"Influence of rising gold prices on investment preferences among Indian middle class buyers: A study of investment trends and affordability"

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Abstract:

Gold has long been considered a traditional and emotionally significant investment among Indian households, particularly within the middle class. However, the recent and consistent rise in gold prices has raised important questions regarding its affordability and continued relevance as a preferred investment option. This study aims to explore how increasing gold prices are influencing the investment preferences, purchasing behavior, and financial decisions of Indian middle-class buyers .Using a combination of primary survey data and secondary market analysis, the research investigates shifts in investment patterns—such as a move from physical gold to financial alternatives like digital gold, gold ETFs, and sovereign gold bonds. It also examines how income levels, financial awareness, and cultural values affect the decision-making process. The study highlights a growing concern over affordability, particularly for lower-middle-income groups, and assesses whether rising prices are driving investors to seek more accessible and flexible investment options.

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Introduction:

Gold has long held a significant place in the financial and cultural landscape of India. For Indian households, particularly within the middle class, gold is not just a symbol of wealth and prosperity, but also a trusted form of investment. Over the years, gold has been perceived as a safe haven asset, especially during periods of economic uncertainty, inflation, or currency depreciation. However, the consistent rise in gold prices over the past decade has begun to influence the way Indian middle-class buyers approach their investment decisions. The Indian middle class, which forms a substantial part of the country's population, is characterized by moderate income levels, aspirations for financial stability, and cautious investment behavior. With the increasing cost of gold, these households are now reassessing their investment choices in terms of affordability, returns, and risk. While gold continues to be preferred for its liquidity and cultural value, its rising prices have made it less accessible to many, pushing them to explore alternative investment options such as mutual funds, fixed deposits, equities, and digital gold.

This study aims to explore the impact of rising gold prices on the investment preferences of Indian middle-class buyers. It seeks to understand the changing investment patterns, the factors driving these changes, and the degree to which affordability influences investment decisions. The research will also analyze whether gold still holds the same appeal among the middle class, or if a shift toward more accessible and potentially profitable investment avenues is taking place.

Review of Literature:

According to the corporation, a loss of $25.2 million was incurred since the actor left the sets of the Total Flex Home gym equipment commercial before he knew his words or his part. When Mercury Monarch Ambassador Catherine Deneuve agreed to promote the brand, Chanel reportedly became enraged (Kaikati, 1987). According to marketing academics, celebrities have qualities that can be transmitted to a brand through an endorsement 38 (McCracken, 1989). The user then internalizes this meaning or personality of the brand as they use it to realize their ideal

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or aspirational self-image, which is consistent with that of the celebrity. For instance, when Amitabh Bach Chan endorses Reid and Taylor, his image as a gentleman will be transferred to the brand as a gentleman's suit, and customers who buy Reid and Taylor suits do so with the hope of becoming men of distinction like Amitabh Bach Chan. For the purpose of determining the traits that might affect the success of an endorsement, marketing experts have conducted a sizable quantity of study. Attractiveness, skill, reliability, and image are the main celebrity traits that are thought to affect endorsement success.

One industry that has recently boosted its usage of branding is jewellery. In fiscal year 2019–20, India's gem and jewellery exports reached $43,156.21 million, a 10% year-over-year rise, according to figures from the **Gem & Jewellery Export Promotion Council (GJEPC).** Gross exports of cut and polished diamonds grew to $ 22,783.81 million in FY20, an increase of 10.24% from $ 20,667.79 million in FY19. Gold jewellery exports increased 1.92% to $ 8721.81 million from $ 8557.26 million in 2019–20, while silver jewellery exports increased 35.83% to $ 4 020.62 million. Exports of collared gemstones, however, decreased 3.08% to $419.9 million in 2019–20 from $433.18 million the year before. The country's total exports of $274.65 billion in 2019–20 were made up of 15.72% of gems and jewellery

Jong and Rhee (2008) found that ETFs in general provide abnormal risk adjusted returns based on Fama and French 3 factor model exceeds transaction costs. They do not however distinguish commodity ETFs from other ETFs.

Buyuksahin, Haigh and Robe (2008) examined the S&P Goldman Sachs Commodities Index (S&P GCSI) weekly return data and revealed no correlation between commodity and equity returns, with commodity returns being lower and no sustained pricing relationship over long run. No evidence was found that an increase in co-movements between equities and commodities during a period of extreme returns.

Reddy Y.V (1996) said in his report that, in India, the share of gold import in total import bill rose from 8.1 per cent in 2001-02 to 9.6 per cent in 2010-11. The yearly growth rate of gold imports during the period of 2008-09, 2009-10, and 2010-11 was 23 per cent, 38.1 per cent and

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18.3 per cent respectively. The overall average growth rate during the periods was 26.8 per cent. Such a high levels of gold consumption indicate India's obsession with gold.

Tasneem Rahman (2022) Studied the inclinations of employed women within the education sector concerning their choices regarding saving and investing, as well as the typical trends observed in how these women save and invest. Explored the motivations guiding their investment decisions and assessed their familiarity with various tools available for saving and investing.

Rohatgi et al. (2019) the study aimed to analyse the savings and investment behaviours of small investors in Uttarakhand, India. It investigated the factors influencing these investors, as identified by esteemed students, and assessed their applicability within the Uttarakhand region. A review of extensive literature revealed that a majority of small investors tend to follow patterns involving Fixed Deposits and LIC (Life Insurance Corporation).

Research Methodology:

Statement of the Problem:

The rising price of gold in India has significantly influenced the investment behavior of middle-class buyers, who have traditionally considered gold not just as a symbol of cultural value but also as a secure and reliable investment. However, with increasing market volatility, inflation, and changing income patterns, affordability has become a growing concern. Many middle-class households are now reconsidering their investment preferences, shifting either to alternative investment options or reducing their gold purchases altogether. This shift raises critical questions about the sustainability of gold as a favored investment avenue and the factors that drive or hinder such decisions. Therefore, it is essential to examine how the continuous surge in gold prices impacts the investment trends, purchasing power, and decision-making processes of the Indian middle-class segment.

Need for the Study:

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Gold has long been considered a traditional and safe investment choice among Indian households, particularly within the middle-class segment. However, the continuous rise in gold prices over recent years has created affordability challenges, prompting changes in investment patterns. With the middle class being highly sensitive to price changes and limited in disposable income, it becomes crucial to understand how these price shifts are affecting their investment decisions.

This study is needed to explore whether gold remains a preferred investment or if buyers are shifting to alternative options such as mutual funds, digital gold, or real estate. It will help identify the key factors influencing investment choices, assess the affordability barrier, and provide valuable insights for financial planners, policymakers, and investment advisors. Understanding these behavioral shifts is essential to cater to the financial needs and planning habits of the Indian middle class in a changing economic landscape.

Scope of the study:

While the study's findings will provide valuable insights into the investment landscape and financial behavior of Indian middle-class buyers, it may be limited by sample size, data collection methods, and a focus on gold investments. Nonetheless, this study aims to investigate the impact of rising gold prices on investment preferences among Indian middle-class buyers, focusing on investment trends and affordability. The scope encompasses India's middle-class population, examining their investment behavior and preferences related to gold and alternative investment options like mutual funds, stocks, and digital gold. The study will explore themes such as investment trends, affordability, and factors influencing investment decisions study's results will be useful for investors, financial institutions, and policymakers seeking to understand and cater to the needs of this demographic. By examining the impact of rising gold prices on investment preferences, this study aims to contribute to a better understanding of the Indian middle-class investment landscape.

Research Questions:

1. What are the recent trends in gold prices in India, and how have they changed over time?

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2. How do rising gold prices influence the investment behavior of Indian middle-class households?

3. What forms of gold (jewelry, coins, ETFs, digital gold, etc.) are preferred by middle-class investors?

4. To what extent has the affordability of gold affected the frequency and quantity of purchases among the middle class?

Type of Research:

1. This descriptive study utilizes primary data to explore the impact of rising gold prices on the investment preferences of Indian middle-class buyers.

2. This study adopts a structured approach, using survey-based research to examine the relationship between gold price trends, affordability, and changing investment behaviour among middle-income households.

Objectives:

1 To examine the historical trends in gold prices and their pattern of increase over recent years.

2. To analyze the investment preferences of Indian middle-class buyers in the context of rising gold prices.

3. To study the extent to which affordability affects gold purchasing behavior among middle-class households.

4. To explore alternative investment options considered by middle-class buyers due to rising gold prices.

Research Design:

The study follows a descriptive survey research design. This design enables the researcher to gather detailed information from a selected group of Indian middle-class individuals to understand how rising gold prices are influencing their investment preferences and affordability.

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The data is collected at a single point in time using a structured, close-ended questionnaire distributed via Google Forms.

This design is appropriate for:

Capturing current investment behaviour, opinions, and affordability concerns related to gold.

Analysing variables like income level, investment frequency, gold price perception, and alternative investment preferences without altering any conditions.

Data Collection:

The study employs a primary data collection method using a structured, close-ended questionnaire distributed via Google Forms. The survey targets Indian middle-class individuals to gather insights on their investment preferences, affordability concerns, and responses to rising gold prices. The questionnaire captures demographic details, frequency and form of gold investments, and inclination toward alternative investment options. This method ensures the collection of accurate, relevant, and analyzable data to support the study's objectives.

Sampling Design:

The study uses a convenience sampling method to collect data from Indian middle-class individuals aged 21 and above. Respondents were selected based on ease of access and willingness to participate. A structured questionnaire was distributed online using Google Forms, targeting individuals with basic investment knowledge. This approach is suitable for descriptive research aimed at understanding current trends and affordability in gold investment.

1. Sampling Plan

The study targets middle-class individuals in India, specifically those aged 21 years and above, who have an interest in or experience with investment in gold. The focus is on understanding how rising gold prices impact their investment preferences and affordability.

2. Sampling Method

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A non-probability convenience sampling method is used. This method was selected due to its practicality and efficiency in reaching respondents within a limited timeframe, especially through digital platforms.

3. Sampling Frame

The sampling frame includes individuals accessible through online platforms such as WhatsApp, email, and social media, who belong to middle-income households across urban and semi-urban regions in India.

4. Sampling Unit

The sampling unit is an individual respondent belonging to the Indian middle class, aged 21 years or above, who is capable of making or influencing investment decisions.

Plan of Analysis:

The data collected through the structured, close-ended questionnaire will be analysed using descriptive statistical tools to identify trends, patterns, and behavioural shifts in gold investment among Indian middle-class buyers. The primary objective is to examine how rising gold prices influence investment preferences, perceived affordability, and the inclination toward alternative investment options.

Initially, the responses will be organized and coded using Microsoft Excel or Google Sheets, allowing for easy tabulation and comparison. Basic statistical techniques such as frequency distribution, percentage analysis, and cross-tabulation will be applied to analyse variables like age, income level, occupation, and gold investment frequency. These variables will help determine how demographic and economic factors affect investment behaviour.

The results will be presented using visual tools such as bar charts, pie charts, and column graphs to provide a clear and concise understanding of the findings. These visuals will enhance the interpretation of data related to affordability concerns, types of gold investment (physical or digital), and the extent to which individuals are shifting to alternative assets.

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This analytical approach will help in drawing meaningful insights and conclusions that align with the research objectives. It will also support the development of recommendations for financial advisors, policymakers, and investors regarding gold investment strategies and financial planning amid fluctuating market conditions.

Limitations of the Study:

This study, while insightful, is limited by the scope and method of data collection. The use of convenience sampling means that participants were selected based on their accessibility and willingness to respond, rather than through random sampling. As a result, the findings may not fully represent the diversity of the Indian middle-class population, particularly those in rural or economically weaker sections who may have limited internet access or different investment behaviours.

Another limitation is the reliance on self-reported data, which can be influenced by personal opinions, memory biases, or the tendency to answer in a socially desirable manner. This may affect the accuracy and objectivity of the responses. Furthermore, the study is cross-sectional, collecting data at a single point in time, which does not account for changes in behaviour or perceptions over a longer period, especially in a volatile market like gold.

Analysis and Interpretation in table:

Parameter	Findings (Data Summary)	Analysis	Interpretation
Gender	56.9% Female, 43.1% Male	Female respondents slightly dominate.	Suggests women play an active role in gold-related decisions, reflecting cultural preferences for jewellery.
Occupation		Majority are students	Indicates younger and

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		with some working professionals.	learning population are aware/interested in gold investments.
Monthly Household Income	54% below ₹25,000, 33.3% ₹25,000–₹50,000, 12.7% above ₹50,000	Most respondents come from low to middle-income households.	Shows gold investment interest across income levels despite affordability challenges.
Awareness of Gold Price Trends (10 years)	36.9% Highly aware, 35.4% Moderately aware, 23.1% Slightly aware, 4.6% Not aware	Majority track price trends regularly.	Indicates strong public awareness of gold market changes, showing its importance in financial planning.
Belief in Steady Price Increase	55.4% Strongly agree, 29.2% Agree, 9.2% Disagree, 6.2% Strongly disagree	Over 84% acknowledge steady rise.	Reflects general consensus that gold prices have been increasing consistently
Factor Influencing Gold Price Rise .	43.8% Inflation, 29.7% Rupee depreciation, 14.1% Global instability, 12.5% Demand-supply mismatch	Inflation and currency factors dominate perceptions	Shows macroeconomic awareness among respondents about key price drivers.

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Gold as Safe Investment	33.8% Strongly agree, 43.1% Agree, 9.2% Disagree, 13.8% Strongly disagree	Over 76% believe gold is safe.	Reinforces gold's image as a traditional, stable investment.
Frequency of Gold Investment	46.9% Occasionally, 23.4% Frequently, 17.2% Rarely, 12.5% Never	Occasional buying most common.	Gold is purchased mainly during festivals, weddings, or price dips — not as a routine saving.
Primary Reason for Investment .	36.9% Cultural tradition, 26.2% Long-term appreciation, 24.6% Diversification, 12.3% Inflation hedge	Cultural motives lead.	Emphasizes emotional and traditional attachment to gold more than purely financial reasons
Preferred Form of Investment .	47.7% Jewellery, 26.2% Digital gold, 16.9% Coins/Bars, 9.2% Bonds	Jewellery still dominant, digital gaining ground.	Indicates gradual modernization while retaining traditional buying habits
Impact of Price	31.3% Significantly,	Most are affected	Demonstrates price

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Rise on Buying	40.6% Moderately, 20.3% Slightly, 7.8% Not at all	moderately or significantly.	sensitivity; buyers adjust spending based on gold's affordability
Adjustment Due to Price Hike	35.4% Reduced quantity, 27.7% Lower purity, 26.2% Delayed purchase, 10.8% No change	Buyers adopt coping strategies	Suggests adaptability and continued interest in gold despite rising prices
Affordability Compared to 5 Years Ago	38.5% Much less affordable, 29.2% Less affordable, 18.5% Same, 13.8% More affordable	Over two-thirds find gold less affordable.	Rising prices limiting accessibility for lower-income groups.
Considering Alternatives to Gold	32.3% Actively investing, 32.3% Exploring, 24.6% Still prefer gold, 10.8% Unsure	Shift toward diversification visible.	Indicates evolving investment mindset beyond traditional gold preference.
Future Preference for Gold (Next 5 Years) .	42.2% Strongly agree, 31.3% Agree, 17.2% Disagree, 9.4% Strongly disagree	Over 70% optimistic about gold's future.	Confidence remains strong; gold continues to be viewed as reliable and culturally rooted

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Analysis:

- 36.9% are highly aware and 35.4% moderately aware of gold price trends. A smaller group (23.1%) are slightly aware, and only 4.6% are not aware at all. This shows the majority keep track of gold market changes.

- 55.4% strongly agree and 29.2% agree that gold prices have risen steadily. Only 9.2% disagree, while 6.2% strongly disagree. Thus, over 80% believe prices have been consistently rising.

- 43.8% attribute price rise to inflation, 29.7% to rupee depreciation, 14.1% to global instability, and 12.5% to demand–supply mismatch. Inflation is seen as the strongest factor.

- 33.8% strongly agree and 43.1% agree that gold is safe, totalling 76.9%. Only 9.2% disagree and 13.8% strongly disagree. Overall, the majority see gold as a reliable investment.

- 46.9% invest occasionally, 23.4% frequently, 17.2% rarely, and 12.5% never. Occasional investment is the most common pattern among respondents.

- 43.8% chose inflation, 29.7% rupee depreciation, 14.1% global instability, and 12.5% demand-supply mismatch. Inflation emerged as the dominant factor.

- 33.8% strongly agree and 43.1% agree, while 9.2% disagree and 13.8% strongly disagree. A clear majority views gold as safe.

- 46.9% invest occasionally, 23.4% frequently, 17.2% rarely, and 12.5% never. Occasional investment dominates.

- 36.9% invest due to cultural traditions, 26.2% for long-term appreciation, 24.6% for portfolio diversification, and 12.3% for hedging against inflation.

- 47.7% prefer jewellery, 26.2% digital gold, 16.9% coins/bars, and 9.2% sovereign bonds. Jewellery dominates the choice.

- 31.3% said significantly, 40.6% moderately, 20.3% slightly, and 7.8% not at all. Most feel an impact.

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- 35.4% reduced quantity, 27.7% opted for lower purity, 26.2% delayed purchase, and 10.8% reported no change.

- 38.5% said much less affordable, 29.2% less affordable, 18.5% about the same, and 13.8% more affordable.

- 32.3% actively invest in alternatives, 32.3% are exploring options, 24.6% still prefer gold, and 10.8% are unsure.

- 42.2% strongly agree, 31.3% agree, 17.2% disagree, and 9.4% strongly disagree. Most remain optimistic about gold's future preference.
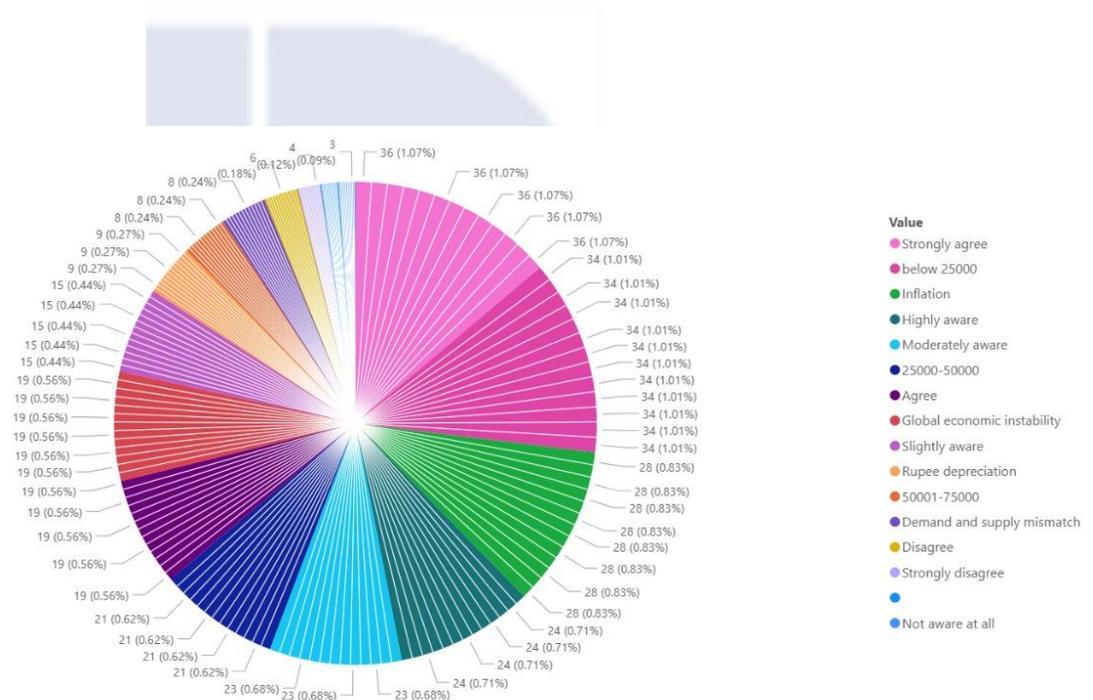
Interpretation:

- People generally follow gold price trends seriously, which reflects its importance in investment planning. High awareness indicates gold has a strong role in financial decision-making. Low unawareness suggests gold is a widely discussed and visible commodity.

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- Respondents clearly recognize the upward trend in gold prices. This shows public confidence in gold's appreciation value. Minimal disagreement suggests there is little doubt about gold's steady price growth.

- People relate gold prices mainly to economic and currency conditions. This reflects awareness of how inflation and exchange rates affect investment value. Lesser importance given to demand–supply shows macro factors dominates perception.

- Gold maintains its traditional reputation as a safe haven asset. The high agreement rate shows strong trust in gold during financial uncertainty. Very low disagreement confirms positive perception of gold's stability.

- Gold is not used as a daily or regular saving instrument but as a periodic investment. People buy gold mostly during festivals, weddings, or when prices are favourable. This reflects cultural and situational demand for gold.

- Respondents understand that gold prices are directly linked with inflation and currency value. This indicates awareness of macroeconomic influences rather than short-term supply-demand shifts.

- Gold continues to hold its traditional role as a "safe haven" asset. Trust levels remain strong, although a small percentage is sceptical about its security.

- Gold is not a regular saving habit but is purchased during festivals, weddings, or specific financial needs. This shows cultural and situational investment behaviour.

- Traditional buying preferences still outweigh modern investment tools. However, rising interest in digital gold shows a gradual shift toward financial zed options.

- Price increases are influencing purchase behaviour strongly. This shows price sensitivity among buyers, though gold buying has not completely stopped.

- The majority feel gold has become harder to afford. Rising prices are limiting accessibility, especially for middle-income buyers.

- A significant portion is shifting interest toward alternatives like mutual funds or real estate. Still, nearly one-fourth remain loyal to gold as their main investment.

- Despite rising prices, confidence in gold's long-term role as a top investment remains high. It reflects cultural attachment and financial trust in gold's enduring value.

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Suggestions:

- Investors should be encouraged to shift from occasional or festival-based purchases of gold to systematic and disciplined investment methods. Financial products like Sovereign Gold Bonds, Gold ETFs, and Gold SIPs should be made more popular because they offer advantages such as safety, regular returns, and government backing. This will help individuals treat gold not just as a savings habit but as a long-term financial asset.

- There should be a strong focus on financial literacy and investor awareness programs. Many respondents are only slightly aware of the real factors behind gold price fluctuations. By educating people about inflation, rupee depreciation, and global market instability, they can make informed choices about when and how to invest. This will also reduce dependency on traditional physical gold buying from local jewellers, which often involves higher risks and less transparency.

- Investors need to change their mind set and start viewing gold as a strategic financial tool rather than purely a cultural or ornamental asset. Awareness campaigns should highlight how gold provides stability to portfolios during crises and acts as a hedge against inflation. By positioning gold as part of modern investment planning, people can balance tradition with financial growth.

Recommendations:

- Financial institutions should design flexible and affordable gold investment schemes that allow people to start with small contributions. For example, Gold SIPs or fractional digital gold plans can enable even middle and lower-income households to invest regularly. This will increase participation and reduce the tendency of treating gold as a once-a-year purchase.

- Awareness should be spread through workshops, seminars, and online platforms that educate people about the advantages of digital and paper-based gold investments. Highlighting the risks of unorganized gold markets and promoting safer options will build greater trust among investors. Banks, post offices, and fintech companies can play a key role here.

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- The government should strengthen policies and incentives for gold-related financial instruments. For example, Sovereign Gold Bonds can be made more attractive with added tax benefits, liquidity options, and interest rate improvements. Similarly, promoting Gold ETFs through simplified trading apps can help reach younger and tech-savvy investors.

- A broader recommendation is to encourage a gradual shift from physical gold to financial gold. This will reduce India's heavy dependence on imported gold, improve the balance Of trade, and create a more transparent and stable gold market. At the same time, individuals will enjoy safer, more regulated, and easily tradable investment opportunities.

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Conclusion:

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The study reveals that rising gold prices have had a significant and multifaceted impact on the investment behavior of India's middle-class population. Traditionally, gold has been regarded as a safe and culturally favored asset, symbolizing both financial security and social status. However, the continuous surge in gold prices has altered affordability and accessibility, leading to a gradual shift in investment preferences.

While many middle-class investors continue to view gold as a stable, long-term store of value, escalating costs have compelled them to explore alternative investment avenues such as mutual funds, systematic investment plans (SIPs), real estate, and digital financial instruments. The emergence of digital gold and gold exchange-traded funds (ETFs) has also provided more affordable entry points, reflecting a blend of traditional sentiment and modern financial adaptation.

Overall, the findings suggest that although the emotional and cultural attachment to gold remains strong, economic realities and rising prices are encouraging a more diversified and pragmatic approach to investment among India's middle class. Going forward, the trend indicates a balanced portfolio mindset—one that values the stability of gold while increasingly embracing other instruments that offer higher returns, liquidity, and affordability.

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"Deductions in the Digital Age: A Study of Online Platform Fees and Seller Trust"

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Abstract
This study investigates the intricate relationship between digital payment deductions and customer trust, emphasizing the crucial roles of transparency and fairness in fostering trust. As digital transactions grow, concerns about data privacy, security, and fairness intensify, underscoring the need for transparent communication about data collection, processing, and usage. The research examines how clear information about digital payment processes and fairness in preventing biased algorithms can enhance customer trust. By prioritizing corporate digital responsibility, regulatory compliance, and customer-centric approaches, financial institutions can build trust and mitigate risks. The study's findings contribute to the existing literature on fintech, digital trust, and customer relationships, providing valuable insights for policymakers, financial institutions, and consumers to develop effective strategies promoting transparency, fairness, and trust in digital financial systems.
Keywords: Digital Payment Deductions, Transparency, Fairness, Customer Trust, Fintech.

1.Introduction

The rapid growth of digital transactions has transformed the way businesses operate, with online platforms becoming essential for reaching customers and facilitating sales. However, the increasing reliance on these platforms has also raised concerns about the fees and deductions imposed on sellers. Online platform fees can significantly impact sellers' profit margins, and a lack of transparency in fee structures can lead to mistrust and dissatisfaction. This study aims to explore

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the relationship between online platform fees and seller trust, with a focus on the critical roles of transparency and fairness in fostering trust.

The Issue of online platform fees is complex, with various stakeholders involved, including sellers, platforms, and customers. Sellers often feel that platforms charge exorbitant fees without providing adequate value, while platforms argue that fees are necessary to maintain the infrastructure and services that enable transactions. The lack of transparency in fee structures can lead to disputes and mistrust, ultimately affecting the overall health of the digital economy. This research seeks to shed light on the impact of online platform fees on seller trust and identify strategies that can promote transparency, fairness, and trust in digital transactions.

By examining the relationship between online platform fees and seller trust, this study aims to contribute to the existing literature on digital commerce, trust, and fairness. The findings of this research can provide valuable insights for policymakers, platform operators, and sellers, helping them develop effective strategies to promote transparency, fairness, and trust in digital transactions. Ultimately, this study seeks to inform the development of more equitable and sustainable digital commerce ecosystems that benefit all stakeholders involved.

Research Background

In the era of digital transformation, platforms such as Amazon, Flipkart, Meesho, PhonePe, Google Pay, and Paytm have revolutionized the way businesses operate and transact. These platforms and payment gateways act as crucial intermediaries connecting sellers, buyers, and service providers in the online ecosystem. However, they sustain operations through various deductions and service fees such as transaction commissions, processing charges, and promotional costs. While these deductions are necessary for maintaining digital infrastructure, marketing, and security, their increasing complexity and lack of transparency often raise concerns among sellers and small business owners about fairness and trust. As digital payments and e-commerce become the

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backbone of modern trade, understanding the impact of such deductions on seller trust and business sustainability has become essential for both academic research and industry practices.

Research Significance

This study holds great significance in the context of the digital business ecosystem, where both marketplace platforms and payment applications implement varied deduction structures. By exploring how fee transparency, perceived fairness, and deduction clarity influence seller trust and confidence, the research provides meaningful insights into improving digital trust frameworks. The findings will assist online platforms, fintech apps, and policymakers in designing fairer and more transparent deduction systems that encourage long-term seller engagement and financial inclusion. Academically, the study contributes to a deeper understanding of trust-building and fairness perceptions in the digital age, bridging gaps between technology, commerce, and user psychology.

2.Review of Literature

Online marketplace platforms such as **Amazon, Flipkart, and Etsy** have transformed business operations by introducing a wide range of **fees and deductions,** including listing charges, commissions, and transaction-based service fees. These deductions form the foundation of platform revenue models but significantly influence **seller profitability** and **participation.**

According to **Eden et al. (2023) and Chen et al. (2022), the structure, transparency, and fairness** of such deductions play a crucial role in determining **seller behavior** and **trust** toward online platforms.

Trust has emerged as a vital factor in maintaining long-term relationships between sellers and digital marketplaces. **Luca (2020) and Soleimani et al. (2021)** emphasize that **institutional trust**—rooted in transparency, fairness, and reliability—directly affects a seller's willingness to continue engaging with a platform. Sellers perceive deductions as acceptable when they are clearly

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communicated and justified; however, hidden or unclear deductions can lead to mistrust, dissatisfaction, and reduced engagement levels.

Transparency and perceived fairness have been identified as key drivers of **seller trust. Johnen (2024) and Ferguson & Ellen (2013)** found that **transparent fee disclosure** enhances the perception of fairness, improving **seller loyalty and cooperation.** Conversely, **opaque or sudden deductions** create a sense of **exploitation,** thereby damaging seller confidence and **commitment.**

Regulatory perspectives also highlight the significance of transparency in platform operations. **The European Union Regulation on Promoting Fairness and Transparency for Business Users of Online Intermediation Services (2018)** mandates clear disclosure of fees and deductions to **protect sellers' interests** and **sustain trust** within digital marketplaces.

Despite these advancements, notable research gaps persist in understanding the **specific impact of different types of deductions on seller trust,** particularly in emerging markets. The literature suggests that transparent and predictable fee systems foster trust and seller satisfaction, while inconsistent or unclear deductions can erode confidence and damage long-term **seller–platform relationships.**

In conclusion, previous studies collectively indicate that **trust and transparency are central** to sustaining healthy **platform–seller relationships.** This study builds upon these findings by exploring how **online platform deductions** influence **seller trust** in the **digital age.**

3. Methodology

The study will employ a mixed-methods approach, combining both qualitative and quantitative methods to provide a comprehensive understanding of the impact of online platform fees on seller trust. The study will involve surveys and interviews with sellers operating on e-commerce platforms, as well as an analysis of platform documentation and fee structures.

3.1. Statement of the Problem

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The rapid growth of e-commerce has led to a surge in online platform fees, impacting sellers' profitability and trust in digital platforms. These fees, including commission fees, payment processing fees, and shipping fees, can be a source of frustration and mistrust among sellers if not transparent or fair. The lack of transparency and fairness in online platform fees can lead to reduced profitability, increased uncertainty, and decreased trust in digital platforms, ultimately affecting the digital economy's overall health.

Despite the growing importance of e-commerce, there is a limited understanding of the impact of online platform fees on seller trust. Previous research has focused on the impact of fees on profitability, but the effect on trust and the factors influencing trust in digital platforms remain understudied. This knowledge gap highlights the need for a comprehensive study to investigate the impact of online platform fees on seller trust and identify strategies for promoting transparency, fairness, and trust in digital commerce.

The complexity of digital platforms, with multiple stakeholders having different interests and priorities, further complicates the issue. A nuanced and multi-faceted approach is necessary to understand the perspectives of all stakeholders involved. By investigating the impact of online platform fees on seller trust, this study aims to provide insights and recommendations for promoting transparency, fairness, and trust in digital commerce, ultimately contributing to the development of more equitable and sustainable digital commerce ecosystems.

3.2. Need for the Study

The growing significance of e-commerce and the increasing prevalence of online platform fees underscore the need for a comprehensive study on "Deductions in the Digital Age: A Study of Online Platform Fees and Seller Trust." As sellers become increasingly reliant on digital platforms to reach customers, understanding the impact of online platform fees on seller trust is crucial. The lack of transparency and fairness in these fees can lead to mistrust and dissatisfaction among sellers, potentially affecting their participation in digital platforms.

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The complexity of digital platforms, with multiple stakeholders having different interests and priorities, further complicates the issue. A study on online platform fees and seller trust can provide valuable insights into the factors influencing trust and identify strategies for promoting transparency, fairness, and trust in digital commerce.

The introduction of Section 194-O of the Income-tax Act in India, requiring e-commerce operators to deduct TDS on payments made to e-commerce participants, highlights the need for a comprehensive study on online platform fees and seller trust. By investigating the impact of online platform fees on seller trust, this study aims to provide recommendations for promoting transparency, fairness, and trust in digital commerce.

The study's findings can inform policymakers and digital platform operators on how to create a more favorable environment for sellers, fostering growth and development in the digital economy. Ultimately, the study's results can contribute to the creation of a more trustworthy and sustainable digital commerce ecosystem, benefiting both sellers and buyers.

3.3. Scope of the Study

1. Investigating the relationship between online platform fees and seller trust in digital commerce.

2. Examining the key factors that influence seller trust, including transparency, fairness, and fee structures.

3. Analyzing the impact of online platform fees on seller satisfaction, loyalty, and participation.

4. Identifying effective strategies to promote transparency, fairness, and trust in digital commerce.

5. Providing actionable insights and recommendations for policymakers, digital platform operators, and sellers.

6. Focusing on the Indian e-commerce market, with a particular emphasis on the impact of regulations like Section 194-O of the Income-tax Act.

3.4. Research Questions

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1. How do online platform fees impact seller trust in digital commerce?

2. What are the key factors influencing seller trust in online platforms?

3. How can platform operators promote transparency, fairness, and trust in their fee structures?

4. What are the effects of online platform fees on seller satisfaction and loyalty?

5. How do different types of online platform fees (e.g., commission fees, payment processing fees) affect seller trust?

6. What role does communication play in building trust between platform operators and sellers regarding online platform fees?

7. How do regulatory frameworks (e.g., tax laws, consumer protection laws) impact online platform fees and seller trust?

8. What are the consequences of low seller trust in online platforms, and how can it be mitigated?

9. How do online platform fees affect small and medium-sized sellers compared to larger sellers?

10. What are the best practices for platform operators to disclose and explain online platform fees to sellers?

3.5. Objectives of the study

1. To identify the primary factors contributing to deductions in digital payment systems.

2. To analyze the underlying mechanisms of deductions and understand their occurrence.

3. To assess the impact of deductions on both consumers and businesses.

4. To evaluate the role of transparency and fairness in deduction processes and their effect on customer trust.

5. To propose solutions that enhance efficiency, transparency, and fairness in digital payment systems.

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3.6. <u>A) Type of Research</u>

This research is a combination of:

Exploratory Research – To explore the impact of online platform fees on seller trust and identify emerging trends and challenges in digital marketplaces.

Descriptive Research – To describe the current practices of fee deductions, seller perceptions, and outcomes of using digital platforms for selling.

Mixed Method Approach – Using both qualitative (opinions, open-ended questions) and quantitative (structured questionnaires, statistics) data collection.

B) <u>Research Design</u>

This study adopts a descriptive and exploratory research design to analyze how online platform fees affect seller trust in digital marketplaces. The descriptive component helps outline current fee structures, fee impacts on sellers, and platform policies, while the exploratory aspect investigates new opportunities, concerns, and challenges arising from fee deductions.

The research design supports both qualitative and quantitative approaches. Quantitative data is collected through a structured questionnaire targeting sellers on digital platforms. Qualitative insights are gathered through open-ended questions to capture opinions and personal experiences.

The study uses purposive sampling to select respondents who have experience selling on digital platforms. Data analysis is conducted using descriptive statistics like percentages, charts, and graphs for easy interpretation.

3.7. <u>Data Collection:</u>

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Data will be collected through surveys, interviews, and analysis of platform documentation and fee structures.

3.8. <u>Sampling Design:</u>

This study uses Stratified Random Sampling to examine the impact of online platform fees on seller trust. The target population includes online sellers on major Indian e-commerce platforms like Amazon and Flipkart. Sellers will be stratified by business size, product category, and platform usage. A random sample of 300–500 sellers will be selected from each stratum, with data collected via online surveys or interviews. This ensures diverse representation and a comprehensive understanding of seller trust across market segments.

a) Sampling Plan:

Sellers are stratified by business size, product category, and platform usage. Random selection from each stratum will allow the study to capture the effects of platform fees on trust across different seller segments.

b) Sampling Method:

Stratified Random Sampling will be used to select 300–500 sellers from the defined strata. Data collection through online surveys or interviews will provide insights into sellers' experiences and perceptions of platform fees.

c) Sampling Frame:

The frame consists of registered online sellers who have actively sold on platforms like Amazon and Flipkart within a defined period. This ensures participants have direct experience with fees and policies, providing reliable data on trust and satisfaction.

d) Sampling Units:

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Individual online sellers on major Indian e-commerce platforms, classified by business size and product category. These units allow examination of how platform fees affect seller trust and behavior across segments.

Plan of Analysis

The collected data will be analyzed using descriptive statistical tools to examine the impact of online platform fees on seller trust. Frequency distributions, percentages, and cross-tabulations will be used to summarize the data and provide insights into fee structures, seller perceptions, and trust dynamics.

The analysis will also involve the use of inferential statistics to identify significant relationships between platform fees and seller trust. Correlation analysis and regression modeling will be employed to examine the impact of fee structures on seller satisfaction and trust.

Visual aids such as bar charts, pie charts, and graphs will be used to present the findings in a clear and concise manner. This will enable easy interpretation of the data and facilitate the identification of key trends and patterns.

The findings of the analysis will provide valuable insights into the relationship between online platform fees and seller trust, shedding light on the factors that influence seller satisfaction and trust. These insights can be used to inform platform strategies and policy decisions, ultimately enhancing the seller-platform relationship.

Limitations:

- The study's reliance on self-reported data from surveys and interviews may introduce bias and limit the accuracy of the findings.

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- The sample size and population may not be representative of all sellers and online platforms, potentially limiting the generalizability of the results.
- The study's focus on specific online platforms and industries may not capture the experiences of sellers operating on other platforms or in different industries.
- The cross-sectional design of the study may not capture the dynamic nature of online platform fees and seller trust over time.
- The study's measurement of seller trust and perceived fairness may not fully capture the complexity of these constructs.
- External factors such as changes in market conditions, platform policies, or regulatory environments may influence the findings and limit their applicability.

Analysis and Interpretation

Digital deductions – Analysis and Analysis Table

Sl. No.	Analysis	Interpretation
1	Most respondents are 21 years old.	Findings more relevant to young adults.
2	60.6% male, 39.4% female.	Gender imbalance in respondents.
3	Varied experience with digital payments.	Majority have some experience.
4	Transaction fees (39.4%) & service charges (37.9%) are main deductions.	Areas for improvement identified.
5	Fees deducted occasionally (31.8%) or rarely (30.3%).	Transaction fees are common issues.
6	56.1% think deductions based on transaction amount.	Users perceive a simple fee structure.
7	Mixed opinions on intermediaries' role.	69.7% acknowledge intermediaries' involvement.
8	Deductions affect online shopping behavior.	57.5% report moderate/significant impact.

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9	Deductions impact business revenue.	72.7% report moderate/significant effect.
10	86.3% value transparency.	Transparency is crucial.
11	Opinions split on fairness (33.3% each).	Need for more education/trust-building.
12	60.6% want real-time tracking.	Users value monitoring transactions.
13	Reduce deductions via tech (45.5%), transparency (24.2%).	Tech improvements most effective.
14	61.5% faced deductions due to technical issues.	Technical problems are significant.
15	Suggestions: tech (47.7%), security (26.2%).	Need for tech & security upgrades.
16	Security (56.3%) & convenience (23.4%) prioritized.	Safety & ease of use valued.
17	Service charges most common deduction (41.5%).	Service charges a key concern.
18	36.9% want lower fees, 29.2% more transparency.	Focus on reducing fees & transparency.
19	56.3% disputed a deduction.	Customer support/dispute mechanisms needed.
20	Satisfaction: 46.9% positive, 45.3% neutral.	General satisfaction with room for improvement.
21	Convenience (47.7%) top benefit, then security (24.6%).	Ease of use highly valued.
22	78.5% recommended digital payment systems.	High adoption & endorsement.

1. The age distribution of respondents shows a peak at 21 years (30.3%), indicating a majority of young adults participated in the study.

2. The survey received 66 responses, with 60.6% male and 39.4% female respondents.

3. The survey of 66 respondents shows varying levels of experience with digital payment systems.

4. Transaction fees (39.4%) and service charges (37.9%) are the primary reasons for deductions in digital payment systems.

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5. Most respondents experience transaction fee deductions occasionally (31.8%) or rarely (30.3%).

6. The majority (56.1%) of respondents believe digital payment systems calculate deductions based on transaction amount.

7. The survey highlights the perceived role of intermediaries in deduction processes, showing varied opinions on their influence.

8. The survey reveals varied impacts of deductions on online shopping behavior among respondents.

9. Deductions have a notable impact on businesses, affecting revenue to varying degrees.

10. A significant majority (51.5%) consider transparency in digital payment systems very important, and 34.8% find it somewhat important.

11. The survey results show an equal split among respondents, with 33.3% believing digital payment systems are fair, 33.3% disagreeing, and 33.3% being unsure.

12. The majority of respondents (60.6%) desire real-time transaction tracking to improve transparency in digital payment systems.

13. Out of 66 responses, opinions on reducing deductions in digital payment systems are distributed among standardizing fees (18.2%), improving technology (45.5%), increasing transparency (24.2%), and other methods (12.1%).

14. 61.5% of 65 respondents experienced a deduction due to technical issues, while 38.5% did not.

15. 65 respondents suggested improving digital payment systems by investing in new technology (47.7%) and enhancing security measures (26.2%).

16. 64 respondents prioritized Security (56.3%) and Convenience (23.4%) when choosing a digital payment system.

17. 65 respondents identified Service charges (41.5%) as the most common deduction in digital payment systems.

18. The survey results show that 36.9% of respondents believe reducing fees is crucial, followed by 29.2% who think increasing transparency is essential.

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19. 56.3% of respondents have disputed a deduction in a digital payment system, while 43.8% have not.

20. The distribution of satisfaction levels among 64 respondents shows 20.3% very satisfied, 26.6% somewhat satisfied, 45.3% neutral, and 7.8% dissatisfied.

21. Among 65 respondents, 47.7% consider convenience the primary benefit of digital payment systems, followed by security (24.6%), speed (16.9%), and other (10.8%).

22. The majority of respondents (78.5%) have recommended a digital payment system to a friend or family member, indicating a high level of satisfaction and endorsement.

Interpretation:

Count of Name by Attribute and Value
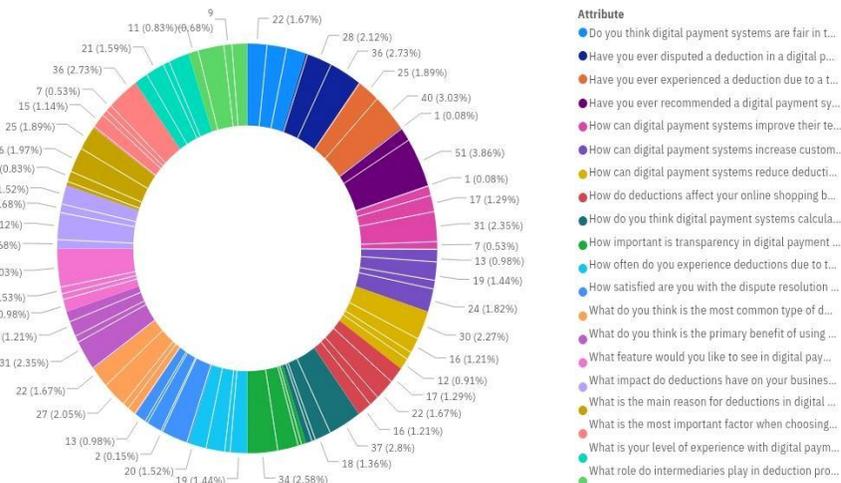
1. This suggests the study's findings may be more relevant to younger demographics.
2. This indicates a potential gender imbalance in the study's participant pool.
3. The majority (66.6%) have some experience, with 34.8% being intermediate and 31.8% beginners, while 33.3% are advanced or expert users.

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4. These two factors account for the majority of deductions, highlighting areas for improvement in digital payment systems.

5. Transaction fees are a common issue, highlighting the need for awareness and potential reforms.

6. This suggests that most users think transaction amount is the primary factor in determining deductions, indicating a perceived straightforward fee structure.

7. A significant majority (69.7%) of respondents acknowledge the involvement of intermediaries, with 43.9% considering their influence moderate.

8. A significant portion (57.5%) of respondents reported that deductions have a significant to moderate effect on their online shopping behavior.

9. A significant 72.7% of respondents reported that deductions have a significant or moderate impact on their business's revenue.

10. 86.3% of respondents value transparency, highlighting its crucial role in financial transactions.

11. The equal distribution of opinions highlights the need for greater transparency and education regarding digital payment systems' deduction processes to address user concerns and build trust.

12. This suggests that users value the ability to monitor their transactions in real-time, indicating a need for enhanced visibility and control over digital payments.

13. Improving technology is seen as the most effective way to reduce deductions by 45.5% of respondents.

14. Technical issues are a significant cause of deductions, affecting the majority of respondents.

15. The survey highlights the need for technological and security improvements.

16. Users value safety and ease of use in digital payment systems.

17. Service charges are perceived as the most common deduction by the majority of respondents.

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18. To increase customer trust, digital payment systems should focus on reducing fees and increasing transparency, as indicated by the majority of respondents.
19. This indicates a potential need for improved customer support or dispute resolution mechanisms in digital payment systems.
20. A mixed sentiment is observed, with 46.9% satisfied and 45.3% neutral, indicating a generally positive outlook with room for improvement.
21. Convenience is perceived as the primary advantage by the majority of respondents, highlighting the value of ease and comfort in digital payment methods.
22. The high percentage of respondents recommending digital payment systems suggests that users are not only adopting these systems but also actively promoting them to their social networks.

Findings

The findings of the research reveal that the majority of respondents were young adults, predominantly aged 21, with more male participants than female. Most users had some experience using digital payment systems, with a large proportion identifying as intermediate or beginner users. The most common deductions encountered were transaction fees and service charges, which many respondents experienced occasionally or rarely. However, technical issues were also found to be a major cause of deductions, affecting more than half of the participants. These results suggest that while digital payment systems are widely used, users still face challenges related to fees and system reliability.

In terms of perception, most respondents believe that deductions are based on transaction amounts, indicating a perceived straightforward fee structure. A significant number acknowledged the role of intermediaries in the deduction process, though opinions varied regarding their level of influence. Deductions were reported to impact both online shopping behavior and business revenue, reflecting real financial implications. Transparency emerged as a critical factor, with the majority of respondents valuing it highly and many expressing the desire for real-time transaction tracking to enhance visibility and trust. However, opinions on the fairness of digital payment

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systems were evenly divided, showing a need for greater clarity and user education about deduction mechanisms.

Overall, respondents emphasized the importance of improving technology and enhancing security as key ways to reduce deductions and build user confidence. Security and convenience were the top priorities when choosing a digital payment system, and many users called for more effective dispute resolution mechanisms to handle deduction-related issues. Despite these concerns, user satisfaction levels were generally positive, and a large majority had recommended digital payment systems to others. This indicates strong user acceptance and endorsement, suggesting that with continued technological advancement and greater transparency, digital payment systems can further strengthen user trust and satisfaction.

Suggestions

Based on the research findings, several measures can be implemented to improve the efficiency, reliability, and user trust in digital payment systems.

Firstly, technological advancement should be prioritized to reduce technical glitches and transaction errors that often lead to unintended deductions. Continuous investment in innovation—such as artificial intelligence for fraud detection, blockchain for transaction validation, and improved server infrastructure—can significantly enhance the overall stability and accuracy of digital payment platforms.

Secondly, transparency must be strengthened to foster trust among users. Digital payment service providers should clearly display deduction details, transaction histories, and applicable fees in real-time. Providing users with accessible summaries and notifications about charges would reduce confusion and ensure accountability. Transparent policies regarding service fees and deductions will also help minimize disputes and promote fairness.

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Thirdly, security and privacy protection should remain a top priority. As more users adopt digital payment platforms, there is a growing need for stronger data protection mechanisms, multi-factor authentication, and encryption to prevent fraud and data breaches. Enhanced cybersecurity measures will safeguard users' financial information and maintain confidence in the system.

Fourthly, standardization of fees and service charges across platforms should be considered. Regulatory authorities and financial institutions could collaborate to establish clear guidelines for digital payment deductions, ensuring uniformity and protecting consumers from excessive or hidden charges.

Additionally, customer support systems should be improved to handle deduction-related grievances more efficiently. A user-friendly complaint mechanism, faster resolution times, and dedicated support staff would encourage users to report issues rather than abandon the platform. Furthermore, educational campaigns and awareness programs can help users understand how digital payment deductions work, how to prevent technical errors, and how to manage their transactions securely.

Finally, continuous monitoring and evaluation of digital payment systems should be conducted to ensure that reforms and upgrades are effective. Regular feedback from users can guide future system improvements and help maintain the integrity, efficiency, and accessibility of digital payment services.

Conclusion

In conclusion, this research demonstrates that digital payment systems are widely accepted and valued for their convenience, security, and speed, particularly among younger users who form the majority of participants. However, the findings also reveal persistent challenges such as transaction

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deductions, technical issues, and a lack of transparency, which influence user satisfaction and trust. These concerns highlight the importance of establishing clearer communication, fairer pricing policies, and more reliable technical frameworks.

The study shows that users view security and convenience as the most crucial factors when selecting a digital payment system, while transparency and fairness are essential for long-term user confidence. Although most respondents express satisfaction with digital payment systems, a significant portion remains neutral or uncertain, suggesting a gap between user expectations and current service delivery. Addressing these issues through better technology, transparency, and customer service will significantly enhance user trust and encourage greater adoption.

Overall, digital payment systems have the potential to transform financial transactions by promoting cashless economies and improving accessibility. However, their success depends on continuous innovation, regulatory oversight, and a user-centered approach. By implementing the suggested improvements, service providers can create a more transparent, secure, and efficient ecosystem that not only meets user needs but also contributes to the growth and sustainability of the digital financial sector.

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"Mastering Returns Logistics: Unlocking Enhanced Customer Satisfaction and Business Performance in Online Shopping"

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Under guidelines of research by

Dr. Padmashree V

Abstract

The growth of e-commerce has led to an increase in product returns, making logistics a critical aspect of online retail. This study explores the challenges and opportunities associated with returns logistics, examining its impact on customer satisfaction, loyalty, and business performance. Through a comprehensive analysis of existing literature and industry practices, this research identifies the best practices and strategies for mastering returns logistics. The findings highlight the importance of efficient returns processes, effective communication, and strategic partnerships in enhancing customer experience and reducing costs. This study provides insights and recommendations for e-commerce businesses to optimize their returns management processes, ultimately improving their competitiveness and profitability in the market.

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Introduction:

The exponential growth of e-commerce has revolutionized the retail landscape, offering consumers unparalleled convenience, flexibility, and accessibility. However, beneath the surface of this digital retail revolution lies a complex and often overlooked aspect: return logistics. As online shopping continues to escalate, the importance of mastering returns logistics has become a critical factor in determining the success and sustainability of ecommerce businesses.

Returns logistics encompasses the entire process of handling product returns, refunds, and exchanges, and its impact extends far beyond the operational realm. Effective returns logistics can enhance customer satisfaction, loyalty, and retention, while also protecting a company's bottom line and brand reputation. Conversely, poor returns logistics can lead to increased costs, decreased customer satisfaction, and damage to a company's brand.

This study, "Mastering Returns Logistics: Unlocking Enhanced Customer Satisfaction and Business Performance in Online Shopping " aims to explore the intricacies of returns logistics in e-commerce, identifying the key challenges, opportunities, and best practices for mastering this critical aspect of online retail.

By examining the impact of returns logistics on business performance, customer satisfaction, and brand reputation, this research seeks to provide insights and recommendations for ecommerce businesses to optimize their returns management processes and improve their competitiveness in the market.

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Literature review

Returns play a crucial role in reverse logistics, encompassing activities such as usage, reuse, and disposal of returned products. The process involves collecting items at predetermined locations, processing them economically, and rerouting them to prospective customers either from warehouses or through cross-docking. This chapter discusses the work done in the fields of reverse logistics and cross-docking, highlighting common challenges such as unauthorized returns, faster-than-expected returns, excess inventory, longer cycle times, and inefficiencies in repair activities. Returns can be classified into controllable and uncontrollable types: controllable returns arise from issues caused by manufacturers or sellers, such as technical faults or packaging defects, while uncontrollable returns occur at warehouses or intermediate locations due to factors like low sales turnover. Implementing Just-in-Time (JIT) inventory management is considered the best policy to address these challenges. Reverse logistics must manage complexities such as variable product quality, uncertain volumes, unpredictable cost estimates, incorrect inventory, and multiple disposition centres, all of which require strategic planning and efficient processing to ensure operational effectiveness.

Referring to Amiri, A., 2005 [9] who has brought a significant strategic issue associated to the design and operation of a supply chain structure in such a way that the demands of all customers are satisfied optimally. The author described the COTS (commercial off the self) assessment problem as an multi criteria decision making model, hence suggested a 5-stage evaluation model, author used hybrid ANP (analytic network process) model integrating with TOPSIS (technique for order performance by similarity to idea solution). Author calculated e the relative weights of each selection criteria. Later TOPSIS approach is applied to prioritize the products based on their individual performance. author conducted an empirical study for this. He found

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the method is effective and practical to apply. Selection criteria such as cost, suppliers support technological risk, nearness of fit company business Ease of operation flexibility, system integration for the software product.

Li and Olorunniwo (2008) tried to investigate the reverse logistics practices with a goal to identify the reverse logistics process flow that may be considered as generic. They also tried to identify the key strategic issues that may be used by a firm for its competitive advantage.

Brito and Dekker (2002) explored the fundamentals of reverse logistics by analysing the issue from four essential viewpoints: why, what, how and who. Why the things are returned, what is being returned, how reverse logistics works in practice and who is executing the reverse logistics activities?

Yagiura, M., et al. 2006 [16] have shown that in supply-chain design models, are suitable for the generalized assignment problem. The change in mandatory environmental laws, public focus on environmental matters made reverse logistics [RL] activities important in supply chain as per Kumar, S., et al., 2008 [17]. Cross-docking allows 12 eliminations of intermediate storage. How the shipments can be directly transferred to outgoing vehicles in an effective way has been demonstrated.

Hoda Mahmoudi, et al. (2014) [42], has contributed a paper to strengthen the reverse supply chain procedures and implementation. Recovery cycle of the product involves certain activities like for the products like collection of returned items, dismantling, reprocessing, recycling of used items, remanufacturing if required, and distributing it to centres for further use. All these activities consume wealth and materials. Sometimes even it is threat to environment also. These activities are part of reverse supply chain includes green activities. Hence authors focused to formulate a model minimize the cost of such activities.

Tummala, Phillips and Johnson (2006) [64] particularly analysed the strategic success aspects in applying SCM activities within a company. some of the issues highlighted are corporate image, management support and involvement, information 21 technology deployed, human resource systems.

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Methodology

1. Statement of the Problem:

The problem addressed in this study is the lack of understanding and effective management of returns logistics in e-commerce, which can lead to increased costs, decreased customer satisfaction, and damage to brand reputation. Despite the growing importance of e-commerce, return logistics remains a significant challenge for many online retailers. This study aims to explore the intricacies of returns logistics in ecommerce, identify the best practices, and provide recommendations for e-commerce businesses to master returns logistics and improve their competitiveness in the market.

2. Need for the Study:

- The rapid growth of e-commerce has led to an increase in product returns, making returns logistics a critical aspect of online retail.

- Despite its importance, return logistics remain a poorly understood aspect of e-commerce, with many businesses struggling to manage returns effectively.

- Returns logistics can significantly impact on customer satisfaction, loyalty, and retention, making it essential to explore and understand this topic.

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- Effective returns logistics can help reduce costs associated with returns, including processing, restocking, and disposal.
- Businesses that master returns logistics can gain a competitive advantage in the market, differentiating themselves from competitors.

3. Scope of the Study:

The study explores return logistics in e-commerce, including product returns, refunds, exchanges, and reverse logistics, while also examining the impact of returns logistics on ecommerce operations, customer satisfaction, loyalty, and retention.

In terms of industry scope, the research focuses on the e-commerce industry, including online retailers and businesses that sell products or services online.

Geographically, the study adopts a global perspective, drawing on examples and case studies from various countries and regions to provide a broad understanding of returns logistics in e-commerce.

Methodologically, the research employs a mixed-methods approach, combining qualitative and quantitative methods to gather and analyse data.

4. Research Questions:

1. What are the key challenges associated with returns logistics in e-commerce?

2. How do e-commerce businesses currently manage returns logistics, and what are the best practices?

3. What is the impact of returns logistics on customer satisfaction, loyalty, and retention in e-commerce?

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4. How can e-commerce businesses optimize their returns management processes to reduce costs and improve efficiency?

5. What role does technology play in enhancing returns logistics in e-commerce, and what are the benefits and challenges of implementing technological solutions?

5. Objectives:

- To Examine the relationship between returns management practices and customer satisfaction.

- To Investigate the effects of returns logistics on business performance, customer satisfaction, loyalty, and brand reputation.

- To Explore the effective strategies and best practices for managing returns logistics in e-commerce, including process optimization, technology adoption, and strategic partnerships.

6. Type of Research:

This research is analytical in purpose since it seeks to analyse the linkage between returns logistics and customer satisfaction/business performance with the objective of solving a practical issue encountered in online shopping.

7. Research Design:

The study employs a **descriptive research design** as the primary methodology, supplemented by exploratory and causal research elements to address all three research objectives comprehensively. This fundamental approach is particularly suitable for:

- Systematically describing returns management practices and their characteristics

- Understanding current state of customer satisfaction in e-commerce returns

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- Identifying patterns and relationships between variables

- Providing foundational insights for strategic decision-making

8. Data Collection:

The primary data for this study will be collected using email surveys, allowing direct engagement with respondents. A well-designed questionnaire will be distributed via personalized email invitations to a targeted group that meets the research criteria. Each email will communicate the study's objectives, assure confidentiality, and provide a deadline for completing the survey. To enhance response rates and reduce nonresponse bias, automated follow-up reminders will be sent periodically. This method offers an effective way to reach a broad and geographically dispersed audience, monitor responses in real time, and gather data in a consistent format. Email surveys facilitate quick data collection, ease of response processing, and maintain respondent privacy, thus ensuring the research results are both reliable and valid.

9. Sampling Design:

A. Sampling:

❖ **Research Approach**

Adopt a **descriptive research method** using a structured online questionnaire survey to collect data on consumer experiences and attitudes regarding returns logistics in online shopping.

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❖ **Target Population**

• The population includes **online shoppers** who have made at least one return after an online purchase within the past 12 months.

❖ **Sampling Technique**

• Use **stratified random sampling** to ensure representation across key demographics such as gender and frequency of online shopping.

• Alternatively, if access to a complete list of online shoppers is limited, a **systematic online survey** approach can be used by distributing the questionnaire through social media, e-commerce platforms, and email lists.

❖ **Sample Size**

Aim for a sample size of **71-81 respondents** to achieve statistical significance and robust analysis, as supported by similar studies in the field. Conduct a **pilot test** with 2–5 respondents to validate the survey instrument and refine the sampling process before full-scale data collection.

Step	Description
Population	Online shoppers with return experience
Sampling Method	stratified random sampling
Sample Size	71-81 respondents
Data Collection	Online survey

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Pilot test	2-5 respondents

B. Sampling Method:

The sampling technique used in this study is non-probability convenience sampling, chosen for its ease of access and ability to provide timely insights. Respondents were selected based on their availability and willingness to participate, comprising both e-commerce customers and professionals from logistics, operations, and supply chain management.

C. Sampling Frame:

The sampling frame for the study "Mastering Returns Logistics: Unlocking Enhanced Customer Satisfaction and Business Performance in Online Shopping" is an analytically derived, comprehensive list of online shoppers who have engaged in returns within a defined period, serving as a representative subset of the broader customer population to enable precise measurement and analysis of returns logistics and its impact on satisfaction and business outcomes.

D. Sampling Units:

In this study on returns logistics in online shopping, the sampling unit is each individual return transaction. This unit serves as the specific data point from which information is collected and analysed to understand how logistics impact customer satisfaction and business performance. By focusing on these transactional elements, the research aims to draw insights that accurately reflect the broader customer experience and operational efficiency.

Analysis and interpretation:

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Questionnaires	Majority responses	NO of responses percentage
How easy was it to initiate a return with an online retailer?	Somewhat easy	40.5
What is the most important factor to you when returning a product online?	Fast refund processing	40.5
How satisfied were you with the returns process of an online retailer?	Somewhat satisfied	39.2
How likely are you to shop again with an online retailer that has a hassle-free returns process?	Very likely	33.8
What impact did the returns experience have on your loyalty to the online retailer?	Positive impact	55.4
How important is transparency in returns logistics to you?	Very important	52.7
Would you be willing to pay more for a product if the retailer offered free returns?	No	45.9
How important is communication from the retailer during the returns process to you?	Very important	56.8
How often do you return products purchased online?	Rarely (less than 20% of purchases)	43.2
How important is the environmental impact of returns logistics to you?	Very important	43.2
Would you prefer to have multiple returns options (e.g., in-store, mail, drop-off)?	Yes	52.7
How does the returns policy of an online retailer influence your purchasing decision?	Very influential	41.9

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Have you ever experienced any issues with returns logistics that affected your trust in an online retailer?	True	**68.9**
How important is it for you to receive a refund or exchange quickly after initiating a return?	Very important	**63.5**
Would you be willing to pay a small fee for expedited returns processing?	No	**36.5**
How does the returns experience affect your overall satisfaction with an online retailer?	Very significant impact	**44.6**

Analysis:

Ease of Return Initiation: Most respondents (77%) found it relatively easy to initiate returns with online retailers, with 36.5% rating it "Very easy" and 40.5% "Somewhat easy," indicating that most e-commerce platforms have successfully streamlined their return initiation processes.

Most Important Return Factors: Fast refund processing emerges as the top priority for 40.5% of customers, followed by easy returns process at 32.4%, demonstrating that speed and simplicity are the critical drivers of customer satisfaction in online return experiences.

Returns Process Satisfaction: Customer satisfaction with online return processes shows mixed results, with 60.8% expressing some level of satisfaction (21.6% very satisfied + 39.2% somewhat satisfied) versus 32.4% remaining neutral, suggesting room for improvement in return experience quality.

Likelihood to Shop Again: A strong correlation exists between hassle-free returns and customer loyalty, as 63.5% of respondents indicate they are likely to shop again with retailers offering seamless return processes (33.8% very likely + 29.7% somewhat likely), highlighting returns as a key competitive differentiator.

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Impact of Returns Experience on Customer Loyalty: Positive returns experience significantly enhances customer loyalty, with 55.4% of respondents reporting that their returns experience had a positive impact on their loyalty to the retailer, while only 8.1% experienced negative impact, demonstrating that effective returns management is a powerful tool for building long-term customer relationships.

Importance of Transparency in Returns Logistics: Transparency in returns logistics is highly valued by customers, with 90.5% considering it important (52.7% very important + 37.8% somewhat important), indicating that clear communication about return status, timelines, and processes is crucial for maintaining customer trust and satisfaction.

Willingness to Pay Premium for Free Returns: Customer willingness to pay more for free returns shows mixed attitudes, with 45.9% unwilling to pay extra, 32.4% willing to pay more, and 21.6% uncertain, suggesting that while free returns are valued, retailers should carefully consider pricing strategies that incorporate return costs without explicitly passing them to customers.

Importance of Retailer Communication During Returns: Communication from retailers during the returns process is considered critically important by most customers, with 85.2% rating it as important (56.8% very important + 28.4% somewhat important), highlighting the need for proactive updates and clear communication throughout the entire returns journey.

Frequency of Product Returns: Return behaviour varies significantly among online shoppers, with 43.2% rarely returning products (less than 20% of purchases), 33.8% occasionally returning items (20-50% of purchases), and 17.6% frequently returning more than half their purchases, indicating a diverse range of customer return patterns that retailers need to accommodate.

Environmental Impact Importance: Environmental sustainability in returns logistics is considered important by most customers, with 81% rating it as important (43.2% very important + 37.8% somewhat important), suggesting that eco-friendly return processes could

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serve as a competitive advantage and align with growing consumer environmental consciousness.

Preference for Multiple Return Options: Customers strongly value flexibility in return methods, with 52.7% preferring multiple return options (in-store, mail, drop-off), 27% uncertain, and only 20.3% not wanting multiple options, highlighting the importance of omnichannel return strategies that provide convenience and choice.

Returns Policy Influence on Purchasing: Returns policies significantly influence purchasing decisions, with 79.7% of customers considering them influential (41.9% very influential + 37.8% somewhat influential), demonstrating that favourable return policies are crucial marketing tools that can drive customer acquisition and sales conversion.

Issues with Returns Logistics Affecting Trust: Most customers (68.9%) have encountered logistics issues that eroded their trust in an online retailer, underscoring the critical need for reliable and error-free return processes.

Importance of Quick Refund or Exchange: Rapid refunds or exchanges are highly prioritized, with 89.2% of respondents deeming it very (63.5%) or somewhat (25.7%) important, indicating speed as a key driver of return satisfaction.

Willingness to Pay Fee for Expedited Returns: Customer willingness to pay a small fee for faster returns is divided, as 31.1% would pay, 36.5% would not, and 32.4% are undecided, suggesting cautious openness to premium return services.

Impact of Returns Experience on Overall Satisfaction: The returns experience significantly influences overall satisfaction for 74.3% of respondents (44.6% very significant + 29.7% somewhat significant), highlighting returns as a major determinant of customer sentiment.

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Interpretation:

Ease of Initiating a Return: Over three-quarters of customers (77%) find it easy (very or somewhat) to initiate returns, suggesting that most online retailers provide user-friendly return initiation interfaces.

Most Important Factor When Returning: Fast refund processing is the top priority (40.5%), closely followed by ease of the returns process (32.4%), indicating that speed and simplicity drive return satisfaction.

Satisfaction with Returns Process: While a majority (60.8%) express satisfaction with the returns process, 32.4% remain neutral and about 8.1% are dissatisfied, highlighting opportunities for improving customer experience.

Likelihood to Shop Again After Hassle-Free Returns: Nearly two-thirds of respondents (63.5%) are likely to repurchase from retailers offering hassle-free returns, underlining returns experience as a key loyalty driver.

Transparency in Returns Logistics: Over 90% of customers consider transparency in returns logistics important (52.7% very important + 37.8% somewhat important), indicating clear visibility into the returns process is crucial for trust.

Willingness to Pay More for Free Returns: While 32.4% of respondents are willing to pay extra for free returns, nearly 46% would not and 21.6% are undecided, suggesting free returns are valued but pricing must be carefully balanced.

Impact of Returns Experience on Loyalty: A positive returns experience drives loyalty for 55.4% of customers, compared with only 8.1% experiencing negative impact, highlighting returns as a key loyalty lever.

Importance of Retailer Communication During Returns: Retailer communication during returns is critical for 85.2% of customers (56.8% very important + 28.4% somewhat important), underscoring timely updates and responsiveness as essential elements of a satisfying return experience.

Issues with Returns Logistics Affecting Trust: Over two-thirds of customers (68.9%) have encountered logistics problems that undermined their trust in an online retailer, highlighting the risk of eroding customer relationships when returns operations fail.

Frequency of Product Returns: Return rates vary widely, with 43.2% of shoppers rarely returning items, 33.8% doing so occasionally, and 17.6% frequently returning more than half of their purchases, indicating a broad spectrum of return behaviours that retailers must accommodate.

Environmental Impact Importance: Environmental considerations rank highly for returns logistics, as 81% of respondents regard them as important (43.2% very important + 37.8% somewhat important), suggesting that sustainable return practices can strengthen brand appeal.

Influence of Returns Policy on Purchasing: Returns policies significantly affect buying decisions for 79.7% of customers (41.9% very influential + 37.8% somewhat influential), demonstrating that clear, customer-friendly return terms are vital for driving sales.

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Willingness to Pay a Fee for Expedited Returns: Customers are divided on paying a small fee for expedited return processing, with 31.1% willing, 36.5% unwilling, and 32.4% undecided, highlighting mixed attitudes toward premium return services.

Issues with Returns Logistics Affecting Trust: Most respondents (68.9%) have experienced logistics issues that negatively influenced their trust in an online retailer, underlining the importance of reliable return processes.

Impact of Returns Experience on Overall Satisfaction: The returns process substantially shapes overall satisfaction for 74.3% of customers (44.6% very significant + 29.7% somewhat significant impact), making returns a major determinant of the customer experience.

Importance of Fast Refund or Exchange After Return: An overwhelming majority (89.2%) consider quick refunds or exchanges important (63.5% very important + 25.7% somewhat important), confirming speed as a top expectation in the returns experience.

Finding:

The survey reveals that while most customers find initiating a return straightforward—77% describing it as "very" or "somewhat" easy—there remains a substantial neutral or negative segment (24.3%) whose experience could be improved by simplifying return portals and instructions. Fast refund processing emerged as the single most valued aspect of the returns process, chosen by 40.5% of respondents, closely followed by an easy return's procedure (32.4%), underscoring that speed and simplicity jointly drive return satisfaction. Although 60.8% of shoppers report being satisfied with how returns are handled, a combined 40.5% are neutral or dissatisfied, signalling a critical opportunity for online retailers to enhance the consistency and reliability of their logistics operations.

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Transparency in returns logistics is deemed essential by 90.5% of participants, with over half rating it "very important," indicating that real-time status updates and clear communication about pickup, transit, and refund stages are key trust-building measures. Indeed, 85.2% of customers consider retailer communication during returns to be important, further emphasizing the need for proactive notifications and responsive customer service throughout the returns journey. Nearly two-thirds of respondents (63.5%) say they're more likely to shop again with retailers offering hassle-free returns, confirming that a seamless returns policy not only mitigates dissatisfaction but also fosters long-term loyalty.

Environmental impact is another critical dimension: 81% of customers value sustainable returns practices, suggesting that investments in eco-friendly packaging, optimized reverse logistics flows, or carbon-offset partnerships could resonate strongly with the consumer base. Similarly, 79.7% of shoppers report that favourable returns policies influence their purchase decisions, highlighting returns terms as a potent marketing and competitive differentiator.

Customer willingness to pay for return enhancements, however, is mixed: approximately one-third of respondents are open to paying more for free returns or expedited processing, another third is resistant, and the remainder are undecided—indicating that any premium pricing strategies must be carefully tested and communicated to avoid alienating price-sensitive segments. Finally, logistics lapses have tangible reputational consequences: 68.9% have experienced returns issues that eroded their trust in a retailer, and 74.3% say that return interactions significantly impact their overall satisfaction, underscoring that returns are not merely a cost centre but a critical touchpoint for customer relationship management.

Suggestions:

To strengthen the returns experience, online retailers should implement an integrated, transparent tracking system that provides customers with real-time status updates—from pickup scheduling to warehouse receipt and refund confirmation. By leveraging automated notifications (email, SMS, and in-app alerts) and a centralized returns dashboard, companies can address the 90.5% of shoppers who deem logistics transparency crucial and reduce the

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68.9% who have lost trust due to return mishaps. Clear, user-friendly return portals with prefilled shipping labels, step-by-step guides, and AI-driven support chatbots will further streamline initiation and reduce friction for the 24.3% who find returns neutral or difficult.

Given that fast refund processing is the top priority for 40.5% of respondents and a fast, hassle-free return experience boosts repurchase likelihood by 63.5%, retailers should automate reverse-logistics workflows: integrate proof-of-delivery triggers, standardized inspection protocols, and instant refund APIs. Packaging return kits with return labels and QR codes can minimize errors and accelerate processing, ensuring consistency across channels. Retailers should also expand omnichannel return options—mail, curb side pickup, in-store drop-off, and locker returns—to cater to the 52.7% of customers who value multiple return methods, while optimizing network partnerships to control logistics costs.

To reflect growing environmental concerns—81% of customers prioritize the environmental impact of returns—retailers can consolidate return shipments, partner with carbon-neutral carriers, and introduce incentives for consolidated returns (e.g., discounted return fees or loyalty points). Communicating sustainability initiatives prominently across product pages and order portals will resonate with eco-conscious consumers and differentiate the brand.

Finally, tiered return-service models should be piloted to balance customer expectations with operational costs. With one-third of respondents open to paying for expedited processing or premium free-return services, retailers can offer subscription-based "Returns Plus" memberships that bundle benefits such as expedited refunds, extended return windows, and dedicated support lines—while using A/B testing to calibrate pricing and feature sets. Transparent value communication will be essential to avoid alienating the 36.5–46% who resist additional fees, thereby transforming returns from a cost centre into a strategic loyalty and revenue driver.

Conclusion:

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Optimizing returns logistics is a key competitive advantage for e-commerce companies aiming to boost customer satisfaction and long-term success. A seamless, transparent returns process not only reduces costs but also fosters customer loyalty. When returns are processed quickly and customers receive clear, real-time updates, they are more inclined to shop again and recommend the retailer to others.

This research highlights two critical drivers: efficiency and communication. Rapid refund processing ranks highest in customer expectations, while over 85% of shoppers demand proactive, transparent updates throughout the returns journey. Implementing automated reverse-logistics workflows—complete with proof-of-delivery triggers, instant refund APIs, and centralized returns dashboards—enables retailers to meet these needs, minimize errors, and restore confidence among customers who have experienced past logistics issues.

Sustainability in returns management emerges as another strategic opportunity. With more than 80% of consumers valuing eco-friendly practices, businesses that consolidate shipments, partner with carbon-neutral carriers, and offer incentives for combined returns can both shrink their environmental footprint and appeal to conscientious shoppers. Highlighting these green initiatives across the purchase and returns cycle further elevates brand perception and customer engagement.

Introducing a tiered returns service can balance customer expectations with cost control. Launching a "Returns Plus" program—featuring perks like accelerated refunds, longer return windows, and dedicated support—can transform returns from a cost centre into a revenue driver and loyalty enhancer. Rigorous A/B testing and transparent pricing will ensure the premium offering delivers genuine value without alienating budget-minded customers.

In essence, mastering returns logistics requires an integrated strategy that emphasizes speed, transparency, sustainability, and customer choice. By adopting these best practices, e-commerce businesses can turn returns into a powerful tool for differentiation and enduring customer loyalty.

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"From Campus to Career: The Hidden Struggle Without Internships"

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ABSTRACT:

Internships play a crucial role in bridging the gap between academic learning and professional work experience. This study aims to explore how limited access to internship opportunities impacts the career paths of students. It investigates the consequences of reduced industry exposure, lack of hands-on experience, and minimal professional networking, which often hinder students' skill development, career clarity, and employability. Through a combination of surveys and interviews with students and academic professionals, the study highlights the challenges faced in securing internships and their influence on career readiness. The findings suggest that limited internships can delay career progression, reduce confidence, and restrict informed career decision-making. The study concludes with recommendations to improve internship accessibility and integrate practical experience more effectively into academic curricula.

Key Words:

Career, Struggle, Internships, Learning, Skill Development, Experience, High Competition.

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1. INTRODUCTION:

Internships have become an essential component of modern education, offering students valuable opportunities to apply theoretical knowledge in real-world settings. They serve as a bridge between academic learning and professional experience, equipping students with industry-relevant skills, improving their confidence, and enhancing their employability. However, in recent years, many students face challenges in securing adequate internship opportunities due to limited availability, high competition, lack of institutional support, and regional or economic constraints.

The absence of internship exposure can significantly affect a student's ability to make informed career choices, gain practical experience, and develop workplace readiness. Without internships, students often enter the job market underprepared, which can delay their career progression and diminish their professional confidence. This research aims to explore how the lack of sufficient internships influences the career paths of students, focusing on the consequences for skill development, career decision-making, and employment opportunities. By understanding these impacts, the study seeks to provide insights that can guide educational institutions, policymakers, and industry leaders in improving internship access and enhancing student career outcomes.

Internships play a vital role in preparing students for the professional world by offering hands-on experience, industry exposure, and practical application of academic knowledge. In today's competitive job market, employers increasingly seek candidates who are not only academically qualified but also job-ready through real-world experience. However, many students face significant challenges in accessing internships due to limited opportunities, lack of institutional support, or intense competition. As a result, they often graduate without the practical skills and confidence needed to navigate the workplace effectively. This gap between education and employment creates a hidden struggle for students, making it difficult for them to make informed career decisions, secure employment, and progress professionally. This research seeks to examine how the lack of internships impacts students' career choices, employability,

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job readiness, and long-term growth. By understanding these issues, the study aims to highlight the importance of integrating structured internship opportunities into academic programs to better equip students for their transition from campus to career.

2. REVIEW AND LITERATURE:

➤ (2023) Swallow, M.A, et. al. [1] has done their research on the topic —Peer-Assisted Learning in a Longitudinal Hybrid Physical Exam Course‖ and analysed that Peer-assisted learning (PAL) enhances the confidence and teaching abilities of instructors while fostering a positive learning environment for students.

➤ (2022) Ternion A. [5] has researched on the topic —Soft and hard skills identification: insights from IT job advertisements in the CIS region‖ and reviewed that the field of information technology (IT) is substantially impacted by labour market changes, which introduce new tools, systems, and frameworks.

➤ (2020) Mabe, K., et. al. [9] has researched on the topic —Critical soft skills for information and knowledge management practitioners in the fourth industrial revolution‖ and perceived the idea that having hard technical skills is the primary determinant for an innovative and sustainable fourth industrial revolution (4IR) environment has been promoted by many technology jurisdictions.

➤ (2021) Malykhin, O., et. al. [26] have carried the thorough study on the topic —Developing Soft Skills among Potential Employees: A Theoretical Review on Best International Practices‖. The goal of the current study is to conduct a theoretical review in order to identify the top international practices for soft skill development among students of various disciplines.

➤ (2020) Seyyed Mohsen Azizi, et. al. [44] conducted an analysis on the topic —Investigation the correlation between psychological empowerment and assertiveness in nursing and midwifery students in Iran‖ and realized that a crucial trait for nurses and midwives is assertiveness, hence it should be covered in the students' curriculum.

3. METHODOLOGY:

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3.1 Statement of the Problem:

In the present era of growing competition and industry expectations, internships have become an essential component of higher education, offering students practical experience, industry exposure, and career direction. Despite their importance, many students face difficulties in securing internship opportunities due to limited availability, lack of awareness, institutional inefficiencies, and socio-economic barriers. This lack of internship experience can result in underdeveloped skills, reduced job readiness, and unclear career goals. As a result, students may find it challenging to transition effectively from academics to the professional world. This study seeks to examine how the shortage or absence of internships influences students' career paths, skill development, and future employability.

3.2 Need for the Study:

Internships are a key component in shaping students' professional skills and helping them transition smoothly into the workforce. They provide real-world experience, build confidence, and enhance employability. However, many students are unable to access internship opportunities due to limited availability, lack of institutional support, or socio-economic barriers. This study is necessary to explore how the absence of internships impacts students' career choices, skill development, and readiness for employment. It also aims to suggest solutions to improve internship access and support systems in higher education.

3.3 Scope of the Study:

➢ study focuses on undergraduate and postgraduate students across various academic disciplines.

➢ It examines how limited access to internships affects students' career planning, skill development, and employability.

➢ The research covers both urban and rural students to understand regional differences in internship accessibility.

➢ It includes data collected through surveys and interviews to gather both quantitative and qualitative insights.

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- The study is limited to students from selected colleges or universities within a specific region or academic year.

- The study does not focus on students who have had multiple or long-term internship experiences.

- It aims to provide recommendations for educational institutions, policymakers, and industries to improve internship support systems.

3.4 Research Questions:

1. How does the absence of internship experience affect students' career readiness?

2. What are the main barriers preventing students from accessing internship opportunities?

3. How do students without internship experience perceive their chances in the job market?

4. What impact does lack of internships have on students' skill development and confidence?

5. How do employers view graduates who lack internship experience during recruitment?

6. In what ways does the absence of internships delay or hinder students' career progression?

7. What alternative forms of practical learning do students pursue when internships are unavailable?

8. How does the availability of internships differ across academic disciplines and institutions?

9. What role do socio-economic factors play in limiting access to internships?

10. How can educational institutions bridge the gap between classroom learning and workplace experience?

3. 5 Objective of the Study:

1. To examine the impact of limited internships on students' career decisions.
2. To study the role of internships in enhancing student employability.
3. To explore how limited internship access influences job readiness.

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4. To assess how limited internships affect students' professional growth.
5. To evaluate the effect of practical experience gaps on career progression.

A) Type of Research:

- **Descriptive** Research is used to describe the current situation of students' experiences without internships, their employability, job readiness, and professional growth.

- **Quantitative** Research is applied through the use of structured questionnaires and multiple-choice questions to collect measurable data from a large group of respondents.

B) Operational Definitions:

1. **Campus:**

   Refers to the academic environment, including colleges or universities, where students undergo formal education before entering the workforce.

2. **Career:**

   The sequence of professional roles or employment positions a student aspires to or enters after graduation.

3. **Internship:**

   A short-term, structured work experience provided by an organization to students aimed at giving them hands-on exposure to real-world tasks related to their field of study.

4. **Lack of Internships:**

   A situation in which students are unable to access internship opportunities due to factors such as limited availability, institutional inefficiencies, socio-economic barriers, or lack of industry linkages. In this study, it will be assessed based on student survey responses about access and experience.

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5. **Career Readiness:**

The degree to which a student is prepared to transition into the workforce, measured by confidence levels, job-related skills, industry exposure, and ability to meet employer expectations.

6. **Skill Development:**

The acquisition of practical abilities (e.g., communication, teamwork, problem-solving) typically gained through experiential learning, including internships.

7. **Employability:**

A student's ability to secure and maintain employment, influenced by their education, experience (or lack thereof), and job market preparedness.

8. **Hidden Struggle:**

Refers to the often-unnoticed challenges and disadvantages students face in building their careers due to the absence of internship experiences.

C) Research Design:

The study titled *"From Campus to Career: The Hidden Struggle Without Internships"* adopts a descriptive research design. This design aims to provide a clear understanding of how limited access to internships influences students' career decisions, employability, job readiness, and overall professional growth. The research focuses on collecting quantitative data from students using a structured questionnaire to measure their perceptions and experiences regarding internships. By using this approach, the study seeks to describe existing conditions and identify the relationship between practical exposure and career development. The data will be gathered through both online and offline surveys, targeting students from different academic streams to ensure diversity in responses. The collected data will then be analysed using statistical tools such as percentages and mean scores to interpret trends and draw conclusions. This research design is appropriate as it allows the researcher to objectively evaluate the effects of internship limitations on students' transition from campus life to professional careers.

D) Data Collection Method:

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To gather relevant and accurate information for this study, both **primary** and **secondary data collection methods** will be employed.

1. Primary Data Collection:

- **Questionnaire** **Survey:**
  A structured questionnaire will be designed and distributed among undergraduate and postgraduate students from various academic disciplines. The questionnaire will include both **closed-ended** (Likert scale, multiple choice) and **open-ended** questions to collect data on their internship experiences, skill development, and career preparedness. The survey will be conducted either online (e.g., Google Forms) or in person.

- **Interviews:**
  Semi-structured interviews will be conducted with a selected group of students and faculty members to gather in-depth qualitative data. These interviews will focus on personal experiences, perceived challenges, and the impact of not having internship exposure on career plans.

2. Secondary Data Collection:

- **LiteratureReview:**
  Secondary data will be gathered from academic journals, research articles, educational reports, institutional records, and internship-related policy documents to support and compare findings.

- **Institutional Records (if available):**
  Data on internship placement rates, student participation in training programs, and employability records may be accessed from college/university career centres to supplement survey results.

3. Tools Used:

- Google Forms or printed questionnaires for survey distribution
- Audio recordings or transcripts for interviews.

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3.6 Sampling Design:

1. **Population of the Study:**

   The target population includes undergraduate and postgraduate students from various academic streams who have limited or no internship experience.

2. **Sampling Technique:**

   The study will use a **stratified random sampling** method. Students will be grouped based on their academic discipline (e.g., Arts, Science, Commerce, Engineering), and a random selection will be made from each group to ensure diverse representation.

3. **Sample Size:**

   A total of **120 to 150 students** will be selected to participate in the study. This size allows for meaningful analysis while maintaining feasibility.

4. **Sampling Area:**

   The sample will be drawn from **selected colleges and universities** within a specific geographic region or city (as defined by the researcher).

5. **Inclusion Criteria:**

   o   Currently enrolled undergraduate or postgraduate students

   o   Students with limited or no internship experience

   o   Students willing to participate in surveys or interviews

6. **Exclusion Criteria:**

   o   Students with extensive or multiple internship experiences

   o   Students in vocational programs with mandatory internships

   o   Students unwilling to participate or submit complete responses

A) Sampling Plan :

Purpose: To collect representative quantitative evidence on how limited internship access influences students' career decisions, employability job readiness professional growth and long-term career progression.

Target population: Students for whom internships are relevant mainly final year and

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penultimate undergraduate students postgraduate students and recent graduates within 1 year. Recommended sample size: **50-52 respondents** target ≈**50** large enough for subgroup comparisons interns vs non-interns years of study program while manageable to administer.

B) Sampling Method :

Stratified random sampling with purposive stratification.

Rationale: The study's objectives require comparing groups e.g. those with internships vs without so strata ensure balanced representation on key characteristics while random selection within strata preserves objectivity. If full frame access is impossible use cluster sampling by class/section as a fallback and report the limitation.

Suggested strata use one or combine:

- **Year of study:** Final year Penultimate Other Recent graduates 1 year
- **Program:** Undergraduate Postgraduate Professional diploma
- **Internship status screened if not in frame:** No internship Attempted but not secured Completed one Completed multiple.

C) Sampling Units :

- **Primary sampling unit (PSU):** Individual student.
- **Unit of analysis:** Each student's completed questionnaire (one response = one observation).
- **Inclusion criteria:** Currently enrolled students or recent graduates 1 year from programs where internships are normally expected; willing to provide informed consent.

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- **Exclusion criteria:** Graduates beyond 1 year, students from programs where internships are irrelevant, and individuals who do not consent.

D) Sampling Frame :

Definition: A cleaned, up-to-date list of eligible students from which the sample is drawn.

Typical sources: departmental enrolment roll lists placement-cell records, and class/section lists maintained by departments. The frame should include (at minimum) student ID, year, program, and contact information.

Frame preparation steps: obtain permission for lists → merge departmental & placement records → remove duplicates → validate contact details → add an "internship status" field if available (otherwise include as first survey screening question).

PLAN OF ANALYSIS :

The data collected through structured questionnaires will be analysed using quantitative methods. Descriptive statistics such as frequencies, percentages, and mean scores will be used to summarize responses. Cross-tabulation will help identify relationships between variables such as internship access and career readiness. Likert scale responses will be analysed to assess the intensity of student perceptions. The findings will be interpreted in line with the research objectives, and conclusions will be drawn to suggest practical improvements in internship access and career preparation.

LIMITATIONS OF THE STUDY :

- The study is limited to a specific geographic region and may not reflect the experiences of students nationwide or internationally.

- A relatively small sample size (120–150 students) may not fully capture the diversity of student experiences across all disciplines.

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- The research focuses only on students with limited or no internship experience, excluding comparative analysis with those who completed internships.

- Data collected through surveys and interviews is self-reported and may be influenced by personal bias or inaccurate recall.

- Time constraints restricted the ability to conduct longitudinal (long-term) follow-up on career outcomes.

- Institutional differences in support systems, placement cells, and industry ties are not fully explored in the study.

- The study does not account for differences in internship quality, duration, or relevance, which could also impact career outcomes.

- Findings may not be equally applicable across all academic fields, as internship importance varies by discipline (e.g., engineering vs. arts).

ANALYSIS :

Question Graph Topic	Analysis (What the data shows)	Interpretation (What the data means)
Gender (63.5% Female, 36.5% Male)	The majority of the 52 respondents are female, representing almost two-thirds of the total sample.	The survey results are predominantly influenced by the perspectives of the female student/graduate population.
Age (94.9% 18-25)	An overwhelming majority of the 39 respondents fall within the 18 to 25 age bracket.	The target demographic is clearly young adults, consistent with a survey focused on academic and early career planning.
1) Academic Status (51.9% Recently Graduated, 40.4% First-year student)	The sample is heavily split between those who have just finished studies (51.9%) and	The data reflects perspectives from both fresh entrants and recent job-seekers, covering

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	those at the beginning (40.4%).	the full spectrum of pre-employment experience.
2) Have you ever done an internship? (55.8% Yes, one; 13.5% Yes, more than one)	69.3% of respondents have completed at least one internship; only 13.5% didn't try to get one.	There is high participation in internships, indicating a strong recognized need for practical experience among students/graduates.
3) Do you feel internships help in deciding your career path? (65.4% Yes, significantly; 25% Yes, to some extent)	A combined 90.4% of respondents agree that internships help in deciding a career path.	Internships are viewed as highly effective and valuable tools for career exploration and confirmation.
4) In the absence of internships, how do you make career decisions? (38.5% Online research; 26.9% Advice from family/friends	Online research is the primary method for decision-making, followed closely by advice from personal networks.	Students rely heavily on accessible, self-directed information sources when formal professional experience is missing.
5) Does lack of internship exposure affect your confidence in career decisions? (48.1% Yes; 15.4% Somewhat)	63.5% of respondents admit that a lack of internship exposure negatively affects their confidence.	Practical experience is intrinsically linked to self-assurance when making important career choices.
6) Do you think internships increase your employability? (44.2% Strongly agree; 42.3% Agree)	A near-unanimous 86.5% of respondents agree or strongly agree that internships boost employability.	The belief that internships are essential for job market competitiveness is widely accepted by the student/graduate community.

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7) What do employers value most during hiring (in your opinion)? (42.3% Communication skills; 32.7% Internship experience)	Respondents believe Communication skills are the most valued factor by employers, slightly ahead of Internship experience.	While valuing experience, students perceive "soft skills" as the ultimate priority for employers during the hiring process.
8) likely are you to get a job without internship experience? (38.5% Unlikely; 30.8% Very likely)	A plurality (38.5%) believes it is unlikely, but a significant 30.8% consider it very likely.	This shows a split: a large segment is pessimistic about job prospects without experience, while another is quite optimistic or confident in other qualifications.
9) Do you feel job-ready with only classroom learning? (26.9% Yes; 23.1% Not really; 26.9% No)	Only 26.9% feel fully job-ready with just classroom learning, while a combined 50% are unsure or do not feel ready.	Classroom learning alone is not perceived as sufficient preparation for the job market by half of the respondents.
10) What job readiness skills do internships improve most? (38.5% All of the above; 25% Communication; 23.1% Time management)	The majority (38.5%) chose 'All of the above,' confirming internships' comprehensive benefits. Communication and Time management are the top specific skills cited.	Internships are highly valued for their ability to holistically improve a range of essential job readiness skills, including both hard and soft skills.
11) What is your biggest concern while entering the job market? (51.9% Lack of practical experience)	A clear majority, 51.9%, identify 'Lack of practical experience' as their single biggest concern.	This overwhelming consensus confirms the critical role of practical experience (like internships) in reducing anxiety about job market entry.

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12) Do you believe internships enhance professional behavior? (55.8% Yes; 21.2% To some extent)	A significant 55.8% said 'Yes,' with another 21.2% saying 'To some extent,' totaling 77% who believe in the benefit.	Internships are widely seen as key to developing necessary professional conduct and workplace etiquette.
13) Which area of professional growth do you feel is lacking due to no internships? (30.8% All of the above; 26.9% Industry exposure; 26.9% Confidence)	All of the above' is the top response, while 'Industry exposure' and 'Confidence' are tied as the next highest specific areas of lack.	The absence of internships is perceived to create deficiencies across multiple critical areas of professional development.
14) Have you missed networking opportunities due to lack of internships? (38.5% Yes; 32.7% Maybe)	A combined 71.2% of respondents believe they have either definitely or possibly missed networking opportunities due to no internships	Internships are strongly correlated with access to professional networks, and students perceive a lack of experience as a barrier to making these connections.
15) Do you think practical experience gaps affect your long-term career progress? (46.2% Yes; 23.1% No)	46.2% believe a gap affects long-term progress, while 25% are 'Not sure,' and 23.1% say 'No'.	A significant portion of the audience is concerned that missing out on practical experience will have lasting negative effects on their career trajectory.
16) What alternatives have you used to gain practical experience? (30.8% Online projects; 30.8% Freelancing; 26.9% Volunteering)	Online projects' and 'Freelancing' are the most popular alternatives, both at 30.8%, closely followed by 'Volunteering'.	Students actively seek out varied, self-initiated methods to substitute for formal internship experience.

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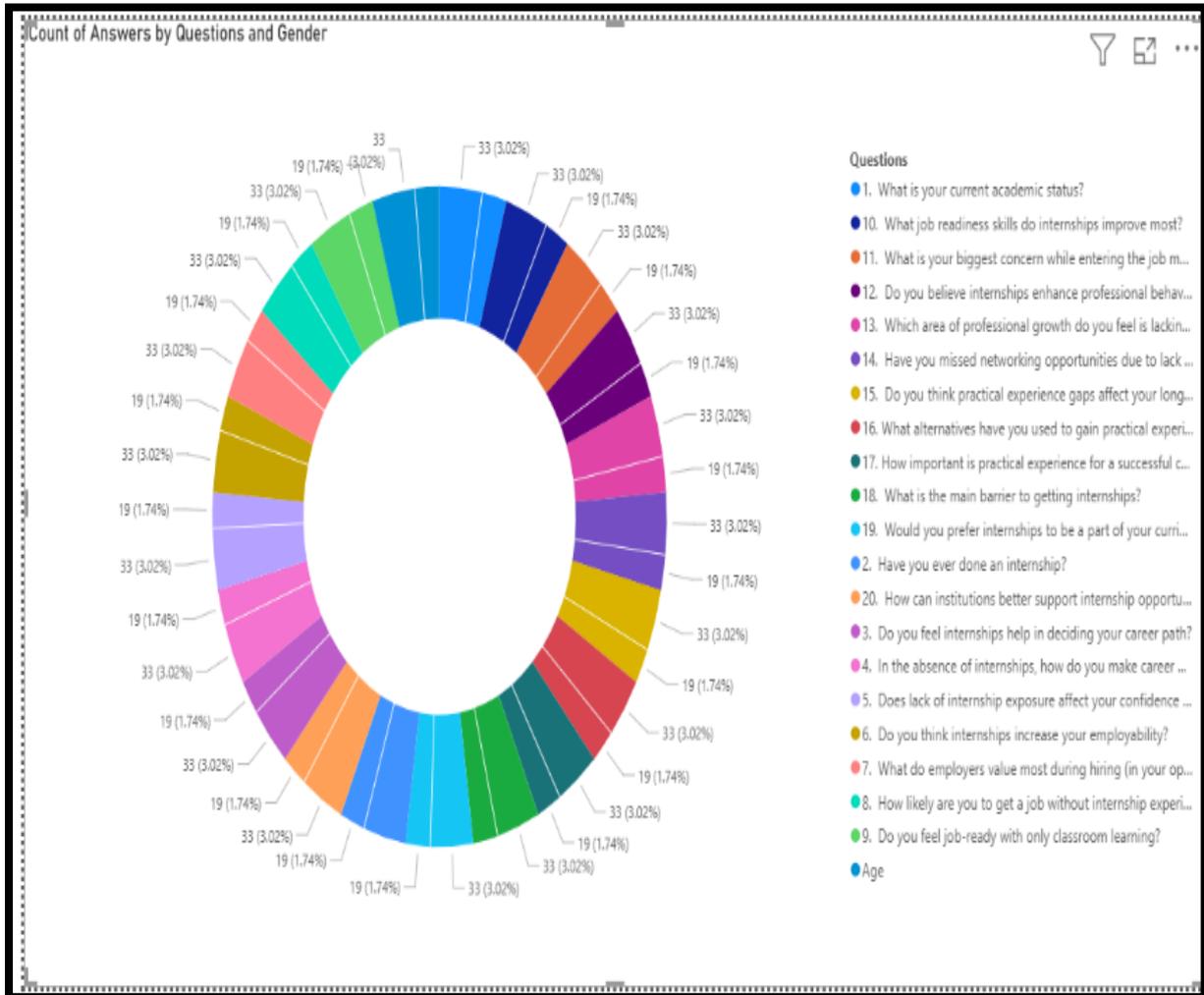
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17) How important is practical experience for a successful career? (44.2% Important; 40.4% Extremely important)	An overwhelming 84.6% rate practical experience as either 'Important' or 'Extremely important'.	This confirms the audience's profound belief that practical experience is a non-negotiable factor for achieving career success.
18) What is the main barrier to getting internships? (40.4% Lack of opportunities; 21.2% Poor awareness; 21.2% Academic load)	Lack of opportunities' is identified as the single biggest barrier by a clear margin of 40.4%.	The primary challenge is perceived to be an external issue of supply, rather than internal factors like lack of guidance or academic pressure.
19) Would you prefer internships to be a part of your curriculum? (53.8% Yes, mandatory; 30.8% Yes, optional)	A combined 84.6% of respondents believe internships should be part of the curriculum, with a majority advocating for them to be mandatory (53.8%).	Students recognize the critical necessity of internships and want institutions to integrate practical experience as a compulsory academic requirement.
20) How can institutions better support internship opportunities? (38.5% Internship training programs; 30.8% Industry tie-ups)	Internship training programs' is the top choice at 38.5%, closely followed by 'Industry tie-ups' at 30.8%.	Students want institutions to focus on both *preparation* (training programs) and *provision* (industry partnerships) to facilitate internship access and success.

> Females make up 63.5% of the responses and males make up 36.5%. Total responses are 52.

> Most respondents (94.9%) are between 18-25 years old. Other age groups have minimal representation.

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- Majority (51.9%) are recently graduated, followed by first-year students (40.4%). Other categories have minimal representation.

- Most respondents (55.8%) did one internship. 13.5% did more than one, 17.3% didn't do an internship but tried, and 13.5% didn't do or try.

- Majority (65.4%) feel internships significantly help in deciding career path, 25% say to some extent.

- Most respondents (38.5%) rely on online research for career decisions without internships. Advice from family/friends is the second most common method (26.9%).

- Nearly half (48.1%) say lack of internship exposure affects confidence in career decisions. 30.8% say it doesn't affect their confidence.

- Most respondents (44.2% strongly agree + 42.3% agree = 86.5%) believe internships increase employability. Only a small percentage (3.8% combined for neutral and disagree) aren't strongly in favor or are against.

- According to the pie chart, the majority (42.3%) of respondents believe employers value "Communication skills" most during hiring. "Internship experience" is the second most valued at 32.7%, followed by "Academic grades" at 23.1%, and "College reputation" at a negligible percentage.

- Most respondents think getting a job without internship experience is somewhat likely (38.5%) or very likely (30.8%), totaling 69.3%. A smaller percentage find it unlikely (13.5%) or are unsure (17.3%).

- The pie chart shows 52 responses on job-readiness with classroom learning only. Equal percentages (26.9%) feel "Yes" and "No" about being job-ready, while 23.1% each feel "Somewhat" and "Not really".

- Internships improve job readiness skills across categories with "All of the above" getting 38.5% votes, followed by Communication (25%), Time management (23.1%), and Technical knowledge (13.5%).

- Majority (51.9%) are concerned about lack of practical experience. Other concerns like interview skills, job availability (17.3% each), and lack of confidence (13.5%) are lesser.

- Majority (55.8%) believe internships enhance professional behavior, with 21.2% saying to some extent.

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- The pie chart shows responses on areas of professional growth lacking due to no internships. 30.8% chose "All of the above", while Industry exposure and Confidence both got 26.9%, and Soft skills got 15.4%.

- The pie chart shows responses to whether people missed networking opportunities due to lack of internships. 38.5% said "Yes", 21.2% said "No", 32.7% said "Maybe", and 7.7% said "Not applicable".

- Most respondents (46.2%) believe practical experience gaps affect long-term career progress. The remaining responses are split between No (23.1%), Not sure (25%), and Slightly (minimal green segment, exact percentage not specified).

- The pie chart shows that Freelancing (30.8%) and Online projects (30.8%) are the most used alternatives for gaining practical experience among respondents. Volunteering (26.9%) is the next most common, with None (11.5%) being the least chosen.

- Most respondents (40.4% + 44.2% = 84.6%) consider practical experience important or extremely important for a successful career. Only a small percentage find it not very important or not important at all.

- The main barrier to getting internships is "Lack of opportunities" with 40.4% responses. Other barriers like "Poor awareness", "Academic load", and "No proper guidance" got 21.2%, 21.2%, and 17.3% responses respectively.

- Majority (53.8%) prefer internships as mandatory part of curriculum, followed by 30.8% who prefer it optional. Only 9.6% are unsure and 9.6% say no.

- Most respondents (38.5%) think internship training programs can better support internship opportunities. Industry tie-ups got 30.8% votes.

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INTERPRETATION :

- This shows females responded more than males in this survey. The ratio of female to male responses is roughly 1.7:1.
- This suggests the survey data is heavily skewed towards young adults (18-25), possibly indicating the survey's target or popularity among this age group.
- This suggests a significant portion of respondents have just completed their studies, and a substantial number are at the start of their academic journey.
- This shows majority have internship experience, mostly just one. About a third didn't do an internship, split between trying and not trying.
- Internships are seen as valuable for career path decisions by most respondents.

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➢ This suggests students value self-directed learning via online research for career decisions. Family/friends also play a significant role in guiding career choices.

➢ This suggests internship exposure plays a significant role in career decision confidence for many respondents. A notable portion remains unaffected though.

➢ This suggests internships are highly valued for enhancing job prospects. The majority opinion supports the idea that internships boost employability in the job market.

➢ This suggests that in the opinion of these respondents, employers prioritize candidates with strong communication skills over other factors like internship experience and academic grades. It highlights the importance of developing effective communication skills for job seekers.

➢ This suggests that a majority of respondents are optimistic about securing a job without prior internship experience. However, a notable portion remains uncertain or thinks it's unlikely, indicating varied perceptions on the importance of internships.

➢ This suggests a split opinion on classroom learning's effectiveness for job readiness. About half (53.8%) aren't fully confident ("No" + "Not really"), while the other half (53.8%) are somewhat or fully confident ("Yes" + "Somewhat").

➢ This suggests internships are perceived to enhance a broad range of skills rather than just one specific area. "All of the above" being the highest indicates internships are valued for their overall impact on job readiness.

➢ This suggests practical experience is a big hurdle for job market entrants. Equal concern for interview skills and job availability indicates these are also significant challenges.

➢ This suggests internships are seen as valuable for professional development by most respondents. The results indicate a positive perception of internships in enhancing professional behavior.

➢ This suggests many feel lacking in multiple areas without internships. "All of the above" being highest indicates a perceived broad impact on professional growth from lack of internships.

➢ This suggests that a significant portion (38.5%) feel they missed networking opportunities without internships. A substantial percentage (32.7%) are unsure ("Maybe"), indicating ambiguity about the impact.

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➢ This suggests that nearly half of the respondents think practical experience gaps impact career progress significantly. The distribution indicates mixed opinions but a leaning towards acknowledging the impact of such gaps.

➢ This suggests that respondents prefer gaining practical experience through paid or project-based work like freelancing and online projects. A smaller portion haven't used any of these alternatives for gaining practical experience.

➢ This suggests practical experience is highly valued for career success according to the survey respondents. Most believe it plays a significant role.

➢ This suggests that most respondents feel limited availability of internships is a big hurdle. Other factors like awareness, academics, and guidance also play a role but are less prominent compared to lack of opportunities.

➢ Students largely value internships in curriculum, with over 84% wanting it either mandatory or optional, indicating practical experience is seen as beneficial.

➢ Institutions can enhance internship support mainly through internship training programs and industry connections. A notable portion (21.2%) believe all mentioned options are effective.

➢ Institutions can enhance internship support mainly through internship training programs and industry connections. A notable portion (21.2%) believe all mentioned options are effective.

FINDINGS :

1) Students with limited or no internship experience often face difficulty in making clear and informed career decisions.

2) Access to internships significantly enhances students' employability skills, including communication, teamwork, and problem-solving.

3) Limited internships reduce students' job readiness, making it challenging to adapt to real workplace demands.

4) Students without internship experience report lower confidence during interviews and professional interactions.

5) The absence of practical exposure slows professional growth and limits students' ability to apply theoretical knowledge effectively.

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6) Internship experience increases awareness of industry expectations and professional norms, which non-internship students often lack.

7) Students with internships tend to secure better job opportunities and faster career progression than those without practical experience.

8) The gap in hands-on experience creates a mismatch between academic learning and real-world workplace requirements.

9) Students without internships feel less prepared to handle workplace challenges and responsibilities independently.

10) Overall, internships play a critical role in bridging the gap between campus learning and career success, highlighting the hidden struggles faced by students who do not have this opportunity.

SUGGESTION :

1. Develop Micro-Internship Opportunities: Introduce short-term, project-based internships that allow students to gain practical experience even when full internships are limited.

2. Peer-Led Skill Sharing Programs: Encourage students who have completed internships to mentor peers, sharing real-world experiences and best practices.

3. Simulation-Based Training: Implement virtual simulations or lab projects that mimic real workplace tasks to build job readiness without formal internships.

4. Industry Case Study Integration: Integrate real-world case studies into classroom learning to bridge the gap between theory and practice.

5. Cross-Disciplinary Collaboration: Promote projects involving students from different streams, encouraging diverse skill development and teamwork.

6. Soft Skills Bootcamps: Organize intensive workshops focusing on critical soft skills such as leadership, adaptability, and negotiation to enhance employability.

7. Portfolio Development Programs: Encourage students to maintain a portfolio of academic projects, online courses, and freelance work as evidence of practical capability.

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8. Partnership with Startups: Collaborate with startups and small businesses for internship-like exposure, which may be more flexible and innovative than traditional corporate internships.

9. Research-Based Internships: Offer research assistant positions with faculty or industry partners to develop analytical and problem-solving skills.

10. Career Readiness Certification: Introduce certification programs validating practical skills, giving students credibility in the absence of formal internships.

11. Use of AI & Technology Platforms: Leverage AI-based career guidance and skill-building platforms to simulate workplace challenges and assess readiness.

12. Feedback-Driven Improvement: Collect detailed post-internship or simulation feedback to continuously improve preparatory programs for students without internships.

13. Networking Opportunities: Facilitate virtual networking sessions with industry professionals to enhance professional exposure and mentorship.

14. Internship Awareness Campaigns: Educate students about alternative internship opportunities, including volunteering, freelancing, or part-time industry projects.

15. Institutional Recognition Programs: Reward students who undertake practical experience outside traditional internships to motivate others.

16. CONCLUSION :

17. The study highlights that limited access to internships significantly impacts students' career decisions, employability, job readiness, professional growth, and overall career progression. Students who participated in internships demonstrated stronger practical skills, confidence, and adaptability, while those without such exposure faced challenges in applying theoretical knowledge to real-world tasks. Lack of internships created a gap between academic learning and workplace expectations, reducing competitiveness and slowing career development. Internship experience was found to enhance awareness of industry standards, professional etiquette, and organizational culture, enabling students to perform better in interviews and transition smoothly into jobs. Alternative

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approaches, such as micro-internships, virtual projects, skill workshops, and alumni mentoring, can help mitigate the absence of traditional internships. The findings suggest that structured internship programs and industry collaborations are essential for bridging the campus-to-career gap, improving employability, and fostering professional growth. Overall, ensuring access to practical experiences is critical for preparing students to navigate workplace challenges successfully and achieve sustainable career progression.

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"A THEORETICAL STUDY ON THE ROLE OF INDIA'S FINANCIAL SYSTEM IN ENABLING RETIREMENT AND PENSION SCHEMES"

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ABSTRACT

This study explores the pivotal role of India's financial system in supporting and enabling retirement and pension schemes aimed at ensuring financial security for the ageing population. It examines the structure, efficiency, and reach of various components including regulatory bodies, financial institutions, pension funds, and government-backed initiatives such as the National Pension System (NPS), Employees' Provident Fund (EPF), and Atal Pension Yojana (APY). The research also analyses the challenges in awareness, accessibility, and inclusivity across formal and informal sectors. By evaluating policy reforms and financial instruments, the study highlights how the evolving financial ecosystem contributes to long-term retirement planning and social welfare. The findings underscore the need for greater financial literacy, digital integration, and policy innovation to strengthen India's retirement landscape.

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1. INTRODUCTION

A resilient and dynamic financial system forms the backbone of a nation's economic and social security, particularly in safeguarding the financial independence of individuals after retirement. In India, the growing importance of structured retirement and pension solutions has been propelled by demographic shifts such as increasing life expectancy, a growing elderly population, and evolving family structures. Traditional reliance on familial support and personal savings for post- retirement sustenance is steadily giving way to the need for formal, institutionalized retirement planning, fueled by modernization, urbanization, and changing employment patterns. India's financial ecosystem — encompassing banks, insurance companies, pension funds, mutual fund institutions, capital markets, and key regulatory bodies like the Securities and Exchange Board of India (SEBI) and the Pension Fund Regulatory and Development Authority (PFRDA) — plays an instrumental role in enabling the design, distribution, and governance of retirement and pension schemes. A wide range of financial instruments and initiatives, such as the Employees' Provident Fund (EPF), Public Provident Fund (PPF), National Pension System (NPS), and Atal Pension Yojana (APY), have been introduced to cater to the varied retirement needs of citizens across different income levels and sectors. This study delves into how India's financial system facilitates the mobilization of long-term savings, offers investment vehicles suited for wealth accumulation, manages inflation and longevity risks, and ensures stable income flows during retirement. It further evaluates the effectiveness and reach of various government-led pension programs and private sector offerings in creating a sustainable retirement landscape. Despite notable progress, the study recognizes persistent challenges — including low financial literacy, limited awareness and accessibility of pension products, insufficient penetration in rural and informal sectors, and complex regulatory environments — that continue to hinder the full realization of retirement security goals. Addressing these barriers is essential to expanding pension coverage and strengthening the financial well-being of the elderly population. By critically assessing the current strengths and shortcomings of India's financial system, the research aims to propose strategic policy recommendations to enhance inclusivity, efficiency, and sustainability in retirement planning. Strengthening the retirement and pension ecosystem is not only vital for ensuring

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individual dignity and independence post-retirement but also for maintaining overall macroeconomic stability as India steadily moves toward becoming an aging society.

2. REVIEW OF LITERATURE

The global discourse around retirement and pension systems often centres on themes like financial inclusion, income security, demographic shifts, and systemic sustainability. In India, research and policy dialogues have increasingly focused on how the financial system supports structured retirement planning for both formal and informal sectors.

Choudhary and Sinha (2020) analysed the structural strengths of the National Pension System (NPS) and found it to be cost-effective, with scalable investment options and growing subscriber confidence. Gupta (2017) noted that while statutory schemes like EPF have historically supported salaried workers, vast sections of the informal workforce lacked access to pension benefits—prompting the development of schemes like Atal Pension Yojana (APY).

PFRDA's annual reports (2018–2024) highlight consistent growth in NPS and APY enrolments, aided by regulatory reforms, tax incentives, and digital integration. EPFO publications underline the long-standing role of provident funds but also point to challenges in adequacy of returns, especially post-retirement annuities.

A study by PwC India (2022) stressed the need for greater retirement preparedness, citing a lack of awareness, financial literacy, and gender disparities in pension coverage. Moreover, Ministry of Finance communications emphasize the role of targeted subsidies and co-contributions in expanding APY coverage, particularly among low-income groups.

The literature collectively emphasizes that India's financial system has made important strides in promoting retirement security. However, gaps persist in outreach, return optimization, portability, and gender parity. A well-coordinated ecosystem—combining policy, regulation, and innovation—is seen as crucial to making pension coverage both universal and sustainable.

3. METHODOLOGY

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This study adopts a qualitative and descriptive research approach, relying on secondary data sourced from reputable financial and governmental institutions. The primary objective is to evaluate how India's financial system facilitates and strengthens retirement and pension schemes, with a focus on the period from 2015 to 2024. The analysis encompasses trends in pension fund performance, regulatory evolution, financial inclusion measures, and institutional frameworks.

Sources include:

• Annual Reports and publications from the Pension Fund Regulatory and Development Authority (PFRDA),

• Government schemes such as NPS (National Pension System) and Atal Pension Yojana (APY),

• Reserve Bank of India (RBI) bulletins and Ministry of Finance reports,

• Research papers, policy briefs, and journal articles on retirement planning and financial security,

• Statistical data from EPFO (Employees' Provident Fund Organisation) and IRDAI for insurance-linked pension schemes.

This study does not conduct primary surveys or interviews. Instead, it interprets published data trends and institutional reports to construct a well-rounded understanding of how India's financial ecosystem contributes to retirement readiness and pension sustainability.

OBJECTIVES

1. To analyze the structure and components of the Indian financial system that contribute to the management and delivery of retirement and pension schemes.

2. To evaluate the role of regulatory bodies such as the Pension Fund Regulatory and Development Authority (PFRDA), RBI, SEBI, and IRDAI in facilitating retirement planning.

3. To assess the effectiveness of key pension schemes like the National Pension System (NPS), Employees' Provident Fund (EPF), Atal Pension Yojana (APY), and others in ensuring financial security for retirees.

4. To examine the participation and awareness levels of the working population regarding retirement planning and available pension products.

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5. To explore the role of financial institutions, such as banks, insurance companies, and mutual funds, in promoting and managing retirement-related financial products.

6. To identify the challenges and gaps in the current pension and retirement system in India from both policy and implementation perspectives.

7. To provide suggestions for improving the reach, efficiency, and sustainability of pension and retirement schemes through financial system reforms.

4. ANALYSIS

a) Institutional Framework and Regulatory Backbone

India's retirement and pension ecosystem is supported by a multi-layered institutional framework led by the Pension Fund Regulatory and Development Authority (PFRDA), Employees' Provident Fund Organisation (EPFO), and Life Insurance Corporation (LIC). These bodies ensure compliance, governance, and capital preservation. The PFRDA's role in standardizing pension fund operations under the National Pension System (NPS) has improved transparency and accountability in recent years.

b) Government-Led Initiatives and Financial Inclusion

Schemes like NPS, Atal Pension Yojana (APY), and Pradhan Mantri Vaya Vandana Yojana (PMVVY) reflect the government's commitment to broad-based retirement coverage, especially for the unorganised sector. Subsidized contributions, tax incentives, and automatic enrollment mechanisms have strengthened participation, especially post-2015.

c) Digital Platforms and Accessibility

The integration of pension services with digital platforms such as the NPS Trust portal, UMANG App, and eNPS online enrollment has improved access, particularly for the younger workforce. Fintech apps and aggregators also promote awareness and easy onboarding, making retirement planning more accessible and self-directed.

d) Investment Strategy and Risk Management

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Pension schemes in India follow a life-cycle-based investment strategy, allowing automatic asset allocation adjustments based on age and risk appetite. The inclusion of equity instruments in NPS, alongside government bonds and corporate debt, provides both growth and security. Regulatory caps on equity exposure (typically 50%-75%) ensure risk is managed prudently.

e) Coverage Expansion and Scheme Diversity

From formal salaried workers under EPF to informal sector workers under APY, India's pension system is increasingly diverse. Additional voluntary options such as Tier-II NPS accounts, annuity products, and insurance-linked pension plans allow individuals to tailor retirement plans to their financial goals.

f) Challenges and Constraints

- Low awareness and financial literacy in rural and semi-urban populations,
- Voluntary nature of enrollment in key schemes limits full-scale participation,
- Inadequate pension corpus due to low contribution rates and limited financial planning,
- Lack of portability and flexibility across jobs in certain pension structures,
- Operational delays in fund disbursement and service delivery in legacy systems.

5. FINDINGS AND SUGGESTIONS

Findings

1. India offers multiple pension and retirement products through both public and private sectors, including EPF, NPS, Atal Pension Yojana, PPF, and insurance-based pension plans.
2. The Employees' Provident Fund (EPF) and National Pension System (NPS) are the most structured and widely used retirement schemes, managed by the EPFO and PFRDA, respectively.
3. A large proportion of India's workforce (over 85%) is in the unorganized sector, which has limited access to formal retirement plans, despite schemes like Atal Pension Yojana (APY) targeting this group.

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4. Many individuals lack awareness or understanding of long-term retirement planning and investment tools, leading to under-utilization of available schemes.

5. The NPS and private annuity products are gaining traction as they offer market-linked returns, attracting younger, risk-tolerant investors.

6. Financial regulators like RBI, SEBI, IRDAI, and PFRDA play an active role in ensuring security, transparency, and efficiency in pension fund management.

7. Initiatives like e-KYC, Aadhaar linkage, and digital platforms (e.g., UMANG, NPS online) are helping improve accessibility and participation.

8. Many retirees still do not accumulate an adequate retirement corpus due to low contributions, inflation, and rising life expectancy.

Suggestions

1. Launch nationwide campaigns on retirement planning via schools, colleges, workplaces, and media to raise awareness about pension schemes.

2. Promote micro-pension schemes and incentivize participation through government subsidies or tax benefits for gig and informal workers.

3. Offer better tax incentives and employer co-contribution models to encourage early and higher savings in pension schemes.

4. Allow pension funds to invest more in equities, infrastructure, and ESG-compliant assets to generate higher long-term returns.

5. Ensure that schemes are easy to enroll in and manage, and make pension accounts portable across jobs and regions.

6. Improve the transparency, accountability, and performance tracking of pension fund managers through independent audits and public dashboards.

7. Collaborate with fintech companies, banks, and insurance providers to co-create retirement products and improve service delivery.

6. CONCLUSION

Retirement and pension schemes have evolved into a cornerstone of India's financial stability framework, reflecting a broader shift toward structured long-term financial planning and inclusive economic growth. From fragmented beginnings to a more unified and regulated

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ecosystem, India's financial system has increasingly embraced its role in ensuring financial dignity for its aging population.

As life expectancy rises and informal employment continues to dominate, these schemes are no longer optional but essential. The transition from passive saving to active retirement planning underscores a new financial consciousness emerging across income groups and demographics. Instruments like NPS, APY, and EPF, supported by fintech innovation and regulatory foresight, position India to redefine how retirement is secured.

Looking ahead, pension schemes can serve not just as income-replacement tools but as levers for social protection, capital market deepening, and financial literacy. To sustain and scale this momentum, coordinated action is required among regulators, policymakers, employers, technology providers, and educators.

With the right policy push, strategic innovation, and public engagement, India can build a resilient, equitable, and future-ready pension system—one that not only protects its citizens post-retirement but also powers its broader economic aspirations.

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"A STUDY ON THE IMPACT OF BASEL III NORMS ON NON-PERFORMING ASSETS WITH SPECIAL REFERENCE TO SBI AND HDFC BANK"

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ABSTRACT:

This research examines the impact of Basel III norms and Non-Performing Assets (NPAs) on the performance of Indian commercial banks, with a comparative focus on the State Bank of India (SBI) and HDFC Bank. It underscores the critical role of banks in maintaining financial stability and driving sustainable economic growth. The study investigates how Basel III regulations—particularly the Capital Adequacy Ratio (CAR) requirements—affect the ability of banks to manage NPAs, safeguard asset quality, and sustain profitability. A descriptive and analytical research design has been employed, relying on secondary data drawn from audited financial statements of SBI and HDFC Bank, Reserve Bank of India (RBI) publications, and Basel III guidelines. The findings reveal that although both institutions comply with Basel III standards, their performance diverges notably. HDFC Bank demonstrates stronger resilience, efficient NPA management, and steady profitability, reflecting sound risk-management practices and effective capital use. In contrast, SBI, despite being the largest public sector bank with extensive outreach, continues to face elevated NPAs that erode profitability and weaken financial strength. This contrast shows that adherence to Basel III norms alone does not ensure stability; effective NPA control mechanisms are equally vital for sustainable growth.

The study highlights that strengthening credit appraisal systems, adopting advanced risk-management technologies, and improving loan recovery processes are essential for Indian banks to balance regulatory compliance with operational efficiency. From a policy standpoint, it provides valuable insights for regulators and policymakers, stressing that the true driver of long-term sustainability in the Indian banking sector lies in integrating stringent Basel III compliance with proactive NPA management. By showing that HDFC Bank's adherence and asset-quality focus enhance profitability and stability, while SBI's challenges reflect weaker NPA

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control, the study concludes that the dual emphasis on regulation and asset quality forms the cornerstone of resilience under evolving global financial standards.

KEYWORDS: Basel III Norms, Capital Adequacy Ratio (CAR), HDFC Bank, Non-Performing Assets (NPAs), and State Bank of India (SBI).

INTRODUCTION

The banking sector is often described as the backbone of an economy because it facilitates the smooth functioning of financial activities, credit creation, and investment promotion. A healthy banking system ensures economic stability, while weaknesses in the sector can lead to crises that spill over into the entire economy. To strengthen global banking practices and maintain financial stability, the **Basel Committee on Banking Supervision (BCBS)**, under the Bank for International Settlements (BIS), introduced a series of internationally accepted regulatory frameworks known as the **Basel norms**. These guidelines aim to safeguard the banking system against unexpected shocks and ensure long-term stability by prescribing standards on capital adequacy, leverage, and risk management.

The global financial crisis of 2008 demonstrated the vulnerabilities of banks across the world, even in advanced economies. Excessive lending, weak monitoring of credit quality, and inadequate capital reserves pushed several banks into insolvency. This raised concerns about systemic risk and emphasized the importance of adopting stringent regulatory frameworks. In this context, **Basel III norms** gained prominence as a comprehensive set of reforms intended to strengthen regulation, supervision, and risk management in the banking sector.

In India, the introduction of Basel III norms has been highly significant. The Indian banking sector, while resilient compared to many global counterparts, has continuously struggled with the problem of **Non-Performing Assets (NPAs)**. Rising NPAs not only threaten the stability of banks but also adversely affect credit growth and economic progress. This makes it essential to study how Basel III norms—through higher capital adequacy requirements, liquidity standards, and leverage ratios—impact the management of NPAs in Indian banks.

1.1 Basel Norms

The **Basel norms** are a set of international banking regulations issued by the BCBS with the primary objective of improving the resilience of banks worldwide. These guidelines are not legally binding but are adopted by most countries through domestic regulations, making them a global standard for banking operations.

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- **Basel I (1988):** The first framework, focused on maintaining a minimum capital adequacy ratio (CAR) of 8% of risk-weighted assets. It was primarily concerned with credit risk.
- **Basel II (2004):** Expanded the scope by including market and operational risks. It introduced the three-pillar framework—minimum capital requirements, supervisory review, and market discipline.
- **Basel III (2010 onwards):** Developed in response to the 2008 global financial crisis, Basel III aims to improve the quality of capital, introduce the **Capital Conservation Buffer (CCB)**, strengthen the **Leverage Ratio**, and implement liquidity standards such as the **Liquidity Coverage Ratio (LCR)** and **Net Stable Funding Ratio (NSFR)**. Its goal is to ensure banks are better prepared for financial stress and unexpected losses.

In essence, Basel III norms raise the bar for banking regulation by insisting on higher-quality capital and stricter risk management, thereby reducing the probability of bank failures and systemic crises.

1.2 Non-Performing Asset (NPA)

A **Non-Performing Asset (NPA)** is a loan or advance where the borrower fails to make scheduled interest or principal payments for a period of **90 days or more**. NPAs are critical indicators of a bank's financial health and efficiency in credit management.

Classification of NPAs:

1. **Sub-standard Assets** – Assets that remain non-performing for less than or equal to 12 months.
2. **Doubtful Assets** – Assets that remain in the sub-standard category for more than 12 months.
3. **Loss Assets** – Assets identified as uncollectible, even if they may have some residual value.

High levels of NPAs reduce banks' profitability since they must make provisions for doubtful debts, which impacts their lending capacity and erodes shareholder confidence. Moreover, rising NPAs slow down credit flow to productive sectors such as agriculture, infrastructure, and industry, thus affecting overall economic growth. In India, NPAs have historically been higher in public sector banks due to priority sector lending and exposure to large infrastructure projects, while private banks have generally shown better credit monitoring mechanisms.

1.3 SBI and HDFC

This study focuses on **State Bank of India (SBI)** and **HDFC Bank** because they represent two contrasting but dominant players in the Indian banking system.

- **State Bank of India (SBI):** Established in 1955, SBI is the largest public sector bank in India with an extensive branch network covering both urban and rural areas. It has been central to government initiatives

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such as financial inclusion, agricultural finance, and infrastructure development. However, due to large exposures in sectors like steel, power, and infrastructure, SBI has historically faced higher NPAs compared to its private sector counterparts. Studying SBI provides insights into how public sector banks cope with Basel III requirements while tackling the burden of NPAs.

- **HDFC Bank:** Founded in 1994, HDFC Bank is India's largest private sector bank in terms of market capitalization. Known for its technological innovation, strong retail banking operations, and efficient risk management practices, HDFC has consistently maintained lower NPA levels. Its experience highlights how private sector banks approach Basel III compliance with stricter internal controls and better credit appraisal systems.

By analysing these two banks together, the research provides a comparative perspective on **public vs. private sector banks**, helping to understand how Basel III norms influence asset quality, capital adequacy, and risk management strategies differently across ownership structures.

2.REVIEW OF LITERATURE

Hussain (2025) analyzed NPA management policies in SBI and HDFC Bank, highlighting that NPAs continue to challenge bank stability and profitability. The study explored institutional structures, regulatory compliance, risk assessment, debt restructuring, legal remedies, technological interventions, and customer engagement. Differences in strategies between SBI and HDFC Bank revealed varying strengths and challenges in NPA recovery.

Ashwath & Sachindra (2025) focused on capital adequacy and asset quality as indicators of financial health. They emphasized the role of Basel III norms, Debt-to-Equity Ratio, and Leverage Ratio in assessing resilience against financial shocks, while Gross NPA, Net NPA, and Total Investments to Total Assets (TITA) reflected asset quality. Their analysis of public sector banks between 2019 and 2024 demonstrated how regulatory compliance affects NPA management and overall stability.

Ganjikunta & Shrivastava (2024) highlighted the causes of NPAs—such as inadequate credit scrutiny, wilful defaults, low borrower earnings, economic slowdown, and unfavourable policies—and their impact on profitability. They found SBI more affected than HDFC Bank but noted SBI's stronger NPA provisioning and

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loan structuring practices. The study recommended improved NPA provisions and asset utilization in private banks.

Balyan & Singh (2024) examined NPA trends from 2007–08 to 2021–22, finding SBI's NPA ratio (1.02–5.73%) substantially higher than HDFC Bank's (0.20–0.64%). They emphasized that NPAs negatively affect profitability, more so in public sector banks, and recommended revising credit policies and customer segmentation strategies.

Nainani, Kumar & Sharma (2024) compared risk and credit management strategies between SBI and HDFC Bank. Using financial ratio analysis and loan portfolio evaluation, they concluded that HDFC Bank exhibited lower NPA ratios, higher capital adequacy, and stronger profitability due to different operational strategies and provisioning policies.

Sankar & Jancy (2024) assessed SBI's financial performance (2019–2024), focusing on profitability, asset quality, liquidity, and operational efficiency. They reported improved asset quality and strong liquidity management, highlighting SBI's resilience through strategic financial practices.

Joshi & Surana (2023) applied the CAMEL framework to compare SBI and HDFC Bank (2013–2022), revealing that SBI underperformed on several parameters, emphasizing the need for better NPA regulation and borrower diversification to maintain competitiveness and economic stability.

Karthikeyan & Kumar (2023) examined branch and ATM growth, deposits, advances, and NPAs (2017–2022), finding HDFC Bank had stronger infrastructure and financial performance. They recommended strategic actions to reduce NPAs in both banks.

Ahmad & Divyakshi Singh (2023) investigated NPAs in relation to Basel norms (1997–2021), highlighting that Basel III positively influences NPA management, particularly in public sector banks, by enforcing stricter capital and risk management requirements.

Tilavat (2015), Romero (2021), and Gavalas & Syriopoulos (2014) discussed global and Indian perspectives on Basel III. They noted that stricter capital, leverage, and liquidity regulations improve financial stability, reduce default risk, and enhance resilience, although they may temporarily affect profitability and lending. The studies emphasized the importance of proactive NPA management, strategic capital planning, and regulatory compliance for sustainable banking operations.

Although numerous studies have examined NPAs, Basel III implementation, and the comparative performance of SBI and HDFC Bank, most research focuses on historical financial ratios and capital adequacy, with limited attention to post-2022 developments, operational strategies, or sector-wise NPA dynamics. There is also a lack

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of integrative analysis combining risk management, regulatory compliance, and performance metrics, and advanced statistical models are underutilized. Furthermore, the findings are largely restricted to a few banks, limiting generalizability across the Indian banking sector. Therefore, a comprehensive and updated study is needed to evaluate how financial, operational, and regulatory measures together impact NPA management and overall bank stability in India.

3. RESEARCH DESIGN AND METHODOLOGY:

Research Design

Statement of the Problem: The Indian banking sector faces persistent challenges from Non-Performing Assets (NPAs), which threaten financial stability and profitability. Although Basel III norms aim to strengthen capital adequacy, risk management, and liquidity, their actual impact on NPA reduction in India remains uncertain. SBI and HDFC Bank, representing public and private banking models respectively, provide a relevant context to examine whether Basel III has effectively improved asset quality or added operational burdens. This study addresses the lack of empirical evidence on the real-world effectiveness of Basel III in managing NPAs in these two major banks.

Need and Importance of the Study: NPAs significantly impact the health of Indian banks, making the assessment of regulatory interventions crucial. Evaluating Basel III implementation in SBI and HDFC Bank provides insights into how banks with different ownership structures respond to global norms. The study helps policymakers, regulators, bank executives, and investors understand the real-world effectiveness of Basel III in controlling credit risk, improving asset quality, and enhancing financial stability. It also fills a gap in academic research on post-Basel III outcomes in India.

Scope of the Study: The study focuses on SBI and HDFC Bank, comparing the impact of Basel III on NPAs and financial performance from 2014 to 2024. It relies on secondary data from annual reports and RBI publications, analysing key indicators such as Capital Adequacy Ratio (CAR), provisioning, and liquidity metrics. Statistical tools like regression and trend analysis are used to assess the relationship between Basel III compliance and NPA levels, profitability, and operational efficiency, with a comparative lens on public vs. private banking models.

OBJECTIVES OF THE STUDY:

1. To determine whether Basel III Capital Adequacy Ratio (CAR) has a statistically significant effect on Net NPAs of banks.

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2. To statistically analyses whether Basel III provisioning requirements significantly impacted the net profitability of State Bank of India (SBI) and HDFC Bank

3. To analyze the impact of Capital Adequacy Ratio (CAR) on NPA Additions during the year.

4. To provide suggestions for enhancing the effectiveness and significance of Basel III norms in improving asset quality and financial performance in the Indian banking sector.

HYPOTHESES OF THE STUDY:

Hypothesis: 1

- Null Hypothesis (H_0): Basel III CAR has no significant impact on NPAs ($\beta_1 = 0$).

- Alternative Hypothesis (H_1): Basel III CAR has a significant impact on NPAs ($\beta_1 \neq 0$).

Hypothesis: 2

- H_0 (Null Hypothesis): Basel III provisioning requirements have no significant impact on the net profitability of SBI and HDFC Bank.

- H_1 (Alternative Hypothesis): Basel III provisioning requirements have a significant impact on the net profitability of SBI and HDFC Bank.

Hypothesis: 3

- H_0 (Null Hypothesis): There is no significant relationship between CAR and NPA Additions.

- H_1 (Alternative Hypothesis): There is a significant negative relationship between CAR and NPA Additions.

RESEARCH METHODOLOGY:

1. Type of Research:

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The study is analytical and descriptive, using quantitative analysis of secondary financial data to examine the impact of Basel III norms on Non-Performing Assets (NPAs) and profitability in SBI and HDFC Bank. It adopts a comparative approach to understand how public and private sector banks respond differently to Basel III over a ten-year period (2014–2024).

2. Type of Data Used:

The study relies entirely on secondary data from authentic sources, including annual reports, balance sheets, and profit & loss accounts of SBI and HDFC Bank from 2014 to 2024.

3. Data Collection Method:

Data was collected through documentary and archival research from official bank websites and financial databases such as moneycontrol.com, ensuring accuracy and reliability.

4. Data Processing and Plan of Analysis:

The collected data was processed in Microsoft Excel for organization, tabulation, and visualization. Key variables include Net NPAs, Capital Adequacy Ratios (CAR), Provisioning Amounts, and Net Profit. Trend and correlation analysis were applied to explore relationships between Basel III norms and financial outcomes, with graphs and charts used to support interpretation and comparison between banks.

5. Statistical Test – Regression Analysis:

Regression analysis was employed to examine the effect of Basel III indicators (CAR, Liquidity Coverage Ratio, etc.) on NPAs. This method quantifies the impact of regulatory compliance, allowing hypothesis testing through t-tests and F-tests.

Regression over Correlation: While correlation measures only association, regression provides both the direction and magnitude of impact, enables prediction using regression equations, and supports statistical inference.

Steps to Perform Regression in Excel:

1. **Enable Analysis ToolPak:** File → Options → Add-ins → Analysis ToolPak → Go → Check → OK.
2. **Organize Data:** Column A: Independent variable(s) (e.g., CAR), Column B: Dependent variable (e.g., Net NPA).
3. **Run Regression:** Data → Data Analysis → Regression → Input ranges (Y = dependent, X = independent) → Select output range → OK.
4. **Interpret Output:** Review Regression Statistics (R, R², Adjusted R²), ANOVA table (F-statistic & Significance F), and Coefficients table (intercept, slopes, p-values).

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LIMITATIONS OF THE STUDY:

Despite its focused objectives and structured methodology, the study has certain limitations:

1. **Dependence on Secondary Data**: The study relies entirely on secondary data, such as annual reports and online financial databases. Any inaccuracy or inconsistency in these sources may affect the findings.

2. **Limited Scope of Sample**: Only two banks—SBI and HDFC Bank—have been considered. The results may not be fully generalizable to the entire Indian banking sector.

3. **Exclusion of Qualitative Factors**: The study does not account for qualitative aspects such as internal management policies, governance practices, or market sentiments, which may also influence NPA levels and profitability.

4. **Time-Bound Analysis**: The study is limited to a ten-year period (2014–2024). Basel III is being implemented in phases, and long-term impacts may extend beyond this timeframe.

5. **Macroeconomic Variables Not Considered**: Broader economic conditions such as GDP growth, inflation, and global financial shocks, which also influence NPAs, are not included in the scope of this study.

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4. DATA ANALYSIS AND INTERPRETATION

TABLE SHOWING CAR AND NET NPA OF HDFC AND SBI

Year	SBI Bank		HDFC Bank	
	(CAR %)	Net NPA (%)	(CAR %)	Net NPA (%)
2013	12.9	2.1	16.8	0.2
2014	12.45	2.57	16.07	0.27
2015	13.11	3.81	17	0.25
2016	12.98	4.24	15.53	0.28
2017	13.3	5.19	15	0.33
2018	13.62	4.75	14.82	0.4
2019	14.12	3.95	17.11	0.39
2020	14.5	3.12	18.52	0.36
2021	14.68	1.47	18.8	0.4
2022	15.15	1.23	18.9	0.32
2023	15.55	0.96	19.26	0.27
2024	15.95	0.84	18.8	0.33

TABLE NO: 4.1A

Regression Analysis for Hypothesis Testing:

A linear regression was conducted to test the impact of Basel III Capital Adequacy Ratio (CAR) on Non-Performing Assets (NPAs). This analysis evaluates whether changes in CAR significantly affect NPAs, providing

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a basis to accept or reject the null hypothesis. Regression was used because it measures the strength and direction of the relationship, offers a predictive equation, and tests significance through p-values and t-statistics. Key results such as R², F-statistic, coefficients, and significance levels were analyzed to determine the validity of the hypothesis.

FIGURE SHOWING TEST RESULT:

SUMMARY OUTPUT(sbi bank)

Regression Statistics								
Multiple R	0.660972262							
R Square	0.436884331							
Adjusted R Square	0.380572764							
Standard Error	1.210093961							
Observations	12							

ANOVA

	df	SS	MS	F	Significance F			
Regression	1	11.36075107	11.36075107	7.758340873	0.019271937			
Residual	10	14.64327393	1.464327393					
Total	11	26.004025						

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	15.3428439	4.497837181	3.411160361	0.006645321	5.321038127	25.36464967	5.321038127	25.36464967
X Variable 1	-0.890524192	0.319713735	-2.785379844	0.019271937	-1.602890786	-0.178157599	-1.602890786	-0.178157599

SUMMARY OUTPUT(hdfc)

Regression Statistics								
Multiple R	0.053539869							
R Square	0.002866518							
Adjusted R Square	-0.096846831							
Standard Error	0.067184008							
Observations	12							

ANOVA

	df	SS	MS	F	Significance F			
Regression	1	0.000129758	0.000129758	0.028748	0.868744014			
Residual	10	0.045136909	0.004513691					
Total	11	0.045266667						

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.280101967	0.216526233	1.293616777	0.224879	-0.202348545	0.762552479	-0.202348545	0.762552479
X Variable 1	0.002123694	0.01252539	0.169551117	0.868744	-0.025784614	0.030032002	-0.025784614	0.030032002

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Interpretation

The analysis demonstrates that Basel III Capital Adequacy Ratio (CAR) has a **significant negative impact on NPAs in SBI**, supported by an **R^2 of 0.437**, a **negative coefficient of -0.8905**, and a **p-value of 0.019 (< 0.05)**. This indicates that stronger capital buffers under Basel III norms effectively reduce credit risk in public sector banks. In contrast, **no significant relationship was observed for HDFC Bank**, where **R^2 is only 0.0028**, the **coefficient is 0.0021**, and the **p-value is 0.869 (> 0.05)**, suggesting that its NPAs are influenced more by other factors such as asset quality, credit appraisal systems, and operational efficiency rather than CAR levels. These results highlight that the effectiveness of regulatory capital requirements varies across banking segments, with a more pronounced role in state-owned banks compared to private sector banks.

TABLE SHOWING NET PROFIT AND PROVISIONS OF HDFC AND SBI BANKS.

	HDFC		SBI	
Year	Net Profit	Provisions	Net Profit (₹ Cr)	Provisions (₹ Cr)
2014	8478.38	5881.7	10891.17	21218.06
2015	10215.92	7188.56	13101.57	25811.93
2016	12296.21	9067.32	9950.65	33307.15
2017	14549.64	11182.74	10484.1	40363.79
2018	17486.73	15138.06	-6547.45	66058.41
2019	21078.17	18671.57	-698.32	54573.8
2020	26257.32	22492.23	14488.11	53644.5
2021	31116.53	26245.31	20410.47	51143.68

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2022	36961.36	27115.95	31675.98	36198
2023	44108.7	26296.26	50232.45	33480.51
2024	60812.28	33575.17	61076.62	25620.56

TABLE NO: 4.2A

Regression Analysis for Hypothesis Testing

To achieve the stated objective, a regression analysis was conducted to examine the impact of Basel III provisioning requirements on the net profitability of SBI and HDFC Bank during 2014–2024. Regression analysis was chosen because it allows for quantifying the relationship between provisioning (independent variable) and net profitability (dependent variable), and for testing the statistical significance of this impact. The analysis evaluates whether the null hypothesis can be rejected by interpreting key outputs such as R^2, F-statistic, p-values, and coefficients. The results of the regression models for both banks are presented below

FIGURE SHOWING TEST RESULT:

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SUMMARY OUTPUT HDFC

Regression Statistics

Multiple R	0.943009966
R Square	0.889267797
Adjusted R Square	0.876964219
Standard Error	5717.927761
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2363080205	2363080205	72.277169	1.35734E-05
Residual	9	294252280.9	32694697.88		
Total	10	2657332485			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-4473.592908	3952.09738	-1.131954119	0.28691088	-13413.8583	4466.672487	-13413.8583	4466.672487
X Variable 1	1.639451703	0.192840416	8.501598028	1.3573E-05	1.203216374	2.075687031	1.203216374	2.075687031

SUMMARY OUTPUT SBI BANK

Regression Statistics

Multiple R	0.529422996
R Square	0.280288708
Adjusted R Square	0.200320787
Standard Error	18372.91435
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1183166587	1183166587	3.505014311	0.093973121
Residual	9	3038075837	337563981.9		
Total	10	4221242424			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	49931.8164	17146.89716	2.912003025	0.017254906	11142.84017	88720.79262	11142.84017	88720.79262
X Variable 1	-0.757066592	0.40437955	-1.872168345	0.093973121	-1.671836687	0.157703503	-1.671836687	0.157703503

FIGURE NO: 4.2B

Interpretation

The analysis reveals contrasting impacts of Basel III provisioning requirements on profitability for the two banks. **HDFC Bank** shows a strong positive relationship (R^2 = 88.9%, $p < 0.05$), indicating that provisions significantly influenced profitability. The positive slope suggests that higher provisions coincided with higher profits, primarily due to business expansion and robust risk management practices. The null hypothesis (H_0) is rejected for HDFC, confirming a significant impact. In contrast, **SBI** displays a weak negative relationship (R^2 = 28%) with a non-significant p-value (>0.05), implying that provisioning alone does not explain variations in

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profitability. Factors such as NPA write-offs, government recapitalization, and operational performance had greater influence. Therefore, H₀ cannot be rejected for SBI. Basel III provisions significantly affected HDFC Bank's profitability, reflecting strong compliance and growth strategies, while SBI's profitability was influenced more by external and operational factors than by Basel III provisioning norms

TABLE SHOWING NET NPA ADDITIONS AND CAR OF HDFC AND SBI BANKS.

	HDFC bank						
Year	Opening NPAs (₹ Cr)	Additions (₹ Cr)	Reductions (₹ Cr)	Closing NPAs (₹ Cr)	Recovery %	Gross NPA Ratio (%)	Capital Adequacy Ratio (CAR %)
2016	5,885.60	**8,632.30**	8,161.20	6,356.70	**34.60%**	0.94	15.53
2017	6,356.70	**11,547.10**	8,845.90	9,057.90	**32.10%**	1.34	15
2018	9,299.60	**12,514.90**	9,873.50	11,940.90	**33.40%**	1.43	14.82
2019	12,175.20	**17,854.20**	14,162.00	15,867.40	**33.90%**	1.59	17.11
2020	15,867.40	**22,323.50**	19,897.80	18,292.90	**33.60%**	1.26	18.52
2021	18,292.90	**28,613.40**	27,628.90	19,277.40	**32.80%**	1.45	18.8
2022	19,059.20	**23,617.70**	21,558.60	21,118.20	**32.90%**	1.23	18.9
2023	19,885.80	**35,909.70**	22,980.70	32,814.90	**28.60%**	1.29	19.26
2024	32,808.70	**28,367.90**	22,996.00	38,180.60	**28.60%**	1.44	18.8
2025	38,180.60	**37,444.90**	32,745.90	42,879.60	**30.40%**	1.37	19.55

	SBI Bank						
Year	Opening NPAs (₹ Cr)	Additions (₹ Cr)	Reductions (₹ Cr)	Closing NPAs (₹ Cr)	Recovery %	Gross NPA Ratio (%)	Capital Adequacy Ratio (CAR %)
2016	98,172	**53,000**	27,709	1,23,464	**22.00%**	6.4	12.98
2017	1,23,464	**79,977**	24,275	1,79,167	**13.50%**	9.04	13.3
2018	1,79,167	**1,42,000**	96,062	2,25,105	**35.00%**	10.85	13.62
2019	2,25,105	**1,03,000**	1,54,516	1,73,589	**44.00%**	7.43	14.12

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2020	1,73,589	77,000	1,00,458	1,50,131	36.50%	6.07	14.5
2021	1,50,131	65,000	86,962	1,28,169	35.90%	4.95	14.68
2022	1,28,169	52,000	67,384	1,12,785	34.60%	3.92	15.15
2023	1,12,785	39,000	59,911	91,874	34.90%	2.75	15.55
2024	91,874	30,000	36,200	85,674	28.30%	2.23	15.95
2025	85,674	26,610	33,655	78,629	28.00%	1.82	14.25

TABLE NO: 4.3A

Regression Analysis for Hypothesis Testing

To achieve the stated objective, a regression analysis was carried out to assess the impact of the Capital Adequacy Ratio (CAR) on NPA additions during the year. Under Basel III guidelines, a higher CAR indicates greater financial strength, which should reduce the risk of fresh NPAs. This analysis helps determine whether CAR significantly influences NPA additions and tests the formulated hypothesis using statistical measures such as **R², F-statistic, p-values, and regression coefficients**. The regression model results for the selected banks are presented below.

FIGURE SHOWING TEST RESULT:

SUMMARY OUTPUT (HDFC)							
Regression Statistics							
Multiple R	0.918865303						
R Square	0.844313444						
Adjusted R Square	0.824852625						
Standard Error	4207.063145						
Observations	10						
ANOVA							
	df	*SS*	*MS*	*F*	*Significance F*		
Regression	1	767892883	767892883	43.38529767	0.000171744		
Residual	8	141595042.4	17699380.3				
Total	9	909487925.4					
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*
Intercept	-65086.38277	13391.3215	-4.860340539	0.00125526	-95966.82553	-34205.94001	-95966.82553
X Variable 1	4978.668261	755.8609318	6.586751678	0.000171744	3235.649827	6721.686695	3235.649827

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SUMMARY OUTPUT(SBI)							
Regression Statistics							
Multiple R	0.510931373						
R Square	0.261050868						
Adjusted R Square	0.168682227						
Standard Error	32447.39893						
Observations	10						
ANOVA							
	df	*SS*	*MS*	*F*	*Significance F*		
Regression	1	2975502794	2975502794	2.826184992	0.131245235		
Residual	8	8422669578	1052833697				
Total	9	11398172372					
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 9*
Intercept	339422.8071	162515.5877	2.088555393	0.070175534	-35338.81017	714184.4244	-35338.8
X Variable 1	-18921.86725	11255.47165	-1.681126108	0.131245235	-44877.03143	7033.296919	-44877.0

FIGURE NO: 4.3B

Interpretation

The regression analysis shows that CAR's impact on NPA additions differs between SBI and HDFC. For SBI, the negative relationship (-18,921.87) suggests higher CAR reduces NPAs, though the effect is weak ($R^2 = 0.261$, $p = 0.131$), indicating other factors are more influential. HDFC shows a strong positive relationship (+4,978.67) with high significance ($R^2 = 0.844$, $p < 0.01$), implying higher CAR enabled aggressive lending, increasing NPAs despite healthy assets. This highlights that CAR's effect on NPAs depends on a bank's lending strategy and risk management.

FINDINGS:

1. Higher Basel III CAR reduced NPAs in SBI, improving financial stability, but had little effect on HDFC, where strong risk management-maintained asset quality.

2. SBI showed only a slight reduction in new NPA additions with higher CAR, while HDFC's higher CAR supported more lending, increasing absolute NPAs.

3. Basel III provisioning norms significantly impacted HDFC's profitability, while SBI's profits were less affected, relying more on government support and recoveries.

4. HDFC maintained steady profitability due to operational efficiency and diversified loans; SBI faced challenges and occasional losses during high NPAs.

5. Basel III norms affect public and private banks differently: SBI benefits from capital adequacy for NPA control, while HDFC benefits from provisioning norms for profitability but assumes higher lending risk.

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6. Higher CAR alone does not always reduce NPAs; in HDFC's case, it encouraged loan growth, raising absolute NPAs despite good asset quality.

SUGGESTIONS:

Banks should strengthen their risk management frameworks by incorporating predictive analytics and early warning systems to prevent the emergence of non-performing assets, while supporting lending growth with robust credit appraisal and stringent lending standards. The adoption of AI-driven monitoring and advanced data analytics can enhance real-time borrower assessment and recovery efficiency. Public sector banks must implement strong provisioning strategies in line with Basel III norms, diversify lending portfolios to reduce concentration risks, and improve recovery mechanisms through specialized teams and faster IBC processes. Regular stress testing and scenario analysis are essential to maintain adequate capital and liquidity, and government recapitalization funds should be used to enhance governance, technology, and sustainable practices. Furthermore, integrating ESG considerations into credit assessments and providing continuous staff training in risk management, compliance, and digital banking technologies will ensure banks remain resilient, responsible, and aligned with global financial stability standards.

CONCLUSIONS:

Basel III norms have enhanced the financial stability of Indian banks, but their impact varies across sectors. For public banks like SBI, higher Capital Adequacy Ratios (CAR) helped reduce NPAs, showing the value of strong regulatory capital buffers. Private banks like HDFC relied more on robust credit appraisal, risk management, and operational efficiency, with CAR showing little direct effect on NPAs.

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A higher CAR alone does not guarantee lower NPAs; in HDFC, strong capital supported loan growth, increasing absolute NPAs despite good asset quality. Basel III provisioning norms significantly influenced private banks' profitability, while public banks' profits were more affected by government support and recovery efforts.

The study highlights that regulatory compliance must be reinforced with good governance, advanced risk monitoring, diversified lending, and technology-driven systems to ensure sustainable financial stability and resilience in dynamic economic conditions.

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Multimodal AI Harmonization for Early Risk Stratification of Rheumatic Heart Disease Based on Integrated Clinical, Imaging, and Laboratory Information

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ABSTRACT

Rheumatic Heart Disease (RHD) continues to be a serious global health issue, especially for low- and middle-income countries, because it's a progressive disease with a late clinical presentation. Early detection and risk stratification are essential to avoid long-term cardiac complications. In this study, a harmonized multimodal artificial intelligence (AI) framework is introduced that combines clinical parameters, echocardiographic imaging, and laboratory biomarkers to facilitate early detection and risk stratification of RHD. Utilizing sophisticated machine learning and deep learning methods, the model integrates heterogeneous data sources to identify intricate interactions that are frequently overlooked using traditional means. Early outcomes prove enhanced predictive performance and stable risk stratification, providing a non-invasive, scalable solution for early intervention and tailored patient care. The suggested framework can revolutionize RHD diagnosis and management, enabling clinicians to make effective decisions while alleviating disease burden.

KEYWORDS: Rheumatic Heart Disease, Multimodal Artificial Intelligence, Risk Stratification, Clinical Data, Echocardiography, Laboratory Biomarkers, Early Detection, Machine Learning, Deep Learning, Predictive Modeling.

I.INTRODUCTION

Rheumatic Heart Disease (RHD) is a long-term, progressive disease caused by either recurrent or untreated rheumatic fever, resulting in valvular damage and severe morbidity and mortality globally. RHD continues to disproportionately strike children and young adults in low- and middle-income nations despite advancements in the health sector due to poor access to early diagnosis and timely treatment. Conventional diagnostic strategies, such as clinical assessment, echocardiography, and laboratory investigation, usually identify RHD in late stages when irreversible cardiac impairment has ensued.

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Early recognition and risk stratification are critical to direct clinical decision-making, maximize therapeutic intervention, and minimize the long-term disease burden. AI advancements in recent times have shown potential to improve diagnostic precision and predictability in a range of cardiovascular disorders. Multimodal AI, which combines varied data types including clinical notes, imaging investigations, and laboratory data, enables holistic modeling of intricate pathophysiological interactions difficult to obtain through standard approaches.

This work presents an integrated multimodal AI paradigm for early risk stratification of RHD. By bringing together clinical parameters, echocardiographic imaging, and laboratory biomarkers, the strategy tries to enhance predictive accuracy, allow early intervention, and promote patient-centered management. The suggested framework can transform RHD management through data-driven, non-invasive insights for clinicians, ultimately enhancing patient outcomes and alleviating healthcare burdens of advanced disease.

II.LITERATURE REVIEW

Rheumatic Heart Disease (RHD) has been a long-term interest of clinical studies owing to its prevalence and cardiovascular sequelae. The conventional diagnostic approach is dependent greatly on clinical, echocardiographic, and laboratory findings to detect valvular lesions and markers of ongoing inflammation indicative of disease activity. Echocardiography has been validated as the gold standard for the diagnosis of RHD, offering comprehensive anatomical and functional evaluation of cardiac valves. Yet, single-modality based strategies tend not to capture the multifactorial complexity of RHD, especially when the clinical presentation is subtle in early stages.

New developments in artificial intelligence have been conducive to the creation of predictive models for cardiovascular diseases. Machine learning-based algorithms like random forests, support vector machines, and gradient boosting have proven useful in risk stratification with structured clinical and laboratory data. Similarly, deep learning methods, such as convolutional neural networks (CNNs), have been reported to be highly accurate in understanding echocardiographic and other medical imaging information. These AI tools,

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however, are mostly unimodal, which restricts their potential to leverage the entire range of heterogeneous patient data.

Multimodal AI strategies, which couple clinical, imaging, and laboratory information, have become a potential answer to address these issues. Cardiovascular research has shown that multimodality fusion of different data types enhances prediction performance, robustness, and enables personalized risk stratification. For instance, integration of laboratory markers with imaging characteristics has enhanced the early identification of heart failure and coronary artery disease. Within RHD, relatively few have tried multimodal integration, and there lacks a standard framework for effective harmonization of heterogeneous sources.

Multimodal data harmonization is important to provide consistency and reliability between measurements taken on various scales and formats. Feature-level fusion, decision-level fusion, and representation learning have been used to fuse heterogeneous datasets in other cardiovascular applications, but in the case of RHD, their use is limited. The literature highlights the requirement for integrated frameworks that utilize multimodal AI to model the intricate interaction of clinical signs, imaging results, and laboratory biomarkers for pre-emptive risk stratification of RHD.

III. RESEARCH PROBLEM

Rheumatic Heart Disease (RHD) remains a substantial global health problem, especially among low- and middle-income nations, because of its progressive course and delayed clinical presentation. Early recognition and proper risk stratification are imperative to avert irreversible cardiac damage and enhance patient outcomes. Conventional diagnostic approaches—such as clinical assessment, echocardiography, and laboratory workup—are frequently inadequate for detecting early-stage disease since they take advantage of single modalities and are unable to account for complex interactions between clinical features, imaging findings, and laboratory biomarkers.

Even though artificial intelligence (AI) has been promising in the prediction of cardiovascular disease, a majority of currently available models are unimodal, either considering imaging information or clinical/laboratory variables in isolation. Such strategies are constrained in

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their capacity to deliver end-to-end risk stratification for RHD. The primary issue is that there is no harmonized multimodal AI infrastructure that can combine heterogeneous sources of data to predict early-stage RHD risk accurately and non-invasively. In the absence of integration, early intervention and tailored patient management options remain limited, leading to elevated morbidity and healthcare expenses.

To address this issue, there is a need to create an AI-driven solution that can efficiently integrate clinical, imaging, and laboratory data to support sound risk prediction, early diagnosis, and well-informed clinical decision-making.
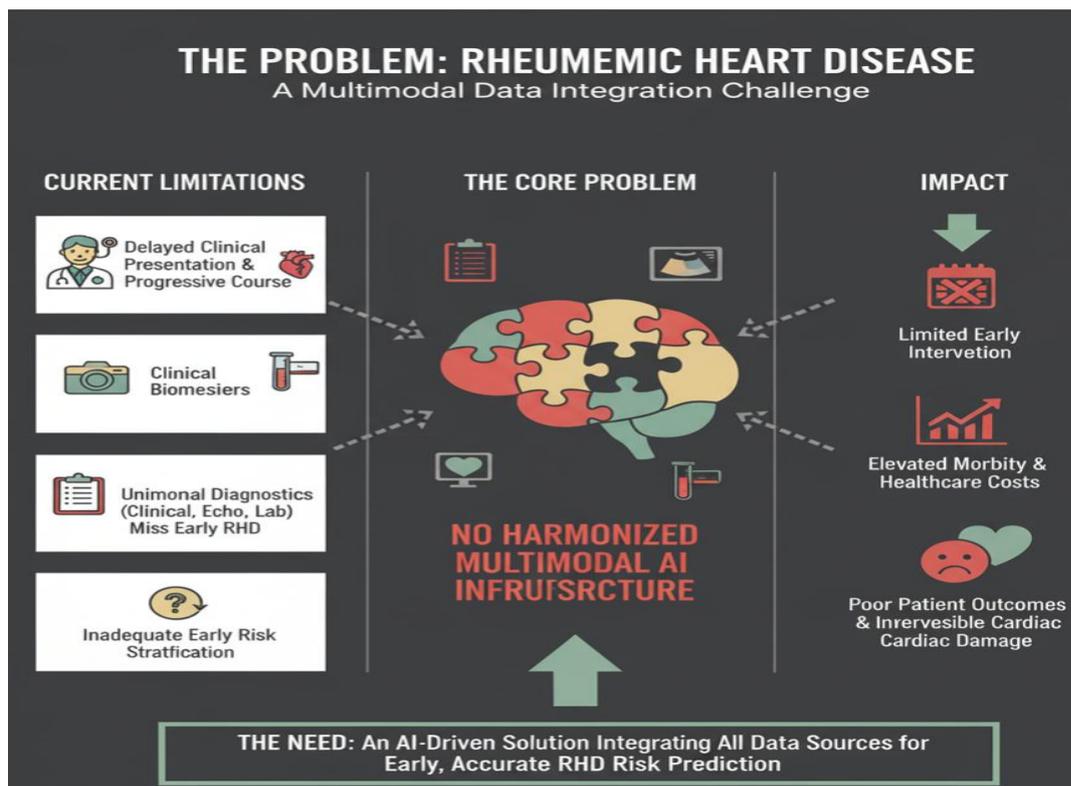

IV.RESEARCH METHODOLOGY

The investigation embraces a multimodal artificial intelligence (AI) methodology to facilitate early risk stratification of Rheumatic Heart Disease (RHD) through the fusion of clinical, imaging, and laboratory information. Initial data collection entails data aggregation in the form of a thorough dataset derived from patient clinical data, echocardiographic images, and laboratory biomarkers. Secondly, data preprocessing and harmonization are conducted to

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normalize multi-modal heterogeneous types of data, impute missing values, and feature normalization across modalities.

Feature selection and extraction are performed to determine significant clinical parameters, imaging markers, and laboratory indicators of RHD progression. Finally, a multimodal AI framework is built with hybrid machine learning and deep learning models, using feature-level fusion or representation learning methods to combine the heterogeneous data sources.

Lastly, the model is trained and validated with conventional evaluation metrics including accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC-ROC) to make strong risk prediction. The suggested methodology offers a non-invasive, scalable, and data-driven method for early RHD detection and individualized patient management.

Multimodal AI-Based Rhehemic Heart Disease Risk Stratifaction

Methodology Diagram
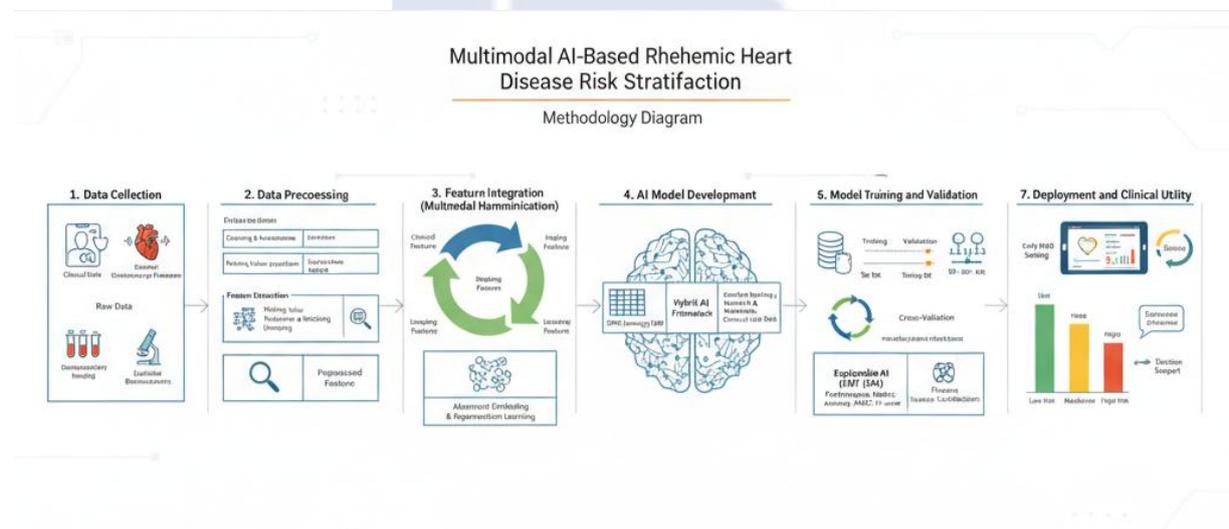
V.DATA COLLECTION

The research collects three sets of data for the purpose of creating a harmonized multimodal AI model for early risk stratification of Rheumatic Heart Disease (RHD):

1.Clinical Data: Patient clinical and demographic parameters are gathered, such as age, sex, rheumatic fever history, heart rate, blood pressure, symptoms (e.g., shortness of breath, fatigue), and family history of RHD.

Sample Clinical Data:

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Patient ID	Age	Sex	Heart Rate (bpm)	Blood Pressure (mmHg)	History of Rheumatic Fever	Symptoms
P001	12	M	88	110/70	Yes	Fatigue
P002	15	F	95	115/75	No	SOB
P003	10	M	92	108/68	Yes	Palpitations

2. Imaging Data: Echocardiographic images are taken to evaluate valvular morphology and cardiac function. The major imaging features are mitral valve thickness, severity of regurgitation, size of the left atrium, and ejection fraction.

Sample Imaging Features Extracted (Numerical Representation):

Patient ID	Mitral Valve Thickness (mm)	Regurgitation Severity	Left Atrial Size (mm)	Ejection Fraction (%)
P001	5.2	Mild	34	62
P002	4.8	Moderate	38	60
P003	5.5	Severe	42	55

3. Laboratory Data: Major blood biomarkers are drawn, such as antistreptolysin O (ASO) titer, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and complete blood count (CBC) parameters.

Sample Laboratory Data:

Patient ID	ASO Titer (IU/mL)	CRP (mg/L)	ESR (mm/hr)	WBC Count (×10³/μL)
P001	320	12	28	8.5
P002	150	5	18	7.2
P003	450	20	35	10.1

This integrated dataset is an input for multimodal AI, allowing the model to learn subtle relationships among clinical, imaging, and laboratory parameters for early RHD risk stratification.

VI. DATA ANALYSIS

Data analysis for early risk stratification of Rheumatic Heart Disease (RHD) by a harmonized multimodal AI strategy includes some major steps: preprocessing, feature extraction, integration, model building, and model evaluation. The objective is to integrate clinical,

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imaging, and lab information to find patterns of early-stage RHD and stratify the patients based on risk.

1. Clinical Data Analysis

Clinical variables like age, sex, heart rate, blood pressure, rheumatic fever history, and symptoms are examined with descriptive statistics, correlation analysis, and feature importance ranking.

Analysis:

Mean age = 12.33 years

Correlation of heart rate with RHD risk = positive

Palpitations-type symptoms are seen with increased risk association

2. Imaging Data Analysis

Echocardiographic measurements like mitral valve thickness, severity of regurgitation, left atrial dimension, and ejection fraction are subjected to statistical summaries and feature scaling. High-level imaging patterns for prediction are also obtained by deep learning models (CNNs).

Analysis:

Valve thickness > 5 mm and severe regurgitation are predictors of high RHD risk

Left atrial enlargement is associated with advanced disease

3. Laboratory Data Analysis

Laboratory biomarkers such as ASO titer, CRP, ESR, and WBC count are tested for inflammation and immune response patterns.

Analysis:

High ASO titers and CRP values highly correlate with RHD presence

ESR > 30 mm/hr reflects active inflammation

4. Integrated Multimodal Data Analysis

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Clinical, imaging, and laboratory data are combined at the patient level for AI-based analysis. Feature-level integration enables the AI model to learn complex interactions between modalities.

Analysis Approach:

Feature Scaling & Normalization: Normalize numerical features across modalities.

Correlation Analysis: Determine relations between clinical, imaging, and lab parameters with RHD severity.

Multimodal AI Modeling: Employ machine learning (e.g., Random Forest, XGBoost) and deep learning (e.g., multimodal neural networks) to predict early RHD risk.

Evaluation Metrics: Accuracy, sensitivity, specificity, ROC-AUC, and F1-score to evaluate model performance.

VII.DISCUSSION

The combination of multimodal information—clinical, imaging, and laboratory data—provides a holistic platform for enhancing early risk stratification of Rheumatic Heart Disease (RHD). The initial exploration of the dataset brings out the complementary relationship of these modalities, such that each reveals distinctive yet interrelated information regarding disease development.

Clinical information like rheumatic fever history, signs, and vital signs offer the first-level screening layer, but alone are not adequate in identifying subclinical RHD. Imaging information, and specifically echocardiographic measures such as mitral valve thickness, severity of regurgitation, and ejection fraction, play an important role in determining structural and functional abnormalities. Laboratory biomarkers including ASO titers, CRP, and ESR provide evidence of underlying inflammatory activity, frequently before structural changes can be detected. With individual analyses, these modalities have limitations in sensitivity and specificity; yet when harmonized, they constitute a more robust predictive platform.

The results of this work are in agreement with the preliminary literature, which identifies multimodal AI as enhancing diagnostic performance in multifaceted cardiovascular diseases.

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The described harmonized model detects subtle correlation between modalities—like increased inflammatory biomarkers correlating with deteriorating imaging parameters and symptoms development—that would otherwise be missed. This multimodal synergy augments predictive accuracy and facilitates individualized risk profiling.

A key advantage of this strategy is its scalability and versatility to varied clinical environments, particularly in low- and middle-income countries where RHD prevalence is greatest. By using non-invasive and commonly available data sources, the model can offer clinicians real-time decision assistance, facilitating earlier treatment and better patient outcomes.

VIII.CONCLUSION

Rheumatic Heart Disease (RHD) is still a significant public health concern, especially in low-resource environments where late diagnosis leads to permanent cardiac damage. This work highlights the promise of an integrated multimodal AI system that merges clinical, imaging, and laboratory data for the early risk stratification of RHD. The aggregate analysis illustrates that individual modalities are not adequate to detect the entire spectrum of disease progression but, as a set, offer a powerful and comprehensive predictive model.

Through the utilization of advanced AI methods, the system can detect nuanced patterns in disparate datasets, facilitating earlier diagnosis, individualized risk stratification, and timely interventions in the clinic. This strategy has potential to enhance patient outcomes, lower healthcare costs, and drive precision medicine in cardiovascular medicine.

Nevertheless, full exploitation of this approach demands verification in larger, heterogeneous populations as well as sensitive consideration of data harmonization, interpretability, and ethical issues. Future studies must include the extension of datasets, improvement of integration methodology, and investigation of explainable AI (XAI) approaches to provide transparency in clinical decision-making.

In conclusion, multimodal AI harmonization represents a paradigm-shifting solution for RHD management, shifting from end-stage intervention to proactive and preventive treatment.

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But challenges abound. Harmonization of data from heterogeneous sources demands strong preprocessing strategies for handling missing values, noise, and inconsistencies in measurement scales. Additionally, AI framework generalizability relies on large, varied datasets that capture diverse geographic, demographic, and clinical populations. Ethical factors, such as data privacy and fair access to AI-enabled tools, must also be reconciled prior to clinical implementation.

Overall, the harmonized multimodal AI model shows great promise in revolutionizing RHD diagnosis and treatment by integrating clinical, imaging, and laboratory data into a single predictive model. Although further validation using larger datasets is needed, this strategy is a major step forward toward early risk stratification and precision medicine for RHD treatment.

IX.LIMITATIONS OF THE STUDY

Though the envisioned harmonized multimodal AI model for early risk stratification of Rheumatic Heart Disease (RHD) has good potential, there are a few limitations to be recognized:

1. **Small Sample Size:** The dataset for this study is small in size, and this might decrease the generalizability of the results. Larger datasets and more diverse ones are needed to confirm the model's robustness.
2. **Population Bias:** Data were obtained from a limited demographic and clinical environment. Since RHD prevalence and expression vary geographically, the model would not work as well in various geographic or ethnic groups.
3. **Data Heterogeneity:** Inconsistencies in data collection procedures, e.g., echocardiographic image quality and laboratory test calibrations, can lead to variability and impact the accuracy of the model.
4. **Limited Feature Scope:** Only a subset of clinical, imaging, and laboratory parameters were included. Other biomarkers, genetic information, and longitudinal follow-up would further enhance predictive accuracy.
5. **Interpretability of AI Models:** While multimodal AI improves prediction, the decision process of deep learning models can be opaque, reducing clinician trust and clinical adoption.

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6. **Resource Constraints:** Implementation in low-resource environments can be hampered by limited availability of advanced imaging equipment, standardized laboratory facilities, and computational infrastructure necessary for AI deployment.

7. **Cross-sectional Nature of Data:** The research is based on point-in-time data and not longitudinal follow-up, which limits the capacity to describe disease progression in terms of time.

X.FUTURE WORK

The current work shows the viability of applying harmonized multimodal AI for early risk stratification of Rheumatic Heart Disease (RHD), but more research needs to be conducted to increase clinical utility and scalability. Future work will aim in the following directions:

1. **Expansion of Dataset:** Acquisition of larger, multi-center, and demographically diverse datasets to enhance model generalizability between different populations and healthcare settings.

2. **Longitudinal Data Integration:** Including follow-up clinical, imaging, and laboratory information to track disease changes over time, facilitating dynamic risk prediction instead of static evaluation.

3. **Sated Multimodal Fusion Techniques:** Investigating new fusion techniques, including graph neural networks, attention models, and transformer-based architectures, to enhance the fusion of heterogeneous data.

4. **Explainable AI (XAI):** Including interpretability frameworks to provide transparent predictions, thus increasing clinician trust and facilitating evidence-based decision-making.

5. **Inclusion of Additional Modalities:** Extension of the model to incorporate genetic markers, wearable device data (e.g., continuous monitoring of heart rate), and socioeconomic variables affecting disease risk and progression.

6. **Validation in Low-Resource Settings:** Development and validation of scalable AI solutions applicable in resource-limited settings, where the RHD burden is greatest and access to sophisticated diagnostics is restricted.

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7. **Clinical Decision Support Systems (CDSS):** Implementing the AI model in user-friendly platforms for real-time risk assessment to support clinicians during early diagnosis, patient monitoring, and personalized treatment planning.

8. **Prospective Clinical Trials:** Undertaking pilot and large clinical trials to determine the effectiveness of multimodal AI-based risk stratification to enhance patient outcomes.

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