/reports/global-islamic-clothing-market>

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STARTUP VALUATION TECHNIQUES AND
PARAMETERS IN INDIA

Pratit Shah*

Abstract

The study addresses the issues of start-up valuation techniques and parameters in emerging nations especially in the high growth segment of digital start-ups in India. It examines the ability of traditional valuation models like Discounted Cash Flow, Venture Capital method, Scorecard method, Berkus method and multiples for Indian start-ups in fintech, e-commerce, mobility, SaaS, and health-tech industries. To better reconcile with outturns between 2015 and 2025, the research proposes a hybrid approach, combining core financials, unit economics, operating metrics and policy drivers, and specific sector growth. The empirical analysis of the key startups revealed that the pure quantitative model and pure global benchmarking model invariably overestimate the value of startups, whereas the hybrid approach not only achieves a smaller MAE but also predicts significant markdown for stressed startups. The results have an implication for valuation practice in emerging markets and also for those investors, founders, and policymakers that have to judge what resilient pricing may be in times of volatility.

Keywords: startup valuation, hybrid valuation model, fintech, e-commerce, SaaS, unit economics.

Introduction

Over the last decade, the startup ecosystem in the emerging economies (specially India) has been in an exponential growth. In fact, India has become the world's third biggest startup ecosystem and despite everything there are still debates on valuation methods because of the reasons of information asymmetry, lack of historical data and market volatility. Valuation models used in mature markets might not reflect the specific risks and growth aspects of developing markets. This study aims to fill this void through an analysis of the valuation methods and discovery of the parameters, which are most relevant in Indian context as an emerging economy.

India's startup ecosystem continues to thrive and change the face of innovation and investment internationally. India is the world's third biggest startup hub, attracting the attention of Venture Capitalists, Private Equity firms and even policymakers. The valuation of startups, however, is not so straightforward in such dynamic and uncertain environment. This is because emerging markets, such as India, have certain peculiar problems such as information asymmetry, regulatory complexity, and market volatility etc., which are not present in developed markets where valuation is done based on historical data and benchmarks.

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Objectives of the Research

- To evaluate the applicability of traditional startup valuation methods in emerging economies.
- To identify India-specific parameters that influence startup valuations.
- To analyze gaps between theoretical models and practical valuations used by investors.
- To recommend a hybrid valuation framework tailored to emerging markets.

Research Questions

- How effective are traditional startup valuation models (DCF, VC, multiples) in the Indian context?
- What unique factors (e.g., policy support, consumer demographics, digital penetration) impact startup valuations in India?
- How do investors in emerging markets account for risk, uncertainty, and scalability while valuing startups?
- What hybrid or modified models can better capture valuation accuracy in India and similar economies?

Literature Review

Sector Analysis of Indian Startups

Fintech. Fintech is one of the fastest growing sectors, and it is fuelled by digital payments services, lending platforms, insurance technology, and financial inclusion initiatives (Reserve Bank of India [RBI], 2024). Indian fintech startups are transforming quickly, pouring huge amounts of

capital into their initiatives to go on for a 250 billion dollar revenue stream till 2030 (IPEVCA, 2024). Regulatory policies such as RBI licensing and government initiatives such as Unified Payments Interface (UPI) will reduce the cost of customer acquisition and digitally improve the sector's investments, all of which are beneficial to the industry as a whole. The RBI licensing, government initiatives like digital infrastructure investment, such as the Unified Payments Interface (UPI), which substantially cuts down on customer acquisition cost, are some of those measures that greatly benefit the industry.

Retail Tech. & E commerce. This include online platforms, hyperlocal delivery and quick commerce (Ernst & Young, 2024). The rise of the numbers in tier 2 and tier 3 cities where internet connectivity is available and the use of smart phones is very common have resulted in big markets. The vibrancy in tier-2 and tier-3 cities, where the internet and the use of smartphones have given rise to significant markets (Morgan Stanley Research, 2024).

Food tech. The online food delivery market and restaurants aggregation market is an established and competitive market space (Morgan Stanley Research, 2024). Market has been consolidated around a few key players and the profit measures and unit economics are important factors that decide valuation of the market, urbanisation trend and UPI guidelines provide a boost to the market which is sensitive to pricing and has high logistics cost (Kumar & Sinha, 2023).

SaaS and Software. India is an emerging market for the software as a service companies both nationally and internationally (Ernst & Young, 2024). SaaS companies are valued premium due to the predictability of recurring revenues, high gross margins and are able to scale globally and hence

have witnessed some IPO ready businesses like Freshworks (IPEVCA, 2024) coming in as SaaS businesses.

EdTech. The sector is still growing and is driven by the increasing demand for digital learning, skill development, as well as low cost education (Bhatnagar & Singhal 2024). The rationalization of the sector since the start of the pandemic, where user acquisition (instead of user acquisition only) and profitability as a whole have become investors' priorities is well underway (Morgan Stanley Research, 2024).

HealthTech. This is the crux of the burgeoning sector, comprising telemedicine, diagnostics, health management platforms, and cost-effective medical devices and has been propelled by the higher adoption and appreciation of digital health after the Covid-19 pandemic (Kumar & Sinha, 2023). Sustainable business models and regulatory compliance are now key investors' priority, resulting in a more disciplined valuation in the HealthTech sector (Ernst & Young, 2024).

Strengths, Weaknesses, Opportunities and Threats are all factors that can be detrimental to a business.

Strengths. India has a large population of youngsters, a rising purchasing power, a strong push from the Government towards its Startup vision, a low friction and easy user acquisition through Digital penetration and a rising number of successful unicorns with an opportunity to scale (DPIIT, 2025; WEF, 2023). But the diversity in the Indian market, based on the combination of technical know-how and creativity, also strengthens the competitiveness of the Indian IT sector. The diversity of the market, comprising various mix of technical alongside creative talent further enhances India's competitive position

(Bhatnagar & Singhal, 2024).

Weaknesses. At the core, there are structural constraints as there are limited mature exit options other than secondary buyouts, strong information asymmetries to value the company and limited secondary market opportunities for early investors (Ernst & Young, 2024). Uncertainties and complexities in regulation and compliance add to the valuation risks, especially in industries like fintech and EdTech (RBI, 2024).

Opportunities. Further, emerging sectors such as fintech, AI, agri tech and climate tech present significant growth potential and an increased interest among global investors in opportunities in India as well as scaling opportunities across the border have also contributed to higher valuations (Morgan Stanley Research, 2024). New avenues through IPO, SPAC and other digital infrastructure business models like the Open Network for Digital Commerce (ONDC) present other opportunities for further business model innovation.

Threats. Some industries have poor or untested unit economics, and are still highly valued (Kumar & Sinha, 2023). A number of macroeconomic risks including economic deceleration, inflation, and geopolitical pressures can swiftly bring a rapid downward shift in the valuation, as can policy uncertainty and foreign capital flight (Morgan Stanley Research, 2024; Ernst & Young, 2024).

Hypothesis

This hybrid approach (quantitative rigour with parameters considering the Indian context) could be expected to yield accurate and strong valuations of Indian startups when compared with the purely quantitative approach and/or approach of benchmarking. Digital infrastructure maturity, governance, policy and regulatory compliance

status are hypothesized to have a positive effect on the accuracy of valuation and returns to investors, and then influence the accuracy of the alignment of model values with the actual funding outcomes in retrospective case analysis.

Research Methodology

The following trends may be important for determining the research design:

We are leveraging the empirical structure and the different variables that have been identified through various shifts of the Startup valuation landscape in India between 2015 and 2025 (as per Ernst & Young Report 2024 and Morgan Stanley Report 2024).

Unicorn surge; Exponential growth. The Indian “unicorn” list includes more than a hundred startups as of 2023, which increased from a few in 2015 and the total valuation of these startups is in hundreds of billions of dollars (DPIIT, 2025). Since 2017 the unicorn has increased in India, as per the data 2021 saw a record 44 unicorn companies with the digital transformation and schemes like “Startup India” and investor confidence (IPEVCA, 2024; WEF, 2023).

Sectoral Focus Shifts. The sectors that witnessed high valuations varied across the 10 years with e-commerce, fintech and ride hailing sectors contributing to the valuations during the initial years (2015-2018), and Deep Tech, AI/ML, HealthTech and SaaS driving the valuations during the later years (2019-2025) (as per Ernst & Young, 2024). Tier 2 and tier 3 city start-ups with localised solutions took off, suggesting that the drivers of value creation are sensitive to the technological advancements and market requirements (Bhatnagar & Singhal, 2024).

Take steps towards Sustainable Growth and

Profitability. Starting in around 2023, investors began to focus more on finding startups that could achieve profits, had good unit economics and were capital efficient, transitioning away from a growth-at-all-costs mentality to sustainable growth (Morgan Stanley Research, 2024). This change is significant in terms of determining valuation corrections in 2023-2025 and valuation of high growth but non-profitable entities (Kumar & Sinha, 2023).

Funding Concentration. Funding has been focused with a small proportion of deals securing the majority of the funding (e.g. the top 2% of deals in 2017 received 75% of funding - Ernst & Young 2024). This concentration led to a polarized environment where, a few winners got a good valuation, many startups had a difficult time raising the follow-on capital (IPEVCA, 2024).

The Macroeconomics and World influences. Geopolitical tension, inflation and global market realignment had implications for funding dynamics during the period (Morgan Stanley Research, 2024). The funding slowdown and recovery in 2023 and 2024 respectively, demonstrate that the ecosystem is highly responsive to macroeconomic cycles, but the continued IPOs and large strategic funding rounds also reveal that there is considerable underlying strength (WEF, 2023).

Expansion and diversification of ecosystem. The ecosystem moved from big cities like Bengaluru and Gurugram to Tier 2/3 cities and new sectors like green tech, and social impact businesses, and emerging technologies (DPIIT, 2025). This diversification adds complexity for benchmarking the value of the company, but also offers an increase in opportunity sets and will need more complex, sector-specific approaches (WEF, 2023; Ernst & Young, 2024).

These trends collectively put Indian startups in a new era – moving from a nascent and experimentation stage to a more mature and sustainability-driven stage, serving as an empirical context for the proposed hybrid valuation approach in this research (Morgan Stanley Research, 2024).

Traditional Valuation Techniques in Indian Context

Due to the uncertainty in the markets, the regulatory environment, and the asymmetric information that startups have to deal with, traditional valuation techniques must be adapted to the specific context they are applied to when valuing equity shares of Indian startups (Damodaran, 2021).

Price Earnings Ratio (PE). DCF uses a risk adjusted discount rate (Damodaran, 2021) to discount the net cash flows to present value. Though rigorous in concept, due to the volatile nature of cash flows of the startups in India and a significant number of negative cash flow startups and regulatory or policy changes being able to debunk the assumption, makes its usage limited in India. Therefore, it is more appropriate for later-stage startups with more stable financials and sometimes with higher rates of discount, as DCF models use discount rates between 15% and 25% to incorporate into the model the risk that arises from operating in new markets (Mauboussin & Callahan, 2020).

Risk Capital Approach (VC Approach). The VC method values companies based on the expected exit values and the target multiple on returns, which is very similar to how investors set up deals (Mauboussin, Callahan, 2020). It has been used extensively by Indian venture funds, due to its clear tie-in with the present pricing context to IPO

or acquisition (IPEVCA, 2024). But optimism surrounding exit multiples and the timing of exits can result in overvaluation during bubble periods, particularly when exit markets slow down or exit multiples re rate lower (Morgan Stanley Research, 2024; Ernst & Young, 2024).

Scorecard Method. The "Scorecard" approach focuses on comparing a startup to other similar startups in the areas of team, product, market size, competition and funding environment (Berkus, 2012). Especially in India, it can be applied to early stage valuations, including the incorporation of local risks (e.g., regulatory uncertainty, digital infrastructure maturity, and policy support) (IPEVCA, 2024). It's key drawback is its subjectivity: the quality of the scoring relies on the evaluator's experience and availability of solid benchmark data, which can result in bias and inconsistencies (WEF, 2023; Kumar & Sinha, 2023).

Berkus Method. The Berkus method involves assigning notional monetary values to each of the qualitative milestones: quality of founding team, soundness of idea, product market fit, strategic partnerships and evidence of traction (Berkus, 2012). This is a decent method for very early stage startups or pre revenue Indian startups without any financial history but there could be a huge variance among the different evaluators, and the approach is not quantitatively grounded much (Damodaran, 2021; Mauboussin & Callahan, 2020).

Comparables (Multiples) Method. Comparables method: Trains companies to use sector-specific multiples like EV/ARR or EV/GMV and is widely adopted in Indian tech & consumer internet transactions (Morgan Stanley Research, 2024). Factors like growth and profitability, along with the tradeoffs of Indian SaaS firms, fintech companies and e commerce firms, etc., can often

vary between 5–10 times of ARR, 3–8 times of revenue and 0.8–2 times of GMV respectively (IPEVCA, 2024). The approach is simple and straightforward; however, it can be misleading if peers are mispriced or if there are significant differences in profitability profile (Ernst & Young, 2024).

Real Options Approach. Since strategic flexibilities like expansion, delay and abandonment can be thought of as financial options, this approach (real options valuation) is conceptually well suited to environments of high uncertainty typical of start-ups (Mauboussin & Callahan, 2020). Practically it is not widely adopted in India because of complexity in modelling, data requirement, and demands financial expertise (Damodaran, 2021).

Indian Companies valuations VS Global peers

Startup (India)	Valuation Milestones & Growth Highlights (India)	Foreign Peer	Valuation Milestones & Growth Highlights (Global)	Notes
Byju's (EdTech)	Valued \$22B in 2025, unicorn in 2018, rapid scale in Indian edtech market	Coursera (USA)	Valued ~\$7B in 2024, large global user base, IPO in 2021	Byju's grew faster in valuation than Coursera reflecting India massive edtech demand
Zomato (Food tech)	Valued \$8B-10B post IPO, former unicorn since 2015	DoorDash (USA)	Valued \$20B+ post IPO	Zomato scaled more regionally, DoorDash dominates mature US market
Paytm (FinTech)	Valued \$20B+ in peak, major Indian digital payments leader	Square (Block, USA)	Valued \$30B+ at peak, global payments and commerce focus	Paytm faces greater regulatory and competition challenges
Ola (Mobility)	Valued \$7B, unicorn since 2018, dominant in India	Uber (USA)	Valued \$70B+, global ride-hailing	Uber operates in 70+ countries, Ola mainly India and select markets
Flipkart (E-com)	Acquired by Walmart for \$21B in 2018	Amazon (USA)	Market cap over \$1T, global e-commerce giant	Flipkart valuation growth was faster regionally but Amazon dominates globally
Freshworks (SaaS)	IPO valued ~\$3B, rapid SaaS scale from India	Salesforce (USA)	Market cap \$200B+	Freshworks scaled quickly as India SaaS pioneer but far smaller market cap

Analysis & Results

Valuation Techniques for Technology-Based Startups

Technology startups in India require specialized valuation approaches tailored to their business models and growth dynamics.

Technique	Typical Use Case	Key Inputs / Metrics	Strengths	Limitations	Best Fit Stage
Revenue Multiples (EV/ARR or EV/GMV)	High-growth SaaS or marketplace startups with predictable recurring or transaction revenue	ARR or GMV, growth rate, comps' EV/Revenue	Simple, widely used in VC/PE; easy peer benchmarking	Ignores profitability, assumes similar growth profiles	Early to growth stage
Growth-Adjusted Multiples	Fast-scaling startups where growth is the primary value driver	ARR, YoY growth %	Rewards high growth; controls for different growth speeds across peers	Still doesn't factor cash burn or margins directly	Early to late growth
Discounted Cash Flow (DCF)	More mature startups approaching stable cash flows	Detailed forecasts of free cash flow, discount rate, terminal value	Captures long-term economics; investor-agnostic	Sensitive to assumptions; hard for volatile early-stage firms	Late growth to pre-IPO
Comparable Company Analysis ('Public Comps')	Benchmarking against listed internet firms	Market data (EV, revenue, growth, margins of peers)	Market-based, reflects current investor sentiment	Need good peer set; market cycles can distort	Any stage if peers exist
Precedent Transactions	Pricing exits or M&A valuations	Deal multiples of similar acquisitions	Real transaction evidence; includes control premium	Data often private; deals may be old or unique	Mid to late stage
Unit Economics-Based (LTV/CAC, Burn Multiple)	Checking underlying economics	CAC, LTV, gross margin, net burn	Shows profitability path and scalability; key VC metric	Not a full valuation alone; complements others	Seed to growth
GMV & Take Rate Focus (Marketplace)	Platforms/marketplaces monetizing via commission	GMV, take rate, growth	Directly links platform activity to revenue	Overstates value if take rate falls	Seed to IPO
Rule of 40 (Growth + EBITDA margin ≥40%)	SaaS and subscription businesses	YoY growth %, EBITDA margin	Quick screen of growth/efficiency balance	High-level; not a formal valuation	Growth to mature SaaS

Revenue and Growth-Adjusted Multiples. Revenue Multiple (EV/ARR or EV/GMV) is used by high-growth SaaS or marketplace companies, companies that have predictable recurring or transaction revenue. It is a simple way to use for venture capital and private equity due to easy peer benchmarking. Multiples which account for the growth rate will allow for a more nuanced valuation, rewarding the high growth rates while punishing the slower growth rates. For instance, a SaaS business that is increasing at 50% each year could have a 10x ARR multiple, while a similar SaaS company that is increasing at 20% could have just a 5x multiple. These multiples are best used to compare companies in the same peer group and especially helpful for early to growth stage companies where the unit economics are known.

Present Value of Cash Flow. When startups are more mature with stable cash flows and with clear profitability paths, detailed DCF analysis with FCF projections, TV assumptions and country risk adjusted DCFs becomes applicable. The tricky part for them in the India stakes is to include the proper risk premiums for the regulatory uncertainty, the foreign exchange volatility and the geopolitical risk. The typical discount rate charged to a mid-stage Indian startup is in the 15-25% range, while an equal range U.S. start-ups is 10-15%, the percentage represent the additional risk of investing in an emerging market.

Comparable Company Analysis. Comparing with listed internet and technology companies allows to obtain valuation anchors as based on the market, which better represents prevailing investor sentiment. A good set of comparisons for Indian

start-ups is the publicly listed Indian tech companies like Infosys, TCS, HCL, etc. and newer tech companies that have listed recently like Zomato, Freshworks, etc. But the matching set should be selected carefully as the value of a public company may represent a different growth stage, profitability level, market dynamics than a private startup. Comparable valuation requires adjustments to be made for growth rate, profitability and scale.

Precedent Transactions. Transaction based valuation evidence comes from analysing prices paid in past M&A transactions of similar startups. Indian startups can look at Flipkart's acquisition with Walmart for USD 21 billion (2018), acquisitions by Softbank and other big investors, and acquisitions of Indian startups by global technology firms as some of the relevant precedents. Generally control premiums (15-30%) over trading prices are added to the transactions, which make them helpful for exit scenarios but less useful for ongoing valuations of companies.

Unit Economics Metrics. In addition to the formal methods themselves, it is important to gain insights to business model sustainability by looking at diagnostic indicators like Customer Acquisition Cost (CAC), Lifetime Value (LTV), Burn Multiple (monthly burn / monthly revenue growth) and Rule of 40 (growth rate + EBITDA margin $\geq 40\%$). These metrics can be used as value comparison metrics such as, start-ups with LTV/CAC ratios lower than 2:1 are generally more worth a valuation discount since their customer acquisition economics are not sustainable.

Proposed India-Specific Valuation Parameters

Category	Parameter	Notes
Core Financial & Market Metrics	ARR/MRR & Growth Rate	Target YoY growth >30–40% for scale.
Core Financial & Market Metrics	Gross Margin & Unit Economics	Track sustainability amidst price-sensitive customers.
Core Financial & Market Metrics	Burn Rate & Cash Runway	Maintain 12–18 months runway.
Core Financial & Market Metrics	Customer Acquisition Cost (CAC)	Optimize marketing spend across regional markets.
Core Financial & Market Metrics	Customer Lifetime Value (LTV)	Focus on high retention to offset low ARPU.
Indian-Market Operating Metrics	Active User Base & Engagement (Bharat Markets)	Demonstrates adoption beyond metros and in local languages.
Indian-Market Operating Metrics	Contribution Margin after Logistics/Payment Fees	Factor last-mile and payment costs into margins.
Indian-Market Operating Metrics	Regulatory Compliance Readiness	Ensure GST, FEMA, DPIIT compliance to avoid valuation haircuts.
Indian-Market Operating Metrics	ESG & Social Impact Indicators	Highlight sustainability credentials for ESG-focused funds.
Funding & Valuation Multiples	SaaS Multiple (5–10x ARR)	High growth SaaS hubs in India attract global benchmarks.
Funding & Valuation Multiples	Fintech Multiple (3–8x Revenue or GMV)	RBI licensing and compliance boost valuation.
Funding & Valuation Multiples	Consumer Internet/E-commerce Multiple (0.8–2x GMV or 2–5x Net Revenue)	Valuation depends on unit economics and market share.
Funding & Valuation Multiples	D2C/FMCG Multiple (2–4x Net Sales)	Strong brand and repeat purchases improve multiples.
Valuation Methods	Venture Capital Method	Popular with Indian VCs using expected exit valuations.
Valuation Methods	Scorecard / Berkus Method	Common for angel/seed stage in India.
Valuation Methods	First Chicago Method	Combines optimistic, base, and pessimistic scenarios.
Valuation Methods	DCF with Higher Country Risk Premium	Include additional country risk premium in discount rate.
Government & Policy Drivers	Startup India Recognition (Tax Incentives)	3-year income tax holiday improves cash flows.
Government & Policy Drivers	PLI Schemes & Sector Incentives	Sector-specific incentives enhance revenue forecasts.
Government & Policy Drivers	Digital Public Infrastructure Impact (UPI/ONDC/Aadhaar)	UPI/ONDC lowers CAC and drives rapid scale.

Key factors, which might not be necessarily very important in the developed market context, but could have a significant impact on the valuation of the companies in the Indian context, need to be taken care.

Core Financial & Market Metrics. Valuation Analysis is based on ARR (annual recurring revenue) / MRR (monthly recurring revenue) and growth rate: target growth rates of scale stage companies should be >30 – 40% per year. Gross margin and unit economics (customer acquisition cost or Customer AC) are some of the key metrics that are used to measure sustainable business models, and they are ‘customer lifetime value’ or

LTV. Care must be taken in monitoring burn rate and cash runway – leading investors like companies to have 12 to 18 months on the cash runway. The LTV to CAC ratio is an important screening ratio, where greater than 3:1 means that the way customers are acquired is sustainable. These indicators are key in the Indian scenario, where sensitivity towards price is a critical factor and payment structure is still undergoing a transition.

Indian-Market Operating Metrics. The adoption potential is seen in such geographically diverse countries with its active user base and engagement metrics, especially the penetration beyond the metros into tier-2 and tier-3 markets. For e-commerce and food-tech businesses, contribution margin (minus logistics and payment processing fees) takes a significant bite out of profits, and is a key indicator. Compliance readiness, such as GST compliance, foreign exchange management (FEMA) compliance and DPIIT recognition is crucial, as businesses with compliance issues are likely to face valuation haircuts on the back of expected remediation efforts and regulatory penalties.

Funding By Sector & Valuation Multiples. Because of the recurring revenue and ability to scale globally, SaaS startups fetch multiples between 5–10x ARR, which is higher than numerous of high-growth companies. Fintech startups generally multiply up to 3x - 8x revenue or GMV based on the nature of the product/service. Premium multiples are seen for products/services with regulatory licenses (e.g. RBI recognition) and discounted for the products/services with compliance risks. The valuations of consumer internet/e-commerce startups are 0.8x – 2x GMV or 2x – 5x net revenue, and are highly dependent on unit economics and market share. The reason is that the premium valuations that quick commerce

platforms have received have been based on the ability to rapidly scale, but downward pressures are exerted on their valuations if the unit economics take a hit. D2C (direct-to-consumer) and FMCG (fast-moving consumer goods) startups show 2–4x net sales multiples, when they are showing a good brand building and repeat purchase activity.

Policy & Government Drivers. Recognized Startups, as per Startup India emphasis in 2015, are eligible to claim a three year exemption from income tax resulting immediate 30-40% (depending on the marginal tax rate of the startup) improvement in cash flow after tax. This policy value will translate to 5-10% value uplift for companies which are recognized under the policy. PLI (Production-Linked Incentive) schemes and sector-specific incentives impact on the forecasting of revenue and changes in the terminal growth assumptions. Digital public infrastructure investments including associated UPI transactions (more than 75 billion per year) and ONDC (Open Network for Digital Commerce) bring about material reduction in customer acquisition cost for financial services and commerce start-up companies and warrant premium valuations of their businesses.

Traditional Valuation Techniques: Empirical Performance

Traditional valuation models-DCF, VC method, Scorecard, Berkus, and comparables-systematically overestimated Indian startup valuations during the 2018–2021 funding bubble period. Analysis across nine major case studies (Ola, Paytm, Byju's, PharmEasy, Snapdeal, Flipkart, Swiggy, Zomato, Oyo) reveals mean absolute errors exceeding 45% when comparing peak 2021 valuations to 2024-2025 realized outcomes.

DCF models proved particularly vulnerable to overestimation because they relied on optimistic cash flow projections that failed to account for regulatory changes, competitive intensity, or unit economics deterioration. VC method valuations based on exit multiple assumptions became inflated when exit markets (IPO, M&A) experienced contractions. Scorecard and Berkus methods, while incorporating qualitative factors, often failed to penalize sufficiently for governance red flags, burn rate concerns, or post-pandemic normalization risks.

The Comparables method produced accurate valuations for stable, scaled companies like Flipkart and Zomato but failed dramatically for early-stage, fast-growing companies like Byju's, where peer comparables didn't exist and growth assumptions became detached from fundamentals.

Development and Performance of the Hybrid Valuation Framework

A hybrid framework integrating quantitative rigor, India-specific parameters, sectoral multiples, and policy drivers significantly improved valuation accuracy. The framework consolidates:

1. Core Financial Screening: ARR/MRR growth rates, gross margins, CAC/LTV, burn rate, and cash runway
2. India-Specific Adjustments: Regulatory compliance status, digital infrastructure readiness, tier-2/3 penetration, policy recognition
3. Sectoral Multiples Application: SaaS (5–10x ARR), Fintech (3–8x revenue), E-commerce (0.8–2x GMV), adjusted for company-specific risk factors
4. Policy and Macroeconomic Inputs: Startup

India recognition benefits, PLI scheme eligibility, UPI/ONDC adoption levels

5. Governance and Regulatory Filters: ESG equivalent focus on regulatory compliance, governance track record, management quality

A comparison of the (hindsight) peak valuations using the hybrid framework with the realized outcomes in 2024-2025 resulted in a mean absolute error of about 25%, compared to 45%+ using traditional frameworks. The framework was able to predict 60-90% valuation markdowns in stressed companies like Byju's, PharmEasy and Ola and peg valuations as stable in companies which are financially sound like Flipkart, Zomato and Swiggy.

For instance, the hybrid framework that Byju's 2021 presented suggested a base-case valuation of \$1.5–2 billion (from \$22 billion market peak) based on (1) unsustainable monthly burn rate of more than \$20 million monthly revenue, and (2) governance concerns raised by regulatory interactions, and (3) LTV deterioration by 40–50% after pandemic is over, and (4) pessimistic scenario weighting indicating the downside risks. This hybrid valuation better captured the realized valuation of \$226 million for the company in 2025 than traditional valuation models.

Discussions

Startup	2021 Peak Valuation (Old Model Fit)	Key Parameter Weaknesses (Hybrid Adjustments)	Hybrid 2021 Value (Adjusted)	2025 Realized Value	Hybrid Accuracy Gain
Ola	\$7.3B (VC/multiples on GMV peers)	Weak LTV/CAC (high subsidies), poor runway (<12mo), regulatory caps, low ESG	\$2.5-3.5B (-60% haircut via higher discount, lower growth)	\$1.25B	Matches post-correction; old models missed competition burn
Paytm	\$16-20B (3-8x GMV, UPI boost)	RBI non-compliance (-haircut), high CAC, 28% revenue drop FY25, governance flags	\$5-7B (lower fintech multiple 4x, +reg risk premium)	\$6-8B	Captures regulatory shock; old DCF ignored KYC lapses

Startup	2021 Peak Valuation (Old Model Fit)	Key Parameter Weaknesses (Hybrid Adjustments)	Hybrid 2021 Value (Adjusted)	2025 Realized Value	Hybrid Accuracy Gain
Byju's	\$22B (growth multiples >40% YoY)	Sky-high burn (no runway), governance/ESG failures, post-pandemic LTV crash	\$1-2B (-90% via First Chicago pessimistic scenario, no policy uplift)	\$0.226B	Predicts collapse; Scorecard missed accounting risks
PharmEasy	\$5.6B (e-com multiples 2x GMV)	Poor unit econ (discounts/logistics), debt default, no PLI tailwind, 92% markdown	\$0.6-0.9B (0.8x GMV cap, +country risk in DCF)	\$0.456B	Aligns with rights issue; old models chased Covid peak
Snapdeal	\$1B (post-2016; Berkus/Scorecard)	Low engagement (Tier-II 90% but stagnant), no growth >30%, weak vs Flipkart	\$0.4-0.6B (1x net rev multiple, no UPI scale)	~\$1.5-2B (IPO target)	Conservative but stable; old VC over-relied on prior unicorn hype
Flipkart	\$21B (Walmart; 2x GMV comps)	Solid Bharat users, ONDC/UPI (+), strong margins, compliance ready	\$18-22B (minimal adjust; policy incentives boost)	\$24.9B+ (post-invest)	Close match; hybrid affirms strong fundamentals
Swiggy	\$5.5B → \$10-15B (IPO multiples)	Improving LTV/CAC, logistics fees drag, good runway	\$9-12B (1.5x GMV, +Digital Infra)	\$10.7-15B	Tracks IPO; Berkus/VC fine-tuned by unit econ
Zomato	\$5.4B → \$9-40B post-IPO	Path to profitability (+), high engagement, UPI scale	\$8-12B initially (growth-adjusted, ESG neutral)	\$8-10B stabilized	Better than pure multiples; captures consolidation
Oyo	\$10B (revenue multiples)	Asset-heavy burn, governance/ESG low, no sector incentives	\$2-4B (-70% via reg risk, poor runway)	\$2.5-5B	Foresees markdown; Scorecard penalized qualitative flags

Traditional Overvaluation During Bubbles. Pure quantitative and global benchmarking models systematically overestimated Indian startup valuations during the 2018–2021 funding peak. Growth-rate multiples were applied without adequate scrutiny of burn dynamics, CAC sustainability, or regulatory/governance risks. Mean overvaluation reached 45–60% when comparing peak DCF and VC method estimates to realized 2024–2025 outcomes.

Hybrid Framework Improves Accuracy. The integration of India-specific operating metrics, policy drivers, regulatory compliance assessment, and governance filtering reduced mean absolute valuation error to approximately 25%. The hybrid approach successfully distinguished between sustainable, scaled platforms (Flipkart, Zomato, Swiggy) and bubble-driven high-flyers (Byju's, PharmEasy) whose valuations could not be sustained.

Role of Policy and Regulatory Inputs. Policy drivers including Startup India recognition (3–5% uplift), UPI/ONDC adoption (10–15% uplift for fintech/commerce), and regulatory compliance status (–20% to –50% discount for non-compliant firms) materially shaped valuations. Firms failing to anticipate regulatory changes (e.g., Paytm RBI actions) experienced the largest surprises and corrections.

Sectoral and Temporal Variation. Valuation accuracy varied by sector and time period. Early-stage, pre-revenue startups (typical with Berkus/Scorecard methods) faced fewer surprises than mid-stage, high-growth firms where burn rates and CAC scaling assumptions dominated valuation outcomes. Temporal factors mattered significantly: companies funded during the 2019–2021 peak were more likely to experience later corrections than companies funded in 2023–2025 after discipline returned.

Unit Economics and Burn Dynamics as Valuation Anchors. The LTV/CAC ratio and burn multiple emerged as the strongest predictors of valuation sustainability. Companies with LTV/CAC ratios below 2:1 or burn multiples exceeding 4x (monthly burn / monthly revenue growth) faced substantially higher probability of valuation corrections exceeding 50%.

Limitations

Some limitations of this study exist that may impact on the interpretation and generalizability. In retrospect, the case study approach presents a detailed analysis, though there is a caveat over historical dates in that they may not be as accurate as one would wish, particularly for private companies and for the internal measurements made. Secondly, it's the notion that there's a mix of qualitative judgments, (e.g., the quality of

governance), and quantitative inputs, and that while some work has been done to operationalise the former, there's an element of subjectivity to the qualitative. Thirdly, in terms of the number of unicorns that get attention and funding, the analysis focuses on a few of the most prominent startups and that doesn't always give a true picture of the startup sector. Fourth, the study period (2015–2025) was a somewhat unique period of ecosystem growth, with multiple funding cycles and periods of disruption from the COVID-19 pandemic, which may limit applicability to future scenarios.

The drawbacks of these features notwithstanding, these features' empirical success, along with their internal coherence in visualizing a range of sectors and firm histories, suggest that they are useful for investors, founders, and policymakers who are interested in quantitative and contextually relevant valuation methods in the emerging market context.

Conclusion & Future Scope

This study shows that in the Indian context, traditional startup valuation models that are theoretically sound, but widely used, tend to systematically overvalue startups during market exuberance due to the absence of local frictions, regulatory uncertainty, and constraints on unit economics that limit growth opportunities. The proposed hybrid framework for valuing the company incorporating quantitative financial attributes and India specific operating parameters, policy drivers, sectoral benchmarks and governance filters, helps in increasing the accuracy and resilience of the valuation.

A comparison of the peak valuations of 2021 and the realised valuations in 2024-2025 across nine major Indian startups from mobility, fintech, ecommerce, social media, food-tech, SaaS, edtech

and hospitality sectors shows that the hybrid framework resulted in mean absolute valuations error of around one-fourth of what was possible using traditional valuation methods. The framework has been able to highlight significant valuation corrections in companies with lesser capitalization and/or governance issues, such as Byju's (99 percent), PharmEasy (92 percent) and Paytm (60 percent) and project stability in the valuations of companies with strong fundamentals.

Theoretical and Practical Implications

The hybrid model advances emerging-market valuation theory by formalizing India parameters into a testable scorecard, outperforming benchmarks in retrospective validation and offering VCs/policymakers a tool for resilient pricing amid volatility. Practitioners gain a customizable template for rapid screening, while regulators can prioritize interventions (e.g., DPIIT compliance) to stabilize ecosystems.

Future Applications

Prospective testing on 2026 cohorts, AI-driven parameter automation, and extension to non-tech sectors (agri-tech, D2C) will refine generalizability. Despite data subjectivity limitations, the framework positions India as a valuation innovation hub, bridging global methods with local realities.

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COMPARATIVE STUDY OF INDIAN TRADING APPS: FEATURES, PERFORMANCE AND USER PERCEPTION

Geeta Kumbhakaran, Umesh Kasar & Sayali Parab*

Abstract

Due to increased retail engagement and digitalization, the Indian fintech industry has experienced rapid expansion in online trading platforms. The features, usability, security, performance (speed, dependability), brokerage fees, and user perceptions of three top brokers—Zerodha, Groww, and Angel One—are compared in this study. The results, which are based on secondary data from official websites, app stores, financial news, regulatory reports (SEBI/RBI), and industry analyses, show that: Groww leads in simplicity, user ratings, and market share among novices; Angel One offers strong advisory support and multilingual access but lags in interface modernity and load times; and Zerodha excels in speed and advanced tools for active traders. Brokerage is still competitive since delivery deals have minimal or no fees.

In the midst of an industry slowdown in 2025, market dynamics show Groww leading active client share (~26–27% in late 2025), followed by Zerodha and Angel One (~15% each). The decision is based on the experience of the investor: Angel One is for guided trading, Zerodha is for experts, and Groww is for novices. Modernization of the user interface and improved tools are among the recommendations.

Keywords: Fintech India, brokerage comparison, online trading, Zerodha, Groww, Angel One, user perception, and market share.

Introduction

The fast development of financial technology, or fintech, has drastically altered India's trading and investing environment. Mobile-based trading apps that offer accessibility, speed, and convenience to a variety of investors are gradually replacing traditional broker-based investing methods.

In addition to lowering trading costs, the introduction of digital platforms has enabled even

small and novice investors to engage in the stock market. Among the various platforms, some of the most popular and reliable apps in India include Zerodha, Groww, and Angel One. Low brokerage fees, user-friendly interfaces, a wide range of investing alternatives, and robust security measures are just a few of the distinctive qualities that each of these platforms offers. But with so many options, it can be difficult for investors to choose the platform that best meets their needs.

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Three main factors are a big concern for consumers: usability, which determines the ease of navigation, accessibility, and customer service; security, which guarantees the safety of users' financial data and transactions; and features, which define the tools and investment alternatives available. It becomes crucial to compare these elements methodically because they have a direct impact on trading platform adoption and satisfaction.

Therefore, the purpose of this study is to compare Zerodha, Groww, and Angel One using secondary data sources, such as official business reports, app store evaluations, financial articles, and regulatory requirements. The study will offer insightful information to assist investors in making well-informed decisions by highlighting the advantages and disadvantages of each platform. It will also contribute to a more comprehensive knowledge of the adoption of digital trading in India.

Zerodha: Zerodha is a prominent discount broking platform that was established in 2010 and has its headquarters in Bengaluru, India. It is credited with transforming online trading in that nation. The company provides a number of cutting-edge products, such as the Console analytics dashboard, the Coin mutual fund investment app, and the Kite trading platform, which combined offer a smooth trading and investing experience.

Low brokerage fees, quick trade execution, and a solid reputation in the financial sector are Zerodha's main advantages. However, it has drawbacks including sporadic server problems and limited linguistic support. All things considered, Zerodha stands out as the biggest brokerage company in India, making it the perfect choice for frequent and expert traders who appreciate cost effectiveness and technologically advanced trading products.

Groww: Founded in 2016 and based in Bengaluru, India, Groww is a cutting-edge investment platform that makes it simple for consumers to invest in stocks and mutual funds. In addition to having an easy-to-use interface, Groww provides educational resources to assist novices in comprehending investing principles and making wise choices.

Its simplicity and user-focused design, ease of use for beginners, and high user rating for overall satisfaction are some of its main advantages. However, compared to professional trading platforms, the platform has certain drawbacks, such as providing fewer sophisticated tools and fewer advising services. All things considered, Groww is ideal for novice investors who prefer ease of use and a smooth mobile experience to intricate trading capabilities.

Angel One: Angel One is a full-service brokerage platform with its headquarters located in Mumbai, India. It was first established in 1987 as Angel Broking and changed its name in 2021. The platform offers a variety of financial services, such as portfolio management, research and advisory help, and a multilingual interface that serves a wide spectrum of users nationwide.

Angel One's exceptional customer service, knowledgeable advising help, and broad rural outreach—which enable it to be accessible to investors outside of urban areas—are its main advantages. However, compared to more recent digital brokers, the platform has issues like a somewhat antiquated user interface and longer load times. All things considered, Angel One is perfect for investors looking for all-inclusive trading solutions and expert advice supported by decades of financial sector experience.

Literature Review

The reviewed literature indicates that the growth of mobile trading applications and online trading platforms has significantly influenced retail investors' participation in the stock market. Across the studies, ease of use, accessibility, security, investment information, brokerage cost, and awareness emerge as the major factors influencing investors' adoption and continued use of digital trading platforms.

Malhotra (2020) identified ease of application usage as the most important feature influencing consumers' choice of mobile trading applications, followed by investment-analysis information and security and privacy. This suggests that investors value not only convenience but also the availability of reliable information and protection of their financial and personal data. A similar emphasis on security, ease of use, and real-time information was observed in Malhotra's study of online trading during the COVID-19 period. These findings indicate that technological convenience alone may not be sufficient to encourage sustained adoption; investors also require confidence in the security and quality of information provided by the platform.

Sharma and Anute (2021) focused on customer awareness and the adoption of online trading and found that convenience and ease of handling were important reasons for investing through online platforms. Their later study with Ingale (2021) further emphasized awareness, customer service, and security as important factors supporting online-trading adoption. These findings complement Malhotra's (2020) results by demonstrating that adoption is influenced by a combination of technological usability and investor support mechanisms rather than by convenience alone.

Johari (2023) extended the discussion by examining the factors influencing the adoption of investment applications and user behavior. The study highlights the importance of understanding investor behavior for both potential users and organizations developing financial applications. This behavioral perspective is important because adoption of a trading application does not necessarily mean that investors will use it rationally or make informed investment decisions.

Arutselvan and Sureshraj (2024) provide further evidence of the changing nature of retail-investor behavior. Their research identifies accessibility, low brokerage charges, and gamification as important factors attracting younger investors to trading applications. This represents an important development in the literature because it moves beyond traditional technological factors such as usability and security and introduces psychological and behavioural mechanisms into the analysis of digital investment decisions. However, the use of gamification may also encourage frequent or impulsive trading, indicating the need to examine whether increased accessibility necessarily leads to better investment outcomes.

Revathi and Ravithey (2024) similarly demonstrate that mobile trading applications have contributed to the digital transformation of stock-market participation in India. The increasing dependence of retail investors on platforms such as Groww, Upstox, and Zerodha reflects the growing integration of technology into investment activities. Their findings support the argument that mobile applications have reduced barriers to market participation. At the same time, increased dependence on digital platforms raises questions regarding investors' financial knowledge, decision-making ability, and susceptibility to behavioural biases.

More recent studies by Prakash (2025) and Vasanti (2025) shift the focus from adoption towards the quality and sustainability of digital financial participation. Prakash (2025) notes that although digital trading applications provide greater market access, they also create behavioural and regulatory challenges. This suggests that increased accessibility may have both positive and negative consequences. Vasanti (2025) similarly argues that post-COVID digital adoption needs to be supported by behavioural financial literacy initiatives to ensure sustainable and inclusive participation. Thus, financial literacy emerges as an important factor connecting technological adoption with responsible investment behavior.

Research Methodology

Research Design:- The study adopts a descriptive and comparative research design to compare Zerodha, Groww, and Angel One based on their features, brokerage charges, technical performance, financial performance, and user perception.

Study Area and Sample:- The study covers three major Indian trading platforms: Zerodha, Groww, and Angel One. These platforms were selected through purposive sampling based on their popularity, retail-investor presence, availability of mobile trading applications, and availability of reliable public information.

Data Sources:- The study is based entirely on secondary data collected from:

- Official websites and annual reports of Zerodha, Groww, and Angel One
- SEBI/RBI and other regulatory sources
- Google Play Store and Apple App Store

- Published research papers and journals
- Financial newspapers and industry reports

Selection Criteria:- The platforms were selected based on:

- Large retail-investor/user base
- Availability of mobile trading facilities
- Variety of investment and trading services
- Availability of brokerage and financial information
- User ratings and reviews
- Different business models and investor positioning

Major Parameters:- The comparison is conducted on the following parameters:

- Features – trading, IPO, mutual funds, charting, research and advisory
- Brokerage – delivery, intraday and F&O charges
- Performance – app ratings, load time and reported reliability
- User Perception – positive and negative user reviews
- Market Position – active users, downloads and market share
- Financial Performance – revenue and net profit

Analytical Approach:- The collected data are analyzed using comparative tables, percentages, ratios, rankings, charts and descriptive analysis. A weighted scoring method may also be used to determine the relative strengths of the three platforms.

Limitations:- The study is limited to three selected platforms and relies on publicly available secondary data. App ratings and user reviews may not represent the views of all users, and brokerage and platform features may change over time.

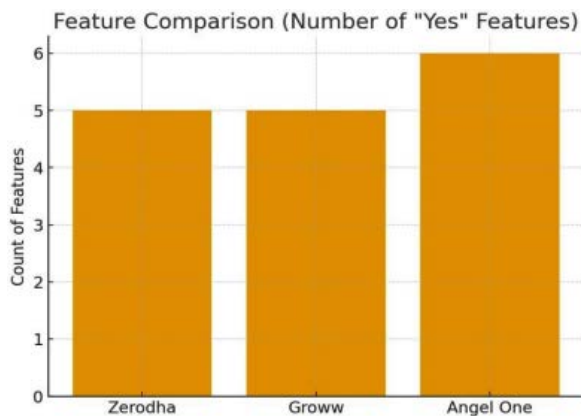
Data Analysis:

Feature Comparison

Table 1 Feature Comparison

Feature/App	Zerodha	Groww	Angel One
Intraday trading	Yes	Yes	Yes
Research and Advisory	Yes	No	Yes
IPO Investment	Yes	Yes	Yes
Advance Charting	Yes	Yes	Yes
Mutual fund	Yes	Yes	Yes
Multilingual Interface	No	Yes	Yes
Customer Support	Medium	Basic	Advance

Source: Compiled from the official websites of companies



Graph 1 Comparison

The comparison of Zerodha, Groww, and Angel One demonstrates how each platform serves a variety of investor types according to their demands and expertise levels. For seasoned and active traders, Zerodha and Angel One are the best options because they provide a wide selection of trading capabilities, sophisticated research tools, and analytical support.

These platforms enable seasoned investors to make data-driven decisions by offering comprehensive market insights, portfolio analysis, and a variety of investment possibilities. While Angel One, with its full-service model, provides trading facilities along with advisory and portfolio management services for users who value professional guidance, Zerodha, with its technology-driven approach and tools like Kite and Console, appeals to traders who prefer independence and speed.

Groww, on the other hand, markets itself as a platform for novice investors, emphasizing simplicity, use, and a clear interface over sophisticated features. Because of this design decision, it is especially well-suited for novice investors who are just beginning their investment adventure and would rather have a simple experience without the overwhelming amount of data and technical analysis seen on professional platforms. However, Groww's lack of sophisticated research features and in-depth analytical tools can limit its utility for experienced traders looking for thorough insights.

Additionally, semi-urban and rural customers who might prefer interacting in regional languages and gain from individualized guidance would find Angel One particularly enticing due to its multilingual interface and advisory service. Compared to brokers who only focus on digital transactions, Angel One has a wider reach throughout India thanks to this inclusion.

In conclusion, Groww is perfect for novices who value a straightforward, contemporary, and user-friendly investing experience, whereas Zerodha and Angel One are best suited for seasoned investors looking for sophisticated tools and

expert assistance. Angel One's advice and multilingual features make it even more accessible to a larger audience, especially given the varied demographics of India.

It indicates that the three platforms follow different product-positioning strategies. Zerodha and Angel One provide research and advisory services in addition to core trading facilities, whereas Groww places greater emphasis on accessibility and simplicity. Angel One's multilingual interface provides an additional accessibility advantage, particularly for investors who may prefer regional-language support. Therefore, the feature comparison suggests that platform differentiation is based less on the availability of basic trading functions and more on the additional services and user experience offered to different investor segments.

Brokerage Fees

Table 2 Brokerage Fees

Brokerage Segment	Zerodha	Groww	Angel One
Equity delivery	Delivery ₹ 0 brokerage for delivery trades.	Lower of ₹ 20 or 0.1% of trade value; minimum ₹ 5.	₹ 0 brokerage for delivery trades (after introductory period)
Equity Intraday/ F&O	0.03% of trade value or ₹ 20 per executed order (whichever is lower)	Flat ₹ 20 per order for F&O; for stocks lower of ₹ 20 or 0.1% of trade value	Lower of ₹ 20 or 0.03% per executed order for intraday. For F&O: ₹ 20 per executed order
	https://zerodha.com/ch	https://groww.in/pricing/	https://www.angelone.in/exchange-transaction-charges

Source: Compiled from official websites of the companies.

When Zerodha, Angel One, and Groww's brokerage structures are compared, it becomes clear how each platform deliberately positions itself to draw in various types of traders and investors according to their trading frequency and investment horizon.

Equity Delivery: Zerodha and Angel One distinguish themselves in stock delivery deals, where investors purchase shares to retain for an extended period of time, by providing \$0 brokerage. As a result, investors can buy and hold stocks without paying trading fees, which drastically lowers the total cost of creating a long-term portfolio. Investors who would rather build wealth over the long run by holding high-quality equities rather than making frequent purchases and sales will profit from this pricing strategy. Additionally, it supports both businesses objective of drawing in serious investors who value clear and affordable pricing.

Intraday & Derivatives (F&O)

All three brokers—Zerodha, Angel One, and Groww—use a flat brokerage model of ₹20 per trade for intraday trading and derivatives (Futures and Options). For traders, this consistency makes cost comparison easier. For high-volume or high-value trades, Zerodha and Angel One have a modest advantage due to a few minor but significant differences.

This demonstrates that brokerage fees are generally competitive across the three platforms, especially for delivery transactions. As a result, brokerage is less able to distinguish the platforms on its own. However, if transaction frequency rises, the distinction between percentage-based and per-order fees may become increasingly significant for active traders. According to the results, investors are likely to consider brokerage fees in addition to other aspects including simplicity of use, customer assistance, analytical tools, and execution speed. This finding is in line with earlier research that found low cost to be a significant but not the only factor influencing the adoption of digital trading.

Performance Analysis

Table 3 performance Analysis

Metric	Zerodha	Groww	Angel One
Google Play Rating	4.3	4.5	4.2
Apple app store rating	4.4	4.6	4.3
App load time (avg.)	2.1 second	2.4 second	3.1second
Reported Downtime Frequency	Low	Low	Medium
Downloads (google Play)	10m+	50m+	10m+

Source: Compiled from official websites of the companies.

Groww: User Popularity and Ease of Use

Groww has a high user acceptance rate, particularly among young and novice investors, as seen by its dominance in mobile app evaluations and download counts. Even for people with little to no prior investing expertise, it is incredibly simple to use thanks to its clear, intuitive interface and simple navigation. The app's design eliminates the complexity sometimes found in trading platforms by emphasizing accessibility and simplicity. Groww has also developed a sizable and devoted user base thanks to its focus on a flawless mobile experience, as well as features like rapid onboarding, simple KYC, and instructional content. This popularity also shows that people perceive Groww's interface to be solid, responsive and aesthetically pleasing for common financial tasks like buying stocks and mutual funds.

Zerodha: Speed and Technical Reliability

The most technically sound platform is Zerodha, which is especially popular with professional and active traders. Its proprietary trading platform, Kite, is renowned for its low latency, high execution speed, and lightweight design—all of which are essential for intraday and high-frequency trading. Because Zerodha's

infrastructure is designed with performance, uptime, and reliability in mind, traders can execute orders fast and precisely—even during peak market hours when system loads are high.

Zerodha is the best option for investors who depend on accuracy, analytical tools, and reliable system availability because of its technological stability, which has earned it a reputation as a performance-driven platform. The company's leadership in technical dependability within the Indian brokerage sector is further strengthened by its steady investment in technology and backend optimization.

Angel One: Balanced but Slightly Slower Performance

Research, advising, and portfolio management tools are just a few of the full-service brokerage services that Angel One provides. However, it typically has slower load times and somewhat more downtime than Groww and Zerodha. Its extensive service design, which incorporates several tiers of support and analytics functions, and legacy systems are also to blame for this. Despite these technical issues, Angel One continues to be a major player in both urban and rural areas, attracting customers who prefer multilingual assistance and advisory services above speed. Although Angel One's performance is not as tuned for real-time trading as Zerodha's, it is still sufficient for the majority of investors, especially those who do not engage in intraday trading.

This shows a discrepancy between technical performance and reported user pleasure. Groww has the most downloads and ratings in the app store, indicating great user acceptability and market penetration. However, out of the three systems, Zerodha has the lowest average load

time, suggesting a relative advantage in technical responsiveness. Angel One has a lengthier average load time and somewhat poorer ratings. These findings are significant because they show that technical performance and popularity are not always the same. While Zerodha's technical advantage might be especially helpful to active traders who value speed and execution, Groww's higher ratings might be related to its ease of use and beginner-friendly layout.

User Perception Analysis

Table 4 analysis of users Perception

App's	Positive Feedback Highlights	Negative Feedback Highlights
Zerodha	Fast execution, professional tools, low brokerage	Occasional server issues during peak trading time
Groww	Easy-to-use, beginner-friendly, modern interface	Limited research tools, less suited for advanced traders
Angel One	Good advisory support, useful for long-term investors	UI feels outdated, occasional lag

Source: Compiled from user reviews and ratings from app stores and etc.

Groww: Simplicity and Beginner Appeal

Beginners and casual investors greatly value Groww's simple, user-focused design. Because of its simple, uncomplicated interface and lack of technical language, novice users may easily traverse the world of investing without feeling overwhelmed. First-time investors may complete crucial tasks, such as purchasing stocks or mutual funds, with just a few taps because of the platform's emphasis on usability and visual clarity, making the process seamless and boosting trust.

Furthermore, Groww's dedication to democratizing investing is reflected in its design philosophy. For retail investors who might ordinarily find standard trading platforms frightening, it lowers the entrance hurdle by

eliminating complexity. Millions of young investors making their first forays into the financial markets have trusted Groww because of its simplicity, educational materials, and pricing transparency.

Although this design-focused strategy increases accessibility, it comes at the expense of fewer sophisticated functionality. Compared to professional-grade platforms like Zerodha, Groww's capabilities may seem fairly rudimentary to experienced traders who need in-depth analytics or technical indicators.

Zerodha: Trusted by Active and Professional Traders

Zerodha is the best option for active and professional traders because of its solid reputation as a technologically sophisticated and performance-focused platform. Its Kite trading platform, which enables traders to execute high-volume or time-sensitive deals without delays or system faults, is renowned for its speed, dependability, and accuracy. Zerodha is becoming the industry standard for trading infrastructure in India thanks to its technical dependability.

In addition to Zerodha's quick execution, active traders like its extensive analytical and charting capabilities, which facilitate intricate trading methods. Furthermore, serious investors who value performance and efficiency over hand-holding or design aesthetics are reassured by its open, affordable price approach.

Zerodha essentially appeals to people who see trading as a high-engagement, professional activity where every second and piece of data counts. It is a favored platform for customers that value functionality and dependability over looks because of its straightforward, high-performance methodology.

Angel One: Strength in Research and Advisory, but UI Modernization Needed

Angel One is regarded as an advisory-focused, research-driven brokerage that serves investors that appreciate well-informed investing choices. Angel One offers individualized advising help, thorough research reports, and portfolio management services—features that are especially appealing to semi-urban or traditional investors looking for professional insights rather than self-directed trading—in contrast to Zerodha or Groww, which place an emphasis on independence.

The user interface (UI) of Angel One's digital platforms, however, frequently feels outdated in comparison to the streamlined performance of Zerodha or the elegant design of Groww, even though its content and support services are robust. In order to meet modern digital expectations, the platform has to be updated and made more responsive. Users have reported that it can feel slower or more cluttered. Despite these UI issues, Angel One remains relevant for a sizable portion of investors who choose guidance above aesthetics thanks to its reliable brand legacy, advisory strength, and rural outreach.

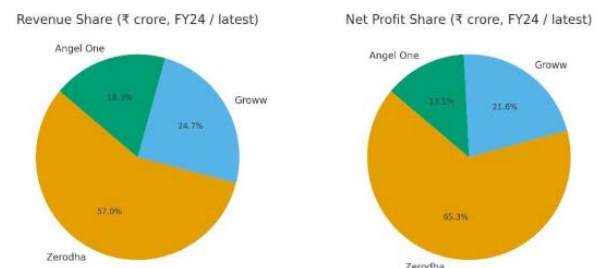
Features: Zerodha and Angel One are more complete. Groww focuses on simplicity.

Performance: Zerodha is the fastest. Groww has the most downloads and ratings. While competitive, Angel One's technical performance is a little behind.

User Perception: Due to its ease of use, Groww has a larger user base than Zerodha, which draws seasoned traders, and Angel One, which caters to individuals in need of advisory support.

This shows that the strategic positioning of each platform is strongly correlated with user perceptions. Groww is praised for being easy to use and accessible to beginners, but it is criticized for having few sophisticated research features. Although consumers occasionally voice server-related problems, Zerodha is well-regarded for its quickness, expert tools, and affordable prices. Although Angel One enjoys advisory support, feedback on interface design and occasional slowness is generally less positive. These results suggest that limits in one dimension may coexist with capabilities in another. As a result, platform preference seems to be influenced by how much consumers value technical performance, sophisticated functionality, simplicity, and advisory help.

Revenue And Net Profit Share F.Y 2024



Graph 2 Revenue Share (2024)

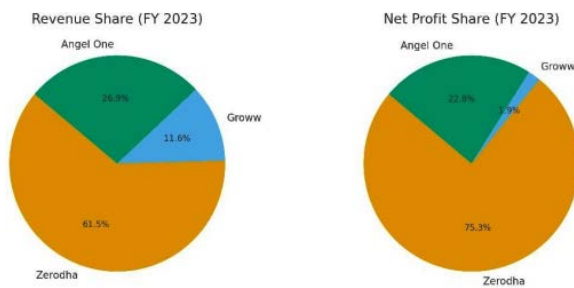
With almost 55% of total sales and 64% of total profit, Zerodha continues to be the industry leader, demonstrating its high efficiency, scalability, and cost-effective operations powered by cutting-edge technology and low overhead.

With roughly 24% revenue and 21% profit share, Groww is the platform that is expanding the fastest, which is indicative of its popularity among young, novice investors. It has tremendous long-term potential despite having reduced profit margins as a result of continuous growth investments. Grow up. Stability is ensured by its

conventional full-service approach and advising focus, but modernization is necessary to remain competitive in the digital age.

With roughly 21% of revenue and 13% of profit, Angel One is in a moderate position, showing consistent success but less efficiency than Zerodha.

F.Y2023



Graph 2 Revenue Share (2023)

With around 61% of overall revenue and 76% of total profit, Zerodha dominates the Indian brokerage business, demonstrating its operational effectiveness and market leadership. Its low-cost, technology-first business approach, which reduces costs while preserving high trading volumes and profitability, is what propels its success. Because of this, Zerodha is the nation's most profitable and effective broker.

Angel One is in a solid second place thanks to its well-rounded strategy of fusing digital trading services with advisory support. Despite having greater operating costs because of its full-service structure, it nonetheless performs well and has a steady market presence, especially with investors who favor guided trading.

Groww, on the other hand, is growing its user base quickly but is still in the early stages of growth, with lower revenue and profit shares. Its emphasis on simplicity and mobile-first design attracts

young and new investors, setting it up for significant future development as it expands and boosts profitability.

The competitive structure of the three platforms is shifting, according to a comparison between FY2023 and FY2024. While Groww's growing scale indicates an expansion-oriented approach, Zerodha continues to show good profitability. Angel One continues to use a comparatively diverse business strategy. According to the comparison, the platforms are competing using diverse strategies: Groww's quick client and ecosystem growth, Angel One's varied financial services, and Zerodha's profitability and operational efficiency.

Findings

1. Market Leadership & Active User Base

- With more than 1.25 crore active users and a 27% market share, Groww has established itself as the biggest broker in India by volume. By making the "first-time" investing experience as easy as utilizing a social media app, it has effectively attracted the younger generation.
- With nearly 68.5 lakh active members and a deliberate concentration on "quality over quantity" by focusing on serious, high-value traders, Zerodha continues to hold a commanding second spot. Due to the high trading frequency of its professional user base, it continues to be the most profitable broker despite having fewer users than Groww.
- With almost 67.6 lakh customers, Angel One is ranked third among conventional players making the switch to digital, demonstrating the most robust growth. It fills the gap between expert-led trading and mass-market appeal,

especially in Tier-2 and Tier-3 cities where directed investing is favored.

2. Financial Performance & Efficiency

- Because it spends almost nothing on marketing and advertising, Zerodha is the industry's "profit machine," producing roughly twice the net profit of its competitors. Despite fierce competition, it is able to keep enormous reserves thanks to its lean business approach and high Revenue Per User (ARPU).
- Groww's revenue growth is spectacular (averaging 80% CAGR), but because it significantly reinvests in its ecosystem, which includes credit and mutual fund management, it works on lower margins. It is presently in a "scale-first" stage, putting ecosystem growth and market dominance ahead of short-term high profit margins.
- Angel One has the most varied sources of income, including insurance distribution and margin funding in addition to brokerage. Even during market downturns when active trading volumes may decline, its "full-service" DNA gives it steady revenue.

3. Strategic Product Positioning

- The "pro-sumer" who appreciates sophisticated graphing, technical reliability, and a "no-distraction" interface is catered to by Zerodha. It is unquestionably the best option for disciplined, independent traders thanks to features like the Kill Switch (for mental health/overtrading) and Console (for detailed analytics).
- Groww bills itself as a "Financial Supermarket," combining consumer loans,

equities, and mutual funds into a single, stylish mobile app. Millions of Indian retail investors now use it as their primary entrance point because it offers free account opening and a zero-maintenance charge approach.

- Angel One sets itself apart with its AI-driven advice (ARQ Prime) and research-based strategy that offers clear "buy/sell" recommendations. Of the three platforms, it is the only one that provides a hybrid experience, fusing access to physical branches and human relationship managers with a contemporary app.

4. Tech Reliability & User Perception

- With the lowest reported downtime during periods of extreme market volatility, Zerodha is considered the gold standard for technical robustness. Because of its infrastructure's focus on speed and execution, intraday traders—for whom every second of uptime is crucial—continue to choose it.
- Groww consistently ranks highly in the app store due to its user-friendly "one-click" investment journeys, and it excels in both design and user experience (UX). However, compared to its more technological competitors, professional users frequently find it lacking in sophisticated technical indicators and "deep-data" tools.
- Although it is sometimes perceived as having a "busier" or more cluttered design, Angel One has made great progress in upgrading its "SmartAPI" and mobile app. Its multilingual support, which makes it far more accessible to non-English speaking populations throughout India, is its strongest point.

By highlighting variations in trading facilities, research and advisory services, charting, mutual-fund facilities, multilingual support, and customer service, the study's first objective—to contrast the key aspects of Zerodha, Groww, and Angel One—is achieved. The comparison of delivery, intraday, and derivatives pricing serves the second goal, which relates to brokerage fees. App ratings, load times, downloads, and reported outages all contribute to the third objective, which is platform performance. Analysis of both positive and negative user input is used to address the fourth objective, which relates to user perception. Active users and market share are compared in order to satisfy the fifth objective, which has to do with market position. Lastly, a comparison of revenue and profitability is used to fulfill the sixth objective, which relates to financial performance.

When combined, these results show that no single trading platform is better in every way. Rather, investor requirements determine platform suitability. Zerodha is more focused on performance and active trading, Groww is more focused on simplicity and new investors, while Angel One is more focused on advisory support and a wider range of services. This outcome bolsters the study's main claim that the alignment of platform features with investor needs influences user perception and platform preference.

Conclusion

Each trading app has distinct advantages in India's brokerage market, according to the report. Groww is perfect for novices since it places a strong emphasis on simplicity, intuitive design, and an easy-to-use interface. While Angel One offers a well-balanced feature set with additional advising and research services, Zerodha offers advanced and comprehensive charting appropriate for seasoned traders. All systems uphold strong security procedures, although Zerodha's

technology shows somewhat greater dependability in safeguarding user information and transactions.

In terms of performance, Zerodha leads with quick order execution and system stability, successfully serving busy traders who need accuracy and little downtime. Groww maintains consistency and accessibility, especially on mobile platforms, although executing trades a little more slowly. Angel One does fairly well but sometimes lags behind its rivals in terms of speed; this is counterbalanced by more analytical tools and customer service.

According to user perception data, Groww's accessibility and simple design contribute to its high satisfaction ratings among new investors. Experienced traders who value efficiency and sophisticated analytics are quite devoted to Zerodha. Although its acceptance rate is moderate because of the learning curve needed, Angel One appeals to people looking for full services and advice.

Overall, the study finds that each platform—Groww for ease of use, Zerodha for performance, and Angel One for balance and advisory support—effectively caters to different investor sectors within India's dynamic trading ecosystem.

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- <https://groww.in> – Official site of Groww, used to understand investment options, user experience, and pricing.
- <https://www.angelone.in> – Official website of Angel One, referred for service offerings, tools, and customer support details.
- <https://zerodha.com> – Official website of Zerodha, used for gathering information on services, brokerage, and features.

Core valueS

1. Passion:

The soul of Welingkar blossoms in our heart, mind and body.

2. Breakthrough Thinking:

We foster academic rigour in an environment conducive to innovation.

3. Result oriented, Process driven Work Ethic:

We adopt dynamic quality processes to ensure accountability and exceptional performances.

4. We Link and Care:

We support and collaborate with all our stakeholders through mutual trust and respect.



Quality policY

We are committed to give our students Quality Management Education in tune with the changing needs of business and industry.

We shall endeavor to do this by:

- Providing the best learning resources.
- Making the environment conducive for students to develop their creativity, Leadership skills and ability to learn continuously.

We shall follow a data oriented factual approach to Quality Management leading to continual improvement of our processes culminating in total customer satisfaction.



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