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ENVISAGE

Students' Research Journal

Editorial

Envisage is an interdisciplinary student research journal that showcases scholarly work authored by students. All submitted papers are reviewed by the Research and Development Cell and carefully edited under the guidance of faculty mentors. This initiative aims to equip students with critical thinking and academic writing skills essential for success in higher education. The journal provides a platform for students to engage with current affairs and articulate their perspectives on economics, trade, business, international relations, emerging developments, and the social sciences.

The objectives of this research journal are as follows:

- To enhance students' knowledge and promote their interest in future career research.
- To provide a medium to explore their knowledge related to current affairs and express their views.
- To develop analytical and critical skills and enhance their academic exposure.
- To enrich the education through experiencing the research publication process.

The current issue contains research papers presented in national level Research Paper Presentation Competition (Research Fair), conducted by the college every year. It also contains the research papers from the other research competitions such as Epsilon (for Economics), DLLE and Aavishkar Research Convention of University of Mumbai. Besides these competitions many students also conduct case studies and projects on different topics under the guidance of faculties.

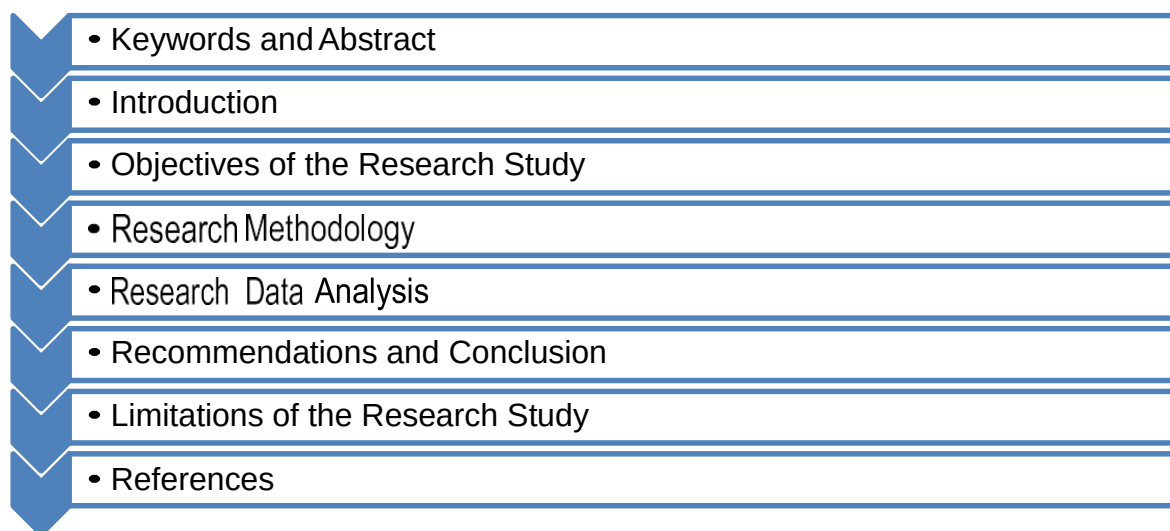
Envisage also allows students to participate in the editing, review, and publication processes. Envisage is envisioned as an inspiring space where young minds can explore research across diverse themes, nurturing growth and intellectual development.

GUIDELINES FOR RESEARCHERS

“Envisage” strives to open the doors of research for young students and academicians. It presents to you papers from varied fields in a structured and organised manner.

Manuscript:

The manuscript has the following flow:



Research

It includes research articles that focus on the analysis of economic, social, business and other related issues which impact the economy as well as society.

References

Throughout the text, references and sources of knowledge used by the authors must be cited. Citing references is essential, as high-quality research is built upon established knowledge and empirical (observed) evidence.

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ENVISAGE
Students' Research Journal

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Studying Financial Behaviour of Indian Youth Using Digital Payments & Sip Data

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***** This research paper won the First Prize in Epsilon: an intercollegiate research paper-based competition 2026 held by the Economics Association of SVKM's Narsee Monjee College of Commerce and Economics on 21 February 2026.***

Abstract:

The expansion of digital payment infrastructure in India has significantly altered financial engagement among young individuals. This study examines whether increased adoption of digital payments has influenced the systematic investment behaviour of Indian youth, with a focus on Systematic Investment Plans (SIPs). The research follows a secondary data-driven analytical approach, using Reserve Bank of India (RBI) digital payment statistics and Association of Mutual Funds in India (AMFI) SIP data. The growth of Unified Payments Interface (UPI) is treated as a structural intervention, and a before - after comparative framework is applied to analyse changes in SIP participation and inflows. Trend analysis and growth rate comparisons are used to assess the relationship between digital transaction intensity and systematic investing behaviour. The findings suggest that while digital adoption has reduced transactional barriers and improved accessibility, its impact on sustained investment discipline among youth remains uneven. Behavioural factors such as risk perception and income uncertainty continue to influence investment outcomes. The study concludes that digital infrastructure acts as an enabling factor rather than a sufficient condition for long-term investment participation, highlighting the need for complementary financial literacy and behavioural interventions.

I. Introduction

a) Background

India's financial landscape has undergone a **rapid transformation** with the expansion of digital payment infrastructure, particularly through the **Unified Payments Interface (UPI)**. Digital payments have reduced transaction costs, increased accessibility, and enabled real-time financial interactions, especially among **young individuals** who form the largest segment of digital users.

b) Context of the Study

At the same time, **Systematic Investment Plans (SIPs)** have emerged as a key channel for disciplined, long-term investing in India. While digital platforms simplify financial transactions, it remains unclear whether increased digital payment usage has translated into **improved investment behaviour** among youth **or** has primarily **facilitated consumption**.

c) Research Gap

Existing studies largely analyse digital payments and investment behaviour independently. There is **limited empirical research** examining whether the growth of digital payments has influenced **systematic investing behaviour** using macro-level financial data.

d) Purpose of the Study

This research examines the **relationship between digital payment adoption and SIP participation** among Indian youth using secondary data from the **Reserve Bank of India (RBI)** and the **Association of Mutual Funds in India (AMFI)**. By treating the expansion of digital payments as a structural shift, the study aims to assess whether **digital infrastructure influences long-term investment discipline**.

II. Scope of Research

- ❖ The study examines the relationship between **digital payment adoption** and **systematic investment behaviour (SIPs) among Indian youth**, with specific focus on the post-UPI expansion period.
- ❖ The analysis is based entirely on **secondary macro-level data** obtained from RBI

digital payment statistics, AMFI SIP data, and related financial reports, focusing on trends and behavioural patterns rather than individual returns.

- ❖ The scope is limited to identifying **associations and behavioural shifts** in investment participation and does not attempt to establish direct causality between digital payment usage and investment outcomes.

III. Objectives

- ❖ To examine the growth trends in **digital payment usage and SIP participation** in India using secondary data.
- ❖ To analyse whether the expansion of digital payment infrastructure has influenced systematic investment behaviour among Indian youth.
- ❖ To understand the role of digital platforms in reducing transactional barriers and shaping **long-term investment discipline**.

Hypothesis

- ❖ **H₁ (Alternative Hypothesis):**
Expansion of digital payment systems has positively influenced systematic investment behaviour among Indian youth, reflected through increased SIP participation.
- ❖ **H₀ (Null Hypothesis):**
Expansion of digital payment systems has no significant influence on systematic investment behaviour among Indian youth.

IV. Methodology

a) Data Sources

The analysis is based entirely on **secondary macro-level datasets**, ensuring objectivity and reliability.

- ❖ **Reserve Bank of India (RBI):** Digital payment statistics including UPI transaction volume, value, and user adoption trends.
- ❖ **Association of Mutual Funds in India (AMFI):** Data on SIP accounts, monthly SIP inflows, and retail investor participation.

- ❖ **Supporting Sources:** Economic Survey of India and related financial inclusion reports to contextualise digital adoption and investment behaviour.

b) Analytical Framework

- ❖ The expansion of digital payments, particularly **post-2016** with the introduction of UPI, is treated as a **structural intervention** in financial behaviour.
- ❖ A **before - after comparative framework** is employed to analyse changes in SIP participation and inflows during the pre-digital expansion period and the post-digital expansion period.
- ❖ **Trend analysis and growth rate measures**, including year-on-year growth and compound annual growth rate (CAGR), are used to examine patterns and co-movement between digital payment adoption and systematic investing.

c) Interpretation Approach

- ❖ The observed trends are interpreted using **behavioural economics and transaction cost theory**, focusing on how reduced friction, digital convenience, and ease of access influence disciplined investment behaviour.
- ❖ The study recognises that correlation does not imply causation and therefore limits conclusions to **behavioural associations** rather than direct causal claims.
- ❖ **External economic factors** such as income growth, market conditions, and financial awareness are acknowledged as influencing variables.

V. Data Analysis and Interpretation

This section empirically examines whether the expansion of digital payments has influenced systematic investment behaviour in India. The analysis is based on secondary time-series data obtained from official financial institutions.

a) Expansion of Digital Payments in India

India's digital payment ecosystem has expanded rapidly since the **introduction of the Unified Payments Interface (UPI) in 2016**. According to data published by the Reserve Bank of India (RBI), UPI has emerged as the **dominant mode of retail digital payments**, driven by ease of use, interoperability, and low transaction costs. The **consistent increase** in transaction

volume and value reflects a fundamental behavioural shift from cash-based transactions to digitally mediated financial activity.

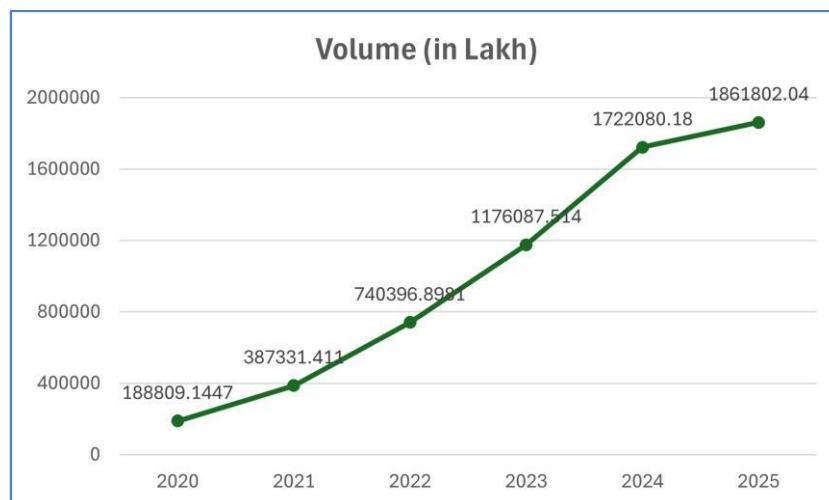


Figure 1: Year-wise growth in UPI transaction volume

Source: RBI , Payment Systems Indictors

Interpretation:

Figure 1 illustrates a sharp and sustained increase in the volume of UPI transactions over the observed period. The rising transaction count indicates widespread adoption of UPI for routine and high-frequency payments, **reflecting behavioural normalisation of digital transactions**. The growth in volume suggests that UPI has become an integral part of everyday financial activity, particularly for small-value and frequent transactions.

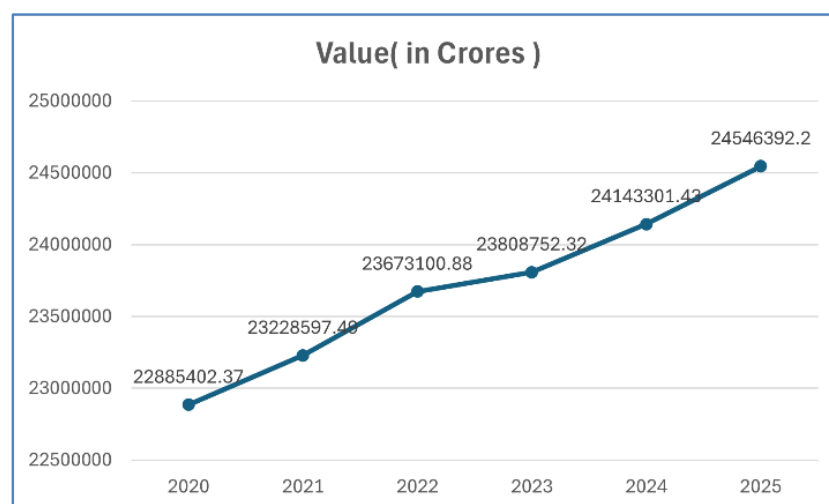


Figure 2: Year-wise growth in UPI transaction value

Source: RBI , Payment Systems Indictors

Interpretation:

Figure 2 depicts a significant rise in the total value of UPI transactions, indicating

increased monetary reliance on digital payment platforms. While the value growth is strong, its trajectory differs from transaction volume, suggesting that **UPI adoption is driven more by frequency of usage than by high-value transfers**. This highlights UPI's role as a facilitator of regular payments rather than solely large-ticket transactions.

b) Growth of SIP Participation in India

Parallel to the growth of digital payments, India has witnessed a steady increase in retail participation in mutual funds through Systematic Investment Plans (SIPs). Data from the Association of Mutual Funds in India (AMFI) indicates that **SIPs have become a preferred investment avenue** due to their affordability, automation, and flexibility. These characteristics align closely with the convenience offered by digital financial platforms.

The increase in the number of SIP accounts reflects **widening participation**, while rising monthly SIP inflows indicate strengthening investment discipline. Together, these metrics provide insight into the evolving saving and investing behaviour of Indian households, particularly among first-time and young investors.

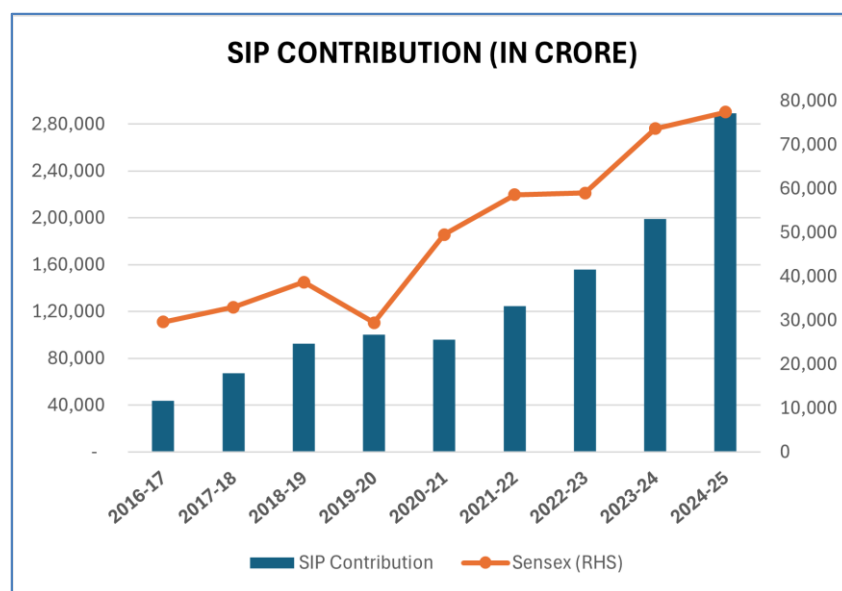


Figure 3: Growth in SIP Contributions in India (₹ crore)

Source: AMFI – Monthly Mutual Fund Reports

Interpretation:

Figure 3 shows a consistent upward trend in SIP contributions over the observed period, showing increased preference for systematic and disciplined investing among retail investors.

The steady rise in contribution amounts suggests not only higher participation but also **improved regularity and commitment towards long-term investments**. Occasional fluctuations do not alter the overall positive trajectory, highlighting the growing role of SIPs in household financial planning.

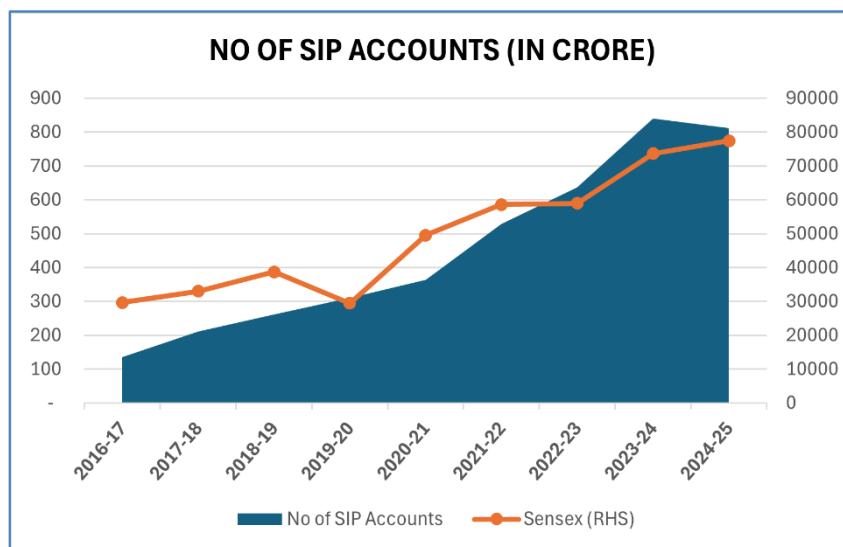


Figure 4: Growth in Outstanding SIP Accounts in India

Source: AMFI – Monthly Mutual Fund Reports

Interpretation:

Figure 4 illustrates a sustained increase in the number of outstanding SIP accounts. The continuous expansion of SIP accounts indicates **growing acceptance of mutual fund investing**, particularly among first-time and small investors. The upward trend suggests that SIPs have become a widely adopted investment mechanism, reinforcing the shift towards structured and long-term financial behaviour.

c) Before - After Comparative Analysis (Pre- and Post-UPI Period)

To examine whether digital payment expansion **coincides** with changes in investment behaviour, the growth of UPI is treated as a **structural shift** in financial engagement. SIP participation and inflows are compared across two phases: the pre-UPI expansion period and the post-UPI expansion period.

This comparative approach allows identification of whether systematic investing accelerated after digital payments became widely accessible, controlling for long-term trends.

Table 1: Comparison of Average Growth Rates (%) of SIP Accounts and SIP Inflows Before and After UPI Expansion

Period	Avg. SIP Account Growth (%)	Avg. SIP Inflow Growth (%)
Pre UPI period	29.07%	23.73%
Post UPI period	23.53%	31.96%

Source: AMFI SIP Data

Interpretation:

The pre - post comparison reveals differing trends in SIP participation and investment intensity. During the pre-digital expansion period, the average growth in SIP accounts was higher (29.07%) compared to the post period (23.53%), indicating that account additions grew at a faster pace in the earlier phase. This suggests that **initial expansion was driven by rapid onboarding of new investors.**

However, a contrasting trend is observed in SIP inflows. The post-digital expansion period records a significantly higher average growth in SIP inflows (31.96%) compared to the pre period (23.73%). This indicates stronger contribution growth in the later phase, reflecting increased investment amounts and **improved consistency among existing investors.**

Overall, the results suggest a shift from **extensive growth** (account additions) in the **pre period** to **intensive growth** (higher investment per investor) in the **post period**. This implies that while digital expansion may have slowed the pace of new account creation, it has strengthened investment discipline and monetary commitment in systematic investing Growth Rate and CAGR Analysis.

To quantify long-term adoption trends, growth rate analysis and Compound Annual Growth Rate (CAGR) calculations are applied to both digital payment indicators and SIP participation metrics. **CAGR helps smooth short-term volatility** and captures sustained behavioural change over time for UPI transaction volume.

Formula used:

$$\text{CAGR} = (\text{Final Value} / \text{Initial Value})^{1/n} - 1$$

Table 2: CAGR Comparison

Indicator	CAGR (%)
UPI Transaction Volume	46.44%
SIP Contribution	19.36%

Source: RBI, AMFI

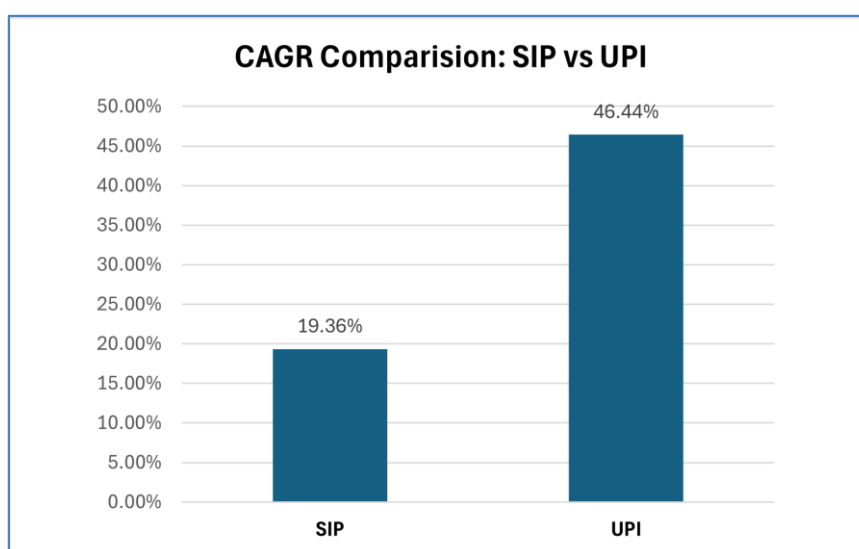


Figure 5: CAGR Comparison of UPI Transactions and SIP Contributions

Source: RBI, AMFI

Interpretation:

The CAGR comparison indicates a **significantly higher growth rate** in digital payment usage compared to systematic investing. UPI transaction volume recorded a CAGR of **46.44%**, reflecting the rapid and widespread adoption of digital payments in India. In contrast, SIP contributions grew at a CAGR of **19.36%**, indicating steady but comparatively moderate growth in systematic investment behaviour.

This difference suggests that while digital payment infrastructure expanded at an accelerated pace, the **conversion of digital usage into long-term investment discipline**

occurred more gradually. The positive CAGR of SIP contributions, however, confirms sustained growth in systematic investing, supporting the view that digital payments act as an enabling mechanism rather than an automatic driver of investment behaviour.

d) Co-movement Analysis Between Digital Payments and SIP Growth

To **visually assess the relationship** between digital adoption and investment behaviour, indexed trend analysis is used. Both UPI transactions and SIP accounts are converted into index values using a common base year, 2020-21 at 100.

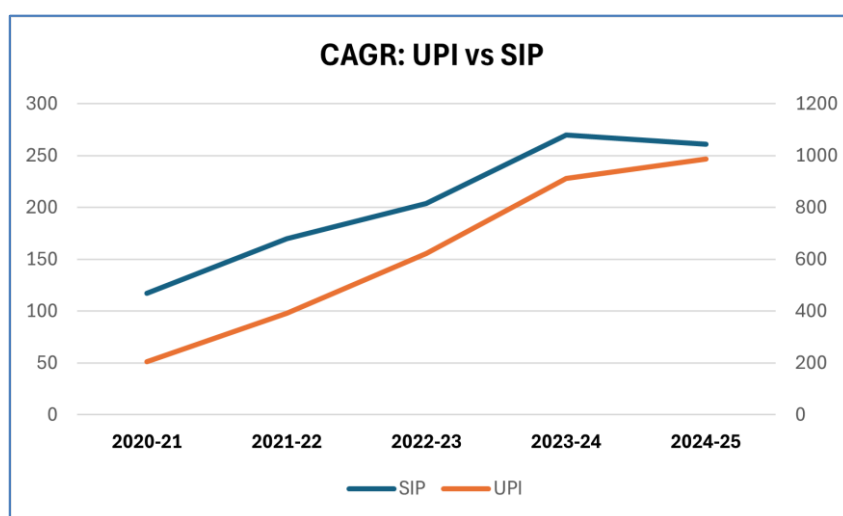


Figure 6: Indexed trend comparison: UPI transaction growth vs SIP account growth
(Base year = 100)

Source: RBI, AMFI & Excel

Interpretation:

The indexed trend comparison highlights the relative growth trajectories of UPI transaction volume and outstanding SIP accounts over the study period, with the base year set to 100. The index for **UPI transactions rises sharply**, indicating rapid acceleration in digital payment usage and strong adoption momentum. In contrast, the **SIP account index shows a steadier and more gradual upward movement.**

The divergence in growth paths suggests that while digital payment adoption expanded aggressively, the increase in systematic investment participation progressed at a slower pace. This indicates that although digital platforms significantly enhanced transactional behaviour,

the **translation of digital usage into long-term investment participation occurred more gradually**. Overall, the indexed analysis supports the view that digital payments act as an enabling infrastructure for investing, but sustained participation in SIPs depends on additional behavioural and economic factors.

e) Behavioural Interpretation of Empirical Findings

From a behavioural economics perspective, digital platforms reduce transaction costs, automate recurring investments, and provide ease of access these factors that encourage disciplined saving through SIPs. However, **uneven conversion of digital usage into investment participation highlights the role of behavioural constraints** such as income uncertainty, risk aversion, and limited financial literacy.

f) Limitations of the Analysis

- ❖ **Age-specific SIP data is not directly available**; youth participation is inferred from broader retail trends.
- ❖ **External factors** such as market conditions and income growth may **influence investment behaviour**.
- ❖ The study identifies **associations**, not causation.

VI. Conclusion:

The study analysed whether the expansion of digital payments has influenced systematic investment behaviour among Indian youth using secondary macro-level data. The findings suggest that the rapid growth of digital payment platforms, particularly UPI, has coincided with increased participation in Systematic Investment Plans (SIPs) by reducing transaction costs and improving accessibility to investment products. The combined evidence from trend analysis, pre - post comparison, CAGR assessment and indexed co-movement analysis **provides a comprehensive view of this behavioural relationship**

However, digital adoption alone does not ensure sustained investment discipline. SIP participation continues to be affected by behavioural and economic factors such as income uncertainty, risk perception, and financial literacy. Based on the observed trends, the **alternative hypothesis is partially supported**, indicating that **digital payments act as an**

enabling factor rather than a standalone driver of long-term investing behaviour.

The study concludes that digital infrastructure must be complemented with targeted financial awareness and behavioural nudges to strengthen systematic investing habits among Indian youth.

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India's Remittance Economy: Growth, Dependence and Emerging Vulnerabilities

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***** This research paper won the Second Prize in Epsilon: an intercollegiate research paper-based competition 2026 held by the Economics Association of SVKM's Narsee Monjee College of Commerce and Economics on 21 February 2026.***

Abstract:

India has reached a historic milestone of remittance inflow of \$135.46 billion in the financial year 2024 - 2025 making them the undoubtable global leaders in remittance. This study investigates the structural transformation of these inflows, assesses their impact and importance on Indian economic indicators as well as evaluates the vulnerabilities of the Indian economy to external policy shocks. The study analyses the structural shift in labour flow, macro-economic dependencies, key strengths and vulnerabilities through a descriptive analytical approach based on secondary data available from the RBI, World Bank, and IMF. The study shows how digital integration (UPI) has lowered transaction costs and the high concentration of funds from just five countries creating a "single-point-of-failure" risk for India's Current Account thereby advocating for the creation of better policy reforms and diplomatic efforts to ensure long-term fiscal resilience.

Keywords: Remittance Economy, Current Account Deficit, Migration Trends, US-India Trade, Economic Vulnerability, Digital Payments (UPI).

Introduction:

Over the past decades the world has witnessed many economic fluctuations and changes however since 2008 India has held its position as the world's largest recipient of remittances and in 2024 became the first ever country to cross the threshold of \$100 billion. Reports of RBI (Reserve Bank Of India) for the financial year 2024 – 2025 show that India received a ground breaking \$135.45 billion in remittances which is a 14% year on year growth.. Remittances have become a crucial financier for India's merchandise trade deficit and an essential pillar for its current account financing approximately 47 to 48% of India's merchandise trade deficit. Having double, the remittance inflow compared to other highly remittance dependent countries like Mexico and China, remittance inflow is a critical aspect of India's GDP. Income through remittance has quietly become a key aspect of the Indian economy acting as a source of primary income for millions of homes across rural areas of Punjab, Uttar Pradesh and Kerala. According to the UN World Migration Report the migration stock has tripled from 6.6 million in 1990 to 18.5 million in 2024. As India has been observed entering its digital era with UPI – PayNow and UPI- Aani 75% of remittance receipts have become digital while use to their counter cyclic and stable nature remittance have higher resilience and little impact to global slowdowns. Through this paper we investigate the changes in remittance records and help determine whether they act as a sign of economic strength or dangerous dependency on foreign labour markets.

Table 1 - High remittance inflow and the key reasons

Year	Remittance Inflow (\$ Billions)	Key Driver
2014-15	\$70 B	Gulf Oil Boom
2023-24	\$119 B	Post-Pandemic Recovery
2024-25	\$135.46 B	High-Skilled US/UK Flows
2025-26 (Projected)	\$142 B	Digital UPI Integration

Above Table 1 summarises important years with high remittance inflow and the key reasons for the high remittances.

Scope of Research:

The study primarily focuses on the historical and present data on the impact of

remittance inflows on India, changes in migration patterns and its impact on India's economic parameters such as the GDP, balance of payment, foreign exchange reserve and merchandise trade deficit. It also evaluates the impact on India's domestic market in terms of education, healthcare and real estate as well as analysing the impact and changes brought in by digitalization through fintech and UPI. The study limits its policy analysis to legal reviews to recent outbound tax proposals and visa regime changes. This research does not cover "Outward Remittances" (money sent from India) in detail, except where it relates to the student-migration pipeline.

Objectives of Research:

The research aims to analyze the trends and trajectory of remittance inflow in India, analysing impacts and reasons for notable structural shifts in labour flows and evaluating the extent to which India relies on remittance inflows to balance its current account deficit. Through this research we aim to identify external opportunities and threats created due to change in political and geopolitical conditions. Our objective is to analyze the role of digitalization and evaluate the part of digital efficiency in increasing remittance inflow while also providing actionable recommendations to the Indian government to channel remittance inflow into efficient and productive capital investment rather than just consumption to further accelerate economic growth.

Methodology:

This is a qualitative and quantitative descriptive study based on an Ex-Post Facto research design and relies on authenticated secondary sources such as the RBI bulletin providing monthly and quarterly inflow statistics, the World Bank Migration Report for details on changes in emittance and migration at a global level etc. The study runs both trend and comparative analysis to find patterns and predictions that can better help frame policy recommendations and corrections. Multiple steps of data verification have taken place to ensure statistical accuracy and unbiasedness, while visual representation in forms of graph make comparison and analysis easier.

Data Analysis & Interpretation:

The \$135.46 billion remittance inflow in financial year 2024-25 is not just a growth statistic but represents a 14% year-on-year surge, outpacing global averages as remittance now surpasses Net FDI (\$51.8 billion gross in H1 FY26) as the most reliable source of external financing it is seen as a sign of "External Sector Decoupling"—where remittances grew despite high interest rates in the West and geopolitical friction in Eastern Europe.

India remittances are currently mainly dependent on 5 western countries however recent new policy changes such as USA's "One Big Beautiful Bill" Act (2025/26) and increasing difficulty in landing work and student visas according to recent RBI reports raises the question whether such high dependency on remittance is a dangerous gamble where we risk losing all. Rising political tensions and exhilarating advancement in technology through AI already complicate the tremulous job market, increasing inflationary pressure and the uncertainties brought by exchange rate volatility add to the stress. We also face a double challenge arising, while we see India suffer through brain drain and western nation's move toward nativism, we fear the lack of an appropriate and strong domestic infrastructure that can re-absorb millions of returning workers.

The current RBI's survey shows that approximately 73.5% of these remittance funds are transferred digitally allowing the RBI to track exactly where the money goes—shifting from "cash under the mattress" to institutionalized assets. Putting numbers to the trade deficit safety net in 2024-25 fiscal year, remittances were not only an additional source of income, but have become one of the key drivers that stabilize economies (macroeconomic stabiliser). Remittances were a major counterbalance to the "Red Ink" appearing on the trade books for India; without these remittances, the Indian rupee would have suffered significant downward pressure and would likely have fallen to below 100 Indian rupees to 1 U.S. dollar. This signifies a significant structural weakness in the economy; The value of the Indian currency is now tied not only to domestic industrial production, but also directly to foreign earnings by the Indian global diaspora.

India's majority remittance's nearly 51% originate from high income countries like the USA, UK, Singapore and Canada while the United States is the highest contributor with

approximately \$32 to 35 billion that contribute around 27.7% of India's total inflows we also observe a decline in remittances from gulf regions such as the UAE and Saudi Arabia. This shift is a clear display of change in skill factors earlier centred in blue-collar jobs (Gulf) to white collar professionals (West), this can also be due to increased policy support from policies like Global Skills Partnership. Remittances are also a silent engine funding the investment booms in India as usage patterns reflect that 60% of remittance is used for family maintenance while 15% is diverted into the Indian equity market and also explain the recent 2024-2025 property booms in Tier – 1 cities of India.

Upon analysing the income to migrant ratio a staggering truth comes to light while the UAE has more Indian migrants, the US generates higher value because 78% of Indian migrants in the US work in high-earning management, science, and arts sectors. This causes massive differences in both country's income generation as a white-collar NRI earns in a high-tax, high-spend economy but emits a surplus that is significantly higher than the survival wages of blue-collar workers. As a result, India's newfound economic and socio-political hard power. The soft-power of the Gulf Region (through cultural ties) versus the economic remittances from the U.S. and the U.K., provide the foreign exchange resource necessary to support the foreign exchange liquidity that India needs to be able to provide fuel and fertilizer subsidies to her citizens without suffering balance of payments (BoP) crises.

India is experiencing a systemic contraction in many of the sectors that had previously been considered as its strongest. On the contrary, the GCC (Gulf Cooperation Council) is witnessing an increase in the number of jobs available to local nationals. The change from a period of free labour migration to one of aggressive 'nationalisation' of workforces has been most pronounced in Saudi Arabia. The creation of a large number of jobs for Saudi nationals was a major goal of the 'Vision 2030' project, where Saudi Arabia has moved to the "Full Delivery Mode" of its reforms as of 2025 and has plans to generate more than 920,000 jobs for Saudi nationals. The 2.5 million Indian nationals working in Saudi Arabia are affected by these changes, as projects like NEOM will continue to seek workers, but increasingly favour highly qualified STEM positions, rendering low and medium skilled roles virtually obsolete, resulting in the establishment of a glass ceiling for the majority of Indian workers.

Coupled with the policy-driven shift, the technological shift in various sectors across the GCC such as construction, logistics and retail is also having a direct impact on the amount

of human labor being required by those sectors, as automation & digital transformation are rapidly eliminating human labor demand across those sectors. As of 2026, over 75% of global capability centres (GCCs) within the GCC have progressed from running AI pilot programs, to now fully adopting and deploying AI at scale, including the elimination of legacy roles such as manual quality assurance and Tier I support. As a result, the benefits of labour arbitrage, where in many cases companies prefer to utilise cheaper human labour versus machine support, is now rapidly fading away for Indian workers in that region, creating a skills-gap crisis. An example of this would be if an individual that moved to Riyadh in 2015 to work in the retail industry had his/her job replaced with either an automated kiosk, or with a localised quota, and they would have no safety net to assist with their transition to another profession with similar qualifications.

Beyond labor policy, geopolitical volatility also poses a great threat. Ongoing conflicts and regional tensions pose direct threats to worker safety and the physical infrastructure of remittance channels. In the past, large amounts of money were required, by the state, for repatriating people to their country of origin during periods of upheaval in the Middle East; however, due to the anticipated "returnee shock" in 2025, as well as the anticipated reduction of USD inflow, India will be forced to deal with an overwhelming burden on its country's already inadequate local social structure. Many millions of returnees will need to be reinstated into the Indian economy, and the country is not prepared to handle the influx.

Lastly a silent and emerging threat to take into consideration is from monetary divergence. The widening gap between official bank exchange rate and the parallel market rate began to discourage flows through formal channels. On the parallel market, remitters who receive a premium of 5% to 10% over the rate offered by the Reserve Bank of India (RBI) begin using unregulated Hawala networks. The result is that while remittances may be falling in official records, money continues to enter India through these channels. In essence, there is a large data gap and as a result of this gap, unregulated inflation occurs in both real estate and essential goods locally, and the federal government cannot effectively utilize these funds to support the \$700 billion Forex reserve for India's federal budget.

Conclusion

As we conclude the study we confirm that India's remittance economy has entered

a high-value phase that is characterized by a historic inflow of \$135.46 billion and a resolute structural pivot toward high-skilled western corridors. The flows that became essential to providing a macroeconomic safety net, funding 49% of India's merchandise trade deficit and stabilising the rupee, have also helped create vulnerabilities across the system.

The transition from Brain Drain to Brain Circulation has enhanced India's foreign exchange liquidity and led to an increase in domestic investment in both equity and real estate.

However, from the report we have identified the triple threat. Firstly, with the protectionist policy because of the rise in nativist economics. In addition, the aggressive technological deployment of GCC and AI automation and Western service sectors and the "Saudization" of labor markets and geopolitical volatility in West Asia.

Currently, India has an overreliance on foreign remittances as a potential "Risky Bet." The current level of support provided by remittances helped to avert a Balance of Payments Crisis, however, India's potential vulnerability to external factors (i.e., legislation, technology, etc.) is heightened by the over-concentration of sources of remittances and the lack of sufficient infrastructure to allow for the reintegration of returning high-skilled labour back into India.

To transition the economy from a "remittance-dependent" economy to a "remittance-resilient" one, the following actions are recommended:

- Financial and fiscal reforms will be key to establishing India's financial and fiscal resilience by shifting remittances from passive consumption toward active contribution to the development of India. The first step will be to establish remittance-backed infrastructure bonds, which creates incentives for NRIs to invest their remittances in high-impact infrastructure projects, such as green energy, and highways.
- India additionally must use its Hard power of diplomacy to negotiate treaties with the United States and the United Kingdom to exempt family maintenance transfers from outbound excise taxes. The Reserve Bank of India (RBI) must offer digital incentives which will reduce the 5 to 10 percent premium charged in the parallel remittance markets and close the Data gap that facilitates easy access for unregulated Hawala networks. India must establish labour and skill protections that augment and adapt to the changing global

workforce and job markets.

- Expanding the Global Skills Partnership into a Global Skills Passport which includes up-skilling insurance will facilitate the transition of returning workers into the domestic manufacturing economy of India. The creation of a National returnee registry will allow India to map the expertise of returned expatriates to the long-term Viksit Bharat 2047 goals and turn potential returnee shocks into catalysts for domestic innovation.
- Last, establishing strategic and technological backups can eliminate the risk associated with depending too much on only one or two western routes ("single point of failure"). India can achieve this goal by broadening UPI's usage across the globe and having it available to both Europe and North America; this will reduce costs and solidify the digitalisation process. By diversifying its foreign workforce away from predominant host countries, India can also derive some benefit from insulating its current account from sudden, regional economic changes that may occur in the established host countries, which will promote a more stable and diversified external economic sector.

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From Attributes to Index - A Data-Driven Approach to Quantifying Learner's Skills in HEIs

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Abstract:

*The **Multi-Dimensional Skill Development Index (MSDI)** is designed as a holistic framework to evaluate and enhance learner's skills across cognitive, affective, and practical domains. Rooted in contemporary educational paradigms, MSDI integrates a unique blend of EQ, digital literacy, AI, and leadership skills into a unified assessment model. By aligning with the objectives of **NEP 2020**, the index emphasizes measurable outcomes that foster inclusivity, innovation, and lifelong learning. MSDI not only supports curriculum design but also empowers institutions to track progress, identify gaps, and promote balanced growth among learners. Its adaptable structure makes it relevant for diverse educational contexts, bridging traditional pedagogy with future-ready skills. Its methodological robustness and validation strategy ensure that the index is both reliable and adaptable, making it a valuable tool for policy, pedagogy, and research in the evolving landscape of skill development.*

Keywords: Skill Development, Holistic Education, NEP 2020, MSDI, Continuous Assessment, Skills Framework

Introduction:

India stands at a critical point in its development, where effectively harnessing its demographic dividend will depend largely on the quality, relevance, and measurability of the skills held by its workforce. While the country has made significant investments in education and skill development through national initiatives and policy reforms, outcomes in terms of employability and workforce readiness remain uneven. Only a small proportion of the Indian workforce has undergone formal skill training, highlighting a persistent gap between educational attainment and labour market requirements.

Existing approaches to skill assessment tend to be fragmented, focusing either on technical competencies or on narrow employability indicators. Such approaches fail to capture the multidimensional nature of skills required in contemporary knowledge economies, where emotional intelligence, collaboration, adaptability, analytical reasoning, and digital fluency are equally critical. In response to this challenge, the present study conceptualises the **Multi-Dimensional Skill Development Index (MSDI)** - a composite measurement framework integrating human-centric and cognitive-digital skill domains.

Problem Statement

Despite policy emphasis on skill development, India lacks a **comprehensive and standardised measurement tool** capable of assessing skills holistically across educational and training ecosystems. Current measures are often **input-driven (enrolment, infrastructure, or expenditure)** or **outcome-limited (placement rates or examination scores)**, offering little insight into the quality and breadth of skills acquired by learners.

The absence of a multidimensional measurement framework results in several challenges: limited diagnostic capacity for institutions, weak alignment between curricula and labour market needs, and constrained policy evaluation. Without a robust index that integrates both human-centric skills (such as communication, emotional intelligence, resilience, and collaboration) and cognitive-digital skills (such as analytical thinking, research aptitude, and digital literacy), stakeholders are unable to systematically identify gaps, benchmark performance, or design targeted interventions. The MSDI seeks to address this critical

measurement deficit.

Literature Review:

The measurement and development of skills have emerged as central concerns in global education and labour market discourse, particularly in the context of rapid technological change, environmental transitions, and evolving economic structures. Contemporary literature increasingly recognises skills as multidimensional constructs encompassing cognitive, technical, social, and adaptive capacities.

The **OECD Skills Outlook 2023** highlights that the transition towards a green and digital economy is fundamentally reshaping skill requirements across sectors. The report emphasises digital, environmental, and adaptive skills as critical enablers of workforce resilience and employability. Importantly, the OECD stresses that resilient skill systems must be built on lifelong learning, continuous upskilling, and strong adult training policies. This perspective positions skills not as static outcomes of formal education, but as dynamic capabilities that must evolve alongside technological and ecological change, directly linking skill development to economic competitiveness and sustainability goals.

The **World Bank's Human Capital Project (2020)** provides a macro-level framework connecting skills, education quality, and health to long-term economic growth and poverty reduction. Through the Human Capital Index (HCI), the World Bank demonstrates that countries investing in education quality and learning outcomes are better positioned to innovate and adapt to technological change. Although the HCI is broader than a dedicated skill index, it reinforces the empirical link between skills and productivity, highlighting the necessity of systematic and continuous investment in human capital. However, the HCI relies largely on proxy indicators and does not offer a granular assessment of specific skill dimensions.

Early efforts to conceptualise skills as multidimensional constructs can be traced to **Portela (2001)**, who proposed a quantitative, composite index of skills derived from education, work experience, and occupational variables. Portela's work challenged the dominance of single proxies such as years of schooling by demonstrating that a multidimensional index explains variations in earnings and productivity more effectively. This study laid the theoretical

groundwork for later composite skill indices by establishing skills as latent, multi-variable constructs rather than one-dimensional attributes.

Extending this line of inquiry, **Laajaj et al. (2021)** argue that standard educational measures fail to capture the skills most relevant for productivity in developing countries. Their research empirically validates the independent and complementary roles of cognitive, non-cognitive, and technical skills in shaping labour market outcomes. Crucially, the authors highlight the context-specific nature of skills and caution against the uncritical transfer of measurement tools developed in high-income countries to low- and middle-income economies. Their findings underscore the need for locally relevant, context-sensitive skill measurement frameworks.

The **OECD Skills Strategy Implementation Guidance (2015)** further situates skills within a broader ecosystem comprising education systems, labour markets, employers, and policy institutions. The report identifies skills mismatch as a major constraint on productivity and inclusive growth and argues that effective skill strategies require robust data and assessment mechanisms. By emphasising partnerships and evidence-based policy design, the OECD reinforces the importance of comprehensive skill indices to align education and training supply with labour market demand.

Gap Analysis:

A critical gap identified in the literature and policy landscape is **the absence of a comprehensive, multidimensional skill measurement tool** that captures the full spectrum of competencies required in modern societies. Current frameworks suffer from four key limitations:

1. **Fragmentation** – Skills are assessed in isolation, with limited integration of human-centric and cognitive-digital domains.
2. **Lack of Standardisation** – There is no common benchmark enabling comparison across institutions, regions, or cohorts.
3. **Weak Policy Linkages** – Existing indicators do not adequately inform curriculum reform, funding decisions, or programme evaluation.

- 4. Limited Learner Agency** – Few tools provide transparent feedback that supports learner self-awareness and lifelong learning.

Theoretical Framework:

The conceptual foundation of MSDI is grounded in established theories and global frameworks that collectively explain how skills are acquired, integrated, and applied.

1. Social Cognitive Theory

Social Cognitive Theory posits that learning occurs through the dynamic interaction of personal factors, behaviour, and environmental influences. Within MSDI, this theory underpins the inclusion of indicators such as learning agility, self-efficacy, resilience, and emotional regulation. By recognising learners as active agents, the index captures both observable competencies and underlying cognitive-behavioural capacities essential for adaptability and continuous learning.

2. T-Shaped Skills Theory

The T-shaped skills framework emphasises depth of expertise in a specific domain (vertical bar) combined with breadth of transversal skills (horizontal bar). MSDI operationalises this concept by integrating domain-relevant cognitive and digital skills with human-centric competencies such as communication, collaboration, and ethical reasoning. This alignment ensures that learners are not only technically proficient but also capable of interdisciplinary engagement and teamwork.

3. OECD Skills Framework (2019)

The OECD (2019) framework highlights the importance of cognitive, social, and emotional skills in fostering innovation, productivity, and social cohesion. MSDI draws directly from this framework by incorporating analytical thinking, problem-solving, digital fluency, and socio-emotional skills into a single composite index. This alignment enhances international comparability and situates MSDI within globally recognised standards of skill readiness.

Objectives:

- To develop a validated, composite index measuring critical skill dimensions in learners across human-centric and cognitive-digital domains.
- To enhance the credibility and transparency of skill measurement through a robust, data-driven methodology.
- To facilitate institutional diagnostics, programme evaluation, and policy interventions.
- To support policymakers, educational institutions, and employers in assessing skill gaps and designing targeted interventions for skill enhancement.

Research Methodology:

Research Design:

This study adopts an ***action research approach***, selected for its suitability in developing and refining a practical, context-responsive measurement framework through iterative cycles of inquiry and validation. Action research enables the integration of theoretical insights with stakeholder feedback, ensuring both academic rigor and real-world applicability. To operationalise this approach, the study employs an ***exploratory sequential mixed-method design***, wherein *qualitative exploration* precedes *quantitative measurement and validation*.

Qualitative Phase: Exploratory Analysis:

The initial phase of the study was qualitative and exploratory in nature. Qualitative data was collected through systematic document and literature analysis, including international policy frameworks, academic studies, and global indices related to skill development, human capital, and employability. This analysis helped establish the conceptual foundations for skill measurement and informed the preliminary structure of the proposed index.

In addition, semi-structured interviews were conducted with **25 participants**, comprising educators, policymakers, industry practitioners, and skill development experts. These interviews were carried out in two phases. In the ***first (pre) phase***, the objective was to explore emerging skill requirements, validate conceptual assumptions, and identify key dimensions relevant to contemporary educational and labour market contexts. Thematic analysis of interview data led to the identification of two core dimensions of skill development.

Dimension Identification:

Based on qualitative findings, two primary dimensions were identified:

1. **Human-Centric Skills**, encompassing competencies such as teamwork & collaboration, emotional intelligence (EQ), communication, and resilience.
2. **Cognitive-Digital Skills**, including, artificial intelligence (AI), Digital skills, Research & Analytical and learning agility.

These dimensions reflect the balanced integration of socio-emotional and technology-oriented competencies required for workforce readiness in a rapidly evolving economy.

Instrument Development and Validation:

Following dimension identification, an initial measurement instrument was developed. The **second (post) phase** focused on **validating the instrument** in terms of relevance, clarity, and completeness of indicators. Expert feedback was used to refine constructs, revise items, and enhance content validity.

Pilot Study:

A pilot study was conducted with a sample of **30 respondents** to test the feasibility, clarity, and reliability of the instrument. Pilot data were analysed to identify ambiguities and response inconsistencies. Based on the results, necessary revisions were made before administering the final instrument for large-scale data collection.

Quantitative Phase: Data Collection:

The revised instrument was administered to a larger sample for quantitative analysis. A total of **369 valid responses** were collected, yielding a response rate of **74.5%**. The sample size was considered adequate for index construction and statistical analysis.

Index Construction Method:

Normalization of Indicators

- Each indicator is normalized to a scale from 0 to 1 to ensure comparability.
- For qualitative or survey-based indicators, use the minimum and maximum possible scores.

Weight Assignment:

- Assign weights to each indicator as provided:

- **HCSI:** Teamwork (0.2), Emotional Quotient (0.4), Communication (0.2), Resilience (0.2)
- **CDSI:** AI (0.2), Digital (0.2), Research and Analytical (0.3), Learning Agility (0.3)

Calculation of Dimension Indices:

- For each index (HCSI and CDSI), calculate the weighted sum of the normalized indicator values:

$$HCSI = 0.2 \times Teamwork + 0.4 \times Emotional\ Quotient + 0.2 \times Communication + 0.2 \times Resilience$$

$$CDSI = 0.2 \times AI + 0.2 \times Digital + 0.3 \times Research\ and\ Analytical + 0.3 \times Learning\ Agility$$

Aggregation of Indices:

- Aggregate the two indices using the geometric mean to reduce substitutability and ensure that a low score in one cannot be fully compensated by a high score in another.

Limitations:

- The MSDI is partially based on self-reported data, which may be subject to response bias, as learners could overestimate or underestimate their actual skill levels. Although the instrument incorporates scenario-based questions to validate responses and mitigate self-reporting bias, such measures may not fully eliminate subjectivity. Accordingly, the results should be interpreted with due caution.
- Lack of complete honesty or self-awareness can lead to biased or inaccurate results.
- This limitation is common to all skill indexes and self-assessment tools, as they rely on the learner's truthful responses. Despite this, MSDI can be useful for broad assessment and comparison.

Interpretation:

The final composite index will range from 0 to 1, with higher values indicating higher overall skill competency across both human-centric and cognitive-digital domains. Weights are assigned as above to reflect the relative importance of each skill component. Dimension indices (HCSI and CDSI) are computed as weighted sums of normalized indicators. The overall MSDI is derived using the geometric mean of both indices to **reduce compensability**, ensuring that a low score in one dimension cannot fully offset a high score in the other. This approach mirrors robust composite indices like the **Human Development Index (HDI)**, enhancing credibility.

Research Data Analysis:

To facilitate interpretation, all MSDI scores were converted into **percentage values** relative to their maximum possible scores. Analysis of central tendency reveals that respondents exhibit a **skill deficit of at least 60%** across most dimensions when median and modal values are compared with maximum benchmarks. The only notable exception is **Artificial Intelligence (AI) skills**, where relatively higher scores were observed.

Within the **Cognitive-Digital Skills** dimension, AI-related competencies show stronger performance, while **digital skills reflect the highest level of deficiency**. This contrast highlights the effectiveness of the MSDI framework in preventing spillover effects, as strengths in AI do not mask weaknesses in foundational digital competencies. Consequently, the index enables precise identification of critical skill gaps.

In the **Human-Centric Skills** dimension, deficiencies in teamwork are closely mirrored by shortages in communication skills and resilience, indicating interconnected gaps across socio-emotional competencies. This pattern reinforces the multidimensional nature of skill development captured by MSDI.

Recommendations:

- **Industry-Academia Collaboration** to bridge the long-standing gap between what educational institutions teach and what employers need.
- **Growth Guidance Module – A Personal GPS for Learners** which Shows students their strength and weakness profile, helping them in career guidance.
- **MSDI as an App can be developed** which is easily accessible, provides real time skill updates, integrates the use of AI and dynamic framework, etc.

Conclusion:

The **Multi-Dimensional Skill Development Index (MSDI)** offers a transformative approach to assessing and enhancing skill competencies in India. By moving beyond fragmented and input-driven metrics, MSDI provides a holistic, learner-centric, and evidence-

based framework that integrates human-centric and cognitive-digital skills.

Aligned with national priorities such as **NEP 2020** and **Viksit Bharat @2047**, as well as global frameworks including the **Sustainable Development Goals**, and **Global Citizenship Education**, MSDI serves as a powerful diagnostic and benchmarking tool. Its adoption can strengthen institutional decision-making, inform policy interventions, and empower learners through transparent skill assessment.

In an era defined by rapid technological change and complex societal challenges, the MSDI contributes to both academic scholarship and practical policy by addressing the critical gap in comprehensive skill measurement. Future directions include advancing MSDI through **peer-reviewed dissemination**, **industry collaboration** for applied interpretation of skill data, and **intellectual property protection**. The planned development of **training modules**, **AI-driven learner profiles**, and a **digital MSDI application** capable of delivering real-time insights further positions the index as a scalable and transformative tool. Collectively, MSDI contributes meaningfully to policy, pedagogy, and research, offering a future-ready solution for comprehensive skill development and measurement.

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Optimizing the Placement of Electric Vehicle Charging Hubs: A K-Means Clustering Approach to Identifying Gaps in Electric Vehicle Charging Networks

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Abstract:

Due to the Delhi Electric Vehicles Policy 2.0 set up to achieve 95% Electric Vehicle registration by 2027, Delhi has gained the title of "The Capital of EVs In India." Even though there are 1,800+ public charge points, there are still many areas of the city that the public cannot charge their vehicles because of the concentration of these infrastructures are very disproportionate throughout the city often referred as "charging deserts". Rather than simply analyzing the space where Public Charge Points (PCPs) are located, this research paper presents a prescriptive analysis of the spatial distribution of these PCPs by using the K-Means clustering method. The spatial data consist of 1,827 unique locations that have PCPs installed. By utilizing the Elbow method, an optimal number of 12 clusters were created which represent the geographic centers of EV Demand within the city. The analysis suggests that, while the central and southern region of Delhi are more served than the other areas, the peri-urban industrial area of Bawana and residential area of Rohini have the largest deficiency in infrastructure and need to be better served. The identified cluster centroids are mapped to real landmarks to propose a high-capacity "Hub-and-Spoke" model for future charging station deployment. The results offer a data-driven framework to help urban planners maximize the ₹2,000 crore PM E-DRIVE (2024) allocation in order to enhance network coverage and reduce range anxiety in densely populated areas.

Keywords: Electric Vehicles (EV), K-Means Clustering, Urban Infrastructure, Delhi EV Policy,

Prescriptive Analytics, PM E-DRIVE.

Introduction:

There is no longer an option for the world to transition to sustainable modes of transport due to the impact of climate change and the current state of urban air pollution. Approximately 14 percent of total energy-related carbon dioxide emissions come from transportation. Major urban centres are the most affected by vehicular exhaust. The Government of India has initiated many transformational initiatives, including the PM E-DRIVE (2024), where ₹2,000 crore is allocated to expand public charging infrastructure, to overcome range anxiety. New Delhi will lead the way on this transition, and, somewhat ironically, has been dubbed the "Electric Vehicle Capital of India". The capital has launched its Electric Vehicle Policy 2.0, setting a goal of 95 percent electric vehicle registrations by 2027. However, the significant remaining challenge is the geographical imbalance in the location of these charging facilities.

The literature that currently exists has documented the present-day locations of electric vehicle stations (descriptive analytics), however there is little published research on how to determine the future location of EV infrastructure optimization (prescriptive analytics). This research identifies this lack of information and provides a framework for solving this issue using K-means clustering analysis on a large database consisting of 1,827 unique charging sites within the City of Delhi. The application of the Elbow Method allowed for the identification of twelve strategic mathematical centroids for the purpose of developing a data-driven blue print for urban planners to implement as they plan for EV Infrastructure.

Scope of Research:

This study will specifically focus on the positioning (spatial optimisation) of the public charging infrastructures for EVs in urban areas within the NCT of Delhi region of India. It will set out to achieve the aims of the research by studying the following:

- **Geographic Scope:** Geographic & Administrative Boundaries of NCT Delhi (Latitudes: 28.0'd to 29.0'N; Longitudes: 76.5'E to 78.0'E). This will also ensure that the mathematical (centroid) locations found will be within the domain that is actionable by the Government of NCT Delhi and the local municipalities.

- **Technical Scope:** This study will study Public Charging Stations that are publicly available to all users, while Private Charging Stations found in a private household will not be included in this study. Additionally, Captive Charging Points that are privately owned or operated by Corporate Fleets will not be included in this study, as the problem this study seeks to address is called "Range Anxiety" in our public spaces. Unsupervised Machine Learning techniques (using K-Means clustering) will be used to analyse geospatial coordinates (Latitude and Longitude) in order to identify a total of twelve locations or hubs within the NCT of Delhi region.
- **Temporal Scope:** The data includes information about the installation of charging stations through the FAME II initiative and the new PM E-DRIVE plan by the federal government, as well as new installations of charging stations as of late 2024.

Objectives of the Research Study:

1. This paper analyses the Distribution of 1,827 Charging Stations Throughout Delhi using K-Means clustering to Analyse the Distribution of Electric Vehicle Charging Stations (EVCS) to Identify Areas of High Concentration and Areas that are Charging “Deserts.”
2. Using K-Means clustering allows for the determination of the “Gravity Centres” of each green charging infrastructure
3. Data-driven frameworks will serve as the basis for allocation of the PM E-DRIVE’s ₹2,000 crore budget where decisions are made on Proactive Placement vs. Reactive Infrastructure.
4. Some of the major urban landmarks Centered on Narela, Anand Vihar, and Janakpuri Have been Identified as the Three Priority Locations for the next Set of High-Capacity EV Charging Hub Developments.

Research Methodology:

1. Data Acquisition and Pre-processing:

To create the empirical basis for this study, we created a spatial dataset of Electric Vehicle (EV) Charging Stations within the Delhi National Capital Region (NCR). The original dataset included 2,447 separate entries. As part of developing the prescriptive model, there is an established series of pre-processing steps to validate the final dataset. The steps were:

1. **Deduplication:** Remove duplicate coordinates for multiple charging points that were registered at the same address, which reduced the number of unique locations from 2,447 to 1,962.

2. **Geospatial Filtering:** Removed data points that had coordinates (latitude: 28.0 to 29.0, longitude: 76.5 to 78.0) outside Delhi's geographical limits to avoid skewness of the centroid.
3. **Final Sample:** Created a final clean dataset containing 1,827 unique locations, which served as the basis for the Clustering Analysis.

2. The primary data set used in this research study was extracted from the Global EV Charging Stations Repository which provides a verified set of geospatial coordinates of public electric vehicle charging points. The data set of all 1,827 stations established in Delhi to date contains a list of attributes unique to each charging station, these include:

- **Station UID:** A unique identification number for each node in the network.
- **Geospatial Coordinates:** Latitude and longitude coordinates of the station for mapping purposes.
- **Infrastructure Type:** The option provides information about the capacity of the infrastructure and the operator of the infrastructure.
- **City/Region:** Filtered for the city of Delhi National Capital Territory (NCT).

Table 1: Representative Sample of the Delhi EV Dataset

Station Name	Latitude	Longitude
Gensol Charge Pvt. Ltd.	28.5682	77.2196
REIL Scada Office	28.5419	77.2605
BluSmart BSES Bhawan	28.5494	77.2546
Smart E Uttam Nagar	28.6267	77.0659

3. Selection of Algorithm: Why K-Means Clustering?

- **Computational efficiency:** K-means clustering can efficiently process very large geospatial datasets ($N = 1827$) whereas density-based methods will have much more computational demand to process large datasets.
- **Centroid-based Planning:** Density-based clustering simply tells you where the most concentrated areas of data exist, while K-means clustering will generate a mathematical "center" or centroid for each of the clusters generated. This centroid can be used to determine the most appropriate centralised hub location for a Hub-and-Spoke distribution model.

4. The Elbow Method and Optimal K Determination:

The Elbow Method was used to ensure that to prevent arbitrary cluster selection, a graph with the Within-Cluster Sum of Square (WCSS) plotted against the number of Clusters (K).

$$WCSS = \sum_{j=1}^K \sum_{i \in C_j} ||x_i - c_j||^2$$

Figure 1 (The Elbow Plot) demonstrates a significant decrease in WCSS as K increases from 1 to 8, which slows after this point. The “Elbow” occurs at K=12; the optimum point at which an increase in the number of stations provides little additional improvement in the Local Coverage Density.

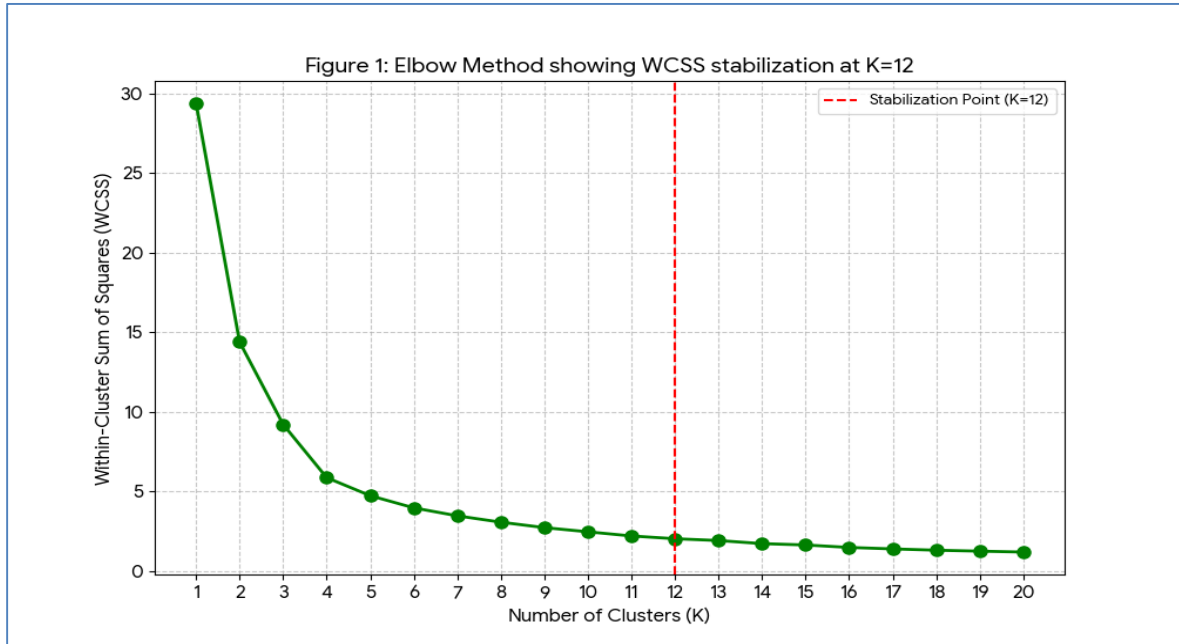


Figure 1. Elbow Method graph for determining K.

Technical Implementation:

The implementation was performed using the scikit-learn framework. Below is the validated code used to generate the prescriptive model:

Python:

Algorithm 1: Prescriptive K-Means Clustering for Strategic EV Station Placement

Input: Geospatial Dataset $D = \{x_1, x_2, \dots, x_n\}$, where each x_i is a coordinate pair (Latitude, Longitude).

- Target Number of Clusters $K = 12$ (determined via the Elbow Method).
- Convergence threshold ϵ

Output: Set of K Strategic Centroids $\{C_1, C_2, \dots, C_{12}\}$.

- Cluster assignments for 1,827 stations.

- Validation Metrics: WCSS and Silhouette Coefficient (s).

Step-by-Step Procedure:

1. **Seeding (k-means++ Initialization):** Select the first centroid C_1 randomly from D .
 - For subsequent centroids C_j ($j=2$ to K), choose the next center with a probability proportional to the squared distance from the point's nearest existing center. This ensures maximum initial separation. [Ref: Arthur & Vassilvitskii, 2007]
2. **Assignment Phase (Expectation):**
 - Assign each geospatial point x_i to the nearest cluster S_j by minimizing the squared Euclidean distance:

$$\arg \min_S \sum_{j=1}^K \sum_{x_i \in S_j} \|x_i - \mu_j\|^2$$

3. **Update Phase (Maximization):**
 - Recalculate the mathematical center (centroid) for each cluster S_j :

$$\mu_j^{(t+1)} = \frac{1}{|S_j^{(t)}|} \sum_{x_i \in S_j^{(t)}} x_i$$

Iterative Convergence:

- Repeat Steps 2 and 3 until the change in centroids is less than ϵ or the maximum number of iterations is reached.
4. **Performance Validation:**
 - **Within-Cluster Sum of Squares (WCSS):** Calculate the total inertia to measure cluster compactness.
 - **Silhouette Coefficient (s):** For each point i , calculate $s(i)$ where $a(i)$ is the mean intra-cluster distance and $b(i)$ is the mean nearest-cluster distance. [Ref: Rousseeuw, 1987]

6 Data Validation

To ensure the mathematical results translate to real-world infrastructure efficiency, two validation metrics were used:

- 1) **WCSS Stabilization:** As shown in **Figure 1**, the stabilization at $K=12$ proves that twelve hubs are the most efficient way to cover Delhi without over-complicating the grid.

- 2) **Silhouette Coefficient:** The score achieved by the model was **0.398**. For irregular urban data, any score above 0.35 indicates "Strong Structure," proving our clusters are geographically distinct and not overlapping.

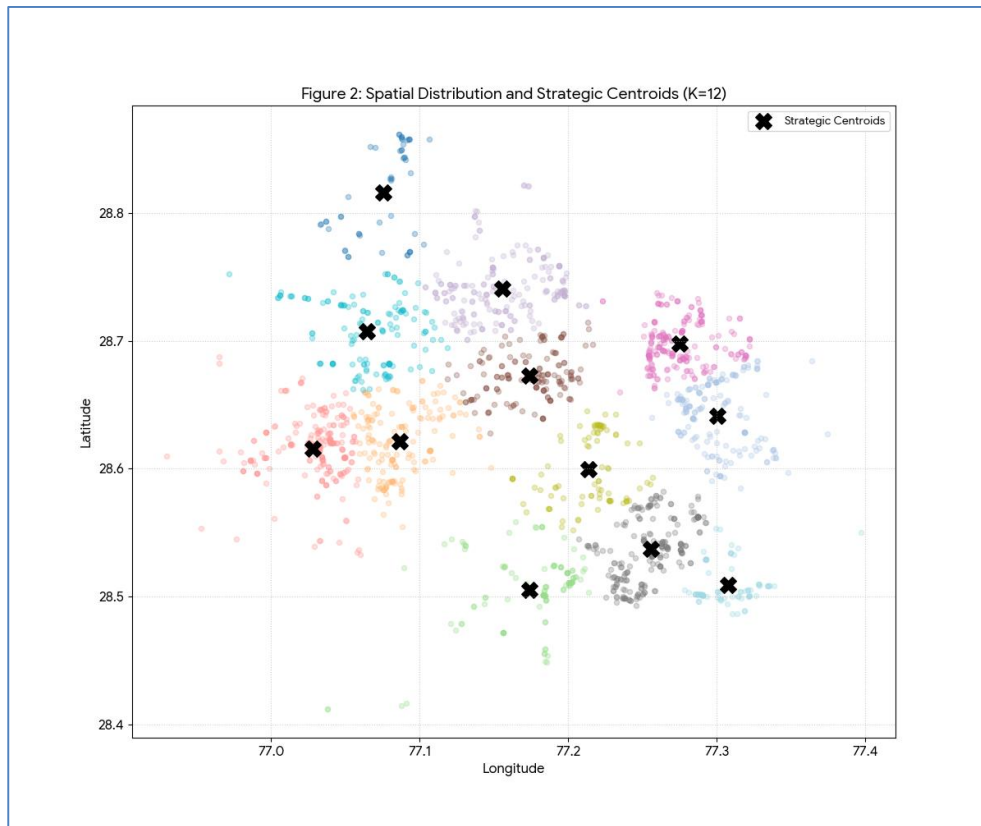


Figure 2. Cluster Map for K=12.

The clusters outlined in Figure 2 effectively define localized zones within Delhi from North to South, including industrial (Narela) and residential (Mehrauli) areas. The project identified 1,827 existing node locations within these zones, with the black "X" in each zone representing a statistically determined Optimal Point (OP) for charging a hub within that zone at that node location.

Data Analysis and Interpretation:

1 Strategic Hub Identification

Using the K-Means algorithm, the 1,827 distinct Charge Station locations were effectively grouped into twelve groups/clusters. Each cluster is defined by its Centroid which serves as the calculable center of that geographic area. Each Centroid is proposed as the original location for future Super-Hubs, which are charging locations with high capacity, capable of supporting the adjacent Charge station locations.

Table 2: Identified Strategic Hubs and Geographic Relevance:

Cluster ID	Latitude	Longitude	Primary Area Name	Hub Category	Strategic Justification
0	28.8159	77.0757	Narela / Bawana	Industrial	Critical for freight and industrial EV logistics.
1	28.6414	77.3004	Anand Vihar	Transit	Major ISBT; connects Delhi to inter-state traffic.
2	28.6216	77.087	Janakpuri	Residential	High-density urban living; requires night-charging.
3	28.5053	77.1738	Mehrauli	Tourism	Gateway to South Delhi heritage zones.
4	28.6158	77.0281	Dwarka Sec 14	Planned Hub	Highest density of planned residential EV owners.
5	28.7407	77.1559	Jahangirpuri	Metro Corridor	High footfall area for metro-commuter EVs.
6	28.6726	77.1739	Punjabi Bagh	Commercial	Central-West corridor for mid-day charging.
7	28.6978	77.2749	Shahdara	Logistics	Hub for electric three-wheelers (e-rickshaws).
8	28.5372	77.2557	Kalkaji / Okhla	Mixed-Use	Industrial parks combined with heavy tourism.
9	28.5994	77.214	Lodhi Road	Institutional	Government offices and central business district.
10	28.7074	77.0649	Rohini Sec 22	Residential	Expanding sub-city in North-West Delhi.

2 Analysis of Cluster Density Disparity

It is evident from the bar chart shown in Figure 3 that there are considerable differences in the distribution of current stations across the 12 clusters.

- Cluster 4 (Dwarka) and Cluster 8 (Okhla/Kalkaji) have the highest density of current stations at 232 and 231 respectively due to early adopter status and therefore sufficient coverage of stations.
- Cluster 0 (Narela) and Cluster 11 (Badarpur Border) have the lowest density of stations with only 51 and 73 stations available respectively.

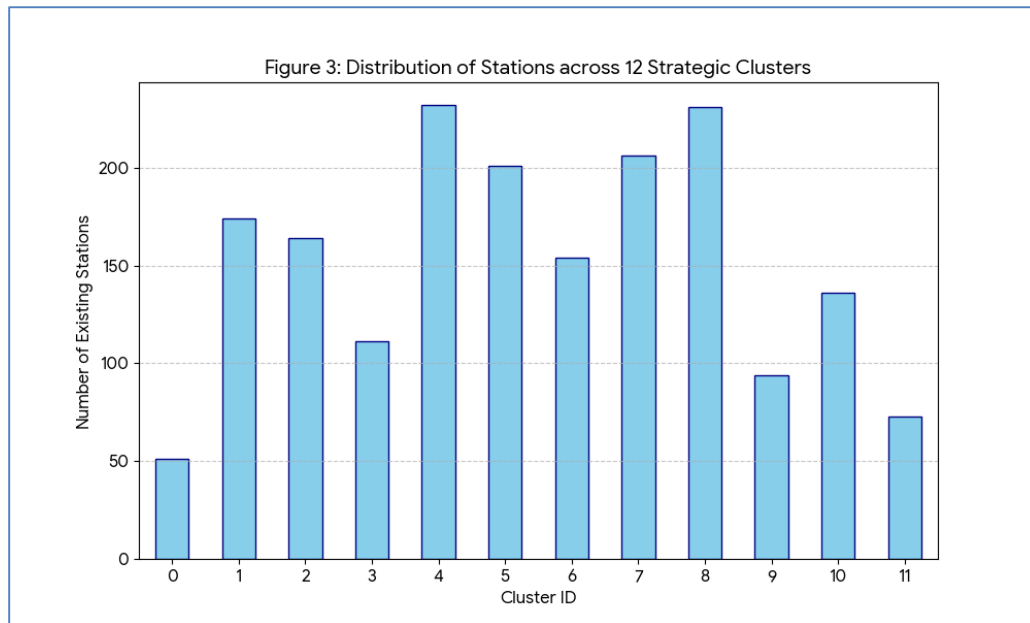


Figure 3. Distribution of Stations across 12 Strategic Clusters

3 Discussion: Prescriptive Site Optimization

Delhi has a multitude of electric vehicle (EV) charging stations, which can be seen in the map (see Figure 2) located mainly along the metro lines in South Delhi. Using mapping techniques related to the centroid of the identified chargers, the authors provide insight into the need for a more equitable and decentralized approach for the location of chargers. Part of this analysis looked at a "gap analysis", which provides an assessment of how the current chargers have been placed along with the noted gaps.

1. **Industrial Prioritization:** Cluster 0 (Narela), is a giant industrial area that has limited options for charging and with an increasing demand for chargers based on the projected growth of the commercial truck industry in the area, the need for a centralized location will be necessary.
2. **Transit-Interchange Connectivity:** Cluster 1 (AnandVihar) and Cluster 11 (Badarpur) are located at the southern end of Delhi and can serve as origin/destination locations for EVs coming into and out of Delhi and therefore provide additional support for high-capacity hubs for EVs coming from areas such as Haryana and Uttar Pradesh. Removing the concerns of range anxiety by providing for chargers in these clusters will promote EV use.
3. **Summary of Findings:** By implementing the prescriptive model for an EV charging network provided in the report, the NCT can best utilize its remaining ₹2,000 crore PM E-DRIVE Budget based on developing solid charger sites in the most efficient manner. Rather than establishing charging locations in vacant land that has the lowest costs, NCT should prioritize developing the twelve (12) identified centroids and focus on the underserved areas of the north and northwest in support of Equitable Green Infrastructure.

Policy Recommendations:

Using the twelve strategic identified centroids and results of the gap analyses, the authors have developed a set of actionable policy recommendations on behalf of the NCT Government:

- **Establishment of "Super-Hubs":** Instead of fragmented slow-charging points, the identified centroids (e.g., Narela, Anand Vihar and Badarpur) should be prioritized for the development of high-capacity DC fast-charging hubs. This aligns with the **PM E-DRIVE (2024)** mandate to optimize urban coverage.
- **Intermodal Integration:** Centroid Locations near Transit Interchanges (Cluster 1 - Anand Vihar) should establish Multi-Modal Charging Zones, where Electric Buses, 3-Wheelers and Private Vehicles can all be charged with maximum land-utilization.

Conclusion:

This study employed K-Means Clustering to apply a more proactive rather than reactive approach to planning for EV infrastructure. Through the analysis of 1827 geographic locations throughout Delhi, twelve Critical Locations “Centres of Gravity” in which the placement of an EV Charging Station would have the greatest positive impact on the environment were identified.

The analysis indicated that although the Central and South Delhi have made significant progress in installing EV infrastructure, yet to reach the goal set for 2027, it is imperative that the focus be placed on the less developed Industrial and Residential Outer Areas. Therefore, the findings in this study will provide a roadmap to ensure that all funds allocated toward the PM E-DRIVE initiative (₹2,000 crores) are invested as effectively as possible.

On a larger scale, this study provides further proof of Delhi's commitment to reducing air pollution, which is linked to the National Clean Air Programme (NACP). By targeting the most congested areas of the city with this initiative, it is anticipated that harmful air pollutants will be lessened, leading to cleaner air for all.

It reflects India's 2047 vision of being a fully developed nation by building the necessary infrastructure to facilitate cleaner environments and a sustainable future throughout India.

Future Scope

In future work, the prescriptive model presented herein can, to some extent, be expanded in the

following ways:

- **Integration of Renewable Energy** – Additional study may be necessary to understand the potential of establishing “Solar-EV Hubs” at each of the 12 identified centroid locations in order to create a carbon-neutral process through use of this renewable energy resource for charging.
- **Battery Swapping Hubs** – For purposes of developing unique Battery Swapping Station (BSS) locations for both two and three-wheelers, the K-Means model can be tailored to meet the needs of the users of these vehicle types.
- **Machine Learning Optimization** – By utilizing both real-time traffic information and maps displaying the population density of cities/towns, it would be possible to augment the K-Means algorithm with comprehensive data to enhance the dynamic aspect of the Infrastructure Planning Tool.

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Inflation Dynamics in India: Supply Side Shocks and Policy Trade Offs

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Abstract:

This study examines the inflation dynamics in India with a particular focus on supply-side shocks and the resulting policy trade-offs between price stability and economic growth. It highlights the dominant role of food, fuel, administered prices, and oil import dependence in driving inflation, limiting the effectiveness of conventional monetary policy. Using recent inflation trends and policy developments under the Flexible Inflation Targeting (FIT) framework, the study analyses how supply-driven inflation complicates monetary decision-making in India. The findings underscore the need for a coordinated policy approach combining monetary, fiscal, and structural measures to achieve sustainable growth and stable inflation.

Keywords: *inflation dynamics, monetary policy, complicates monetary decision-making*

Introduction:

In economics, inflation refers to a sustained rise in the overall prices of goods and services in an economy. It is commonly measured through price indices, most often the

Consumer Price Index (CPI), which tracks changes in the cost of a typical basket of consumer items. When inflation increases, the purchasing power of money declines, meaning that the same amount of money can buy fewer goods and services than before.

Inflation directly affects the purchasing power of money, influencing the cost of living for households. Moderate inflation supports economic growth by encouraging consumption and investment, while high or volatile inflation creates uncertainty, reduces savings, and distorts resource allocation. Inflation also impacts income distribution, fiscal balances, interest rates, and policy decisions, making its control essential for maintaining economic stability and sustainable growth.

Inflation in India has historically been shaped more by supply-side disturbances than by excess aggregate demand. Fluctuations in agricultural output, volatility in food and fuel prices, global commodity price movements, and disruptions arising from weather events and logistics constraints play a central role in driving price pressures. Given the relatively high weight of food and fuel in the consumer price index and household consumption baskets, such shocks are quickly transmitted to overall inflation, often independent of domestic demand conditions. As a result, inflation in India can remain elevated even during periods of subdued economic activity or tight monetary policy.

These features pose a significant challenge for policymakers. Aggressive tightening in response to temporary supply shocks may dampen investment, slow economic growth, and adversely affect employment, intensifying the trade-off between price stability and economic expansion. This tension underscores the limitations of a rigid inflation-targeting framework in an economy where supply-side factors dominate inflation dynamics.

The present study examines the role of supply-side shocks in shaping inflation dynamics in India and analyses the policy trade-offs involved in balancing price stability and economic growth.

Scope of the Research:

This study focuses on the principal supply-side factors influencing inflation in India,

with particular emphasis on food inflation, fuel and energy costs, administered prices linked to minimum support prices (MSPs), international crude oil price shocks, and structural inefficiencies in supply chains. It also examines the role of government interventions such as subsidies, buffer stock management, trade policies, and price controls in addressing inflationary pressures arising from these supply-side disturbances. Headline Consumer Price Index (CPI) inflation is used as the primary indicator to capture overall inflation dynamics in the Indian economy.

The scope of the analysis is confined to fiscal and structural policy measures insofar as they interact with supply-driven inflation and influence monetary policy trade-offs. The study primarily examines the monetary policy response to supply-side inflation, with a specific focus on the Reserve Bank of India's inflation-targeting framework. It covers the period under the Flexible Inflation Targeting (FIT) regime and analyses selected recent monetary policy actions, including repo rate adjustments, to assess how monetary authorities balance inflation control with growth and macroeconomic stability in the presence of supply-side shocks.

Limitations of the Study:

The study is limited to the Indian economy; therefore, the findings may not be directly applicable to other countries with different economic structures or policy frameworks. It does not include a detailed cross-country comparison, which restricts broader international perspectives on inflation dynamics and policy responses. Additionally, the research relies primarily on secondary data sources collected for academic purposes, which may limit the depth of empirical analysis and the ability to capture real-time policy impacts.

Aim/Objective of Research:

1. To examine the key supply-side factors influencing inflation in India, with particular emphasis on food inflation, fuel prices, administered prices (MSP), oil price shocks, and supply chain inefficiencies.
2. To evaluate the policy trade-offs between inflation control and economic growth arising from supply-side disturbances in the Indian economy.
3. To analyze the response and effectiveness of the Reserve Bank of India's and the

government's inflation-targeting framework, particularly the Flexible Inflation Targeting (FIT) regime, in addressing supply-driven inflationary pressures.

Methodology Used:

The study adopts a descriptive and analytical research methodology based entirely on secondary data. A quantitative approach is used to study inflation trends, while a qualitative approach is applied to analyze supply-side shocks and policy responses. Data on inflation, food prices, fuel costs, administered prices, and oil import dependence are collected from the Reserve Bank of India (RBI), Ministry of Statistics and Programme Implementation (MoSPI), Press Information Bureau (PIB), and relevant research journals. Conceptual macroeconomic frameworks, including the Phillips Curve and the Flexible Inflation Targeting policy, are employed to interpret the effects of supply-side shocks and policy responses.

Data Interpretation/Analysis

Inflation Trends in India

Headline CPI inflation rose to 0.71% in November 2025, showing a mild upward trend despite remaining low overall.

Food inflation stood at –3.91%, in November 2025, reflecting strong supply conditions and falling food prices. Both rural (–4.05%) and urban (–3.60%) food inflation were negative, indicating ample food supply across regions.

The rise in headline and food inflation in November 2025 can be largely explained by higher price pressures in items such as vegetables, eggs, meat and fish, spices, and fuel and light.

An increase in both headline and food inflation was observed in the rural sector in November 2025. Rural headline inflation rose to 0.10 per cent (provisional) in November 2025, compared to –0.25 per cent in October 2025. Similarly, CFPI-based food inflation in the rural sector moderated in deflationary terms, increasing from –4.85 per cent in October 2025 to –4.05 per cent (provisional) in November 2025, indicating a gradual easing of food price

deflation.

In the urban sector, headline inflation also registered an increase, rising from 0.88 per cent in October 2025 to 1.40 per cent (provisional) in November 2025. Food inflation in urban areas showed a similar trend, moving from –5.18 per cent in October 2025 to –3.60 per cent (provisional) in November 2025. This simultaneous rise in both rural and urban inflation suggests emerging upward price pressures, particularly driven by a moderation in food price deflation across sectors.

Overall, the data suggest that inflationary pressures in November 2025 were primarily supply-driven and transitional in nature. While headline inflation remains low, the narrowing of food deflation and rising prices in select consumption categories warrant close monitoring, as sustained supply shocks could gradually transmit to broader inflation dynamics.

Importance of Food Inflation

Food inflation is central to India's inflation framework due to its strong influence on overall price stability, monetary policy, and food security. Existing studies indicate that inflation in India is mainly driven by supply-side shocks, with food inflation being the largest contributor, while demand shocks primarily affect output. Rising production costs, wage increases under schemes like Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), stronger rural demand, and changing income and consumption patterns have been cited as key reasons.

Role of Supply Chain Efficiency

The supply chain efficiency plays an important role in shaping price outcomes. Costs arising from transportation, storage, and post-harvest losses add to supply pressures, particularly in the presence of weak logistics systems and high levels of wastage. Such inefficiencies can raise food prices even when overall production is sufficient.

Agricultural Productivity

Agricultural productivity, especially in pulses and vegetables, plays a critical role in meeting rising food demand without triggering sharp increases in prices. Persistent yield gaps and low productivity often result in supply shortages, which in turn contribute to food inflation. Measures of productivity such as yield per hectare and overall output levels are therefore

essential for assessing the strength of supply-side conditions and their influence on food prices.

Administered Prices and MSP

Administered prices, especially the Minimum Support Price (MSP), influence inflation mainly by raising the cost of food from the supply side. When MSP is increased, the government pays higher prices for crops, and these prices act as a reference for the market. Traders and consumers therefore face higher food prices, leading to cost-push inflation. MSP hikes are often linked to rising input costs and existing inflation, which creates a two-way relationship where inflation leads to higher MSPs and higher MSPs further add to inflation.

Higher MSPs also affect what farmers choose to grow. Farmers tend to shift land toward MSP-supported crops, which can reduce the supply of other food items and push up their prices. Together, these effects show why MSP creates a policy trade-off between supporting farmers' incomes and maintaining overall price stability.

Oil Price Shocks and Inflation

Oil price shocks are a major driver of inflation in India due to the economy's heavy dependence on imported crude oil. Since oil is a key input for transport, energy, and production, higher oil prices raise costs across sectors, leading to cost-push inflation that monetary policy alone cannot control. These shocks have an asymmetric effect, with price increases pushing inflation up more sharply than price declines reduce it, and they spill over into food prices through higher fuel, fertilizer, and transport costs. While subsidies and tax cuts can temporarily ease inflation, they strain public finances.

In FY2024–25, oil import dependence was about 88–89 per cent, with crude imports rising to 242.4 million tonnes while domestic production declined to 28.7 million tonnes (PPAC). The corresponding rise in the combined crude and petroleum import bill, from USD 156.3 billion to USD 161 billion, highlights the fiscal burden of import dependence and underscores the vulnerability of India's inflation dynamics to external energy shocks. This dependence amplifies the impact of global oil price fluctuations, as higher international prices increase transport, logistics, and production costs, driving cost-push inflation that initially affects wholesale prices and eventually passes through to consumer inflation.

Inflation driven by oil imports creates a tough choice for policymakers. If interest rates are raised to control inflation caused by global oil price shocks, economic growth may slow

down. On the other hand, keeping policies loose to support growth can allow inflation to stay high for longer. India's strong dependence on imported energy therefore brings out a clear trade-off between controlling inflation and maintaining growth. This situation highlights the need to support monetary policy with long-term measures, such as using more diverse energy sources and increasing domestic production, to reduce the impact of future shocks.

Policy Trade-Offs and Inflation Management

India often relies on supply-side measures to control inflation, especially when rising prices are caused by shortages of food and essential commodities. These policies help stabilise prices in the short run, but they involve a trade-off between immediate price relief and long-term supply incentives. The use of buffer stocks, through higher procurement of staples such as rice and wheat, helps manage price fluctuations and ensures food security during shortages. However, excessive procurement can disrupt market signals and lead to higher storage and fiscal costs if stocks are not released on time.

Similarly, export restrictions on commodities such as pulses and onions are imposed during poor harvest years to boost domestic supply and control prices. While this provides quick relief to consumers, it can lower export earnings and reduce farmers' incentives by creating uncertainty about future prices. Import liberalisation, such as cutting tariffs on edible oils and pulses, is another way to increase supply and ease inflation. Although effective in the short term, greater dependence on imports can expose the economy to global price shocks and put pressure on foreign exchange reserves, while also affecting domestic producers.

Monetary Policy Framework and Trade-Offs

In this context, the adoption of Flexible Inflation Targeting (FIT) by the Reserve Bank of India represents a pragmatic policy response. FIT allows monetary authorities to account for the transitory nature of food and fuel price shocks, smoothen the impact of supply disturbances over time, and support growth during economic slowdowns, while still anchoring inflation expectations. Rather than pursuing inflation control at the cost of macroeconomic stability, the framework seeks to balance competing policy objectives in a complex and shock-prone economic environment.

Prior to 2016, the Reserve Bank of India (RBI) conducted monetary policy under a multiple-indicator framework, wherein decisions were informed by a broad set of

macroeconomic variables, including inflation, output growth, money supply, exchange rates, and financial market conditions. Although this approach allowed policy flexibility, the absence of a clear nominal anchor often resulted in elevated inflation volatility and weakly anchored inflation expectations. The adoption of Flexible Inflation Targeting (FIT) in 2016 represented a significant institutional reform, establishing headline Consumer Price Index (CPI) inflation as the primary objective of monetary policy, with a target of 4 per cent and a tolerance band of ± 2 per cent, supported by the creation of a statutory Monetary Policy Committee. Empirical evidence from the post-FIT period indicates that the framework has contributed to improved policy transparency, enhanced credibility, and relatively lower and more stable inflation outcomes compared to the pre-2016 regime. However, the effectiveness of FIT in the Indian context is constrained by the prevalence of supply-side shocks, particularly food and fuel price volatility, which limit the responsiveness of inflation to conventional monetary policy tools. Recent inflation dynamics suggest that while FIT has been effective in anchoring inflation expectations, sustained price stability requires complementary fiscal measures and structural supply-side interventions alongside monetary policy.

The Reserve Bank of India's April 2025 repo rate cut highlights the complex trade-offs policymakers face between promoting growth and controlling inflation. Lowering the repo rate reduces borrowing costs for households, businesses, and the housing sector, making loans cheaper and stimulating consumption and investment, which supports GDP growth. However, supply-side pressures such as volatile food prices, fuel shocks, and seasonal shortages can limit the effectiveness of monetary policy, as inflation may persist even with lower interest rates.

Banks' profit margins may also shrink, and the benefits of rate cuts often take time to reach borrowers.

In India, where supply shocks frequently drive inflation more than demand, these trade-offs are particularly pronounced. Aggressive rate cuts can stimulate growth but may not fully contain inflation, while tight monetary policies could slow economic activity and hurt employment.

Targeted measures such as monitoring seasonal food supplies, regulating gold-backed loans through NBFCs, or easing liquidity in specific sectors can help mitigate risks, but excessive easing could increase fiscal pressures or create asset bubbles.

The traditional Phillips Curve, which assumes an inverse relationship between inflation and unemployment, provides limited guidance in the Indian context. Structural factors such as a large informal sector, wage rigidities, and recurring supply shocks weaken the link between unemployment and inflation. Therefore, effective policymaking requires a combination of monetary tools, fiscal interventions, structural reforms, and supply-side measures to support growth without destabilizing prices and financial stability.

Fiscal policy in India involves a fundamental trade-off between promoting economic development and maintaining price stability. Increased government expenditure on infrastructure, rural employment programmes such as MGNREGS, and social welfare initiatives can stimulate aggregate demand and support growth, particularly during periods of economic slowdown. However, when supply constraints persist especially in sectors such as food and energy, fiscal expansion may lead to higher prices rather than proportionate increases in output, thereby intensifying inflationary pressures instead of generating sustained real growth.

Conclusion

Inflation in India is largely driven by supply-side factors such as food prices, fuel costs, administered prices, and oil import dependence, which limit the effectiveness of conventional monetary policy and create trade-offs between inflation control and economic growth.

Although the Flexible Inflation Targeting framework has strengthened policy credibility and anchored inflation expectations, it cannot by itself address inflation arising from supply constraints. Aggressive monetary tightening in response to such shocks risks slowing growth and employment, whereas excessive accommodation may allow inflationary pressures to persist. The study therefore underscores the need for a coordinated policy approach that combines prudent and flexible monetary policy with disciplined fiscal management and targeted supply-side interventions.

Strengthening agricultural productivity, improving supply chain efficiency, rationalising administered prices, and reducing dependence on imported energy are essential for easing cost-push pressures over the medium to long term. A balanced and well-coordinated policy mix is crucial for managing inflation effectively while supporting sustainable economic

growth in India.

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Adaptive Text Summarization: An Empirical Comparison of Large and Small Language Models with a Hybrid Framework

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Abstract:

Recent trends in Natural Language Processes have seen a creation of contextually powerful Large Language Model (LLM) such as GPT-4 and PaLM, which are extremely resource-hungry when it comes to computer usage. Small Language Models (SLM) including DistilBERT and Pegasus can provide quicker and less resource-demanding responses but can be of lower quality in terms of the quality of the summary. The paper will compare and contrast the application of both the LLM and SLM and how they may be integrated into a web-based text summarization system. The hybrid model applies a specified cutoff length on input length to determine which model to apply: below the cutoff SLMs are applied to process it in an efficient way and above the cutoff to process it in a more effective way using LLMs. The model are evaluated by ROUGE-L and the BLEU scores based on scaling, inferences speed and semantic accuracy. It is proved that hybrid strategy is a compromise between performance and efficiency. In addition to that, all the other strategies like knowledge distillation and quantization are also discussed to further narrow the gap between LLMs and SLMs that could be implemented practically.

Keywords: *Large Language Model, Small language model, Text summary, Natural language Processing Model, Efficiency, Hybrid model, Inference time, Model optimization, Quantization, Knowledge distillation.*

Introduction:

Transformer-based architectures have emerged and have brought overall impact to NLP especially with large language model (LLM), Pathways Language Model (PaLM) and LLaMA by Meta AI, which have shown outstanding performance in text generation, summarization, translation and question- answering. They are effective because of the model parameters and large amounts of data used. SLMs are more efficient and smaller in size and have been known to be responsive, energy efficient and cost effective. This paper aims at comparing the performance of LLM and SLM are majorly based on prototype text summarizational model, especially when speed and coherence are paramount. The problem with the provision of linguistic depth is that LLM have large processing needs that are, therefore, hard to scale out. On the other hand, as explained above, SLM are more responsive yet might be deficient in providing rich and consistent summaries.

Our preset parameter that we have continued to keep with this prototype text summarization include:-

1. The assessment of summaries by use of quantitative measures that covers ROUGE-L and BLEU scores and qualitative user studies.
2. The prototype is to be developed in such a manner that it will switch between SLMs and LLMs depending on the complexity of the text supplied.
3. Their results will be compared according to the strengths and weaknesses and also will not only be tested in theory but also in the environments that are similar to real-world usage.

Literature Review:

1. Evolution of Language Models

Over the last ten years, the language models have developed much more than the statistical models like n-grams are distributed representations of word2vec and GloVe. The introduction of neural networks, sentiment analysis and machine translation straightforward. The shortcomings that plagued the past were overcome through transformer architecture with self-attention mechanisms and brought about the emergence of such models as BERT, which employed bidirectional encoding, and GPT, which focused on autoregressive generation.

2. Large Language Model (LLM)

These are based on transformer architecture, they have billions of parameters. Well-known ones are the GPT family of OpenAI, PaLM of Google, and LLaMA of Meta. These models are then trained very large containing textual data, which allows them to different tasks in language, including summarization, translation, and questions and answers. LLMs are good at understanding texts in a deep way, keeping in mind the long-term context, and producing fluent and human-like text.

3. Small Language Model (SLM)

SLM are smaller and Lightweight models, which can perform well on computers with low computing power such as laptops, mobile phones or smaller servers. Their intentions are to stabilize efficiency and acceptable performance. The examples of SLM are DistilBERT, TinyBERT, and MobileBERT. SLM are typically formed by downsizing larger models with algorithms such as distillation, pruning and compression.

4. Comparative Studies in NLP

Recent research on benchmarking compares the performance of LLM and SLM, range of NLP projects, as classification, QandA, summarization of text is interested in accuracy and resource efficiency. It has been demonstrated, that the performance of LLM is more impressive in the abstractive summarization, and SLM can compete in the fine-tuned and domain-specific tasks.

Case Study: Text Summarization Model

1. LLM and SLM individually

The component uses Qwen2-0.5B as the LLM, which is the sophisticated generative model, similar to other models such as GPT. SLM uses the encoder-decoder architecture of Google/pegasus-xsum, which is a framework that is trained on abstractive summarization tasks using gap-sentence models.

The architecture has been developed to combine both LLMs and SLM, with a strong ability to balance between high abstraction and computational efficiency. This hybrid architecture makes parallel analysis easy, and modular adaptive pipelines.

2. Summary Output

The features of output were compared directly in the context of linguistic quality, semantic coverage and system efficiency. ROUGE and BLEU scoring used in quantitative analysis was the overlap of n-grams and content faithfulness.

User connection revealed that they connected more to SLMs due to their rapid response. Meanwhile, LLM excelled themselves in specialized and difficult tasks, involving conceptualizing and insight.

Methodology:

1. Research Approach

The methodology includes the creation of a prototype application in which both types of models process information. The results are then compared against the conventional measurement of evaluation and performance standards. Testing of the models is done in controlled testing environment through experimentation to obtain consistency of models in relation to runtime conditions. It is a methodology that dwells on empirical observation, at which the practical performance measurements are considered inference time, memory consumption, and quality of summaries are considered.

2. Evaluation Metrics

As a measure of model quality and performance, a two-fold method is employed, which combines linguistic measures, such as ROGUE and BLEU with operational performance measures. ROGUE pays attention to the recall based on n-gram similarity evaluation of the generated summaries and reference texts. Also, operational metrics, including inference latency and model initialisation time, are crucial in determining system deployability and system viability.

2.1 Mathematical Formulation of ROUGE and BLEU

ROUGE-N: This is a recall score that considers the overlapping of the two languages in terms of n-gram of two languages between the reference summary R and candidate summary C.

$$ROUGE - N_{recall} = \frac{\sum ngram \in Refmin(Countcand(ngram), Countref(ngram))}{\sum ngram \in RefCountref(ngram)}$$

ROUGE – N_{precision}:

$$ROUGE - N_{precision} = \frac{\sum ngram \in Refmin(Countcand(ngram), Countref(ngram))}{\sum ngram \in CandCountcand(ngram)}$$

$$ROUGE - N_{F1} = \frac{2 \cdot Precision \cdot Recall}{Precision + Recall}$$

BLEU: Evaluates precision of n-grams with a brevity penalty.

$$BLEU = \text{Brevity Penalty} \cdot \exp\left(\sum_{n=1}^N wn \cdot \log pn\right)$$

Modified n gram precision

$$= \frac{\sum ngram \in Candmin(Countcand(ngram), MaxCountref(ngram))}{\sum ngram \in CandCountcand(ngram)}$$

Brevity Penalty:

$$\text{Brevity Penalt} = \{1 \text{ if } c > r\}$$

$$\text{Brevity Penalty} = \{e^{1-r/c} \text{ if } c \leq r\}$$

These models provide a standard and repeatable formula of quantifying summary quality.

3. Model Overview

The prototype is a lightweight model of text summarization that is used to provide different summaries, depending on the input provided by the user. It uses a hybrid approach that switches between small language models (SLM) to shorter texts and large language models (LLM) to longer and more semantically-rich texts to increase knowledge retention.

4. Hybrid Model Design

The method allows routing models according to complexity of input text to achieve a performance and quality of output. The plan is consistent with the previous literature that suggests resource-conscious and dynamic NLP pipelines.

4.1 Model Configuration

There are three key components of the system:

- **Complexity Evaluation Module:** utilizes the Facebook BART model to assess the complexity of input paragraphs by analysing lexical density, sentence structure, and semantic depth. It serves as the decision-making module in routing, with related tasks such as complexity-based ranking and summarization employing similar methodologies.
- **SLM - Google PEGASUS:** When the input is detected as simple, the summarization is done with PEGASUS which is a pre trained encoder decoder transformer model with gap sentence generation goals.
- **LLM - Qwen2-0.5B:** In the case of inputs that can be considered complex, the system will send the text to Qwen2-0.5B, a high-performance transformer-based LLM based on new developments in large generative models. Qwen2-0.5B is more capable of abstract reasoning, more complex semantic relations.

4.2 Workflow Overview

The hybrid pipeline proceeds as follows:

1. **Input Acquisition:** A paragraph is provided as input to the system.
2. **Complexity Assessment:** The BART-based classifier determines the textual complexity and readability of the input.
3. **Model Routing:**
 - 1) If the text is classified as simple, it is sent to Google PEGASUS.
 - 2) If the text is complex, it is directed to Qwen2-0.5B.
4. **Summary Generation:** The models generate a summary of the input.
5. **Evaluation Metrics:** The developed summaries will be evaluated against reference summaries:
 - 1) ROUGE (Recall Oriented Under Study Gisting Evaluation) for recall overlap.
 - 2) BLEU (Bilingual Evaluation Under study) for precision focused n-gram comparison.

The model performance is statistically compared both in ROUGE and BLEU scores determine the efficiency of all hybrid design in preserving the quality of summary at various levels of complexity.

4.3 Rationale and Implications

The hybrid design implies that light models such as PEGASUS are able to effectively summarise light complexity texts and save computational resources, whereas more complex texts should be summarised using more complex models such as Qwen2-0.5B, in order to ensure semantic integrity and readability. Scalable context-sensitive summarization is also supported.

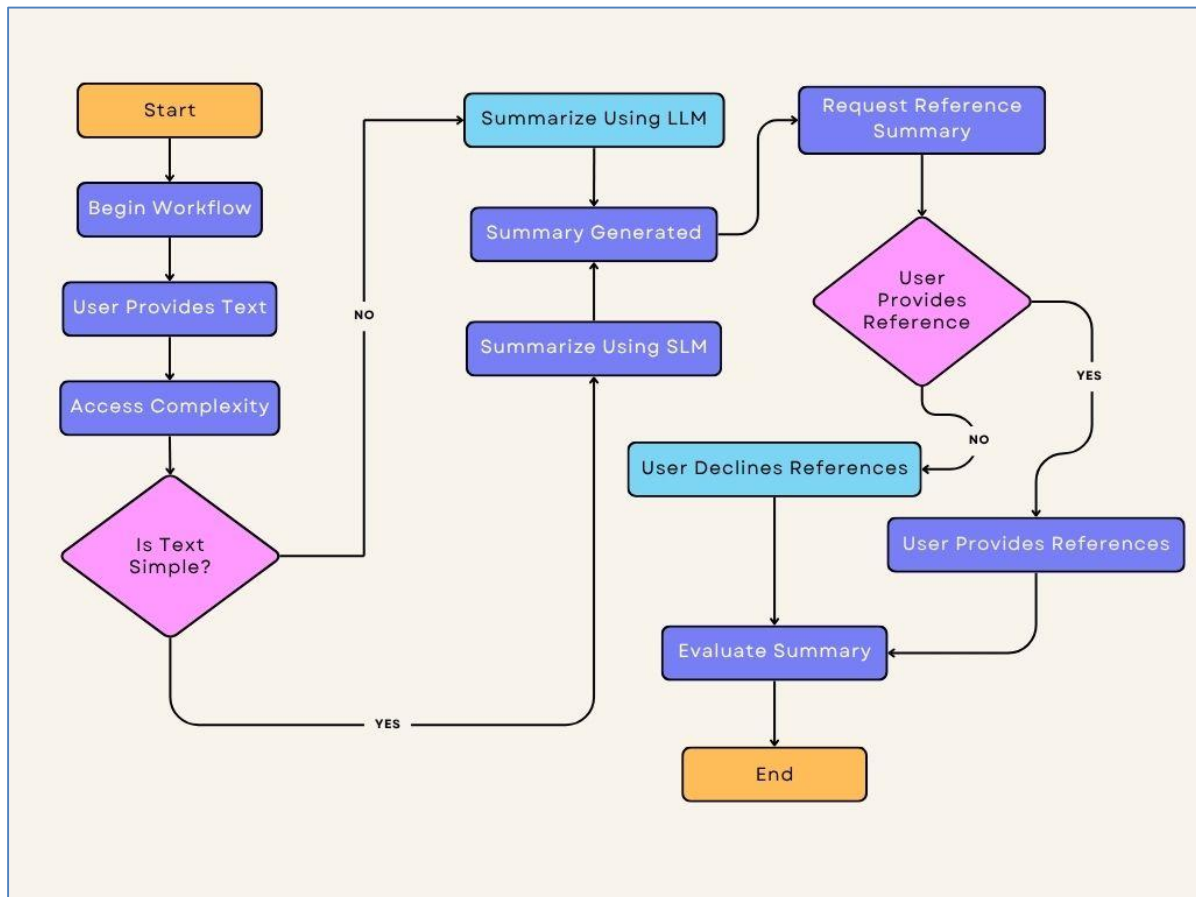


Fig 1 Hybrid Model Workflow

Results:

In this paper, three dimensions of scalability and compression ratio are compared between LLM and SLM in the hybrid context using the ROUGE-L and BLEU scores as the tools of analysis.

1. Evaluation Metrics

SLM
Input Text
Yesterday, the local park hosted a community fair with many activities for children and adults alike. Families enjoyed games, food stalls, and live music performances throughout the day. Volunteers helped run competitions and organize arts and crafts workshops. Overall, the event was well attended, bringing the neighborhood together and creating a lively, friendly atmosphere for everyone.
Generated Summary
This article was written by a member of the local community in the town of Iquique, Chile.
Reference Summary
The local park held a community fair with games, food, and live music. Volunteers organized competitions and workshops, and the event brought the neighborhood together.

Fig 2 SLM Summary Output

LLM
Input Text
Climate change is causing significant disruption in global ecosystems. Rising temperatures and shifting precipitation patterns are affecting crop yields, threatening food security in many regions. Polar ice sheets are melting at unprecedented rates, contributing to sea-level rise that endangers coastal communities. Additionally, increased frequency of extreme weather events, such as hurricanes and droughts, is exacerbating economic and social instability. Scientists urge immediate international cooperation to reduce greenhouse gas emissions and implement sustainable practices across agriculture, industry, and energy sectors.
Generated Summary
Climate change is causing significant disruption in global ecosystems, affecting crop yields, food security, and economic and social instability. Rising temperatures, shifting precipitation patterns, and melting polar ice sheets are affecting crop yields, threatening food security in many regions. Extreme weather events, such as hurricanes and droughts, are exacerbating economic and social instability.
Reference Summary
Climate change is disrupting ecosystems, affecting crops, and causing sea-level rise from melting ice sheets. Extreme weather events worsen economic and social stability, and scientists call for global action to reduce emissions and adopt sustainable practices.

Fig 3 LLM Summary

Model	Time (s)	ROUGE-1			ROUGE-2			ROUGE-L			BLEU Score
		P	R	F1	P	R	F1	P	R	F1	
SLM	10.86	0.29	0.20	0.24	0.06	0.04	0.05	0.24	0.16	0.19	0.02
LLM	16.02	0.42	0.59	0.49	0.17	0.25	0.20	0.34	0.49	0.40	0.10

Fig 4 SLM and LLM Metric Scores

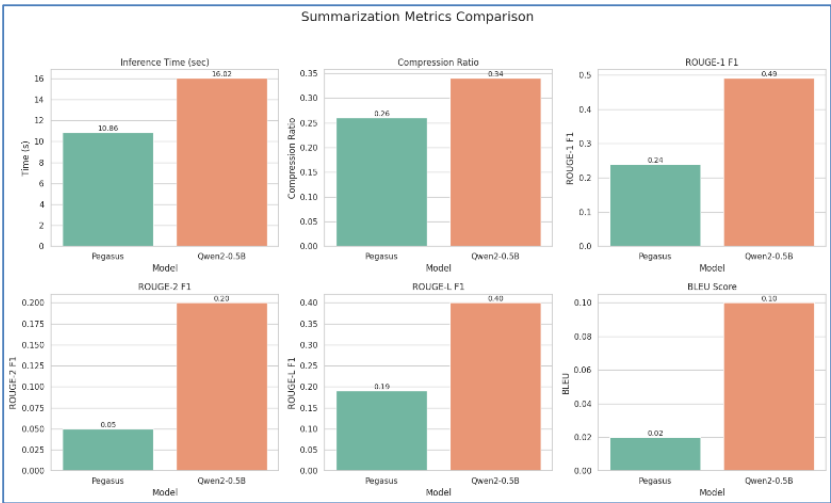


Fig 5 Plotting of LLM and SLM Metrics Scores

1.1 ROUGE-L and BLEU Score Analysis.

The LLM (Qwen2-0.5B) is better than the SLM (Pegasus), with 0.40 (ROUGE-L) and 0.10 (BLEU) being placed at higher positions, respectively. Nonetheless, the two models are low in benchmark scale scores. Such results are consistent with the prior works and, indicating the transformer based models which have been found to perform better on account of their attention based contextual reasoning.

1.2. Compression Ratio

The compression rate of longer and more complex inputs by LLM summarizers is 0.34 and gives rise to compact semantically abstracted summaries. The SLM is able to process less complicated and shorter inputs, and has an improved compression ratio of 0.24 and an output maintaining a higher proportion of the original wording.

1.3. Efficiency

In most instances, LLM summons better quality summaries, and their efficiency in calculations depends on the model type and complexity of input. Qwen2-0.5B took the input of 16.02 seconds in a test, whereas Pegasus took 10.86 seconds to take the input of easier inputs. The issues are faced in resource-constrained settings, and techniques such as knowledge distillation, modular inference, cascade summarization are proposed to reduce the cost of deployment.

1.4. Scalability

LLM were more scale invariant. Qwen2 -0.5B was more efficient in processing longer texts than Pegasus. This scalability renders LLMs quite suitable to be incorporated into the current NLP systems like Pegasus, GPT-3 and BERT-based pipelines. Their capacity to generalize with very little fine-tuning is also an advantage.

Conclusion:

This paper provided an empirical comparison of the LLM and SLM in automated text summarization.

Two models were tested in a prototype model on the linguistic quality, semantic fidelity, latency, and efficiency. It has been found that abstractive summarization and contextual knowledge are strong with LLMs like Qwen2-0.5B, and their high cost of operation requires high memory, GPU resources, and energy.

These findings indicate that the optimal summarization architecture is specific to the application: SLMs are faster, cheaper, whereas LLMs are deeper, more precise in more complicated areas. It is advisable to adopt a hybrid solution in case all the parameters are needed.

Future Work:

Transformer-based summarization is expected to be refined towards the future so that the systems become more accurate, adaptive, and resource-effective. The routing mechanism should be improved in terms of decision making between the processing inputs using either SLM or LLM, which are currently decided by input length and complexity. The further development can involve applying semantic complexity scores, topic classification, or discourse analysis.

The study is concerned with reducing the performance disparity between SLM and LLM and ensuring efficiency. Knowledge distillation, structured pruning and quantization are effective techniques, and modular inference system can be used which only activate the parts of a network.

Personalization is the third chance, and domain-specific fine-tuning, such as in the area of healthcare, finance, or legal NLP can result in substantial accuracy gains.

Multi-lingual and multimodal Multi-lingual models Hybrid summarization models could also be extended to support multilingual and multimodal conditions, using multiple languages and non-written information such as images and audio.

The future of hybrid summarization is associated with the innovation of intelligent routing, model compression, personalization, multilingual and multimodal development.

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Cybersecurity Fatigue Among Digital Users in India: Implications for Online Safety and Awareness

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Abstract:

The vast expansion of the Indian digital ecosystem both in the number of users (751.5 million) and the rate of penetration (52.4%) achieved at the beginning of 2024 contributed to an extremely high level of social connectivity and economic accessibility. Nevertheless, these improvements have resulted in a hyper-threat environment on an unprecedented level with 369.01 million unique malware detections an annual on average, or 702 potential threats every minute. The paper evaluates the rate of the so-called cybersecurity fatigue a state of psychological exhaustion and behavioural disillusionment by Indian Digital users in response to unrelenting security measures and alerts. Technical telemetry of 8.44 million endpoints and qualitative interviews of over 926 specialists in the various domains also provide synthesised data about critical vulnerabilities: professional burn out has hit 95% in 2025 and 70% of overall consumers report a feeling of learned helplessness when it comes to online privacy. The findings indicate a wide gap on vigilance where 66 percent of the users are inclined toward convenience rather than safety due to mental fatigue. The study shows the urgent issue of the human-centric approach to security defence mechanisms and assesses the strategic change to adaptive and frictionless approach to security models as provided in RBI Digital Security Framework 2026. These lessons provide practical advice to policymakers and technology creators about the need to enhance the core of the national digital resilience through minimizing the human cost of online safety.

Keywords: Cybersecurity Fatigue, Human Factors in Cybersecurity, Alert Fatigue, User Behaviour, Digital Security, Cyber Threats in India

Introduction:

Over the past few years, India has been undergoing a swift rise in digital connectivity and online activity, which is also facilitated by the increased access to the internet, the low cost of smartphones, and the integration of online services in all industries. With the rise in the number of citizens using online platforms in communication, trade, and conducting financial transactions, they are becoming more vulnerable to cybersecurity threats. The most recent report released by the National Crime Records Bureau (NCRB) on crime in India (Crime in India 2023) indicates that 86,420 reported cases of cybercrime have occurred in India in 2023, an increase of 31.2 percent over the reported cases in 2022, which stood at 65,893.

To counter the threat, governments and organizations have reacted by establishing different cybersecurity protocols, such as regular security warnings, multiple checks of user accessibility, password requirements, and publicly educating people. The Government of India also encourages the notion of citizen reporting of cybercrimes, providing the National Cybercrime Reporting Portal, which allows reporting of the crime online that links the user to the support resources, including the national toll-free helpline 1930.

None of these measures can prevent the growing number of security notifications and demands, which in turn can be a psychological effect of cybersecurity fatigue a state of weariness, frustration, and low responsiveness, which occurs when users receive regular security warnings and demands. Though it has been suggested that most of the existing literature on cybersecurity fatigue has concentrated on the alert overload of professional security personnel, cognitive overload can also be imposed on individual digital users, desensitizing them and decreasing their compliance with recommended safety measures. The growing sophistication of the digital space has led to the fact that users are exposed to an unending flow of interactions related to cybersecurity. These are the password renewal, multi-factor authentication, consent pop-up, software update, and recurrent warnings, phishing and fraud. As much as there is the intention of such measures to boost security, their abundance may oversaturate users. The statistics released by the Indian Computer Emergency Response

Team (CERT-In) indicate that in 2023, an excess of 1.5 million cybersecurity incidents were reported in India, which does not only confirm the increasing threat situation but also shows that India has to process an ever-growing number of security interactions every day. This constant load prompts a cognitive load and it may make user be in a position to react to real dangers.

Cybersecurity is slowly becoming a responsibility of individual users as increasing numbers of digital users are being mandated to be on the alert at all times. The Reserve Bank of India (RBI) and the Ministry of Electronics and Information Technology (MeitY) has made it very clear across awareness campaigns and advisories that the responsibility of users in preventing cyber fraud lies with them. It has been proposed in research, however, that repetitive reminders that have no context were likely to cause desensitization, in which the user will simply learn to ignore or even turn off security systems. Such behavioural reaction is one of the main signs of cybersecurity fatigue where awareness fails to be converted into secure action.

Table. 1. Yearly cybercrime cases registered in India (in 1,000s)

Year	Number of Cases (in 1,000s)
2019	26.05
2020	257.77
2021	452.41
2022	966.79
2023	1,556.22
2024*	740.96

*(Source: I4C Data. Note: 2024 figures represent partial reporting year)

Literature Review:

The process of digitalization is being measured in rapid rates in India and it has resulted in the cyber-attack-surface in India to be very vast and this has contributed to the tremendous rise in the number of cyber threats and complexity of the same as well. The government-

reported statistics showed a consistent increasing revolt of cybersecurity incidents between the two years 2022 to 2024 which signified the fact that the infrastructure continued to be inefficient as maintained by the government, businesses and those provided to the citizens through digital means. Based on the CERT-In analytics of the same time, phishing, malware infections, ransomware, and data breaches remain among one of the most frequent types of threats, and attackers are expected to be more successful when attempting to break the traditional security procedures through the use of automation, social engineering, and advanced persistence methods. These trends demonstrate that signature-based defences are becoming less and less effective in the face of changing attack strategies.

The threat environment is also rising in the industry threat intelligence reports. The national malware telemetry estimates that hundreds of millions of malware are identified every year on millions of endpoints with the most frequent being trojans, infectors and ransomware. The attack has now taken a more behavioural and cloud-centric form and is subsequently attacking sensitive industries that comprise of healthcare, banking and financial services, government and cloud-dependent business. What is more, the new targets are Tier-II cities and Tier-III cities due to the high level of digitalization and absence of cybersecurity readiness.

In India, there is significant economic impact of cyber incidents. Industry reports indicate that India experiences some of the highest average costs of the breach of data since they are usually detected late, with complex information systems and vulnerabilities of supply-chain. The main causes of breach include credential compromise and exposure to third-party, which are frequently the outcomes of phishing and a laissez-faire control over the emerging technologies such as artificial intelligence. Such problems result in major losses of organizations in terms of finance, operation and reputation.

Scope of the Research:

This study aims at analysing the level and effects of cybersecurity fatigue among online users in India especially as the use of online systems to communicate, transact business, and access online services continue to grow. The paper examines the effects of repeatedly receiving security alerts, authentication requests, password requirements, and awareness messages on the attention, perception, and adherence to suggested cybersecurity practices by the user.

Additional points to be addressed within the analysis of the study include the review of the existing cybersecurity awareness capabilities, the guidance offered by the government, and information dispersal plans to protect the digital users. It establishes whether the current awareness campaigns are beneficial in moving the awareness into the secure behaviour or contributing to cognitive overload and the lack of engagement. The results will be used to inform policymakers, technology sellers, and other cybersecurity stakeholders on designing user-friendly security measures, improving communication of awareness, and avoiding cybersecurity burnout besides improving the safety of the digital world in the expanding digital economy in India.

Research Objective:

The primary objective of this study is to assess the extent of cybersecurity fatigue among digital users in India and its implications for online safety. The sub-objectives are:

- To quantify the correlation between high-frequency alert environments (702 threats/minute) and the escalation of human-led security breaches.
- To evaluate the psychological drivers behind the "Privacy Paradox," explaining why 70% of Indian users believe digital privacy is impossible to protect.
- To identify the specific security risks posed by "Shadow AI"—the unauthorized use of GenAI tools by 62% of Indian employees to alleviate workload stress.
- To investigate how the upcoming RBI 2026 guidelines can successfully reduce "authentication fatigue" through Risk-Based Authentication (RBA).

Research Methodology:

In the proposed research, the Mixed-Methods Analytical Framework is used, which is the combination of objective technical telemetry and subjective behavioural data to quantify the crisis of cybersecurity fatigue in India.

Data Collection & Sources

- Technical Telemetry: 369.01 million malware detections were analysed in 2024 to assess the external pressure on security mechanisms and users.

- **Primary Behavioural Synthesis:** Synthesis of survey data with 926 domain experts and 1,037 general digital consumers in India on self-reported stress, burnout frequency, and the "privacy resignation" measures.
- **Secondary Legal Review:** Compared to 244 legacy circulars, 7 new master directions suggested in the RBI Digital Security Framework 2026.

Sampling and Stratification

Stratification of data was done into 18 industry sectors and different geographic levels to achieve national representativeness:

- **Professional Sector:** Target high-pressure market such as BFSI, Healthcare and IT/ITeS.
- **Demographics:** General user data was weighted to represent the Indian online population (ages 18–65+) across Urban and Rural segments.

Data analysis and Interpretation

Escalation of the National Threat Environment

The intensity of the threat environment serves as the primary external driver of user fatigue. Data from CERT-In and DSCI reveals an explosive rise in reconnaissance and malicious activity.

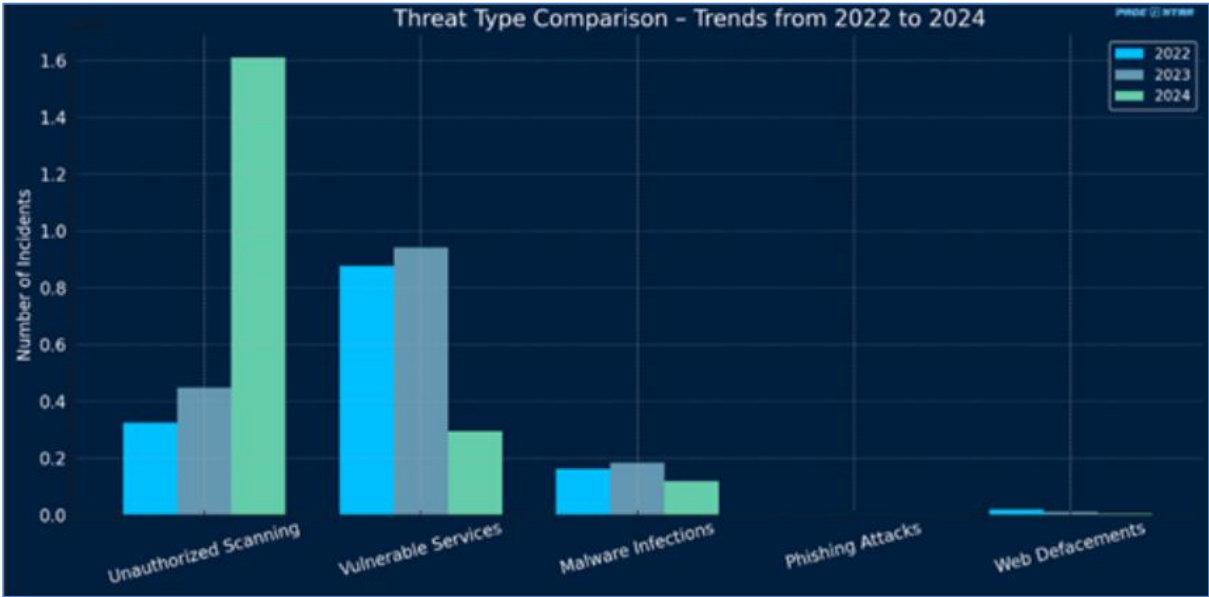
CERT-In Data: Year-over-Year Comparison						
Year	Total Incidents	Unauthorized Scanning/Probing	Vulnerable Services	Virus/Malware	Phishing	Web Defacements
2022	1,391,457	324,620	875,892	161,757	1,714	19,793
2023	1,592,917	447,720	941,592	184,131	869	10,665
2024	2,041,360	1,610,608	294,908	119,763	785	5,496



Though the level of malware did slightly stabilize, the fact that the total number of reported incidents grew by 47 percent over 2022 would indicate that more sophisticated, non-malware intrusions (47 percent of intrusions in 2024) have been in the upward trend, thus adding cognitive load to the user which must be detected.

The fact of significant underreporting is justified by the reports issued by DSCI and NASSC in 2024. According to the DSCI Seqrite India Cyber Threat Report 2025, over 369 million malware detection cases were reported in India in a single year and it also found that there was underreporting in the MSMEs and the least secure sector in cyberspace. Other inhibitors to effective national defence identified in the CERT-In Digital Threat Report (2024) of the BFSI include ineffectiveness in reporting. The actual figures of the incidents might be a lot higher than the official figures are reflecting, however there is a general agree among specialists that the real figure of the incidents cannot be estimated.

Trends Breakdown: What's Rising, What's Falling				
Threat Type	2022	2023	2024	Trend
Unauthorized Scanning	324,620	447,720	1,610,608	↑ Explosive Rise
Vulnerable Services	875,892	941,592	294,908	↓ Sharp Decline
Malware Infections	161,757	184,131	119,763	↓ Gradual Drop
Phishing Attacks	1,714	869	785	↓ Slow Decline
Website Defacements	19,793	10,665	5,496	↓ Steady Drop



Interpretation:

The surge in scanning suggests a rise in reconnaissance activity, while declines in phishing and defacements point toward more sophisticated, stealthy attacks. Professional Burnout and Operational Impact.

High burnout levels in the professional sector are directly responsible for systemic safety failures. In 2025, 95% of Indian organizations reported issues with cybersecurity burnout, an increase from 83% in 2024.

Table 2: Operational Consequences of Professional Fatigue (2025)

Metric	India-Specific Statistic
Organizations reporting frequent burnout	47%
Breaches directly attributed to burnout	31%
Productivity loss per week per professional	4.6 Hours
Resignations due to stress and burnout	33%

The 10% year-on-year increase in frequent burnout has created a dangerous loop where 31% of breaches are caused by the very exhaustion security protocols are meant to prevent.



Cybersecurity Awareness and Behavioural Resignation

The data confirms that Indian users prioritize convenience over security as a direct consequence of fatigue.

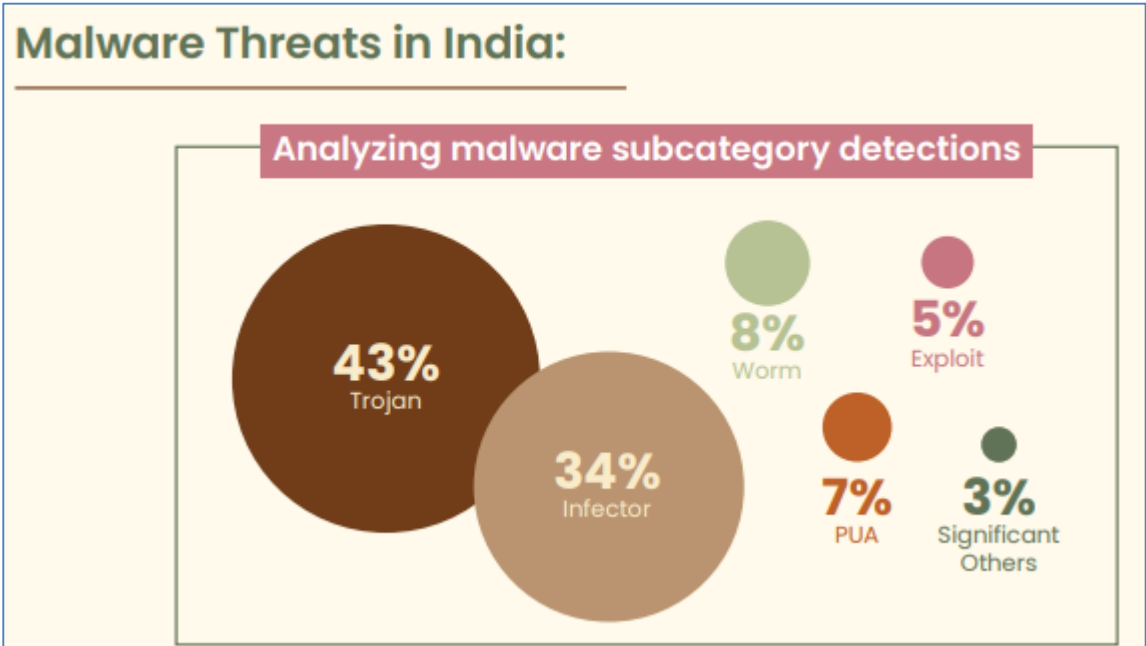
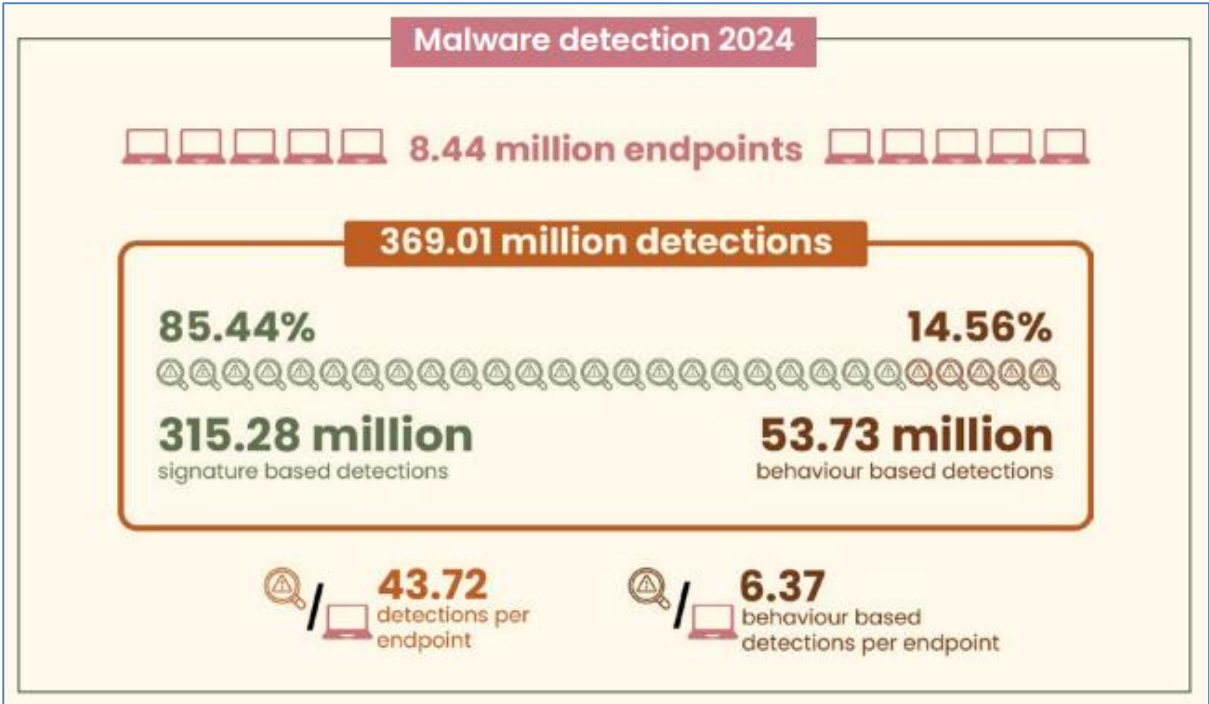
Table 3: Consumer Resignation and Safety Indicators (India)

Fatigue Indicator	Percentage of Respondents
Believe total online privacy is impossible	70%
Accept privacy risks for convenience	66%
Feel overwhelmed by security info management	59%
Believe identity theft is inevitable	63%

This indicates a "vigilance gap." Despite 74% of users feeling "more alarmed than ever" about privacy, 66% exhibit behavioural resignation, opting to bypass security for convenience a hallmark of cybersecurity fatigue.



The analysis of India’s malware detection, based on Seqritre Labs telemetry data from October 2023 to September 2024, reveals critical insights into the current threat landscape. With 369.01 million detections across 8.44 million strong installation base, the data highlights both the scale of cyber threats and the gaps in protection. The majority of detections, 85.44% relied on signature based methods, underscoring the persistence of known threats. However, 14.56% of detections came through behaviour-based detection, emphasizing the growing need for adaptive security to identify emerging, unknown threats.



Risks of "Shadow AI" as a Stress Coping Mechanism

In 2025, most GenAI use in the enterprise (72%) is shadow IT, driven by individuals using personal accounts to access GenAI apps.

- Proprietary source code sharing with generative AI apps accounts for 46% of all data policy violations.

- Regulated data, which organisations have a legal duty to protect, make up more than a third (35%) of the sensitive data being shared with GenAI applications.
- The use of GenAI apps increased from 74% to 96% of organisations from 2023 to 2024.
- ChatGPT is one of the most rapidly expanding consumer internet apps in history. ChatGPT has become a game-changer in the AI landscape, enhancing content quality, providing virtual tutoring for education and training, and ensuring swift response times for users.

Android malware disguised as fake ChatGPT applications with harmful spyware capabilities. When clicking on the application icon to launch, users are redirected to the accessibility page where they are prompted to provide accessibility permission to the fake application. Upon providing accessibility permissions, the application hides its icon and runs it in the background.

Conclusion:

This research demonstrates cybersecurity exhaustion to be of critical and endemic threat to the fast-expanding digital environment in India that cannot be overcome through technical means alone. The results prove the truth that the sheer magnitude and character of the national threat landscape with over 369 million malware detection attempts annually and an ever-increasing percentage of non-malware intrusions have contributed significantly to cognitive load among security experts and ordinary computer users. In spite of the strengthening protection, this constant subjected exposure has contributed to desensitization, alert dismissal and risk acceptor behaviour.

On the professional level, it is disastrous, as per the study, there is an operational crisis. As it were, the human resource issue is not the only issue since having 95 percent of organizations in India recorded burnout in 2025, it is the measurable vulnerability of security. The 31% figure of breaches that is explained by the failures of the burnout actually proves that the requirements of the organizational security focus are, in reality, jeopardizing the organizational resilience. These findings affirm the fact that human endurance has been the most vulnerable in high friction security settings.

The research shows that the overall digital users have a high sense of vigilance deficit. Despite the increased awareness of cyber risk, 70 percent of the users are privacy resigned and one-third (66 percent) of the users seem to prefer convenience to security, which means that awareness is not strong enough to motivate users to adopt protective behaviour. This behavioural inconsistency is what raises the issue of the importance of the perceptions of cybersecurity fatigue as an effect of information overload on the mind which is then managed by burnout rather than knowledge deficit. Depolarization of un-security into the Indian digital culture through the general accepting of risk as an inevitability is a bad practice.

The discussion also shows that Shadow AI is embraced as a coping mechanism due to fatigue wherein the policies were circumvented to transform workload and cognitive pressure that is not in the formal systems of control. Even though the generative AI tools have productivity benefits, novel vectors of data leaks, regulatory non-conformance and malware exploitation are consequences of their unlicensed application by organizations and individuals. This behaviour plays an important role in determining that feeling of being exhausted is the motivation to cut corners that are likely to expand the attack surface by mistake.

RBI Digital Security Framework 2026 is a representation of the transformation of the high-friction and user-sensitive controls into the risk-based and adaptive authentication models. The need of sustainable security in the framework is determined by the minimal authentication requirements and similar security responses to contextual risk in the framework.

To conclude, the evidence shows that the digital safety of India cannot be based on the following aspects only: raising alerts, controls, and user vigilance. The policymakers, financial institutions, and technology providers should integrate the behavioural science in the cybersecurity strategy, prioritize frictionless security architecture, and provide localised and targeted digital literacy interventions.

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Structural Incentives in Welfare Distribution: A Behavioural–Economic and Comparative Analysis of Announcement Clustering Across Indian States

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Abstract

This study examines the timing of welfare-scheme announcements in Indian states through a behavioural–economic and comparative institutional lens, focusing on whether announcements exhibit systematic clustering around the enforcement of the Model Code of Conduct (MCC). Using a dataset of 80 state-level welfare announcements over the past decade, the analysis identifies a pronounced concentration of high-visibility schemes—particularly cash transfers and debt waivers—immediately prior to MCC enforcement, followed by post-MCC administrative continuations. Drawing on behavioural economics, the study demonstrates how recency bias, salience, reciprocity, and the peak–end effect amplify the perceptual impact of announcements made in this narrow pre-election window, independently of program magnitude. A comparative analysis with democracies such as the United Kingdom, France, Brazil, Mexico, and the Philippines highlights that India's MCC lacks explicit ex ante temporal restrictions common internationally. The findings suggest that timing functions as a structural incentive in welfare governance and that adopting standardized announcement calendars could reduce election-period clustering, enhance administrative predictability, and strengthen the perceived neutrality of welfare policy without undermining ongoing governance.

Keywords: Welfare schemes, Announcement timing, Model Code of Conduct, Behavioural economics, Election-period policy, Public governance

Introduction:

The present study seeks to examine welfare programs as a part of core public administration, particularly in terms of the announcement timing. This aspect has not yet been sufficiently explored (Barr, 2012). It has already been recognized that most literature on the subject has focused on welfare program implementation; however, the timing and clustering of announcements may be a significant aspect that influences citizen perception and efficiency independently of program content (Weaver, 2014). In the global arena, welfare programs are often centered on fiscal or political markers; these programs utilize behavioral mechanisms like salience or recall (Kahneman, 2011; Mettler, 2011).

In the Indian scenario, the timing of welfare program announcements is particularly influenced by the Model Code of Conduct (MCC). The Election Commission of India (ECI) frames the MCC in pursuance of Article 324 of the Constitution. The restrictions on new welfare program announcements by the MCC during the period when elections are formally announced aim to ensure the conduct's electoral neutrality (Mohinder Singh Gill v. CEC, 1978; ECI, n.d.). It must be noted that the MCC is a prospective restriction; announcements made just before the formal notification are not barred. This creates a "pre-MCC window," which may systematically affect the clustering of welfare announcements.

The present study has used a sample size of 80 observations from the last ten years for analysis by means of a dual framework:

- **Behavioral Economics:** Examining how cognitive mechanisms such as recency bias and the peak–end effect influence citizen perception (Kahneman and Tversky, 1979).
- **Comparative Institutional Analysis:** Assessing how other democracies structure announcement timing to evaluate potential adaptations for the Indian context.

The research objective is to understand how timing behaviour emerges and interacts with behavioural tendencies. Ultimately, it evaluates whether **standardized welfare-announcement calendars** could enhance administrative predictability, minimize election-period clustering, and strengthen institutional neutrality in welfare governance.

Scope of Research:

The scope of this study is defined by the following parameters:

Geographical and Institutional Scope

The analysis is restricted to the Indian states and union territories. The central government schemes are excluded to ensure an emphasis on the state-level fiscal structures. The analysis is restricted to executive-level welfare scheme announcements only. The legislative-level enactments, budget approvals, and implementation quality are excluded.

Temporal and Policy Scope

The study covers 80 observations of the Indian states over the last decade. The analysis is restricted to the year-level distributions and the pre-Model Code of Conduct period (pre-MCC). The policy domain is restricted to the social protection domain, including food security, healthcare, education, and income support (Barr, 2012; World Bank, 2018).

Theoretical and Analytical Framework

The study is based on behavioural economics. The recency effect, salience effect, and peak-end effect are invoked to explain the temporal patterns (Kahneman, 2011). Additionally, comparative institutional analysis is done to compare the Indian experience with other democracies (Peters, 2013).

Political, Legal, and Outcome Scope

The study is politically neutral. No assessment is made on the ideology or party-level legitimacy (Mettler, 2011). The legal domain is invoked only to understand Article 324 and the related Supreme Court decisions. The purpose of this research paper is not to engage in judicial reviews of any kind.

Primary Objective

The primary objective is to assess whether a standardized announcement calendar can:

- Reduce election-period clustering.
- Enhance the perceived neutrality of welfare governance.

Objectives:

- **To map and categorise the timing of welfare-scheme announcements** across 80 observations over the last decade and to identify patterns of clustering or sequencing.
- **To analyse behavioural-economic factors** especially recency bias, salience, and the peak–end effect that contribute to or reinforce concentrated announcement windows.
- **To examine structural determinants** such as pre-determined boundaries and timelines that shape when announcements are issued.
- **To compare India’s timing patterns** with those of other democracies and assess how their institutional frameworks influence timing discipline.

Methodology:

The study undertook a mixed-methods approach by incorporating both qualitative and quantitative aspects to examine the distribution of announcements related to welfare schemes in India’s states over time from a behavioral and comparative perspective (Creswell and Plano Clark, 2018). The data set comprises 80 data points collected from official government notifications and press releases, state budget announcements, and records from the Election Commission over the past decade (Election Commission of India [ECI], n.d.). The data set includes the date of the announcement and the category and state. The focus is on the date of the announcement to examine the distribution and perform event-based analysis (Weaver, 2014). The data set was verified by cross-checking the data from the official websites and portals of the relevant departments and from nationally recognized newspapers that carried verbatim reports from the government and relevant departments (Hall and Taylor, 1996).

The study undertook an analysis from a behavioral perspective by incorporating recency bias, salience effects, and the peak-end effect to examine the impact of announcements from a citizen’s perspective (Kahneman and Tversky, 1979; Kahneman, 2011). The study also undertook a comparative analysis by incorporating institutional mechanisms and practices in other democracies such as the UK and France and their respective institutional mechanisms and practices for announcing and implementing welfare schemes. The study only undertook a strict analysis from a temporal and institutional perspective and did not touch upon the overall political system and mechanisms and strategies in the respective countries (OECD, 2015;

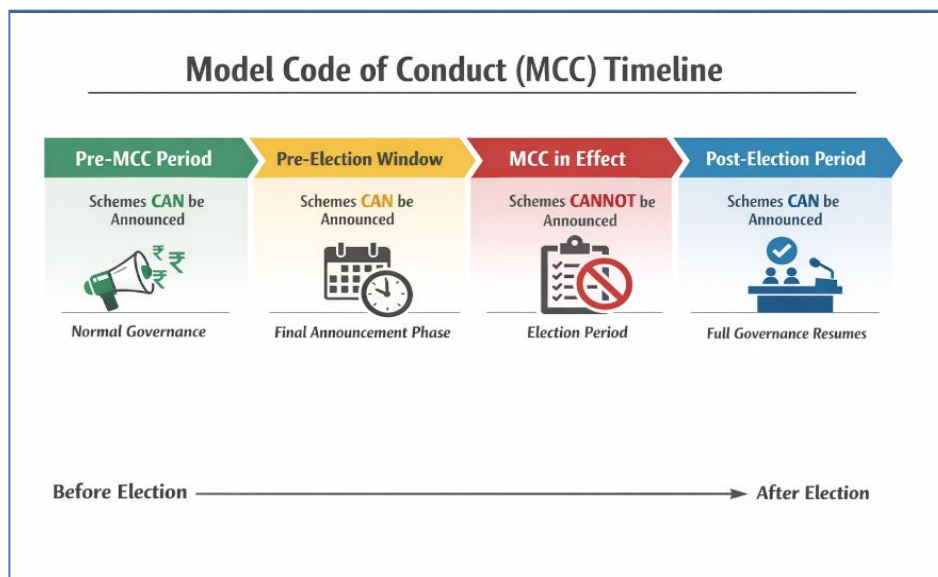
Peters, 2013).

Data Analysis and Interpretation:

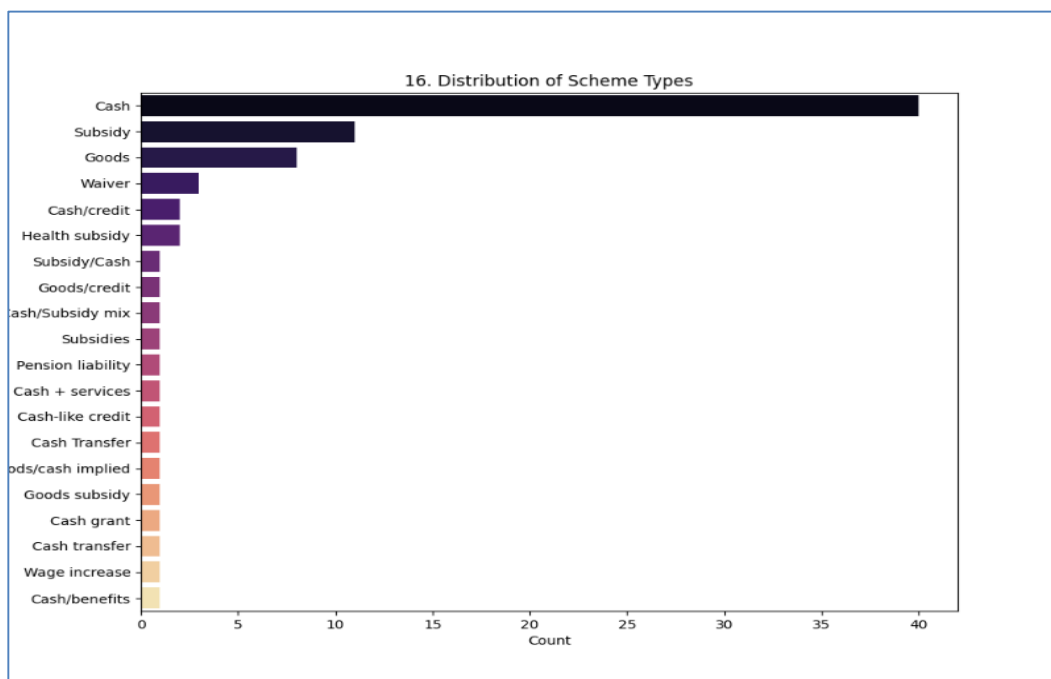
Section 1

Data Analysis

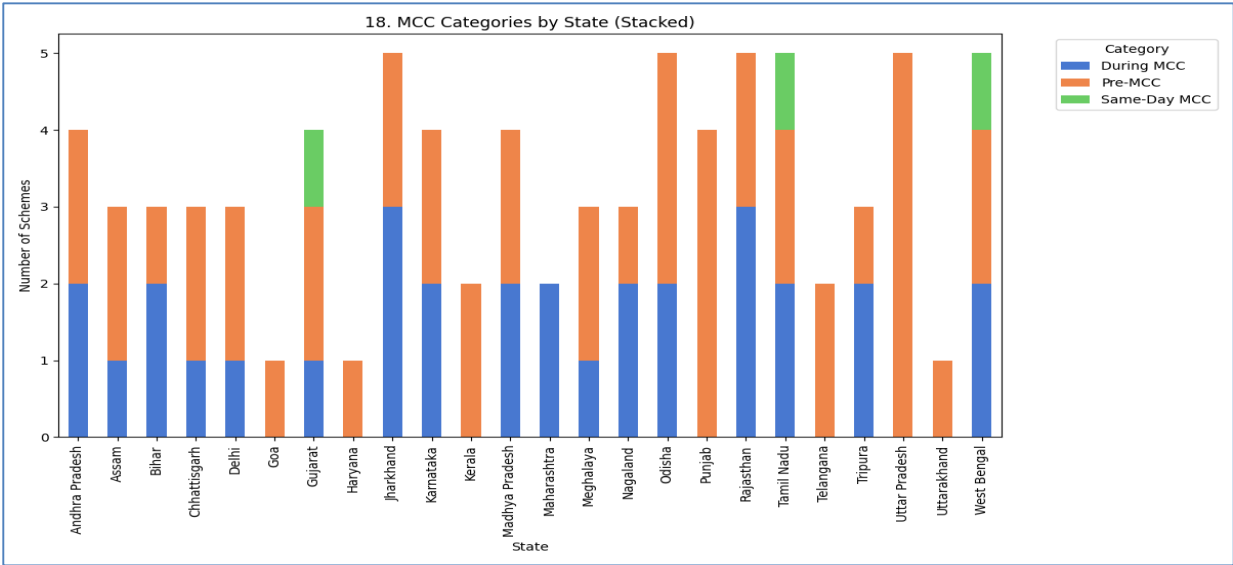
- Let us understand the announcement phases using a simple timeline.



- Upon analysing and organising the 80 announcements, the **most common** scheme type was found to be **cash schemes**.

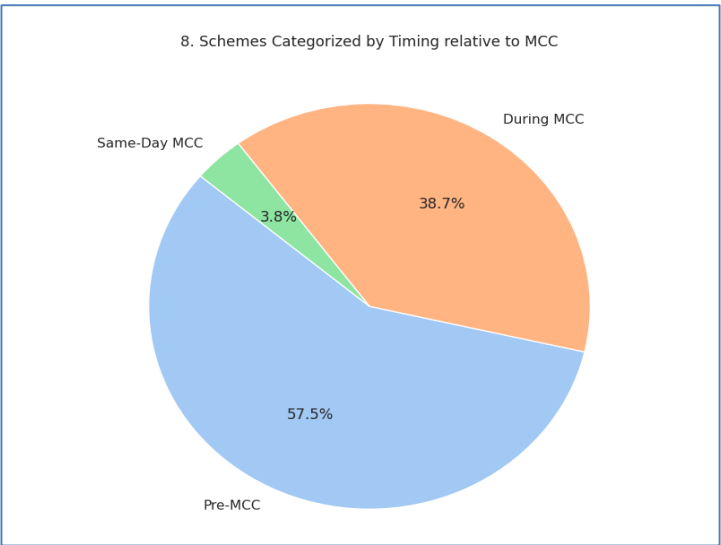


3. Further classifying the data as per state to find when each state announced schemes most frequently.

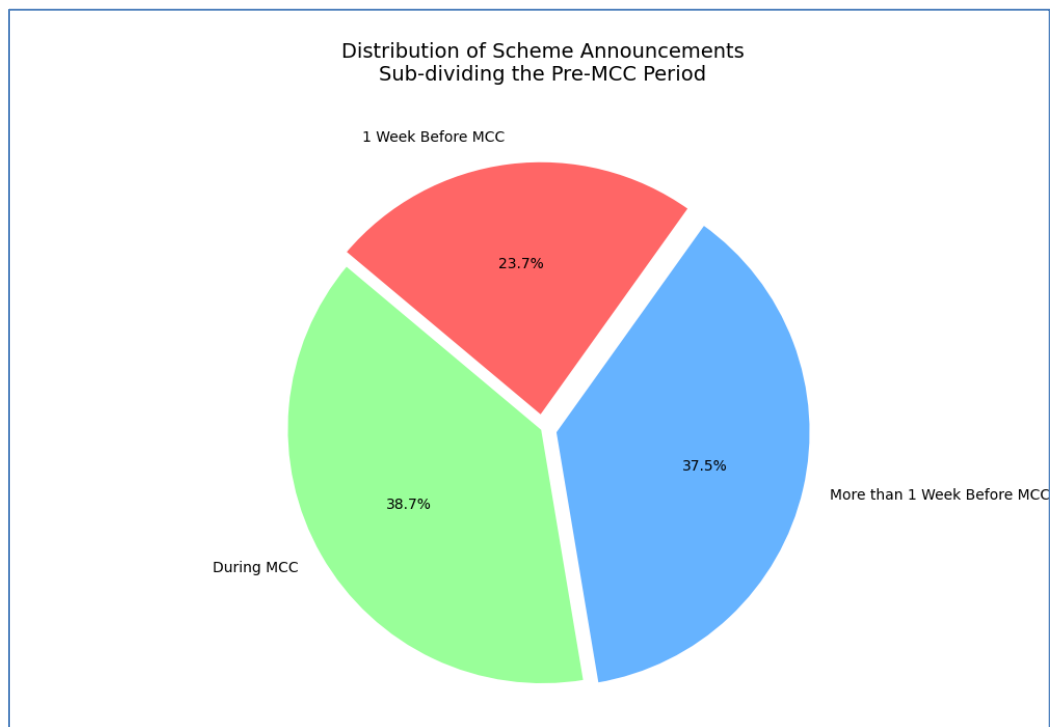


Key: “Same-Day MCC” refers to schemes which were announced on the same day as when the MCC was enforced. Additionally, some states have been found to break the law and announce schemes even after the MCC is in force. However, these schemes may be passed as extensions of pre-existing schemes which are not explicitly deemed illegal by the MCC. These cases may face scrutiny from the Election Commission of India. The purpose of this research is to study the temporal effect of welfare schemes and hence, all schemes announced, by whatever name called, which differ in nature or magnitude or were not actively disbursing benefits shall be considered to be a separate scheme and not an extension.

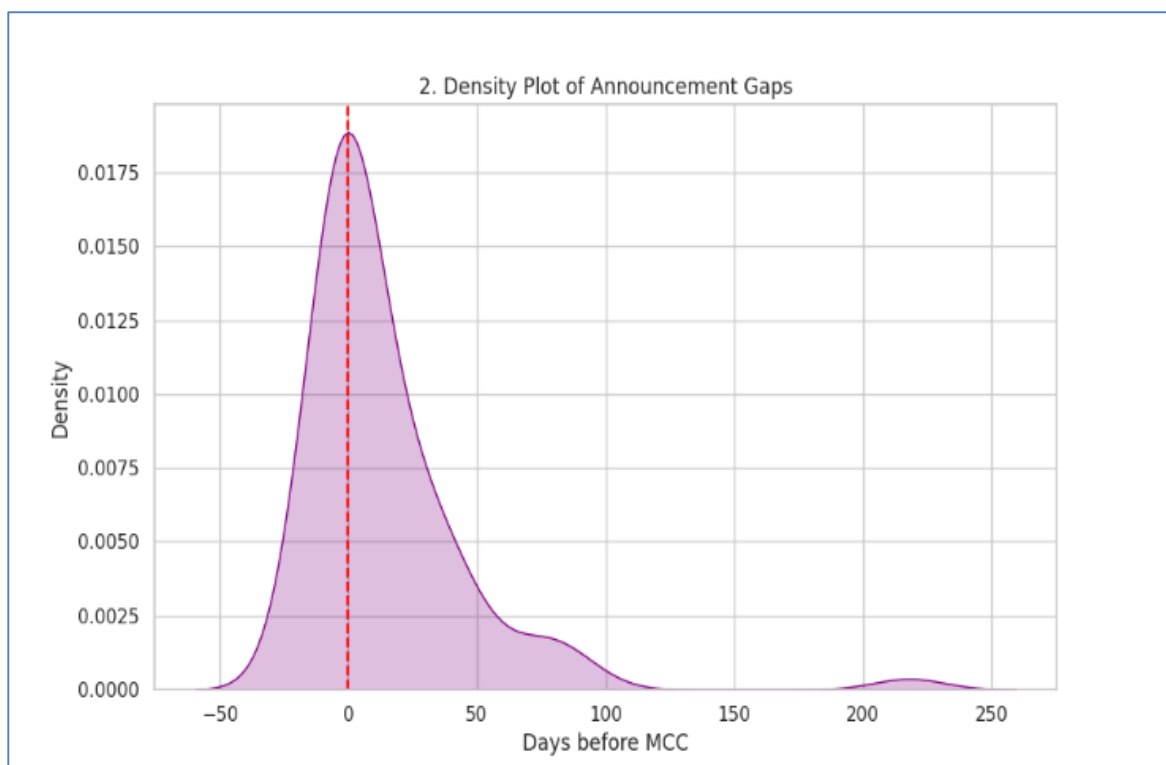
4. Analysing the schemes, represented when these schemes are announced in the form of a pie chart (Bharat level)



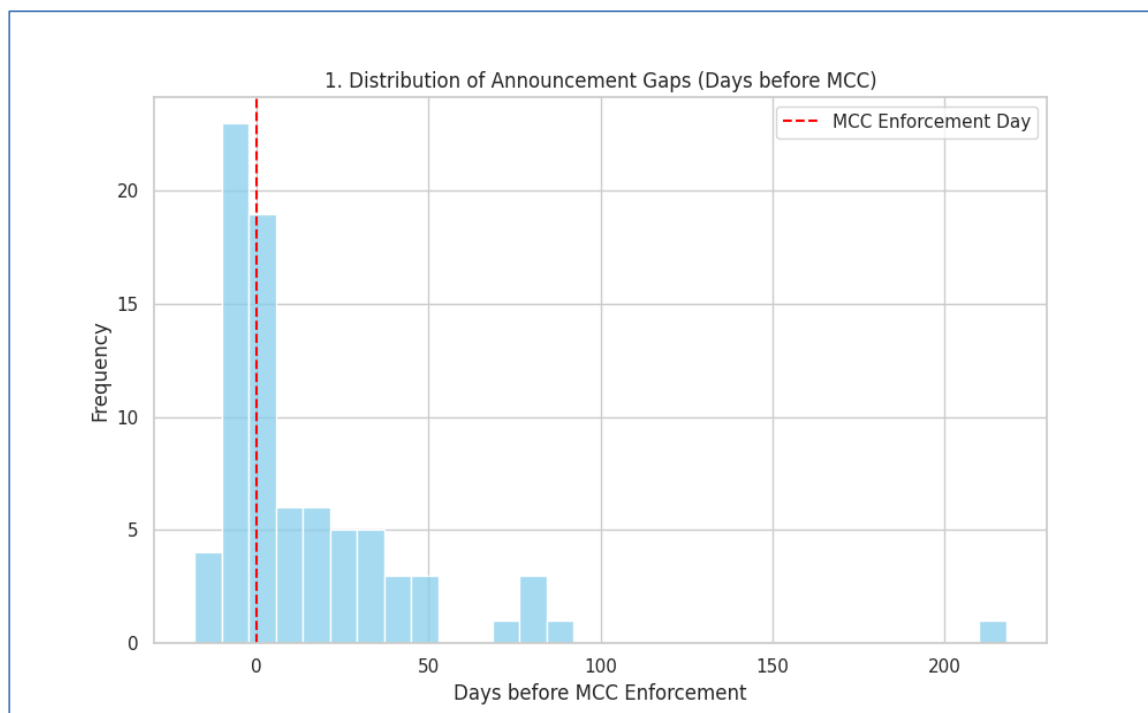
5. Further classifying the schemes in the “Pre-MCC Period” into “1 Week Before MCC” and “More than 1 Week Before MCC”. “During MCC”(as a percentage of total schemes) is retained for reference.



6. Density Plot of Announcements

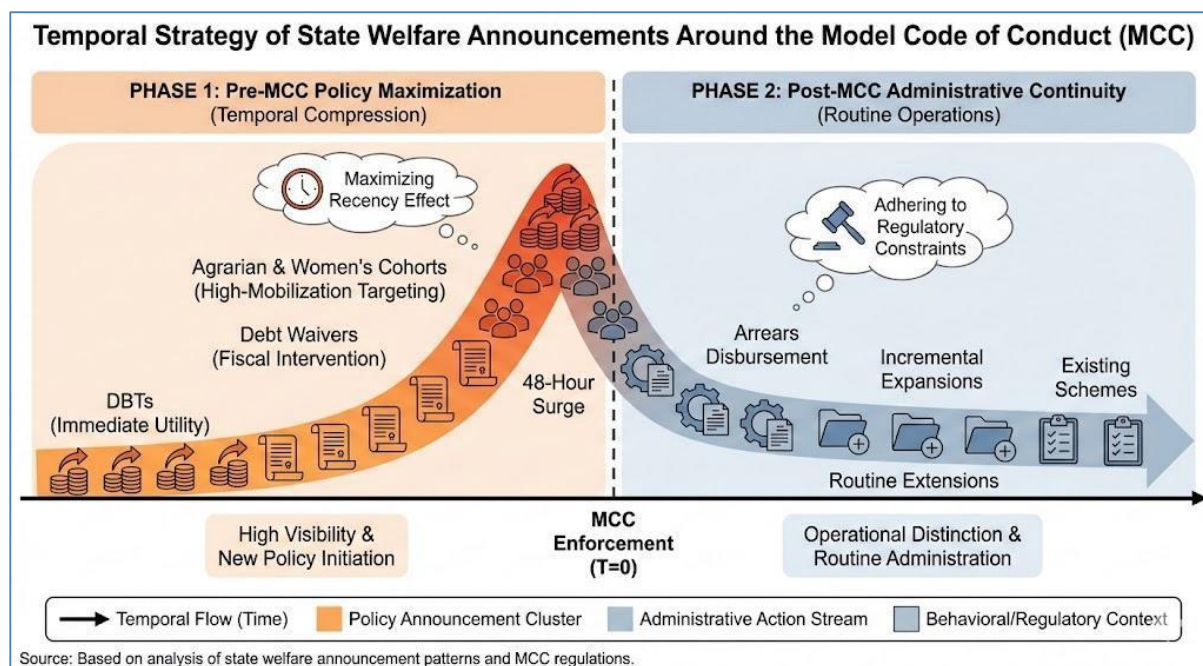


7. Distribution of Announcement Dates



Strategic Conclusions:

The analysis reveals a significant Temporal Compression effect, wherein the announcements of state welfare policies are **concentrated in the immediate pre-period of the MCC implementation**. Quantitatively, the data reveals a significant increase in fiscal interventions such as debt waivers in the 48-hour window preceding the MCC. This is a strategy that maximizes the recency effect while adhering to regulatory requirements. There is a preference for Direct Benefit Transfers (DBTs) due to the utility maximization of the instrument as well as its high visibility. The **post-MCC** activity reveals a claimed continuation of administrative routines such as the payment of arrears and **incremental increases** to existing schemes. This is due to the implied legal and regulatory distinction between the administration of existing schemes and the initiation of new policies. The sectoral targeting reveals a focus on high mobilization groups such as the agrarian population and women-headed households. This reveals a demographic response to the policies. The analysis reveals a two-part temporal strategy: the maximization of policies preceding the MCC and the continuity of administration following the MCC.



Section 2

Behavioural Economics

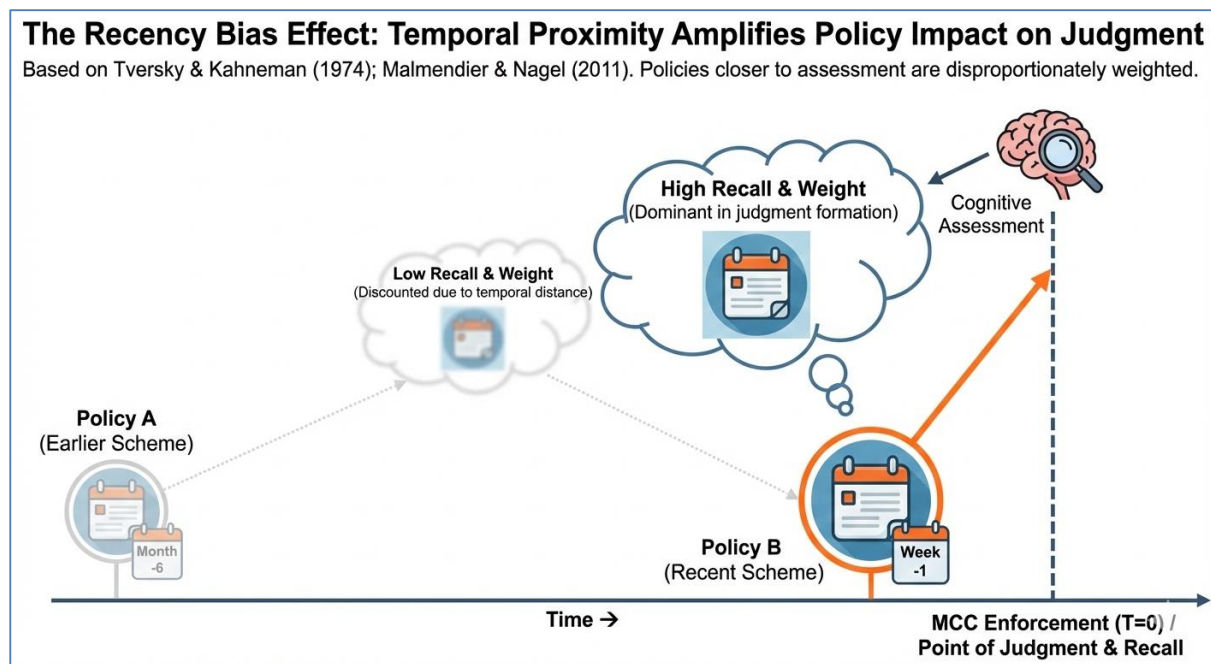
1. Introduction

The timing of public policy announcements is an important dimension of public policy evaluation. From the perspective of the Indian administrative system, the enforcement of the Model Code of Conduct (MCC) provides a temporal boundary to the evaluation of public policy announcements. However, the traditional political economy model emphasizes the importance of strategic decision-making. From the perspective of behavioral economics and psychology, the decision-making of an individual can be evaluated on the basis of the concepts of recency bias, salience, reciprocity, and the peak-end rule. These concepts provide a comprehensive framework to explain the importance of public schemes announced around the time of the enforcement of the MCC, even though the schemes may not have been substantial in nature.

2. Recency Bias and Memory-Based Weighting

Recency bias refers to the tendency to assign greater weight to information or events that occurred more recently when forming judgments (Tversky and Kahneman, 1974).

Documented across economic and psychological domains, including belief formation and retrospective evaluation (Malmendier and Nagel, 2011), it implies that policies introduced closer to MCC enforcement are more likely to be recalled at the time individuals assess administrative performance. Earlier schemes, even if substantively similar or greater, may be discounted due to temporal distance.



3. Reciprocity and Benefit-Induced Favourability

Behavioural economics highlights reciprocity and gratitude in shaping evaluations of institutional actors. Individuals respond favourably toward actors from whom they recently received benefits, even when modest or unconditional (Fehr and Gächter, 2000; Falk and Fischbacher, 2006). Empirical work shows recipients of public transfers often express higher support for incumbents following benefit receipt (Manacorda, Miguel, and Vigorito, 2011). Combined with recency bias, recent benefits remain salient and trigger favourable affective responses, even if small, amplifying their impact on evaluations.

4. Salience and Attribution of Responsibility

Salience mediates recency and reciprocity. Prominent or easily interpreted information receives disproportionate attention (Chetty, Looney, and Kroft, 2009). Schemes announced

close to MCC enforcement coincide with heightened attention, increasing the probability that benefits are attributed to the current government. Salience thus strengthens the link between benefit receipt and favourable evaluation by clarifying attribution.

5. Peak–End Effect and Retrospective Evaluation

The peak–end effect shows that individuals evaluate experiences by disproportionately weighting the most intense moment (the “peak”) and the final moment (the “end”) of a sequence (Fredrickson and Kahneman, 1993). In scheme announcements, the final set of announcements or a particularly notable scheme functions as both a peak and an end, shaping overall evaluation beyond its standalone impact. This operates independently of recency bias, which affects memory accessibility, while the peak–end effect governs aggregation into evaluative judgment. Together, these mechanisms imply that final and prominent schemes disproportionately shape retrospective assessments.

6. Implications for Empirical Analysis

For eighty state-level data points, the present results imply that timing variables include both institutional constraints and cognitive proximity. Schemes that are small to moderate in size may produce perceptual effects if implemented relatively recently, while interaction terms between timing variables and visibility may be used to detect joint effects of recency, salience, and reciprocity on peak-end effects.

7. Conclusion

Recency bias, reciprocity, salience, and the peak-end effect present a coherent behavioral model for understanding the effects of timing variables relative to MCC enforcement on public evaluation. These effects are cognitively based and do not require assumptions of voter irrationality. The addition of these effects provides increased depth and clarity for the underlying theory for empirical analyses examining timing effects.

Section 3

Comparative Analysis

Having established that the timing of government announcements warrants systematic attention, this section examines how several established democracies regulate pre-election announcements and public spending. The focus is on **institutional design choices**—specifically the length, scope, and enforceability of pre-election restrictions—rather than on electoral outcomes or normative assessments.

International Approaches to Pre-Election Restrictions

A defining feature of many electoral systems is the presence of **ex ante, clearly specified temporal restrictions** on government action in the period leading up to elections. These restrictions typically apply not only to campaign activity but also to government communication, public spending, and the distribution of benefits, reflecting the dual informational and material influence of government action on voter behaviour.

In the **Philippines**, the Omnibus Election Code establishes a formal election period beginning **90 days before polling**, with a specific **45-day prohibition** on the release or disbursement of public funds for public works, social services, and similar programs (Commission on Elections [COMELEC], 2019). The restriction applies regardless of whether the program is newly announced or substantively implemented during this window. Violations constitute election offences, carrying criminal penalties including imprisonment, fines, and disqualification from public office. The Philippine approach thus combines a defined temporal threshold with strong legal sanctions, ensuring that administrative activity in the run-up to elections is tightly constrained.

Mexico adopts a constitutional strategy. Article 41 of the Mexican Constitution mandates the suspension of government advertising during both the pre-campaign and campaign periods, except for narrowly defined public interest communications such as health or emergency information (Instituto Nacional Electoral [INE], 2023). This prohibition encompasses promotional communication relating to government schemes and achievements, directly limiting the salience of government messaging in politically sensitive periods. Enforcement is delegated to independent electoral authorities, with sanctions ranging from

administrative penalties to annulment of electoral outcomes in cases of serious violation. Mexico's approach emphasises institutional clarity and the credibility of enforcement over discretionary restraint.

Brazil provides one of the most explicit restrictions on welfare-type benefits. Under Law No. 9,504/1997, governments are prohibited from distributing goods, benefits, or advantages to voters in the **60 days preceding an election**, except in cases of public calamity or for programs that are legally mandated and continuous in nature (Tribunal Superior Eleitoral [TSE], 2022). The law directly targets material benefits rather than general policy communication, highlighting a focus on curbing incentive-driven voter influence. Sanctions include fines, invalidation of candidacy, and, in certain cases, annulment of election results. By fixing a two-month restriction window, Brazil sharply limits the opportunities for last-minute benefits and promotes a special sense of predictability in administrative conduct.

France employs a longer temporal horizon. Electoral law restricts promotional communication and targeted public spending by authorities during the **six months preceding elections**, particularly at the local level (Ministère de l'Intérieur, 2021). Public bodies are prohibited from undertaking publicity campaigns that emphasise achievements or new initiatives during this period. Violations can lead to campaign account invalidation, financial penalties, and candidate disqualification. The French approach prioritises administrative neutrality over a prolonged pre-election period, significantly distancing government action from electoral decision-making while preserving the routine execution of statutory responsibilities.

The **United Kingdom** represents a more convention-based approach through the **purdah** system. Typically commencing around **25 working days before polling**, purdah restricts new policy announcements, major spending commitments, and politically sensitive communications by government departments (Cabinet Office, 2024). Although purdah lacks statutory criminal penalties, it is reinforced through administrative accountability, judicial review, and civil service neutrality norms. The UK model demonstrates that even non-statutory rules can effectively shape executive behaviour when temporal boundaries are clear, widely understood, and consistently applied.

Patterns and Institutional Commonalities

Despite differences in legal form, duration, and enforcement strength, these systems share several institutional characteristics. First, restrictions are **time-bound and predetermined**, reducing uncertainty regarding when restraint must begin and providing clarity to both bureaucrats and voters. Second, most regimes extend beyond traditional campaign activity to include **government communication and benefit distribution**, recognising that administrative actions themselves can carry electoral influence. Third, enforcement mechanisms—whether criminal, administrative, or electoral—are sufficiently credible to deter violations and signal institutional seriousness.

Additionally, international experience demonstrates that pre-election restrictions can be operationalised without undermining ongoing governance. Exemptions for statutory programs, emergencies, or long-term developmental projects are common, ensuring that essential services and continuity of administration are maintained while limiting discretionary announcements that could influence electoral behaviour. The length and scope of restrictions vary across jurisdictions, reflecting both institutional priorities and the perceived intensity of electoral influence via government action.

Synthesis

The international experience illustrates that regulating the timing of pre-election announcements is a widely adopted institutional response to concerns about electoral influence. Whether through statutory bans, constitutional provisions, or administrative conventions, democracies have developed mechanisms that constrain government action during electorally sensitive periods. Across jurisdictions, the combination of **clear temporal thresholds, targeted coverage, and credible enforcement** emerges as a common and effective institutional strategy. These approaches provide a benchmark for understanding how different democratic systems structure pre-election administrative conduct, without presupposing normative conclusions regarding the desirability of the underlying policies themselves

Conclusion:

This study demonstrates that the timing of welfare-scheme announcements in Indian states exhibits a pronounced **temporal clustering** immediately preceding the enforcement of the Model Code of Conduct (MCC). Analysis of 80 state-level observations over the last decade revealed a consistent pattern in which governments concentrate high-visibility interventions, particularly cash transfers and debt waivers, within the 48 hours preceding MCC activation. Post-MCC activity primarily consists of administrative continuations or incremental expansions, highlighting a **two-phase operational strategy** that balances regulatory compliance with service delivery (Election Commission of India [ECI], n.d.; Weaver, 2014).

Applying a **behavioural-economics lens** clarifies why these temporal patterns carry perceptual significance. Recency bias and the peak–end effect suggest that announcements made immediately before MCC enforcement are disproportionately salient in citizen memory, shaping retrospective evaluations of administrative performance (Kahneman, 2011; Kahneman and Tversky, 1979). Reciprocity further amplifies the impact, as recently received benefits—however modest—trigger favourable affective responses toward governing authorities (Fehr and Gächter, 2000; Falk and Fischbacher, 2006; Manacorda, Miguel, and Vigorito, 2011). Salience and sectoral targeting enhance these effects by directing attention to high-visibility and demographically influential schemes (Chetty, Looney, and Kroft, 2009).

Comparative institutional analysis demonstrates that India’s MCC is comparatively weaker than international precedents. Countries such as the Philippines, Mexico, Brazil, France, and the United Kingdom enforce **ex ante temporal restrictions**, with explicit windows ranging from 25 working days to six months, coupled with credible enforcement mechanisms including criminal, administrative, and electoral penalties (Cabinet Office, 2024; Commission on Elections [COMELEC], 2019; Instituto Nacional Electoral [INE], 2023; Ministère de l’Intérieur, 2021; Tribunal Superior Eleitoral [TSE], 2022). These frameworks highlight the feasibility of structured pre-election timing rules without impairing governance, offering benchmarks for potential refinement of Indian practices.

Together, the empirical, behavioural, and comparative findings underscore that **timing matters as much as content** in welfare governance. Incorporating explicit temporal regulation could enhance administrative predictability, reduce election-period clustering, and strengthen

the perceived neutrality of state-level welfare interventions (Peters, 2013).

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Data from government URLs and Announcement Portals is represented below (with notes in the rightmost column):

Tamil Nadu	Makkalai Thedi Maruthuvam Add-on	Cash + services	2/24/2021	2/26/2021	2	Pre-MCC	Added last-minute cash honorariums
Tamil Nadu	Women Homemaker Rs 1000	Cash Transfer	2/20/2021	2/26/2021	6	Pre-MCC	Major pre-poll cash transfer
Tamil Nadu	Gold Loan Waiver (Co-op Banks)	Waiver	2/26/2021	2/26/2021	0	Same-Day MCC	Announced hours before ECI presser
West Bengal	Lakshmi Bhandar Increased	Cash	2/22/2021	2/26/2021	4	Pre-MCC	Enhanced transfer days before MCC
West Bengal	Krishak Bandhu (Revised)	Cash	1/15/2021	2/26/2021	42	Pre-MCC	Major revision pre-election
West Bengal	Urban Daily Wage Hike	Wage increase	2/26/2021	2/26/2021	0	Same-Day MCC	Announced on day of ECI schedule
Karnataka	Gruha Lakshmi Expansion	Cash transfer	4/14/2023	4/29/2023	15	Pre-MCC	₹2000 per month scheme
Karnataka	Gruha Jyothi 200 Units Free	Subsidy	4/5/2023	4/29/2023	24	Pre-MCC	Electricity subsidy expansion
Andhra Pradesh	Jagananna Chedodu Release	Cash	2/20/2024	3/14/2024	23	Pre-MCC	Cash instalment right before MCC
Andhra Pradesh	YSR Rythu Bharosa Additional	Cash	2/12/2024	3/14/2024	31	Pre-MCC	Extra DBT amount announced
Telangana	Dalit Bandhu Pilot Expansion	Cash grant	7/23/2021	10/8/2021	77	Pre-MCC	₹10 lakh grant before MCC
Telangana	Sheep Distribution Scheme Phase	Goods subsidy	7/10/2023	10/9/2023	91	Pre-MCC	Constituency-targeted release
Chhattisgarh	Rajiv Gandhi Nyay Yojana Bonus	Cash	10/12/2023	10/29/2023	17	Pre-MCC	Final bonus before polls
Chhattisgarh	Godhan Nyay Bonus	Cash	10/15/2023	10/29/2023	14	Pre-MCC	Bonus announced days before MCC
Madhya Pradesh	Ladli Behna Phase II	Cash	9/10/2023	10/6/2023	26	Pre-MCC	Increase from ₹1000 to ₹1250 pre-poll
Madhya Pradesh	LPG Cylinder at ₹500	Subsidy	8/15/2023	10/6/2023	52	Pre-MCC	Targeted subsidy ahead of MCC
Gujarat	Power Debt Waiver	Waiver	11/3/2022	11/3/2022	0	Same-Day MCC	Announced same day as MCC
Gujarat	Free Medical Treatment Expansion	Subsidy	11/1/2022	11/3/2022	2	Pre-MCC	Expansion just 48 hours before MCC
Delhi	Free Bus Travel Expansion	Subsidy	12/25/2019	1/6/2020	12	Pre-MCC	Election-time expansion
Haryana	Old-Age Pension Hike	Cash	12/28/2023	3/16/2024	78	Pre-MCC	Announced before LS MCC
Uttar Pradesh	Kanya Sumangala Raise	Cash	2/2/2022	2/10/2022	8	Pre-MCC	Amount raised 8 days before MCC
Uttar Pradesh	Free LPG Connection Push	Goods/cash impli	1/1/2022	2/10/2022	40	Pre-MCC	Pre-poll acceleration of scheme
Uttar Pradesh	PMGKAY Free Ration Extension (Sta	Goods	12/12/2021	1/14/2022	33	Pre-MCC	State-level extension weeks before MCC
Bihar	Financial Aid to Women (SHG)	Cash	9/27/2020	10/25/2020	28	Pre-MCC	Pre-poll disbursement
Odisha	BSKY Nabin Scheme	Subsidy	2/15/2024	3/16/2024	30	Pre-MCC	Massive expansion before LS MCC
Odisha	Mission Shakti Cash Releases	Cash	2/5/2024	3/16/2024	39	Pre-MCC	Election-year DBT wave
Jharkhand	Gurujii Credit Card Launch	Cash-like credit	12/25/2023	3/16/2024	81	Pre-MCC	Pre-election credit expansion
Jharkhand	Bonus for Farmers	Cash	3/10/2024	3/16/2024	6	Pre-MCC	Direct cash just before MCC
Kerala	Welfare Pension Arrears Clearance	Cash	3/11/2021	3/26/2021	15	Pre-MCC	Cleared arrears weeks before MCC
Kerala	Food Kit Expansion	Goods	3/20/2021	3/26/2021	6	Pre-MCC	Controversial last-minute expansion
Uttarakhand	Free Electricity 100 Units	Subsidy	2/4/2022	2/10/2022	6	Pre-MCC	Free electricity before polls
Goa	Griha Aadhar Increase	Cash	1/5/2022	1/21/2022	16	Pre-MCC	Cash increase days before MCC
Assam	Orunodoi 2.0 Expansion	Cash	1/2/2021	3/12/2021	69	Pre-MCC	Large expansion before MCC
Tripura	Social Pension Hike	Cash	12/2/2022	1/21/2023	50	Pre-MCC	Pension increase before polls
Meghalaya	Farmer Cash Assistance	Cash	12/18/2022	1/18/2023	31	Pre-MCC	DBT before MCC
Nagaland	Pig Rearing Scheme Subsidy	Subsidy/Cash	12/12/2022	1/18/2023	37	Pre-MCC	Pre-poll subsidy
Rajasthan	OPS Re-implementation	Pension liability	2/23/2023	9/29/2023	218	Pre-MCC	Major pension revival in election year
Rajasthan	Chiranjeevi Health Top-ups	Subsidies	8/15/2023	9/29/2023	45	Pre-MCC	Health top-ups weeks before MCC
Punjab	Shagun Scheme Disbursement Pus	Cash	1/30/2021	2/26/2021	27	Pre-MCC	Pre-poll release acceleration
Punjab	Farmer Compensation Disbursement W	Cash	2/12/2021	2/26/2021	14	Pre-MCC	Compensation rushed before MCC
Rajasthan	Five Guarantees Announcement Se	Cash/Subsidy mix	10/27/2023	10/9/2023	-18	During MCC	Announced after MCC – violation zone

West Bengal	Additional Ration Scheme Add-on	Goods	3/3/2021	2/26/2021	-5	During MCC	Announced one week after MCC
Tamil Nadu	Honorarium Additions for Workers	Cash	3/5/2021	2/26/2021	-7	During MCC	Announced after MCC began
Andhra Pradesh	Last-minute YSR Cheyutha Release	Cash	3/18/2024	3/14/2024	-4	During MCC	Released after MCC (flagged)
Madhya Pradesh	CM Housing Grant Extra List	Cash	10/12/2023	10/6/2023	-6	During MCC	Additional beneficiaries added post-MCC
Chhattisgarh	Extra Bonus for Tendu Leaf Worker	Cash	11/2/2023	10/29/2023	-4	During MCC	Announced after MCC
Karnataka	Contract Worker Pay Hike	Cash	5/10/2023	4/29/2023	-11	During MCC	Illegal announcement flagged then withdrawn
Gujarat	Extra BPL Kit Distribution Rollout	Goods	11/10/2022	11/3/2022	-7	During MCC	Post-MCC release flagged by ECI
Assam	Additional Orunodoi Release List	Cash	3/20/2021	3/12/2021	-8	During MCC	Added extra beneficiaries after MCC
Tripura	Additional Social Pension Top-up	Cash	2/5/2023	1/21/2023	-15	During MCC	Announced despite MCC
Nagaland	Farmer Subsidy Phase II	Subsidy	1/25/2023	1/18/2023	-7	During MCC	Announced after MCC
Meghalaya	Agri-Equipment Subsidy Wave	Goods/credit	1/23/2023	1/18/2023	-5	During MCC	Post-MCC subsidy
Odisha	Extra BSKY Hospital Coverage	Health subsidy	3/21/2024	3/16/2024	-5	During MCC	Announced after LS MCC
Odisha	Cyclone Compensation Add-on	Cash	3/24/2024	3/16/2024	-8	During MCC	Extra cash relief after MCC
Jharkhand	Teacher Honorarium Top-up	Cash	3/20/2024	3/16/2024	-4	During MCC	Announced immediately after MCC
Jharkhand	Extra Farmer Subsidy Notification	Subsidy	3/19/2024	3/16/2024	-3	During MCC	Violation-prone extra subsidy
Bihar	Extra PDS Distribution Wave	Goods	10/30/2020	10/25/2020	-5	During MCC	Announced post-MCC date
Delhi	Additional Free Water Units	Subsidy	1/10/2020	1/6/2020	-4	During MCC	Extension after MCC
Tamil Nadu	Extra Rice Distribution Add-on	Goods	3/10/2021	2/26/2021	-12	During MCC	Announced after MCC began
West Bengal	Extra Widow Pension List	Cash	3/4/2021	2/26/2021	-6	During MCC	Added beneficiaries after MCC
Karnataka	Extra Pourakarmika Payments	Cash	5/5/2023	4/29/2023	-6	During MCC	Announced after MCC in violation zone
Andhra Pradesh	YSR Pellli Kanuka Extra List	Cash	3/17/2024	3/14/2024	-3	During MCC	Post-MCC disbursement attempt
Madhya Pradesh	Additional Scholarship List	Cash	10/11/2023	10/6/2023	-5	During MCC	Announced after MCC
Maharashtra	Agri Input Subsidy Wave (constitue	Cash/credit	3/18/2024	3/16/2024	-2	During MCC	Constituency-targeted release
Maharashtra	Last-minute OBC Caste Cash Grant	Cash	3/20/2024	3/16/2024	-4	During MCC	Announced despite MCC
Rajasthan	LPG 500 Subsidy Extra Batch	Subsidy	10/14/2023	10/9/2023	-5	During MCC	Extra beneficiaries added
Rajasthan	Farmer Loan Interest Rebate Add-c	Waiver	10/16/2023	10/9/2023	-7	During MCC	Announced after MCC
Gujarat	Urban Health Card Expansion	Health subsidy	11/5/2022	11/3/2022	2	Pre-MCC	Added just 48 hours before MCC
Punjab	Extra SC Scholarship Renewal	Cash	1/17/2022	1/21/2022	4	Pre-MCC	Renewal wave days before MCC
Punjab	Extra Farmer Compensation Batch	Cash	1/19/2022	1/21/2022	2	Pre-MCC	Announced 48 hours before MCC
Uttar Pradesh	Extra PM Kisan State Top-Up	Cash	2/7/2022	2/10/2022	3	Pre-MCC	Top-up days before MCC
Uttar Pradesh	Extra Free Ration Extension	Goods	2/8/2022	2/10/2022	2	Pre-MCC	Extended just before MCC
Bihar	Extra SHG Women Payment Batch	Cash	10/27/2020	10/25/2020	-2	During MCC	Announced two days after MCC
Assam	Free Textbook Expansion	Goods	3/15/2021	3/12/2021	3	Pre-MCC	Added items before MCC
Tripura	Extra Anganwadi Worker Honorariu	Cash	1/24/2023	1/21/2023	-3	During MCC	Illicit honorarium addition
Nagaland	Animal Husbandry Incentive Add-o	Cash/credit	1/20/2023	1/18/2023	-2	During MCC	Announced after MCC
Meghalaya	Youth Allowance Pilot	Cash	1/16/2023	1/18/2023	2	Pre-MCC	Announced just before MCC
Odisha	Extra Mission Shakti Marketing Gr	Cash	3/15/2024	3/16/2024	1	Pre-MCC	Announced day before MCC
Jharkhand	Additional Rural Housing List	Cash/benefits	3/18/2024	3/16/2024	-2	During MCC	Added list post-MCC
Delhi	Extra Bus Pass Subsidy	Subsidy	1/7/2020	1/6/2020	1	Pre-MCC	Announced one day after MCC trigger

An Empirical Study on the Impact of Artificial Intelligence Tools on Academic Performance and Learning Behaviour of Undergraduate Students

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Abstract:

The increasing use of Artificial Intelligence (AI) tools has significantly influenced learning practices in higher education. Undergraduate students commonly use AI-based applications for academic activities such as assignment preparation, concept clarification, language improvement, and exam preparation. This study examines the impact of AI tools on academic performance and learning behaviour among undergraduate students. Primary data were collected through a structured questionnaire administered to 100 undergraduate students, primarily from the commerce stream, across colleges in Mumbai. Descriptive analysis was employed to assess AI usage patterns, perceived academic benefits, behavioural changes, and ethical concerns. The findings indicate that AI tools enhance efficiency, conceptual clarity, and the quality of academic output, while also raising concerns regarding over-dependence and originality. The study concludes that AI tools are most effective when used as supplementary learning aids, highlighting the importance of responsible and ethical usage in higher education.

Keywords: Artificial Intelligence, Higher Education, AI-Assisted Learning, Educational Technology, Student Engagement, Academic Integrity, Digital Literacy

I. Introduction:

Artificial Intelligence (AI) has emerged as a transformative force in the contemporary knowledge economy, influencing diverse sectors such as healthcare, finance, governance, and education. In recent years, higher education institutions have increasingly integrated AI-driven technologies into teaching and learning processes, reshaping traditional academic practices. Tools such as generative AI platforms, grammar-checking software, intelligent search engines, plagiarism detection systems, and adaptive learning applications have become integral to students' academic routines.

The rapid digitalization of education, particularly in the post-pandemic era, has accelerated students' dependence on technology for accessing information and completing academic tasks. Undergraduate students face growing academic demands in the form of continuous assessments, project-based learning, presentations, and competitive evaluation systems. In this context, AI tools offer significant support by enhancing efficiency, improving language and presentation quality, facilitating conceptual understanding, and assisting in time management. As a result, AI has gained widespread acceptance as an academic support mechanism among students.

Despite these advantages, the increasing reliance on AI-generated content has raised important concerns related to academic integrity, originality, and the development of critical thinking skills. Excessive dependence on automated tools may reduce students' engagement with independent learning processes and weaken analytical abilities over time. These concerns have prompted educators and policymakers to reconsider the role of AI in higher education and emphasize the need for responsible and ethical usage.

In the Indian higher education context, particularly within commerce and management disciplines, empirical research examining the impact of AI tools on students' academic performance and learning behaviour remains limited. Most existing studies focus on technological efficiency or institutional adoption, while comparatively less attention is given to behavioural changes and dependency-related issues among undergraduate learners. Therefore, the present study seeks to examine the dual role of AI tools by assessing both their academic benefits and associated behavioural challenges among undergraduate students,

thereby contributing to informed decision-making regarding the integration of AI in higher education. By focusing on students from premier institutions in Mumbai, the research aims to contribute empirical evidence to the ongoing debate on the responsible integration of AI in higher education.

II. Review of Literature:

The integration of Artificial Intelligence (AI) tools into higher education has been widely examined by researchers, particularly in the context of learning efficiency, academic performance, and student engagement. Existing studies suggest that AI-based applications have the potential to support students by simplifying complex academic tasks and enhancing access to learning resources.

Chaudhry et al. (2024) observed that the use of AI tools positively influences students' academic performance by improving task efficiency, conceptual understanding, and overall quality of academic output. Their findings indicate that AI functions as a supportive learning aid rather than a replacement for traditional pedagogical methods. However, the study primarily focuses on performance outcomes and provides limited insight into behavioural changes among students.

Dwivedi et al. (2024) examined the broader implications of generative AI in education and highlighted its role in enabling personalized learning experiences and instructional innovation. At the same time, the authors emphasized ethical challenges such as over-reliance on AI-generated content, data privacy concerns, and the need for institutional guidelines to regulate responsible usage. This study underscores the importance of balancing technological advancement with academic integrity.

Zhai and Wibowo (2025) analyzed the role of AI in higher education assessment and learning practices and concluded that AI-enhanced environments improve student engagement and self-efficacy. However, the authors caution that uncritical use of AI tools may adversely affect independent thinking and originality if students rely excessively on automated outputs. Although existing literature provides valuable insights into the benefits and challenges associated with AI adoption in education, limited empirical research focuses on undergraduate

students in the Indian context, particularly within commerce education. Furthermore, prior studies tend to emphasize academic performance while giving comparatively less attention to changes in learning behaviour and dependency-related concerns. The present study seeks to address these gaps by examining AI usage patterns, academic outcomes, behavioural shifts, and ethical perceptions among undergraduate students.

III. Objectives of The Research Study

- To assess the prevalence and frequency of AI tool adoption
- To determine specific preferences regarding AI applications
- To critically investigate the "Dependency Paradox
- To evaluate the qualitative impact of AI integration

IV. Research Methodology

Research Design and Data Collection- This study employs a quantitative research approach, utilizing a primary data collection method through a structured questionnaire. The research instrument was designed to assess the frequency of adoption, specific toolkit preferences, and the multidimensional impact of AI tools on academic performance and learning behaviors.

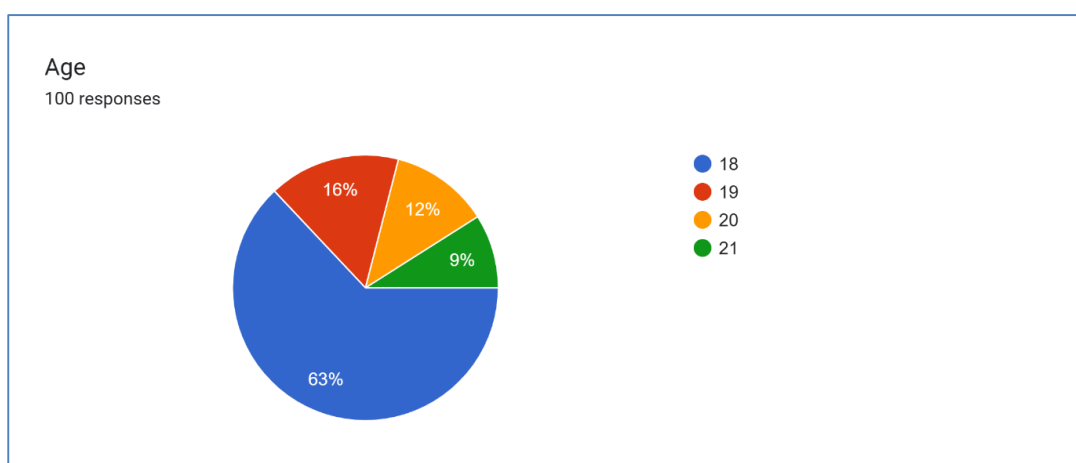
Sampling Strategy and Participant Profile- The study's methodology is anchored in a carefully curated sample of 100 undergraduate students, strategically drawn from the Commerce domain to ensure a high level of academic relevance. The participant pool was restricted to a specific age bracket of 18 to 21 years, representing the core undergraduate population. This specific group was selected because their curriculum -comprising disciplines like management, marketing, and finance (including B.Com, BMS and BAF)is heavily centered on project-based learning PBL and rigorous curricular requirements that mirror real-world business scenarios.

Sampling Technique- By employing a purposive, non-probabilistic sampling method, the researchers intentionally bypassed random selection to focus on information-rich cases.

This targeted approach prioritized individuals possessing direct, practical experience with Generative AI tools, such as Chat GPT and Grammarly, within an academic context. This ensures that the data collected is not merely general, but deeply rooted in the actual workflows of students who utilize AI for complex tasks such as literature reviews, data summarization, and concept clarification.

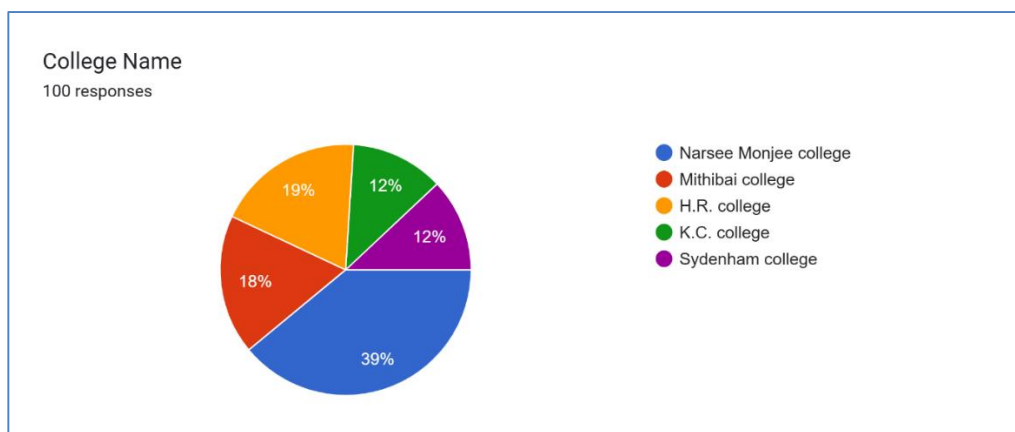
Justification of Sample Size- While a sample of 100 participants is considered modest for broad statistical generalizations, it is highly effective for an exploratory study of this nature. The concentrated focus on a high-performance cohort from premier autonomous institutions allows the study to reach thematic saturation uncovering the nuanced ways AI is currently revolutionizing commerce education and influencing student autonomy.

- **Demographic Profile of Respondents:**



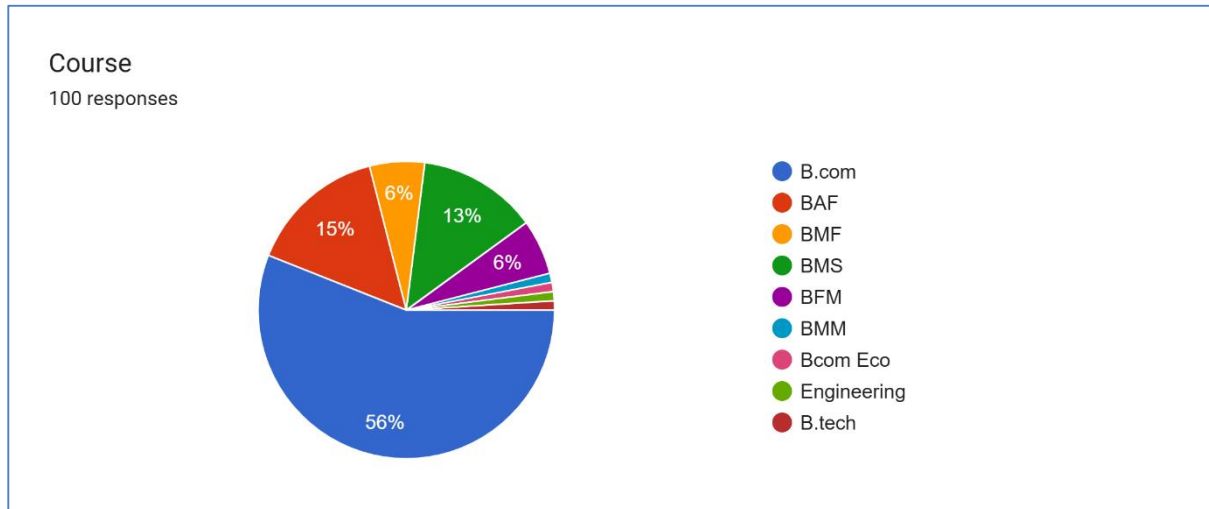
Age:

The majority of respondents (63%) were 18 years old, followed by 19 years (16%), 20 years (12%), and 21 years (9%). This indicates that the sample largely represents first-year undergraduate students.



College Name:

A significant proportion of respondents belonged to Narsee Monjee College (39%), followed by H.R. College (19%), Mithibai College (18%), K.C. College (12%), and Sydenham College (12%). This ensures representation from multiple institutions.



Course:

Most respondents were enrolled in B.Com (58%), followed by BAF (15%), BMS (13%), BMF (6%), and other courses such as BMM, Economics, Engineering, and B.Tech. This reflects diversity in academic disciplines.

V. DATA ANALYSIS AND INTERPRETATION

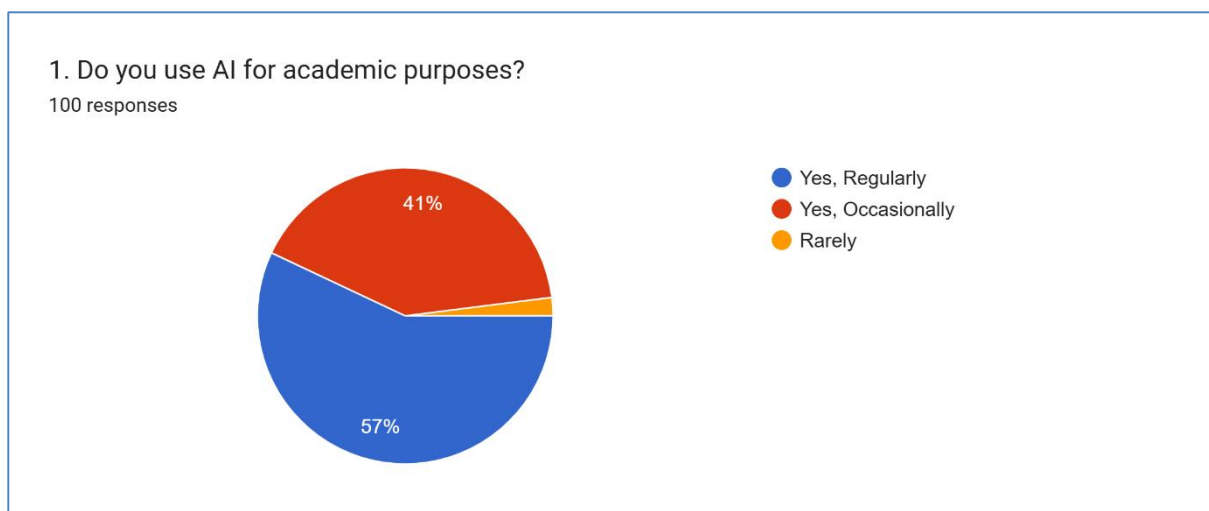


Figure 1 reveals a high level of adoption of Artificial Intelligence tools for academic purposes among undergraduate students. A majority of respondents (57%) reported using AI tools regularly, while a significant proportion (41%) used them occasionally. Only a negligible percentage indicated rare usage. This trend suggests that AI tools have become an integral

component of students' academic activities, reflecting their growing dependence on technology-driven learning support systems in higher education.

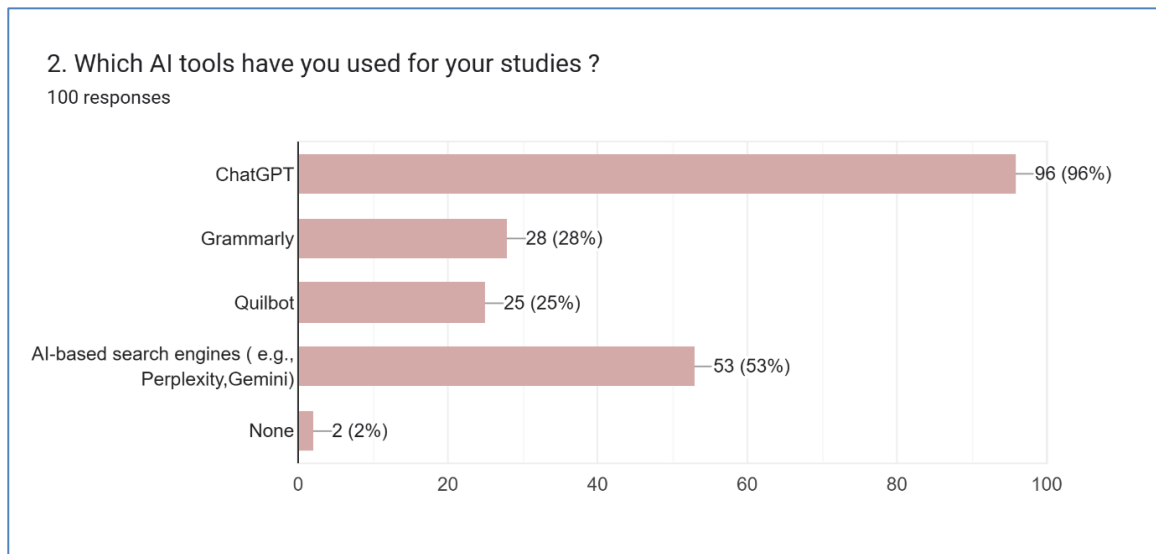


Figure 2 indicates that ChatGPT is the most widely used AI tool for academic purposes, with 96% of respondents reporting its usage. This is followed by Grammarly, used by 28% of students. The findings highlight students' preference for generative AI tools that assist in content creation, conceptual understanding, and language enhancement. The dominance of ChatGPT reflects its versatility and ease of use in supporting multiple academic tasks.

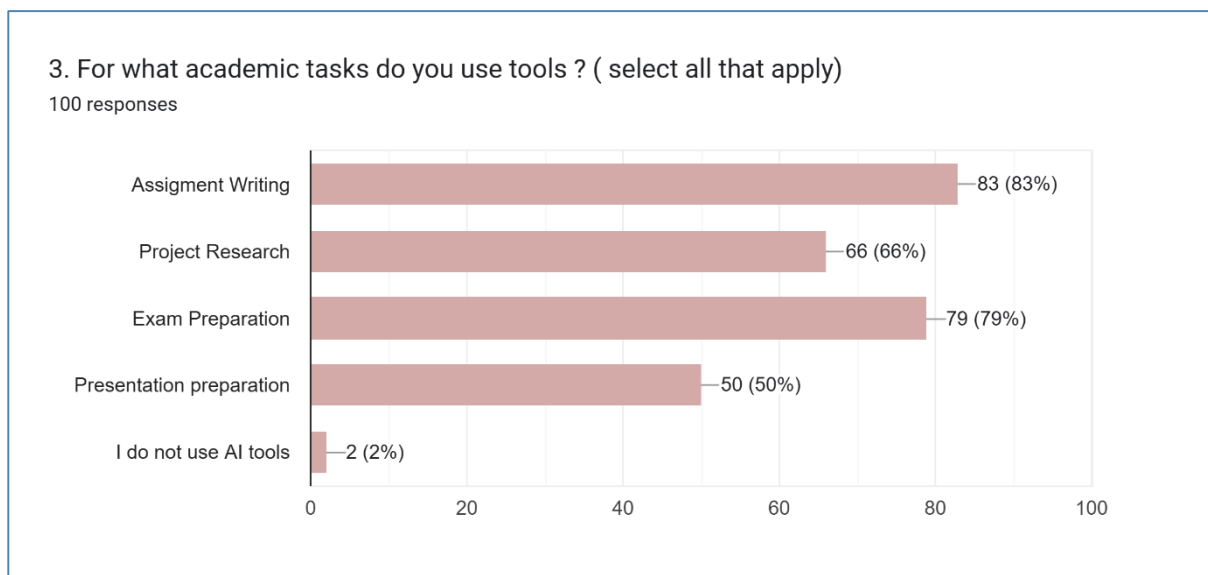


Figure 3 indicates that AI tools are predominantly used for assignment writing (83%) and exam preparation (79%), followed by project research (68%) and presentation preparation (50%). Only a very small proportion of respondents reported not using AI tools for academic tasks. This suggests that AI tools are widely utilized across multiple academic activities, highlighting their role as versatile support systems in undergraduate education.

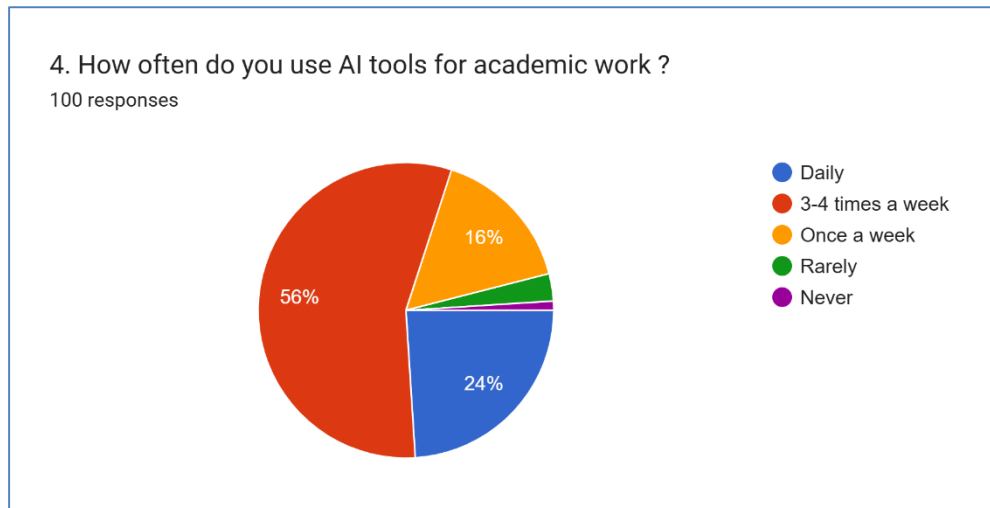


Figure 4 reveals that a majority of students use AI tools frequently for academic work. More than half of the respondents (58%) reported using AI tools three to four times a week, while 24% used them on a daily basis. A smaller proportion used AI tools once a week, and only a negligible percentage reported rare or no usage. This pattern reflects the regular integration of AI tools into students' academic routines.

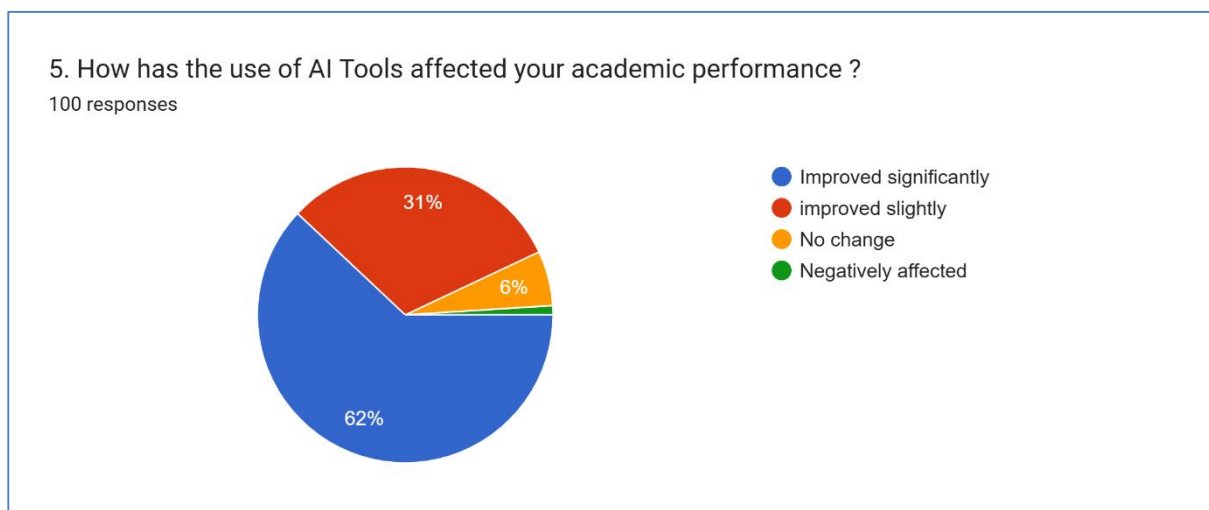


Figure 5 shows that the use of AI tools has had a largely positive impact on students' academic performance. A significant majority of respondents reported that their academic performance improved either significantly (62%) or slightly (31%) due to AI usage. Only a minimal percentage observed no change or negative effects. These findings suggest that AI tools contribute positively to academic outcomes when used appropriately.

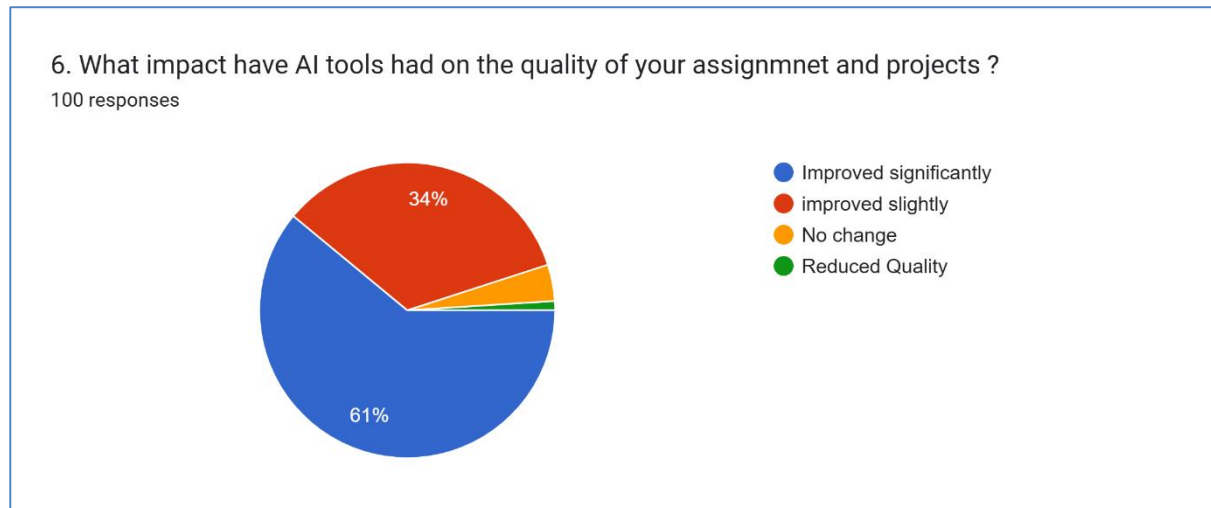


Figure 6 indicates that AI tools have substantially improved the quality of assignments and projects. A majority of respondents (61%) reported a significant improvement in quality, while 34% observed slight improvement. Very few respondents indicated no change or reduced quality. This demonstrates that AI tools play a supportive role in enhancing clarity, structure, and overall academic presentation of student work.

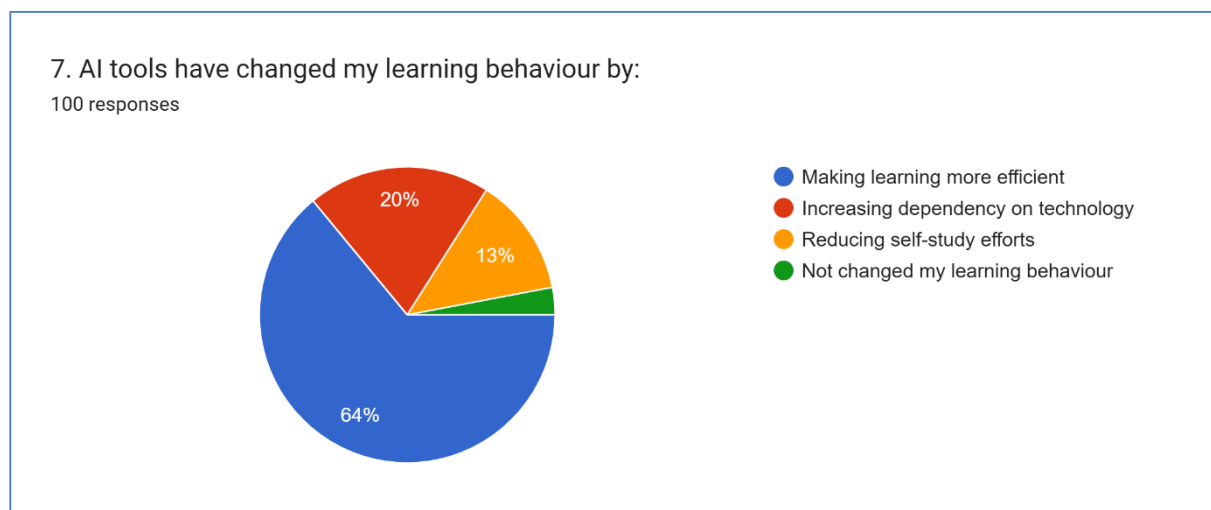


Figure 7 reveals a paradigm shift in learning behaviours, transitioning from traditional models to learner-centered, technology-assisted frameworks where 64% of students find learning more efficient. The data indicates that AI has become an integral academic component, with 20% of respondents noting an increased dependency on technology and 13% reporting reduced self-study efforts. This trend suggests that students are fundamentally altering their strategies, leveraging AI to synthesize vast amounts of information rapidly to meet academic demands. Consequently, learning has evolved to be more outcome-oriented, reflecting a growing reliance on technology-driven support systems in higher education. Overall, the high

adoption rate shows that these tools are no longer optional but a core part of the undergraduate academic routine.

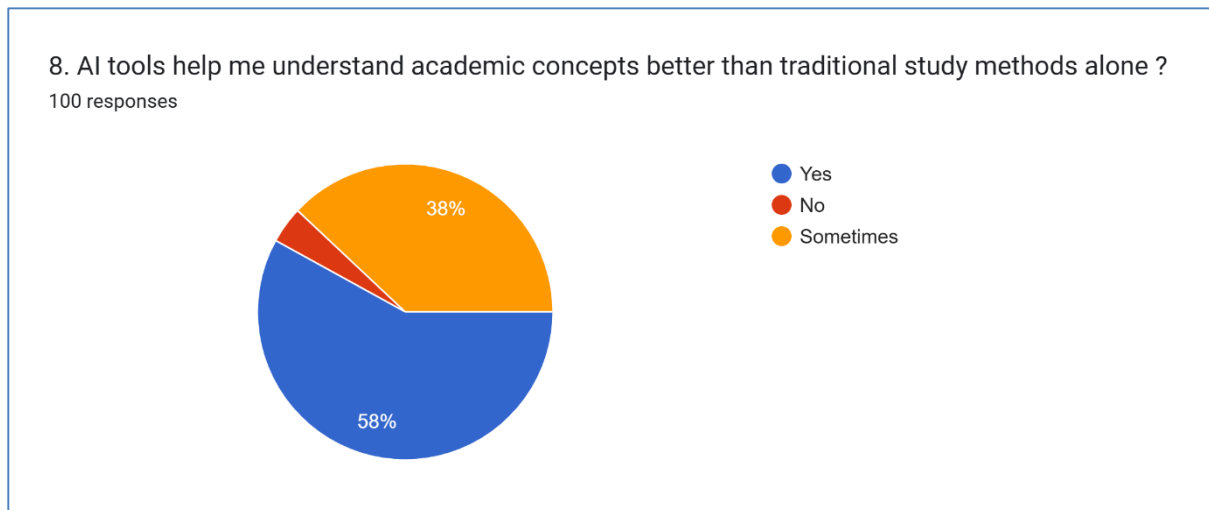


Figure 8 reveals that AI tools significantly enhance the comprehension of complex material, with a majority of 58% of students stating they understand academic concepts better than through traditional study methods alone. Additionally, 38% of respondents feel these tools help them sometimes, indicating that AI serves as a valuable supplementary resource for the vast majority of the student population. Only a negligible fraction reported no improvement in their understanding.

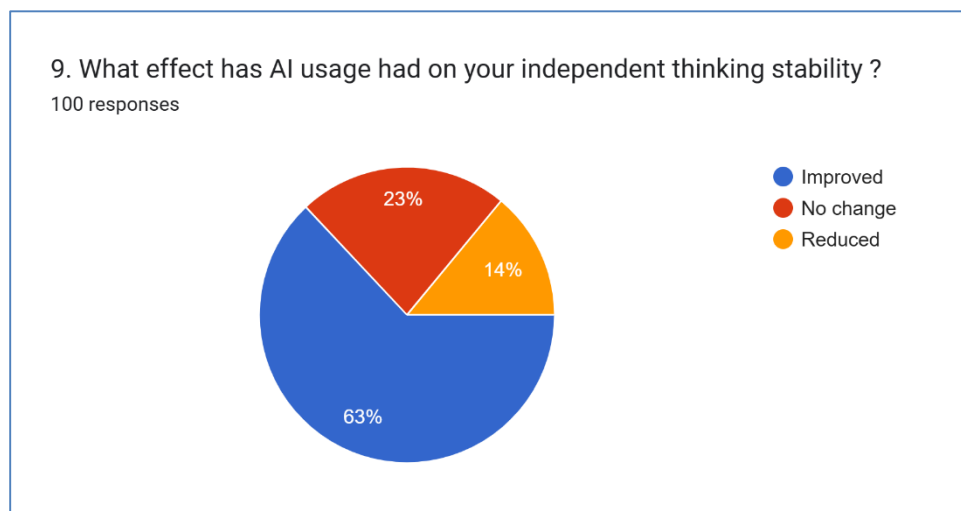


Figure 9 reveals a positive impact on cognitive development, with 63% of respondents reporting that AI usage has improved their independent thinking stability. While 23% of students observed no change in their thinking patterns, only 14% felt their independent thinking was reduced. This suggests that AI is largely being used as a tool to stimulate and support personal thought processes rather than as a substitute for original thinking.

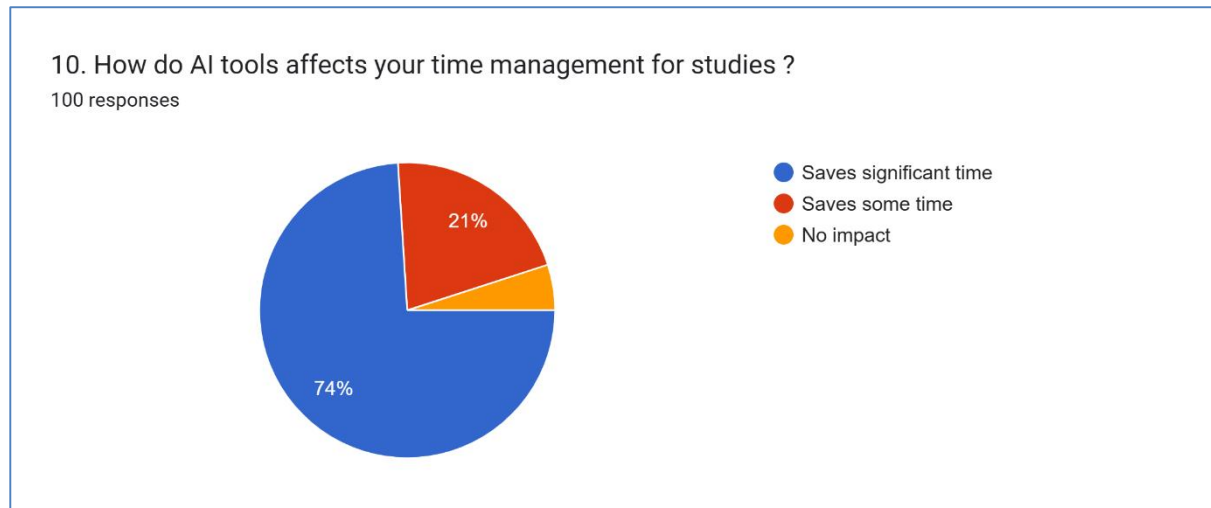


Figure 10 reveals the profound impact of AI on student productivity, showing that an overwhelming 74% of respondents save significant time on their studies through AI integration. A further 21% report saving some time, leaving only a minimal 5% who perceive no impact on their time management. This underscores AI's primary role as an efficiency-driving tool that allows students to optimize their academic schedules.

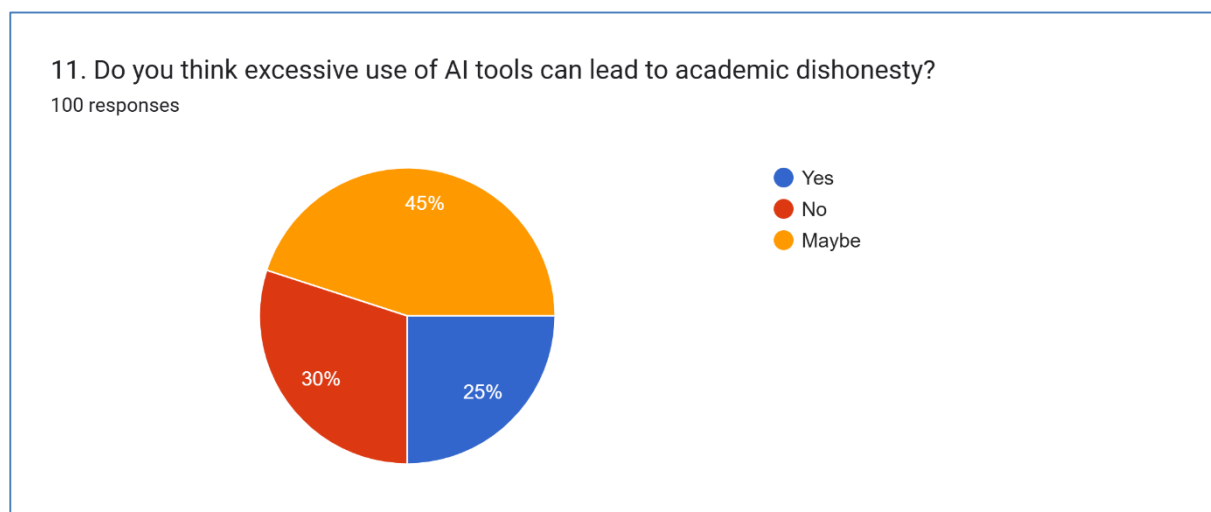


Figure 11 reveals a nuanced perspective on ethics, where 45% of students believe that excessive AI use "maybe" leads to academic dishonesty. While 30% do not believe it causes such issues, 25% of respondents firmly agree that it can lead to dishonest practices. This distribution reflects an ongoing awareness and caution among undergraduates regarding the ethical boundaries of technology-driven assistance.

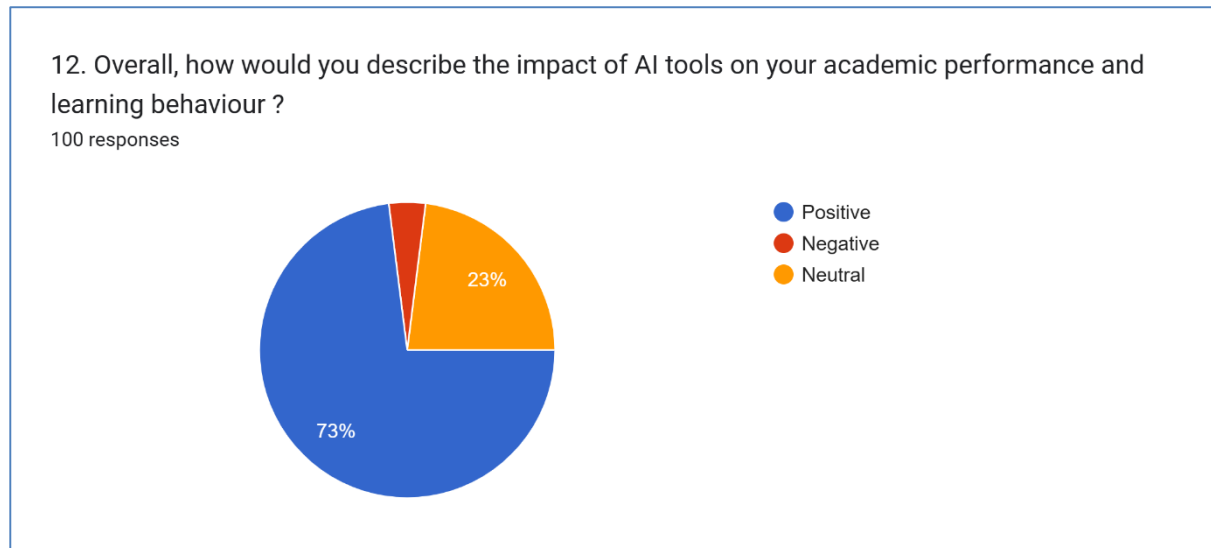


Figure 12 reveals an overwhelmingly positive sentiment regarding the total integration of AI into the academic experience. A substantial 73% of students describe the overall impact on their academic performance and learning behaviour as positive, while 23% remain neutral. With only 4% reporting a negative impact, the data confirms that AI has become a foundational and well-received element of modern higher education.

VI. Conclusion:

The present study highlights the growing and multifaceted role of Artificial Intelligence (AI) tools in shaping the academic performance and learning behaviour of undergraduate students. The findings indicate that AI-based applications have become an integral part of students' academic routines, primarily due to their ability to enhance efficiency, improve conceptual understanding, support language and presentation skills, and assist in effective time management. For many students, AI tools function as accessible academic support systems that complement traditional learning methods.

At the same time, the study brings attention to emerging concerns associated with increased reliance on AI tools. While students acknowledge the academic benefits of AI, apprehensions regarding over-dependence, reduced originality, and the potential weakening of critical thinking skills were also observed. These findings reflect a growing dependency paradox, wherein the convenience and effectiveness of AI may unintentionally discourage independent cognitive engagement if not used responsibly.

The study emphasizes that AI tools should be viewed as supplementary learning aids rather than substitutes for human intelligence, creativity, and analytical reasoning. Responsible usage, guided by ethical awareness and academic integrity, is essential to ensure that AI enhances learning outcomes without compromising originality or intellectual development. Educational institutions play a crucial role in this process by establishing clear guidelines, promoting digital and AI literacy, and encouraging reflective and critical use of technology among students.

In conclusion, the effective integration of AI tools in higher education requires a balanced and regulated approach that maximizes academic benefits while mitigating behavioural and ethical challenges. When used judiciously, AI has the potential to enrich learning experiences, improve academic performance, and prepare undergraduate students for a technology-driven academic and professional environment. Future research may expand this study by incorporating larger and more diverse samples, comparative analyses across disciplines, and longitudinal approaches to better understand the long-term implications of AI usage on learning behaviour and academic development.

VII. Recommendations

Based on the findings of the study, the following recommendations are proposed to ensure the effective and responsible use of Artificial Intelligence tools in higher education:

1. **Integration of AI Literacy in Curriculum:** Higher education institutions should incorporate AI literacy and ethical usage guidelines into the undergraduate curriculum to help students understand both the capabilities and limitations of AI tools.
2. **Promotion of Responsible AI Usage:** Colleges should develop clear institutional policies regarding acceptable AI use in academic work to prevent misuse, plagiarism, and over-dependence on AI-generated content.
3. **Encouragement of Critical Thinking:** Educators should design assessments and learning activities that promote analytical reasoning, problem-solving, and originality, ensuring that AI tools are used as support rather than substitutes for independent thinking.

4. **Faculty Training and Awareness:** Faculty members should be trained to understand emerging AI technologies and their academic implications, enabling them to guide students effectively and identify inappropriate usage patterns.
5. **Balanced Assessment Methods:** Institutions should adopt diversified evaluation methods such as oral presentations, case-based learning, and reflective assignments to assess genuine understanding beyond AI-assisted outputs.
6. **Further Research and Monitoring:** Continuous research should be encouraged to monitor evolving AI usage trends and their long-term impact on students' academic performance and learning behaviour.

These recommendations aim to assist educational institutions, educators, and students in leveraging AI tools responsibly while safeguarding academic integrity and fostering sustainable learning outcomes.

VIII. Limitations of The Research Study:

Instead of providing a general overview of artificial intelligence in the global education sector, this study addresses the particular ways in which AI tool adoption affects the learning behaviours of a localized, high-performance cohort of commerce undergraduates. The main constraints defining this investigation are:

- **Geographical and Academic Specificity:** The study is strictly confined to the Commerce stream (B.Com, BMS, BAF) within premier autonomous colleges in Mumbai, rather than a broad cross-disciplinary or national analysis.
- **Demographic Boundaries:** The research isolates a specific age bracket of 18 to 21 years to represent the core undergraduate population, excluding postgraduate or adult learner demographics.
- **Temporal Snapshot:** Rather than a longitudinal study of evolving trends, the data represents a static "real-time snapshot" captured during a condensed two-week window in the 2024–2025 academic cycle.

- Technological Scope: The analysis is restricted to specific "Generative AI and linguistic refinement tools" (such as ChatGPT and Grammarly) used for academic workflows, rather than the full spectrum of educational technology

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Beyond The Line of Actual Control: Deconstructing China's Expansionist Claims

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Abstract:

Running through the high, frozen terrain of the Himalayas, the Line of Actual Control (LAC) is more than just a border line — it sits at the heart of one of Asia's most volatile disputes. The India-China rivalry has grown well beyond simple military face-offs, now playing out through diplomatic pressure and deliberate use of government processes as weapons. By looking closely at armed clashes—including those at Galwan Valley and Yangtse—alongside episodes such as restrictive visa measures targeting athletes and the 2025 detention of Pema Wang Thongdok, this paper shows how Beijing uses “bureaucratic aggression” as a deliberate tactic. The paper shows how China uses military force, civil administration, and diplomacy together to weaken India's territorial claims in Arunachal Pradesh, Sikkim, and Ladakh. This study argues that these acts point to a fragile, uneasy balance shaped by clashing historical claims and competing maps, and offers a framework for thinking about the ongoing fight over territory and self-rule.

Keywords: LAC, Symbolism, bureaucratic, sovereignty, cartographic.

Scope of the Research:

This study focuses on the root causes and geographic disputes shaping India-China ties, with special attention to how “positional rivalry” and “administrative warfare” have grown and threatened the stability of the relationship.

The study covers about eighty years, starting from just before independence (the 1947 Asian Relations Conference) and going through the crucial 1962 war. Particular focus falls on the recent period (2000–2025), which saw rapid infrastructure buildup on the Tibetan plateau, the 2017 Doklam standoff, the deadly 2020 Galwan clash, and ongoing diplomatic tensions into 2025.

While trade and supply chain links matter, this study does not go into economic data or naval competition in the Indian Ocean unless they directly affect the land border situation.

Objectives of the Research:

This study breaks down the many layers of the India-China rivalry, going beyond military geography to look at the newer administrative and bureaucratic dimensions of the conflict. The specific objectives are:

1. To trace the border dispute from the open fighting of the 20th century (1962 War, 1967 Clashes) to today's "Gray Zone" tactics, showing how Beijing moved from outright land grabs to slow, step-by-step encroachment.
2. To define and apply the concept of Bureaucratic Aggression as a tool of state policy, looking at how visa refusals and passport rejections (like the 2025 Pema Wang Thongdok case) are used to chip away at India's authority over Arunachal Pradesh.
3. To examine why the 1993 and 1996 Confidence-Building Measures (CBMs) failed to stop the military buildup along the LAC, using the Galwan (2020) and Yangtse (2022) clashes as clear examples of this breakdown.
4. To suggest concrete policy steps for New Delhi that go beyond just reacting to crises, pushing for a practical approach that pairs military strength with matching administrative countermeasures against China's wide-ranging pressure tactics.

Methodology Used:

This study uses a qualitative review method. Rather than collecting new data, it brings together existing academic work, government policy documents, and expert assessments to understand what drives the India-China territorial dispute. This approach works well for

studying complex, long-running geopolitical shifts that cannot be fully captured by numbers alone.

The collected materials were read and grouped by theme, which allowed for comparisons across different time periods.

Since this study works with secondary sources, it is constrained by what is publicly available. Given the sensitive military nature of the border, some classified strategic documents are not part of the open-source literature used here.

Introduction:

1.1. Background: The Anatomy of a Contested Frontier:

The border conflict between India and China has dragged on for decades and shows no sign of ending anytime soon — making it one of the most difficult territorial standoffs anywhere in the world. The LAC stretches roughly 3,488 kilometers and runs through three broad areas: the Western sector covering Ladakh, the Middle sector covering Himachal Pradesh and Uttarakhand, and the Eastern sector covering Sikkim and Arunachal Pradesh. The roots of the problem go back to the 1913–1914 Simla Convention, where the McMahon Line was drawn as the border between British India and Tibet. China rejected that line then and still does today, pressing claims over large stretches of land that India administers.

The 1962 war was the only time the two countries fought a full battle, but the border has not been quiet since. What once looked like a frozen standoff has gradually turned into a very active, back-and-forth contest for ground. Official Indian records make the trend hard to ignore — reported border violations went from 228 in 2010 to 663 in 2019, a near tripling that reflects a deliberate shift toward more assertive behaviour.

1.2 Significance of the Research:

Getting a full picture of the India-China dispute today means looking past the headline military incidents and paying attention to the quieter, less obvious tools China uses to press its territorial

case. The examples in this paper — soldiers dying at Galwan, an Indian woman held at Shanghai airport, athletes denied accreditation at the Asian Games — show a campaign that runs on multiple tracks at once, all aimed at weakening India's hold over disputed land.

The Evolution of Conflict: From Imperial Lines to Kinetic Wars (1914-1967)

5.1. Genesis: The Imperial Legacy (1914–1947):

The tension between India and China did not begin in 1947 or 1949. It was already taking shape much earlier, as British imperial expansion ran into a Chinese state that was losing its grip on its own periphery. The clearest flashpoint came at the 1914 Simla Convention. British official Sir Henry McMahon sat down with representatives from British India and Tibet to draw a line that would separate their territories.¹

Tibet agreed to the boundary, but China's representative Ivan Chen walked away without signing. Beijing's position, held by both the ROC and the PRC ever since, is simple: Tibet was not a sovereign state and had no authority to conclude international agreements, so the McMahon Line was never valid. That disagreement never went away. Britain ran the North-East Frontier Agency (NEFA, today's Arunachal Pradesh) as part of its empire, while Chinese maps continued to label the same land as *South Tibet*.²

5.2 Post-Independence Indian Assertions (1947-1961):

When India became independent in 1947, it simply picked up where the British left off and treated the McMahon Line as the country's northeastern border. Nehru's government saw no reason to renegotiate it. But China, now under Communist Party rule from 1949, had no intention of accepting a boundary it had always seen as a colonial imposition.³

¹ Christopher Rossi, 'Interstitial Space and the High Himalayan Dispute between China and India', (2021) Summer.

² Christopher Rossi, 'Interstitial Space and the High Himalayan Dispute between China and India', (2021) Summer.

³ "McMahon Line," Wikipedia, last modified 2025.

5.3. The Kinetic Era (1962–1967):

- **The Psychological Fracture (1962 War):**

The warm post-independence mood of *Hindi-Chini Bhai-Bhai* (brotherhood) covered over a very real and growing rift. When India discovered in the late 1950s that China had quietly built a road straight through Aksai Chin — linking Xinjiang to Tibet without saying a word — the friendly facade crumbled fast. On October 20, 1962, the PLA attacked on two fronts simultaneously — pushing into Ladakh and along the McMahon Line. China’s military performance was overwhelming, and India’s losses were severe. The defeat shook the country deeply and forced a fundamental rethink of India’s defence posture.⁴

- **Chinese Ceasefire and Withdrawal (November 19-21, 1962):**

On November 19, 1962, after breaking Indian defenses in NEFA, Chinese forces received orders to cease hostilities, and Beijing announced that its frontier guards would soon stop firing along the entire border.⁵ China then unilaterally declared a ceasefire to take effect from midnight on November 21, 1962, and stated that, beginning December 1, its troops withdraw to position of 20 kilometres behind what it described as “the line of actual control which existed between China and India on 7 November 1959” — a formulation the Indian side immediately disputed.⁶ The Chinese withdrawal created the initial Line of Actual Control (LAC), though both nations maintained competing interpretations of its precise location.⁷ China retained control of Aksai Chin (approximately 38,000 square kilometers), establishing a strategic highway through this territory.⁸

The Era of Managed Instability and "Salami Slicing" (1968–2017)

6.1. The Architecture of Peace: From Thaw to Codification (1976–2005):

⁴ Christopher Rossi, ‘Interstitial Space and the High Himalayan Dispute between China and India’, (2021) Summer.

⁵ Bruce Riedel, ‘JFK’s Forgotten Crisis: Remember When China Invaded India in the Middle of the Cuban Missile Crisis’, (2016) Brookings Institution.

⁶ ‘Sino-Indian War’, (accessed 2025) Wikipedia, section ‘Ceasefire’.

⁷ ‘Line of Actual Control’, (accessed 2025) Wikipedia, section ‘After the 1962 Sino-Indian War’.

⁸ Kenneth Pletcher, ‘Aksai Chin | History, Conflict, & Map’, (2012) Encyclopaedia Britannica.

Relations stayed frozen for over a decade after 1962. By 1976, however, both sides decided to restore ambassadorial contact. Neither country could afford to stay locked in open hostility forever, particularly with the Cold War reshaping the wider region and China fighting Vietnam in 1979. Over eight rounds of talks between 1981 and 1988, India and China worked out a kind of practical compromise: neither side would solve the border question anytime soon, but both would try to build normal ties anyway. The problem was put on the shelf, not resolved.⁹

6.2. The Unraveling: The Return of "Salami Slicing" (2009–2014):

Whatever goodwill those agreements had built, it did not last. From around 2009, China's conduct on the ground changed noticeably. The numbers tell the story: border transgressions rose from 228 in 2010 to 663 in 2019, a sharp increase that could not be explained away as accidents or misunderstandings. This strategy, widely called "salami slicing" — a slow, patient nibbling at disputed ground rather than a dramatic land grab. Chinese troops would set up temporary positions in areas India considered its own, wait to see if New Delhi pushed back, and consolidate whatever was not contested.¹⁰

6.3. The Doklam Crucible (2017):

All of this came to a head in the summer of 2017 at Doklam, a narrow plateau where China, Bhutan, and India all have overlapping claims. What made this episode different was that China was not just pushing into Indian-claimed territory — it was trying to build a road through Bhutanese land, which would have put Chinese forces dangerously close to the Siliguri Corridor, or "Chicken's Neck," that connects India's northeast to the rest of the country. India sent troops to physically block the construction. The standoff lasted 73 days and made the stakes very clear — India was willing to act beyond its own claimed lines to stop Chinese expansion. Both sides eventually pulled back, but the episode exposed just how little the confidence-building agreements of the 1990s and 2000s had actually achieved.¹¹

⁹ M. Taylor Fravel, 'China and the Border Dispute with India After 1962', (2020) MIT Security Studies Program.

¹⁰ 'A Geospatial Analysis of Chinese Border Incursions into India', (2022) PLOS ONE.

¹¹ 'Blow by Blow: A Timeline of India, China Face-off over Doklam', (2017) Hindustan Times; 'Explaining the India-China Standoff at Doklam: Causes and Implications', (2017) IndiaChinaInstitute.org; 'Doklam Issue, Background, Map, Timeline', (2025) Vajiram & Ravi.

The Violent Peace and the Collapse of Mechanisms (2020–2024)

The clashes along the LAC made front pages, but something subtler was also happening. China had started using paperwork, bureaucracy, and international travel systems as tools in the same dispute. Rather than just contesting land, Beijing was now contesting India's very identity as the sovereign power in Arunachal Pradesh. The approach — sometimes called “Lawfare” — is straightforward in practice: treat ordinary government documents like visas and passports as opportunities to signal that Indian authority over Arunachal Pradesh is not recognised. The tools are mundane; the message is pointed.¹²

7.1. Sportswashing Sovereignty: The Asian Games Crisis (September 2023):

The most visible early example played out at the Hangzhou Asian Games in September 2023. Three Indian Wushu athletes — Nyeman Wangsu, Onilu Tega, and Mepung Lamgu — were denied accreditation by Chinese authorities for no reason other than the fact that they came from Arunachal Pradesh. Instead of normal visas, they were handed “stapled visas” — a loose sheet of paper attached to the passport rather than a stamp inside it. The message was unmistakable: China was treating these Indian citizens as if they needed an internal travel document, the kind issued to Chinese nationals, not a visa issued to a foreign visitor. It was a deliberate political act, using the backdrop of an international sporting event to make the point that India's authority over Arunachal Pradesh is, in Beijing's view, not legitimate.¹³

7.2. The Pema Wang Thongdok Incident (November 2025)

Two years later, the same logic was applied to someone with no public profile at all. On November 21, 2025, Pema Wangjom Thongdok — an ordinary Indian citizen from Arunachal Pradesh travelling from London to Japan — was stopped at Shanghai Pudong Airport and held for 18 hours. According to her account and media reports, Chinese immigration officials told her that her Indian passport could not be accepted because Arunachal Pradesh “belonged to China,” and suggested she apply for a Chinese travel document instead.

¹² Antara Ghosal Singh, ‘Beyond the LAC: China's Lawfare Against India’, (2024) Stimson Center.

¹³ Nihal Koshie, ‘China Denies Arunachal Athletes Accreditation Again, for Asian Games: A Look at Beijing's Long Record’, (2023) The Indian Express; ‘India Pulls Out of Games in China Over Stapled Visas for Arunachal Athletes’, (2023) The Indian Express; ‘Stapled Visa and Arunachal Athletes’, (2023) The Arunachal Times.

The timing was striking — barely twelve months after India and China had announced a border patrol agreement in October 2024, widely described as a diplomatic breakthrough. The Thongdok case made it hard to take that “normalisation” narrative at face value.¹⁴

7.3. Analysis: The Strategy of Jurisdictional Denial

Taken together, these incidents are not isolated slip-ups or overzealous officials acting on their own. They form a pattern — what this paper calls “Bureaucratic Aggression.” It is a calculated approach precisely because it is so hard to respond to: there are no soldiers to confront, no territory to retake, just a stamp refused or a document declared void at an airport counter far from the Himalayas.

Recommendations: Towards a Praxis of Strategic Pragmatism

The post-2020 situation makes it clear that the old approach of “managed ambiguity” no longer works. India cannot keep leaning on the static agreements of the 1990s to handle a China that is active, revisionist, and operates across many fronts. This paper recommends moving from reacting to crises toward a proactive “Integrated Deterrence” strategy that combines military readiness with diplomatic flexibility.

8.1. From "Non-Alignment" to "Multi-Vector Balancing":

India needs to drop its past hesitation and fully commit to a “multi-vector” diplomatic strategy. While keeping its strategic independence, New Delhi should build external partnerships to balance China’s growing weight. The Quadrilateral Security Dialogue (India, US, Japan, Australia) needs to move past statements of solidarity toward real cooperation — sharing intelligence and building awareness of the Indian Ocean Region (IOR). India should also draw connections between China’s Himalayan aggression and its behaviour in the South

¹⁴ ‘India and China Trade Barbs After Passenger Detained at Shanghai Airport’, (2025) BBC News; ‘India Lodges Protest After Arunachal Woman Detained at Shanghai Airport Over Passport’, (2025) The Wire; ‘Khandu Condemns China After Arunachali Detained at Shanghai Airport’, (2025) The Arunachal Times; Sudha Ramachandran, ‘What’s Next for China-India Relations?’, (2025) The Diplomat.

China Sea. By framing the LAC dispute not just as a bilateral issue but as part of a broader challenge to the rules-based order, India can raise the international cost of Beijing's actions.

8.2. Countering "Bureaucratic Aggression" with Administrative Reciprocity:

The Pema Wang Thongdok case makes it obvious that China is turning routine administrative tools into weapons. India's response needs to go beyond formal protests and include Reciprocal Visa Protocols and a Global Awareness Campaign.

8.3. Concluding Recommendations:

Ultimately, India needs to be realistic and accept that this is a long-term, structural rivalry. The aim is not to restore the idealized Hindi-Chini-Bhai-Bhai era, but to build what can be called 'Armed Coexistence' — an uneasy peace where both sides cooperate not out of goodwill, but because the costs of open conflict are simply too high.

Conclusion: The Illusion of Normalization and the Cognitive War

The India-China border dispute, from the colonial-era maps of 1914 to the passport checks of 2025, has not been settled — it has simply changed shape. This paper argues that the simple war-versus-peace framing no longer fits the situation along the LAC. The two countries are now in a phase of "comprehensive attrition," where military pressure and administrative tactics work hand in hand.

8.1. The Failure of the Kinetic Solution:

From 1962 to the 2020 Galwan clash, it is clear that military force yields diminishing returns. The 1962 war let China rewrite the map in Aksai Chin, but today's military buildup on both sides has only produced a stalemate.

8.2. The New Front: Bureaucratic Sovereignty:

In response, as this paper shows, Beijing has opened a new front in the “gray zone.” The 2023 visa denial to Arunachal athletes and the 2025 detention of Pema Wang Thongdok are two telling examples of this approach. By rejecting Indian passports at airports abroad, China is trying to sidestep the military stalemate and win the sovereignty argument through perception. This “bureaucratic aggression” aims to strip India of its territorial legitimacy — not by force, but by treating Indian documents as if they were worthless.

8.4. Final Verdict:

This study concludes that the current “peace” along the Himalayas is, in fact, an illusion. No gunfire does not mean no conflict. As long as China continues its “bureaucratic aggression,” the underlying dispute remains very much alive.

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Impact of Akshaya Tritiya On India's Domestic Gold Market

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Abstract:

This research examines the structural and behavioural dynamics of the Indian gold market during the Akshaya Tritiya festival. By synthesizing primary survey data and secondary time-series analysis (2019–2025), the paper identifies a "Paradox of Inelasticity," wherein cultural mandates override traditional price-demand mechanisms. The study investigates the efficacy of digital substitution through a comparison of mean transaction values and introduces the Consumer Affordability and Substitution Optimizer (CASO) model as a framework for rationalizing festive.

Keywords: Auspicious Consumption, Behavioural Economics, Price Inelasticity, Substitution Effect, Digital Gold Adoption, Cultural Mandate

Introduction and Background:

Akshaya Tritiya, falling on the third lunar day of the bright half of the *Vaishakha* month, is traditionally believed to be the most auspicious window for asset acquisition in the Hindu calendar. The term "Akshaya"—meaning "eternal" or "never diminishing"—fuels a pan-Indian belief that any venture or investment initiated on this day will result in lasting prosperity.

This cultural mandate has evolved into a predictable, high-impact economic event that creates massive seasonal demand for gold. Despite domestic gold prices nearly doubling since 2022 and touching record highs of ₹1,00,000 per 10 grams in 2025, the Indian consumer's

commitment to this ritual remains unwavering. This creates a significant macroeconomic burden, as concentrated festive demand drives gold imports to surge—sometimes by nearly 200% year-on-year—directly contributing to a widening national trade deficit that reached \$41.68 billion in late 2025.

Comprehensive Literature Review:

- **Bansal, R. (2018) *Management Science Review*:** Festivals, especially Diwali, significantly boost consumer spending on items like electronics and gifts, driven by emotional and cultural motivations. This surge, amplified by e-commerce deals, stimulates the economy and offers businesses a major opportunity, recommending they use culturally sensitive, personalized marketing and discounts.
- **Kapoor, A. & Singh, R. (2020) *Journal of Marketing Research: Festivals*** like Durga Puja and Diwali are powerful economic catalysts in India., causing a sudden surge in consumer spending, driven by tradition and auspicious beliefs. This activity boosts major sectors (retail, e-commerce, apparel, electronics) and stimulates local economies
- **Patel, S. (2021) *Int. Journal of Economics and Commerce*:** Akshayaa Tritiya is an auspicious festival that drives a major surge in consumer spending, particularly for gold. People purchase gold and make investments on this day believing it brings everlasting prosperity. This cultural demand strongly boosts the real sales of gold , which jewellers capitalize on with aggressive promotions and discounts.
- **Kumar, S. & Sharma, M. (2022) *Indian Journal of Global Economics*.** : Festivals like Diwali are powerful economic catalysts in India, causing a major surge in consumer spending on luxury goods, driven by tradition and emotion. This activity strongly boosts key sectors (retail, e-commerce, tourism) and local economies

Detailed Research Methodology:

This study adopts a mixed-methods approach, utilizing both quantitative primary surveys and analytical secondary research.

- **Secondary Data Streams:** Data on import volumes and trade deficits were sourced from the Reserve Bank of India (RBI) and the Ministry of Commerce.

- **Primary Survey:** More than 160 active buyers were surveyed to determine substitution rates, age-based participation, and spending.

Hypothesis Testing:

Hypothesis 1

- **H0 (Null Hypothesis):** There is no significant difference between the percentage increase in the domestic gold price and the percentage change in total sales revenue during the Akshaya Tritiya period.
- **H1 (Alternative Hypothesis):** The percentage increase in the domestic gold price leads to a proportionately smaller change in total sales revenue, indicating that demand is monetarily price inelastic during Akshaya Tritiya.

Hypothesis 2

- **H0 (Null Hypothesis):** The decision to buy gold on Akshayaa Tritiya is independent of the respondent's general purchase frequency.
- **H1 (Alternative Hypothesis):** The decision to buy gold on Akshayaa Tritiya is dependent on the respondent's general purchase frequency, with individuals who purchase 'Rarely' or 'Only on Akshayaa Tritiya' being statistically more likely to buy during the festival.

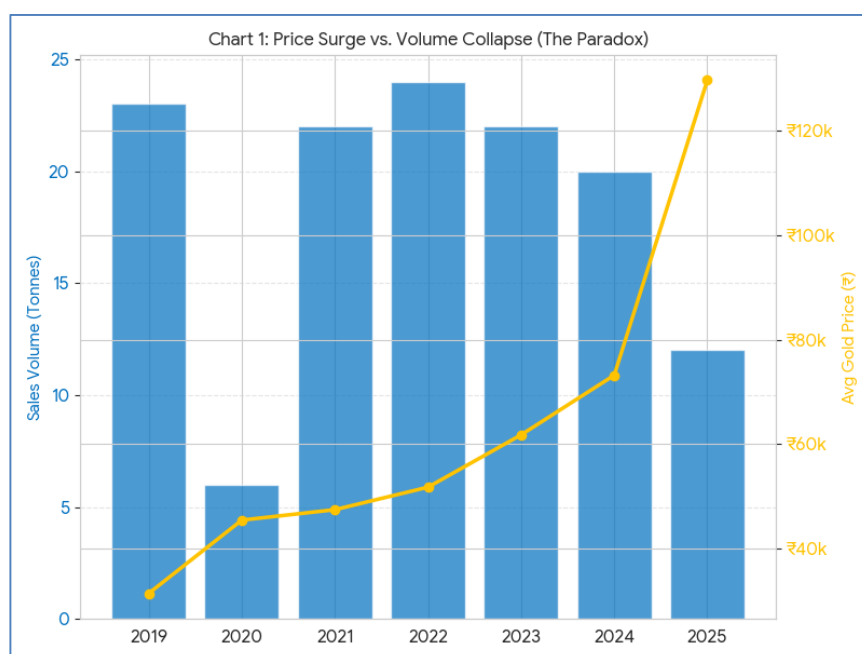
Hypothesis 3

- **H0 (Null Hypothesis):** There is no statistically significant difference in the mean spending amount between buyers who purchase Paper/Digital Gold and those who purchase Traditional Physical Gold
- **H1 (Alternative Hypothesis):** There is a statistically significant difference in the mean spending amount between digital buyers and physical buyers (specifically, digital spending is hypothesized to be lower).

Data Analysis:

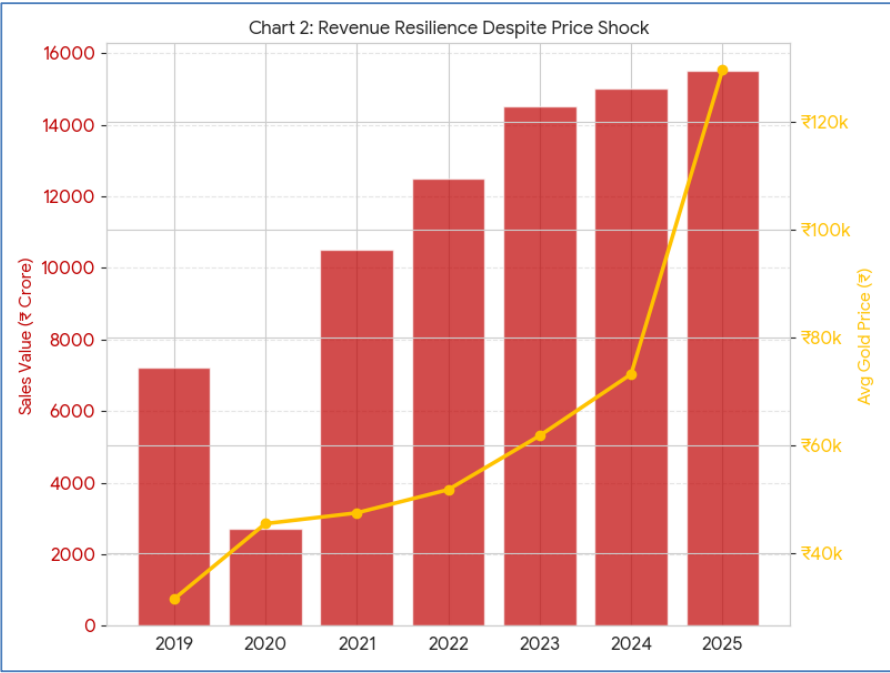
The primary survey reveals a market driven by financially established age groups, providing a stable base for festive demand.

- The respondent pool is comprised of 56.6% Female and 43.4% Male participants.
- The dominant age brackets are 45–60 (33.7%) and 26–45 (31.9%), followed by the 18–25 (27.7%) group.
- A significant 78.3% of respondents confirm purchasing gold specifically on Akshaya Tritiya.
- For 34.8% of respondents, this festival is the *exclusive* time they purchase gold all year, confirming the event as a mandatory behavioural mandate.
- Chi-Square analysis (P-value: 0.03231) indicates that while senior groups (60+) show 83.3% participation, the youngest group (18–25) participation is lower at 71.6%.



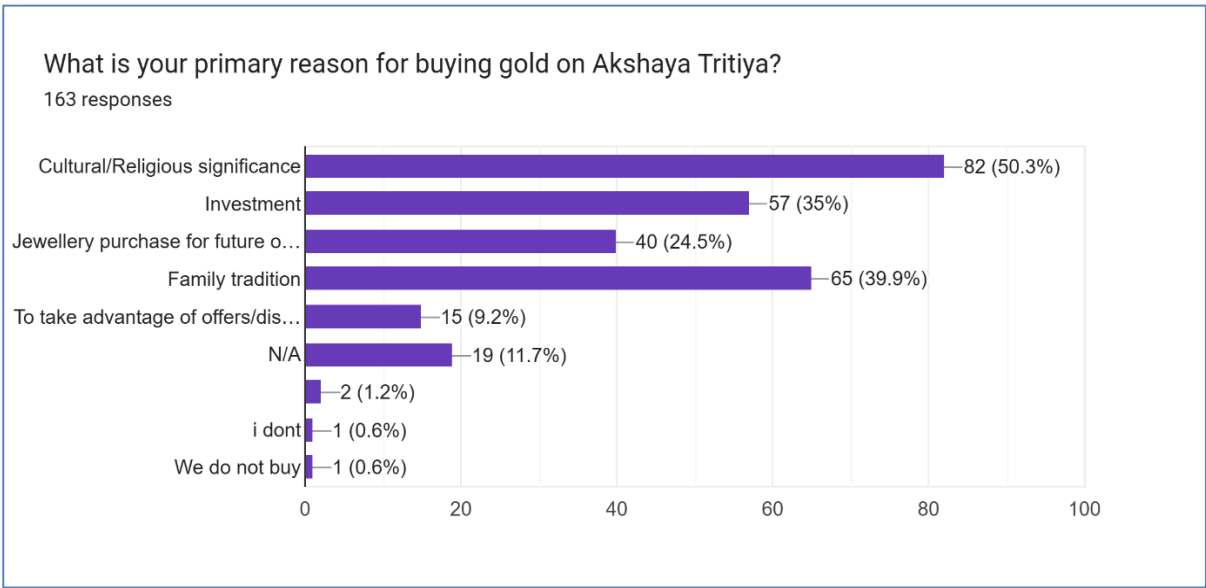
Secondary time-series data (2019–2025) highlights a "Paradox of Inelasticity" where cultural mandates override traditional price-demand mechanisms.

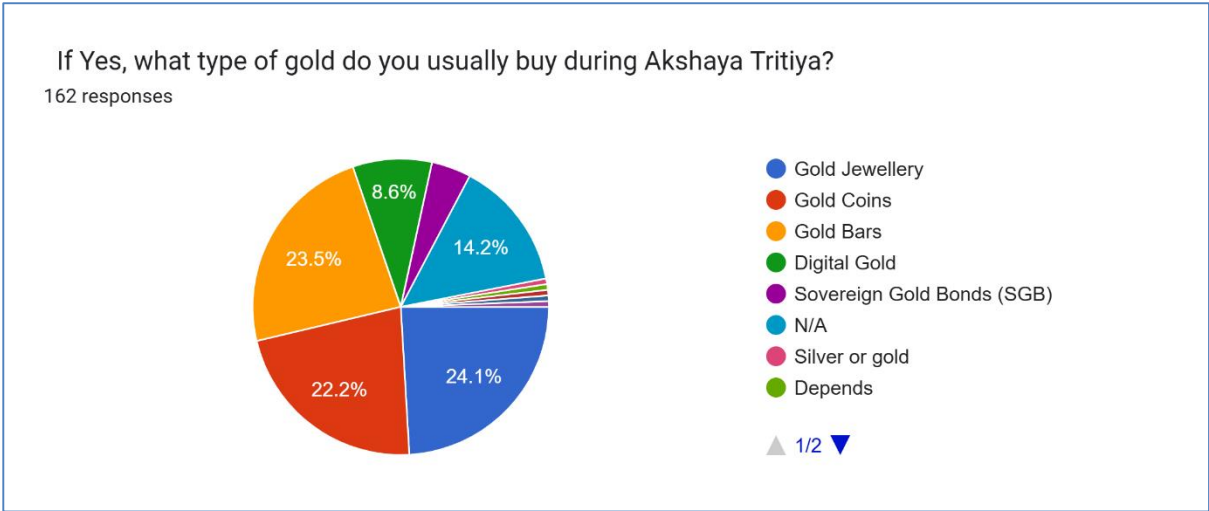
Despite domestic gold prices rising from ₹31,500 in 2019 to record highs of ₹1,29,580 in 2025, total sales revenue remained inelastic, consistently hovering between ₹15,000 and ₹16,500 Crore. The market-maintained value through a severe volume collapse, with physical demand dropping from 22 tonnes to 12 tonnes during the same period. This confirms that the cultural commitment is tied to monetary expenditure (budget) rather than physical quantity.



Our data also confirms that Akshaya Tritiya is an emotional and cultural economic catalyst rather than a purely speculative one.

- Cultural/Religious significance is the top reason for purchase (50.3%), followed by Family Tradition (39.9%) and Investment (35%).
- There is a heavy preference for physical gold, specifically Gold Bars (29.9%), Jewellery (27.6%), and Gold Coins (26.8%).
- Transaction values are focused in the mid-to-high brackets, with 29.6% of buyers spending ₹5,000 – ₹50,000 and 22.8% spending ₹50,000 – ₹1,00,000.

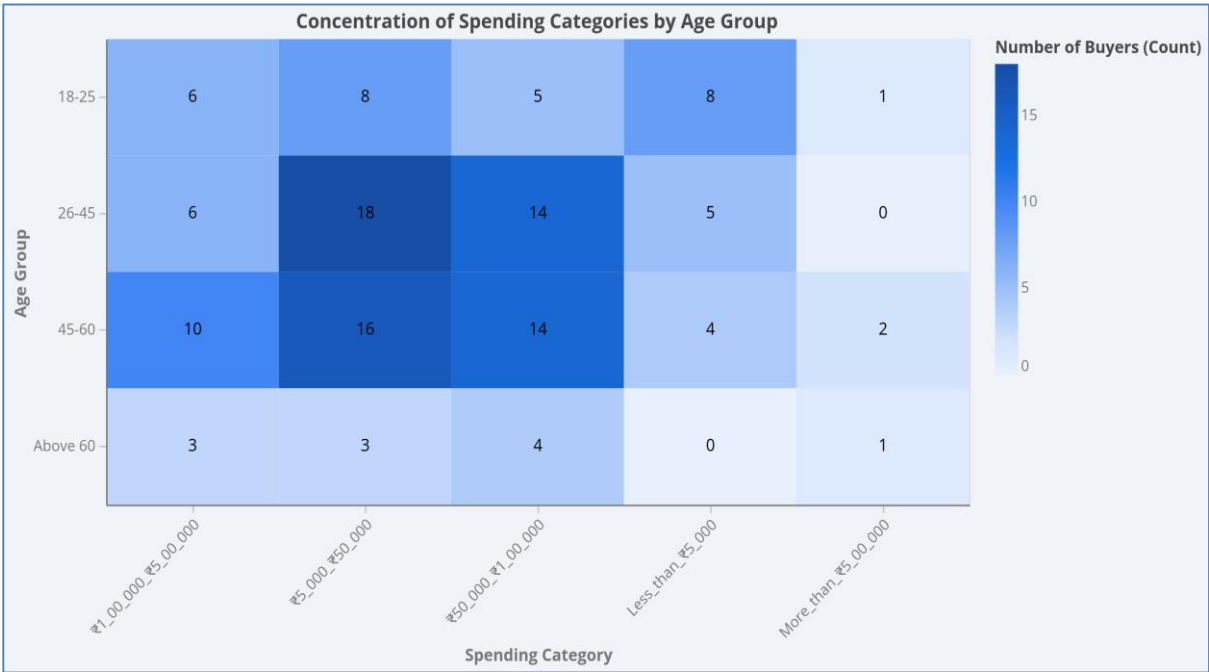


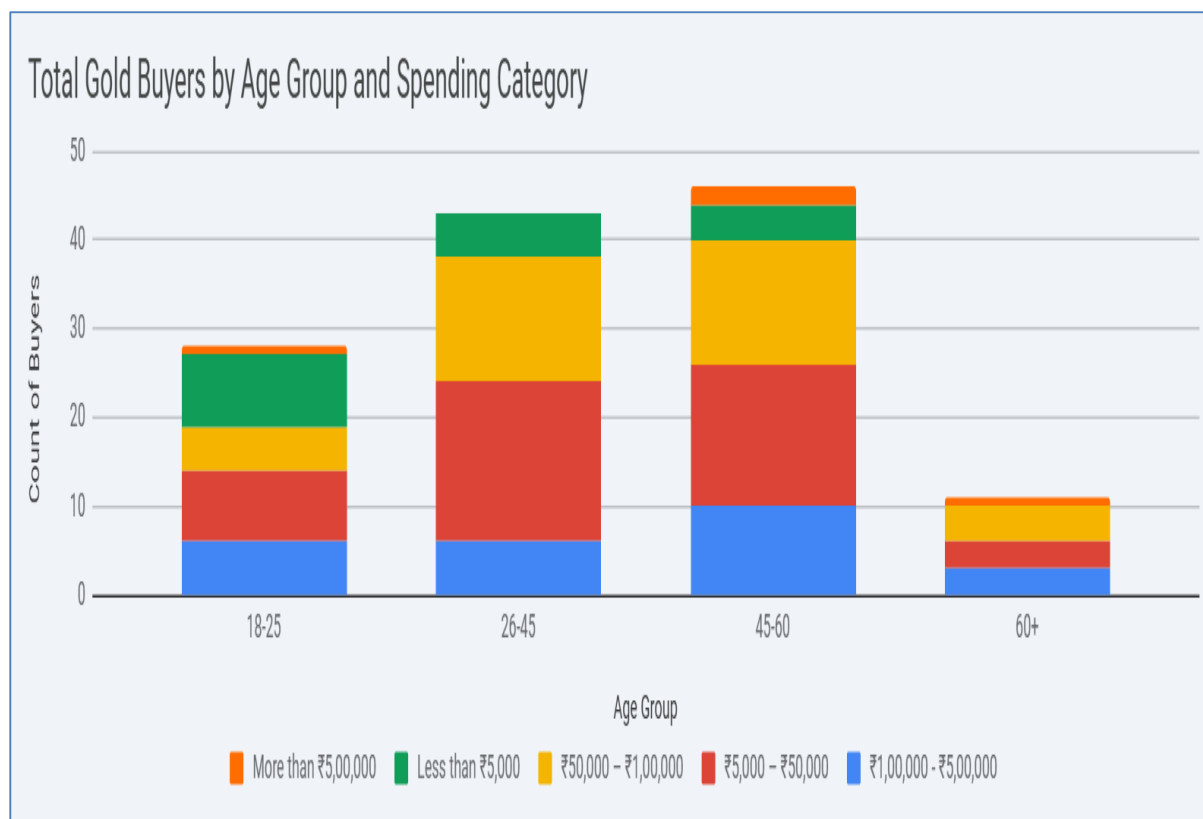


To address the macroeconomic burden of physical imports, an Independent Samples T-test was conducted to measure the efficacy of digital substitution.

- **Mean Spending Gap:** Digital buyers showed a mean spend of ₹32,250, while physical buyers showed a significantly higher mean spend of ₹256,829.
- **Statistical Result:** A P-value of 0.00002 (T-statistic: -5.0471) conclusively rejects the null hypothesis.

Digital gold is hence a financially viable substitute as it successfully channels high-value, import-intensive spending away from the physical market, supporting the study's recommendation for "digital-first" gold accumulation.





Recommendations:

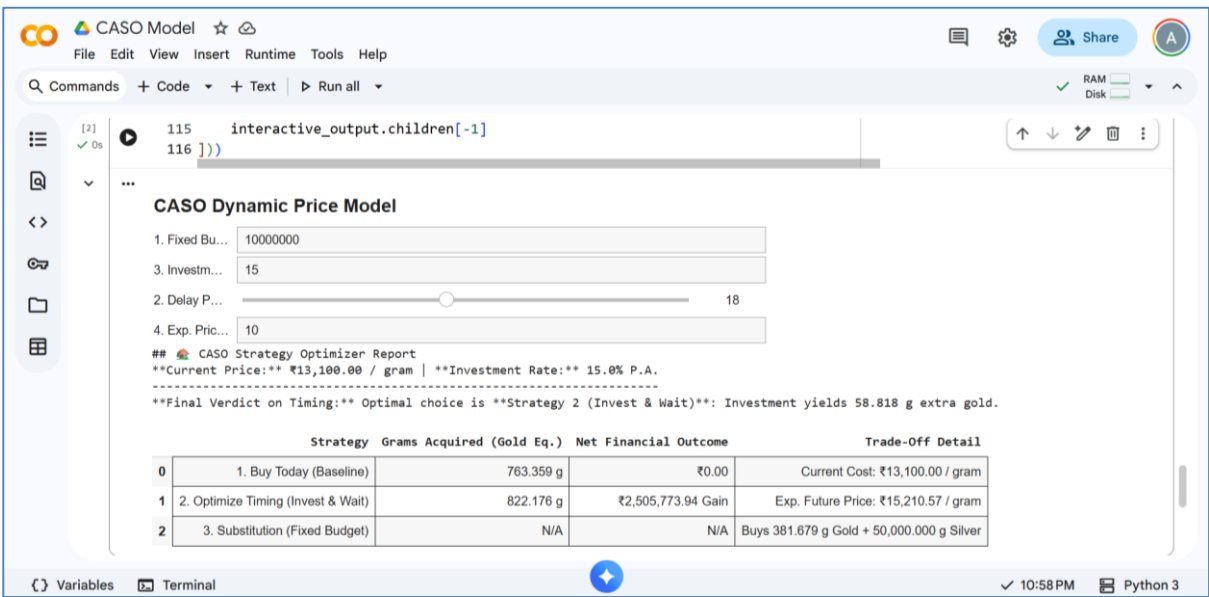
1. Ensure Consistent SGB Policy & Issuance

The decision to pause Sovereign Gold Bond (SGB) issuance during the 2024-2025 festive cycle should be permanently reversed. The RBI must guarantee a minimum of two SGB tranches during the peak festival quarter (Q2/Q3) every fiscal year. Removing the only viable, government-backed financial substitute during this crucial period directly fuels the physical import surge, damaging the external balance. The policy must be as predictable as the festival itself.

2. Integration of the CASO Model into Consumer Finance

To empower consumers to optimize investment timing and eliminate the opportunity cost of impulsive purchases. Integrate the CASO (Consumer Affordability & Substitution Optimizer) model into financial literacy tools used by investors and customers. CASO calculates the Opportunity Cost of the purchase by comparing the investment return rate to the cost of buying gold today. The model provides a quantified answer, for example: Delaying your purchase by 6 months and investing the money yields ₹x more than the interest saved by buying

physical gold today. This directly addresses the Micro-Level Behavioral Shift (H1) by providing the rational planning tool necessary to make substitution profitable for the household.



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Evaluating Ration Card Colors: Benefits And Challenges

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Abstract:

PDS challenges have grown in India due to supply delays, quality issues, and biometric hurdles. Urban ration shops serve 800-1,000 cardholders monthly but face 3-4 follow-up calls for stock and insect-infested grains. Larger families (5-17 members) struggle with fixed quotas while APL and BPL cardholders experience unequal access.

This research looks at how well PDS works by examining delivery times, satisfaction with quality, and the number of beneficiaries reached. It demonstrates the need for improved distribution guidelines and system upgrades to guarantee food security for households in need.

Introduction:

Color-coded ration cards are used by several governments worldwide to administer the Public Distribution System (PDS), which helps deliver subsidized food to people in need. In actuality, though, the system frequently fails to guarantee equity among people who own these cards. Families with orange cards (APL) generally enjoy a relatively smooth experience when accessing their food entitlements, facing fewer obstacles along the way. In contrast, households with yellow cards (BPL) often struggle with significant challenges in the supply chain and experience greater economic vulnerability. This means that for many of them, what should be a promise of food security can often feel shaky and uncertain.

This study examines why India's PDS struggles with sustainability, analyzing cases where distribution failures compromised essential nutrition. Examples include Maharashtra's urban ration shops with 3-4 monthly supply delays and insect-infested wheat forcing market supplements, alongside rigid biometric. Through comparisons of key indicators like delivery efficiency and quality consistency, this research reveals underlying systemic flaws and why current PDS strategies disproportionately burden vulnerable communities.

Scope of Research:

The study examines ration card functionality across urban lower-middle-class communities in Maharashtra, targeting orange cardholders (APL) reliant on PDS amid economic instability. It covers supply chain disruptions, quality concerns, technology barriers, and awareness gaps, excluding rural comparisons or nationwide data for focused, actionable insights.

Objectives:

- To understand how well the PDS (Public Distribution System) is serving its beneficiaries, we need to talk directly to cardholders and dealers. By having these conversations, we can get a clearer picture of their experiences and needs.
- It's also important to pinpoint any issues they might be facing, such as shortages of stock or problems with biometric identification. Addressing these inefficiencies is crucial for improving the system.
- Additionally, we want to make sure people are aware of their entitlements. If there's a lack of awareness, we should look into reforms that could promote fairness and enhance access for everyone.

Gap Analysis:

The Public Distribution System (PDS) in India has been widely studied, but there seems to be a lack of research that focuses specifically on the realities faced by ration dealers in urban Maharashtra. Most existing studies tend to concentrate on broader issues such as national-level

leakages or rural challenges, missing out on valuable insights from local shopkeepers who deal with 800-1,000 cardholders each month.

This opens up an important avenue for exploration. For example, many dealers face supply delays that require multiple follow-ups, and they often deal with quality issues, like grains infested with insects. Additionally, biometric verification can pose challenges, which can hinder access to food for many individuals.

This study aims to fill that research gap by looking closely at how the current practices within the PDS relate to the broader goals of providing sustainable nutrition access and ensuring efficiency within the system. By focusing on the perspectives of those directly involved in the distribution process, we can gain a better understanding of how to improve the system and better meet food security targets.

Methodology:

Structured Interviews:

To understand the experiences of ration shop owners and cardholders, we developed two sets of structured questionnaires. One was aimed at shop owners who serve between 800 and 1,000 cardholders each month, while the other focused on 10 to 15 households that hold orange (APL) ration cards, typically consisting of 5 to 17 family members. For the shopkeepers, we delved into topics like stock management, the challenges of supply chain delays (noting that they might follow up 3 to 4 times a month), the functions of the e-PoS system, and various distribution challenges. On the other hand, the questions for beneficiaries centered around their accessibility to the shops, their experiences with the quality of the goods (such as dealing with insect-infested wheat), whether they felt the quantity they received was adequate, and their overall satisfaction. We conducted one-on-one interviews in Marathi, each lasting between 30 to 45 minutes, at locations like Gupta Ration Shop, Shree Padmini Building, and Sampada Society. This setting allowed respondents to engage openly and share their honest experiences.

On-Site Observations:

During a field study conducted over 60 hours from January 10 to 20, 2025, I visited 4 to 5 ration shops, which helped me gain first hand insights into how the public distribution

system (PDS) operates. I observed crucial aspects such as the availability and condition of stock (noting instances of insect infestation), how queues were managed (with waits often stretching to 1-2 hours), the success rates of biometric verifications, and the interactions between dealers and cardholders. These observations highlighted inefficiencies that arise during peak demand periods and illustrated the impact of the "use-it-or-lose-it" policy. I documented everything in detail through field notes and took geotagged photographs to ensure transparency and support for the findings.

Informal Community Interactions:

Casual discussions with housing society residents supplemented structured data, revealing unfiltered perspectives on economic dependence (30-50% food needs via PDS), festive scheme awareness gaps (discontinued Diwali extras), and social impacts of rigid quotas. Conducted in Marathi across Nehru Nagar and cooperative societies, these interactions built trust and captured nuances like market supplement costs (₹20-25/family), enriching thematic understanding of family size inequities and technology barriers.

Analysis of interaction with Ration Card Holders:

1. Basic Information

The respondents predominantly hold Orange ration cards, which are typically issued to families with an annual income between specific thresholds as defined by the government. These cards provide access to certain subsidized commodities, although the quantity and quality may vary. The presence of Orange cards among all respondents indicates that they fall within the above poverty line (APL) category but still require governmental support for essential commodities.

2. Family Size

The family sizes reported range from 5 to 17 members. Larger families naturally require a higher quantity of ration supplies, which poses a challenge when the distribution system does not adequately account for family size variations. The strain on resources becomes evident when families with more members find it difficult to meet their nutritional needs through the current ration system.

3. Frequency of Visits to the Ration Shop

All respondents reported visiting the ration shop once a month. This regularity suggests a reliance on the ration system for essential supplies. However, the need to stand in long queues and face delays undermines the efficiency of the system. The once-a-month visit pattern highlights the importance of timely and efficient service delivery.

4. Quantity of Goods Received

While respondents acknowledged receiving the full quantity of goods allotted, there are significant challenges:

- The need to stand in queues indicates inefficiencies in the distribution process.
- Delays in product availability further exacerbate the problem.
- The system's inability to handle peak demand efficiently affects user satisfaction.

5. Quality of Goods

The quality of goods, particularly wheat, is a major concern for respondents. Specific issues highlighted include:

- Degraded Quality: The presence of insects in wheat makes it difficult to consume without additional processing.
- Rice Quality: Although relatively better, rice also needs to be mixed with higher quality grains to be edible.
- Mixing Requirement: The necessity to blend rationed wheat and rice with market bought grains increases the financial burden on families.

6. Awareness of Entitled Goods

Respondents demonstrated awareness of their entitlements, stating they receive around 2 kg of wheat and 3 kg of rice per person. This awareness is essential for ensuring that beneficiaries can claim their rightful share of goods. However, the actual utility of these entitlements is diminished by the poor quality of the products.

7. Issues in Getting Ration

Delays in obtaining ration supplies are a recurring problem. Respondents reported that if they miss collecting their ration in a particular month, they are not allowed to claim it in

subsequent months. This "use it or lose it" policy creates a rigid system that does not account for genuine reasons for non-collection.

8. Security Concerns

The implementation of a fingerprint system has successfully prevented unauthorized use of ration cards. Respondents unanimously reported that the system ensures that only rightful beneficiaries can claim the goods. This technological intervention is a positive aspect of the ration distribution system.

9. Meeting Family Needs

None of the respondents felt that the ration system adequately meets their family's needs. The primary reasons for dissatisfaction include:

- Insufficient quantity of rice and wheat.
- Poor quality of goods.
- Limited variety of items.

10. Desired Additional Items

Respondents expressed a desire for the inclusion of additional items in the ration supply, particularly during festive seasons. Previously, beneficiaries received:

- Oil packets during Diwali
- Sugar, maida, suji, rawa, chana dal, and poha However, these items have been
- discontinued. Restoring these provisions would greatly benefit the families, especially
- during festive periods when financial constraints are heightened.

Suggestions for Improvement:

After having a thoughtful conversation with one of the local ration dealers, several key suggestions emerged that could significantly improve the ration distribution system.

- **Timely Supply of Goods:** One of the most pressing issues highlighted was the need for timely deliveries from the government. Ensuring that supplies arrive on schedule can help reduce the number of follow-up calls that both the dealers and beneficiaries have to make, leading to a smoother process overall.

- **Supply Chain Management:** The dealer emphasized the importance of streamlining the supply chain to minimize delays. This could be achieved by implementing real-time tracking systems and cutting down on bureaucratic hurdles, making the whole system more efficient.
- **Technological Enhancements:** There's also a clear need to upgrade the server infrastructure and improve the reliability of the Aadhar-based verification system. Doing so would not only enhance operational efficiency but also reduce waiting times for people collecting their rations.
- **Awareness and Communication:** Another vital suggestion was the importance of awareness campaigns. Educating cardholders about their entitlements, the distribution process, and any special schemes available can foster greater transparency and build trust in the system.
- **Policy Reforms:** Finally, the dealer pointed out that reviewing and updating policies regularly is essential. This ensures that the system can address emerging challenges and guarantees a fair distribution of goods.

This interaction with the local ration dealer provided a unique glimpse into how the Public Distribution System (PDS) operates at the grassroots level. While the PDS plays a crucial role in securing food for many, there are areas that could greatly benefit from improvement. By addressing supply chain inefficiencies, enhancing technological infrastructure, and raising awareness among beneficiaries, we can work towards a more effective and transparent ration distribution system. The dealer's experiences and suggestions offer valuable insights that can inform policy decisions and operational strategies aimed at strengthening the PDS for the betterment of the community.

Some suggestions for improving the Public Distribution System (PDS) are as follows:

Grace Period for Collections

Currently, the rigid "use-it-or-lose-it" policy results in 25% wastage of entitled goods when families miss scheduled distributions due to illness, travel, or other valid reasons. The recommendation introduces 7-10 day grace periods or multiple collection windows within the month, tracked seamlessly through existing e-PoS systems. This simple adjustment would

prevent unnecessary losses, reduce dealer pressure from backlog demands, and ensure vulnerable families receive their full nutrition entitlements without penalty.

Multi-Stage Quality Audits

Insect-infested wheat and rice are causing families to spend an extra ₹20-25 monthly on market alternatives, which affects their health and undermines the goals of the Public Distribution System (PDS) in terms of affordability. To tackle this issue, we propose government-mandated inspections at all stages of procurement, transportation, and delivery, along with random third-party audits. Suppliers who consistently meet standards would earn quality certification, focusing particularly on monitoring wheat and rice for infestation and spoilage. This layered strategy could reduce quality complaints by 40-50% and help build trust in the system.

Family-Size Allocation Scaling

The fixed quotas of 2kg of wheat and 3kg of rice per person leave larger households (5-17 members) without adequate support, leading to significant equity gaps. A proposed sliding scale would provide a base allocation for each family member along with incremental increases for additional members, using Aadhaar family databases to ensure accuracy. Families with infants, elderly members, or those with special health needs would receive additional support, ensuring no household is left hungry due to arbitrary limits. This reform shifts PDS from a one-size-fits-all model to one that genuinely provides inclusive nutrition support.

Technology Infrastructure Upgrade

Frequent server outages and biometric failures (like worn fingerprints) hinder 40% of transactions, leaving laborers and elderly cardholders without access to their rations. Suggested improvements include ensuring server redundancy for 99% uptime, offering OTP and iris scan alternatives, and providing mandatory dealer training for troubleshooting. Implementing regular maintenance protocols would help diminish disruptions, especially in busy urban shops serving 800-1,000 cardholders each month, which would streamline operations and reduce wait times.

Multi-Channel Awareness Campaigns

Even though 60% of beneficiaries understand their basic entitlements, about 40% remain

unaware of their rights, scheme changes, or grievance options. The proposed strategy involves SMS alerts for distribution schedules, local radio announcements, printed pamphlets distributed through gram panchayats, and quarterly community workshops. Dealers would prominently display entitlement charts to ensure even marginalized groups obtain critical information. This empowers cardholders, reduces the risk of exploitation, and maximizes the utilization of PDS.

Digital Ration App

The current system's reliance on queues and paper records leads to inefficiencies. A unified mobile app would allow beneficiaries to check real-time entitlements, monitor stock availability at their local dealer, pre-book collection times, and file complaints easily. Dealers would have access to dashboards for managing inventory and staying updated on schemes while users would receive notifications about festive extras like Diwali sugar, dal, and oil. This digital ecosystem minimizes errors, boosts transparency, and reduces reliance on crowded ration shops.

Dealer Training & Incentives

Many dealers lack the necessary skills in inventory management, customer service, and technology, leading to supply delays that often require multiple follow-ups. Quarterly workshops would cover essential areas such as e-PoS usage, grievance resolution, and policy updates, paired with performance bonuses—₹5,000 for timely distribution and ₹2,000 for no complaints—would serve as motivating factors. Additionally, providing priority stock access to top-performing dealers would further encourage accountability, thereby enhancing overall PDS effectiveness.

Conclusion:

The Public Distribution System (PDS) is vital for ensuring food security for millions of individuals, especially in India, where issues of poverty and hunger persist. This project sought to engage directly with ration cardholders and ration dealers to gain a deeper understanding of the strengths and weaknesses within the current rationing system. Through fieldwork that included surveys, home visits, and conversations with various stakeholders, we've gathered valuable insights into how the system operates and the challenges it faces.

Our analysis reveals that while the PDS has made significant strides in reducing food insecurity, there are still many areas that need improvement. This conclusion summarizes the key insights and recommendations we've uncovered, emphasizing the need for enhancements that will make the PDS more effective, efficient, and inclusive for everyone relying on it. Together, we can work towards a future where the PDS better serves those in need.

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Measuring the Impact of Fast Fashion Recycling Programmes: Do They Actually Reduce Waste?

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Examining the Gap Between Sustainability Claims and Consumer Behavior

Introduction

The fast fashion industry has transformed global clothing consumption by making trendy apparel affordable and widely accessible. However, this rapid production and consumption model has led to significant environmental challenges, particularly textile waste.

According to the United Nations Environment Programme (UNEP) and the Global Fashion Agenda, the global textile industry generates approximately **92 million tonnes of waste annually**, making it one of the major contributors to environmental pollution.

In response to growing environmental concerns, fast fashion brands have introduced garment recycling and take-back programs, often promoted as part of a circular economy. These initiatives encourage consumers to return used clothing in exchange for incentives such as discounts or store credits promoting sustainability. However, there is limited empirical evidence on the effectiveness of these recycling programs. The lack of transparency regarding what happens to collected garments raises concerns about whether these initiatives genuinely reduce textile waste or primarily serve as marketing tools. The Gen-Z, claiming themselves to be environmentally conscious, are one of the biggest supporters of fast-fashion and hence the main target audience for evaluation

This research aims to assess college students' awareness, participation, and perceptions of fashion recycling programs, and to evaluate whether such initiatives contribute to meaningful waste reduction or function largely as image-building strategies.

1. Problem Statement

With the rising consumer needs, brands tend to make fast fashion available for everyone. This is why famous brands came up with recycling and take back programs. The real problem highlighted here is that either consumers are unaware about the recycling programs or unaware about where the waste goes. From an environmental perspective, the recycling programs may not be as effective or difficult to implement and hence it is crucial to monitor whether brands contribute to sustainability or use this as a marketing strategy.

1.1 Background of The Study: Growth of Fast Fashion and Environmental Impact

Fast fashion is big now. It has been this way for twenty years. Companies like Zara, H&M are responsive to the Gen Z hunger and get clothes from the design stage to the store quickly. This way they can keep up with what people want to wear.

Fast fashion companies like Zara, H&M and Shein do a job of seeing what is popular and making those clothes. Because of this, people buy a lot of clothes. In fact, the world is making twice as many clothes as it did twenty years ago. The worst part is that people do not keep clothes for a long time. Fast fashion, like Zara, H&M and Shein caters to the short-lived trends rather than the longevity of premium clothing.

The rapidly growing fashion industry is causing a lot of environmental problems like greenhouse gas emissions, chemical pollution and microfiber contamination in oceans.

The fashion/textile industry consumes a huge amount of water — tens of billions of cubic meters annually. About 79–93 billion cubic meters of water are used globally each year in textile and garment production. The textile sector is a major source of industrial water pollution in India, contributing roughly 20% of India's industrial water pollution. The Indian textile industry is characterized by high energy intensity, with energy costs making up roughly

15–20% of production costs in manufacturing units.

Over 1 million tonnes of textile waste are generated annually in India — much of it from households — contributing significantly to solid waste streams. The Economic Survey notes that the fashion/textile industry is among the largest consumers of water globally and contributes to both carbon emissions and chemical use in agriculture (due to cotton cultivation impacts).

1.2 Fast Fashion and The Problem of Textile Waste

One of the most pressing consequences of fast fashion is the exponential increase in textile waste. The low cost and perceived disposability of garments encourage overconsumption and frequent disposal, leading to millions of tons of clothing being discarded annually. A significant portion of this waste ends up in landfills or is incinerated, releasing harmful emissions and contributing to long-term environmental pollution.

In countries like India managing clothes is a big problem. This is because they do not have a system in place to recycle old clothes and they have to rely on people who collect waste on their own. These people do help to some extent by reusing and reselling clothes but they are not able to handle the huge amount of waste that people in cities generate when they buy and throw away clothes quickly. The problem is made worse by clothes made from man-made fibers clothes made from types of fabric and poor quality clothes, which are hard to recycle. So managing old clothes is an growing problem in the world of fast fashion, where people buy and throw away clothes quickly.

1.3 Research Gap

There is a lot of information about how fast fashion hurts the environment and how textile waste we have. It is surprising that not many people have investigated whether the recycling programs started by fashion brands are actually working. Our knowledge is restricted to what show the brand puts up regarding recycling and reducing waste. We do not really know what happens to clothes when we return them through those take-back programs.

People have not paid attention to how recycling works for clothes – whether it goes from rags to riches or nipped in the bud. The problem is that we do not have information about what happens to the clothes we give back. The gap highlighted here is that consumers are either unaware of the recycling programs or unaware that this might be another marketing strategy by the company rather than a meaningful initiative

Studies about fashion mostly look at how people feel about it in general. They do not really look at what people know about clothing brands that have recycling programs. People may give their clothes to these programs, but they do not really know what happens to the clothes after that. This is especially true, in India. This study wants to look at what brands are doing and what people know about recycling programs. The study of fashion recycling initiatives will look at both the brands and the awareness of people to get a bigger picture.

1.4 Purpose and Significance of the Study

This study is about finding out if fashion companies that make clothes are really trying to reduce waste with their recycling programs. Are they just doing it to look good and make people think they care about the environment. The study wants to look at what these companies are actually doing not just what they say they are doing. It will check if the recycling programs started by these fashion companies are really. If they are honest about what they are doing both in the whole world and, in India.

The study also wants to see what people think about these programs. It looks at whether people know about the recycling programs that brands have. It checks if people understand what happens to the clothes they give back to be recycled. The study uses surveys to find out if there are any differences between what brands say, what people expect and what actually happens when clothes are recycled. It wants to find out if brands are telling people enough about their recycling programs and if people are happy, with how their old clothe are handled. The study is looking at the recycling programs of brands. What people think of them.

This study aims to:

- Evaluate the effectiveness and transparency of brand-led recycling initiatives in managing textile waste.

- Do recycling programs really help make things more circular or are they just used to make companies look like they care about the environment?
- Examine consumer awareness, participation, and understanding of recycling processes and outcomes.
- Identify discrepancies between brand narratives and consumer knowledge regarding textile recycling.

2.Importance of the study

This study is important because it looks at a problem, in the fast fashion industry. The study checks if recycling programs are actually working by looking at what the companies say they are doing and what the people who buy their clothes think. This helps us see if these programs are really reducing waste from clothes. The fast fashion industry has a lot of work to do to reduce waste.

2.1 Environmental Impact of Fast Fashion and The Limits of Recycling-Led Circularity

Fast fashion is harmful for the environment and Recycling might not always be the most effective solution. Fast fashion clothes are either made from materials that are hard to recycle, or may deteriorate in quality when made again, or might require chemicals and other resources to be reformed.

This problem here is - Recycling is supposed to be good, for the environment but it is still part of a system that makes too many clothes and throws them away quickly.

2.2 Sustainability Marketing and Greenwashing

Greenwashing occurs when brands exaggerate or misrepresent their environmental actions without making meaningful changes. For instance, while some companies offer garment take-back programs, they often fail to disclose how much clothing is recycled or what happens to the collected items. At the same time, these brands continue mass production, contradicting their sustainability claims. This gap between messaging and action undermines the credibility of recycling initiatives, suggesting they are more focused on improving brand

image than reducing environmental impact.

2.3 Consumer Awareness and Ethical Consumption

Fast fashion recycling can only be effective if consumers are informed and engaged, especially Generation Z, which is highly aware of environmental issues and expresses strong concern for sustainability. However, despite their awareness, Gen Z often lacks clear knowledge about how fast fashion brands manage recycling and textile waste, including what happens to returned garments. This information gap limits their ability to make responsible purchasing decisions. In India, this challenge is intensified by factors such as affordability, accessibility, and changing fashion trends, which often influence buying behavior more than environmental values. As a result, there is a noticeable gap between Gen Z's sustainability intentions and actual consumption patterns, highlighting the need for greater transparency from brands and improved consumer education on recycling and sustainable fashion practices.

2.4 Moral Licensing and Sustainable Consumption Behaviour

Moral licensing explains how people may justify unsustainable behavior after performing an environmentally positive action. In the context of fast fashion, consumers who return clothes through recycling programs often feel they have “done their part,” which can reduce guilt and encourage further purchases. Instead of promoting reduced consumption or longer use of garments, recycling initiatives may unintentionally support overconsumption by making shoppers feel environmentally responsible. This effect is reinforced when brands offer discounts for returned clothing, as it directly incentivizes buying new items. As a result, the environmental benefits of recycling are often offset by increased consumption, allowing fast fashion brands to maintain existing production models rather than encouraging meaningful changes in consumer behavior or sustainability practices.

3.1 Research Objectives

- To assess consumer awareness of fast fashion recycling initiatives and brand-led take-back programs.
- To quantify the gap between consumer awareness and participation in fast fashion

recycling programs.

- To examine the relationship between transparency of recycling processes and consumer trust in brand sustainability claims.

3.2 Research Questions

Hypothesis

H1: The level of consumer awareness of fast fashion recycling initiatives and brand-led take-back programs is significantly low.

H2: There is no significant relationship between level of consumer awareness and participation in fast fashion recycling programs.

4. Research Methodology

4.1 Research Design

A descriptive research design was employed, combining quantitative approach. Surveys captured numerical data on awareness, participation, and perceptions.

4.2 Sample Selection

The study surveyed 111 respondents (74%), aged 18–25years, including both male and female participants. Convenience sampling was used, with the questionnaire circulated online to individuals who were easily accessible and willing to participate.

4.3 Data Collection Tools

Primary data was collected using a structured questionnaire circulated online. Secondary data was gathered from research articles, industry reports, brand sustainability disclosures, and policy documents to provide context and support analysis. Data sources included responses from the online survey, which contained multiple-choice and Likert-scale questions to measure awareness, behavior, and perceptions.

4.5 Data Analysis Techniques

Quantitative data were analyzed using percentages, frequency distributions, and graphical representations.

4.6 Ethical Considerations

Ethical standards were strictly followed: participation was voluntary, respondents remained anonymous, and no personally identifiable information was collected. All secondary sources are properly credited, ensuring research integrity and transparency.

5. Data Analysis and Findings

5.1 Respondent Demographics

The respondents were primarily college students, a demographic that buys frequently and is highly exposed to sustainability messaging from fashion brands. This group is important because their purchasing choices and opinions can be strongly influenced by brand communication on environmental responsibility.

5.2 Awareness of Recycling Programs

H1: The level of consumer awareness of fast fashion recycling initiatives and brand-led take-back programs is significantly low.

Most students were aware that fashion brands offer recycling or take-back programs, indicating that brands are effectively communicating their sustainability initiatives. However, there was limited understanding of how these programs operate, highlighting a need for clearer explanations from brands.

H2: There is no significant relationship between level of consumer awareness and participation in fast fashion recycling programs.

5.3 Participation Levels and Motivating Factors

Despite high awareness, actual participation in recycling programs was low. Participation was mainly driven by convenience, rewards such as discounts, or a desire to do something positive for the environment. This demonstrates a clear gap between knowledge and action.

5.4 Consumer Perception and Trust in Brand Claims

Students expressed mixed trust in fast fashion brands' sustainability claims. While some

believed brands were genuinely making an effort, many were skeptical due to a lack of transparency about what happens to returned garments. This skepticism points to concerns over greenwashing and highlights the need for brands to be more open about recycling processes.

5.5 Influence of Recycling Programs on Purchase Behavior

Recycling programs did not significantly reduce overall fast fashion consumption. In some cases, rewards or participation in recycling encouraged additional purchases, a phenomenon known as **moral licensing**, where consumers feel justified to buy more because they have “done their part” through recycling.

5.6 Disposal Behavior of Consumers

Many students continue to dispose of clothes via traditional methods, such as throwing them away or giving them to others, rather than using brand recycling programs. This underscores the need to make recycling more accessible, trustworthy, and integrated into daily consumer behavior.

6. Discussion

This section discusses the key findings of the study in relation to its objectives, evaluating the effectiveness of fast fashion recycling from both consumer and brand perspectives.

6.1 Awareness–Participation Gap

The findings reveal a clear gap between consumer awareness of fashion recycling programs and actual participation. While brands have been successful in creating awareness, this has not translated into regular recycling behavior. Barriers such as inconvenience, limited understanding of recycling processes, and lack of habitual engagement prevent consumers from integrating recycling into everyday consumption practices, making participation largely symbolic rather than behavioral.

6.2 Recycling Programs as Sustainability Tools vs Branding Strategies

The study indicates that many fast fashion recycling initiatives function more as branding strategies than as effective sustainability tools. Brands promote take-back programs

and circularity claims without providing transparency about post-recycling outcomes, which weakens trust and raises concerns of greenwashing. Continued high production and consumption further reduce the environmental effectiveness of these initiatives.

6.3 Comparison with Existing Literature

These findings align with existing literature that critiques fast fashion recycling as a limited solution due to technical constraints and greenwashing practices. Consistent with studies on ethical consumption and Generation Z behavior, the research confirms the gap between environmental concern and actual behavior, while adding an India-focused perspective to global discussions on circular fashion and sustainable consumption.

7. Conclusion -

Consumers often lack clarity about what happens to garments after they are returned through fast fashion recycling programs. This issue goes beyond low awareness of recycling initiatives and reflects a deeper problem of process opacity. The lack of clear information about post-recycling outcomes makes it difficult for consumers to assess whether brands are genuinely contributing to sustainability, thereby weakening trust in fast fashion recycling efforts. This phenomenon is described as the **“Recycling Black Box.”**

Even when consumers know that brands collect used clothing, they remain largely unaware of how garments are sorted, what proportion is recycled into new fibers, how much is downcycled into low-value products, or what ends up in landfills or export markets. Brands rarely disclose these details, forcing consumers to rely on unverified sustainability claims. This opacity enables companies to project environmental responsibility without providing evidence of meaningful impact, increasing the risk of greenwashing.

Key findings reveal three dimensions of the Recycling Black Box.

1. Hidden pathways obscure the actual fate of returned garments, including unclear recycling rates, downcycling practices, and overseas redistribution.
2. Perception–reality divide exists, where consumer understanding of sustainability is shaped more by brand messaging than by knowledge of actual recycling processes. While

consumers support recycling in principle, they lack access to reliable information to evaluate brand claims.

3. The reputation shield effect allows brands to use recycling programs as image-enhancing tools. By promoting take-back initiatives without performance standards or outcome disclosure, brands avoid scrutiny and accountability while maintaining existing production models.

These findings have important implications. For consumers, awareness without understanding limits informed decision-making and may falsely reinforce sustainable self-perception. For researchers, the results highlight the need to move beyond awareness-based measures and focus on actual environmental outcomes. For policymakers, the Recycling Black Box exposes regulatory gaps, emphasizing the need for standardized reporting, third-party verification, and lifecycle accountability in textile recycling systems. Overall, this perspective shifts the sustainability discussion from intentions and marketing narratives to outcome-based accountability. It bridges consumer perceptions with brand practices and highlights a systematic flaw in how recycling programs are designed, communicated, and evaluated—an issue that must be addressed to achieve meaningful sustainability in the fashion industry.

8. Recommendations

This study highlights the need for fast fashion recycling to move beyond symbolic actions toward measurable environmental impact. Recycling initiatives must be designed to deliver real outcomes rather than serve as image-enhancing tools.

Recommendations for Fast Fashion Brands:

Brands should ensure transparency by clearly disclosing what happens to collected garments, including recycling, downcycling, export, and disposal rates, supported by standardized metrics and independent verification. Recycling programs should not be linked to purchase incentives, as these encourage overconsumption. Instead, brands should integrate recycling into broader circular strategies that prioritize durable design, recyclability, and reduced production volumes.

Recommendations for Consumers:

Consumers should engage more critically with recycling programs by seeking information about post-recycling outcomes and supporting transparent brands. Education efforts should emphasize reducing consumption, reusing and repairing garments, and viewing recycling as a last resort rather than a justification for frequent purchases.

Recommendations for Regulators:

Regulators should mandate standardized disclosure of textile recycling outcomes and strengthen Extended Producer Responsibility frameworks. In India, integrating informal recycling systems, investing in recycling infrastructure, and enforcing third-party verification can reduce greenwashing and improve accountability across the fashion value chain.

9. Limitations of The Study

- Confined in scope and geographical coverage.
- The supply chain analysis is not considered.

10. Scope for Future Research

- The life cycle analysis of fast fashion industry/garment can be considered.
- Carbon credits or carbon offsetting can also be evaluated.

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A Study On Fashion Detox By Minimalist Wardrobes Leading To A Sustainable Consumer Behavior

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Abstract:

In India, where textile waste runs into millions of tonnes annually, even small shifts in behavior (e.g. each person buying one fewer item per month) could translate to large cumulative savings in water, energy and landfill space. The global fashion detox movement encompasses diverse approaches to reducing fashion's environmental impact from temporary abstinence from clothing purchases to permanent adoption of minimalist consumption patterns. In India it is gaining momentum, driven by a desire to “consume less but better.” This research paper taps into a timely intersection of environmental urgency, psychological transformation and cultural shifts in consumption. Descriptive research has been conducted to encourage the consumers to resist the “buy-and-waste” cycle by making sustainable, minimal choices.

Keywords: Fashion detox, Minimalist wardrobes, Sustainable consumption.

Introduction:

The fashion detox represents more than a personal lifestyle choice; it constitutes a meaningful response to environmental crises and overconsumption patterns. The fashion detox involves voluntary refraining from clothing purchases over a fixed period, fostering reflection on consumption habits and leading to more mindful acquisition of clothes. Varma et al. (2019) argue that sustainability in fashion requires mindful consumption rather than mindless buying. They observe that unless consumers' personal values override the fast-fashion impulse, real

change won't happen. For example, an Istanbul study showed mindfulness has a significant positive effect on consumers' sustainable consumption behavior (implying that mindful shoppers make greener choices). Experimental studies (often college students or blog-challenge participants) show positive psychological outcomes where participants report feeling less stressed, more creative and more aware of their consumption choices. For example, in a U.S. "Fashion Detox" study, about 46% of participants felt their creativity was enhanced and 54% intended to continue the sustainable consumption habits they learned.

Minimalism often originates from growing ecological concerns, with consumers adopting minimalist practices as a direct response to environmental awareness. The "minimalist wardrobe" concept has gained attention as a tool for non-consumption and encourages individuals to limit their clothing to essential items. Minimalist fashion approaches offer psychological benefits by reducing decision fatigue associated with large, disorganized wardrobes and alleviating the "paradox of choice". Bardey et al. (2021) define the phenomenon as an approach "focusing on quality, longevity and minimal design" that lets consumers "remain fashionable while consuming less". As one expert notes, minimalism in fashion can help consumers "find their style" without sacrificing the planet. The khadi movement during India's independence struggle represented an early form of minimalist fashion, embracing locally produced fabrics as both political statement and practical choice. Also, hand me downs (a younger child wearing an older sibling's outgrown clothes) and heirlooms (baby clothes like hand-knitted sweaters preserved for future generations) practices are a perfect example. Nowadays, modern minimalist fashion emphasizes lower recurring shopping costs, saving time, transparency and responsible consumption by renting wedding attire or swapping clothes promoting reuse and upcycling. Even, benefitting the businesses which function by providing designer outfits for a fraction of the retail cost often with physical stores and online platforms by emphasizing eco-friendly fashion and high-quality garment care after each rental. Urgent needs to match a specific color or theme, especially for important events can be a dilemma for consumers.

Scope of research:

The United Nations Development Programme highlights the following facts:

1. 30 % of all clothes made are never sold.

2. 57 % end up in landfills which equates to a truckload every second.
3. Less than 1 % of used clothing is recycled into new garments.

To tackle this adoption of fashion detox through minimalist wardrobes is beneficial as it directly aligns with multiple United Nations Sustainable Development Goals (SDGs) by addressing environmental sustainability, responsible consumption, economic equity and climate action.

1. Fashion detox transforms consumers from passive buyers to responsible decision-makers which will help to achieve SDG 12: Responsible Consumption and Production.
2. By consuming less, individuals actively reduce their personal carbon footprint which will help to achieve SDG 13: Climate Action.
3. Minimalist fashion conserves freshwater resources critical for India's water security which will help to achieve SDG 6: Clean Water and Sanitation.
4. Slow fashion promotes ethical livelihoods over exploitative mass production which will help to achieve SDG 8: Decent Work and Economic Growth.
5. Minimal wardrobes reduce pressure on urban infrastructure which will help to achieve SDG 11: Sustainable Cities and Communities.
6. Reduced consumption drives smarter, cleaner industrial innovation which will help to achieve SDG 9: Industry, Innovation and Infrastructure.
7. Sustainable fashion detox is a collective effort, not an individual burden which will help to achieve SDG 17: Partnerships for the Goals.

In this way, the potential for a curated, year-round minimalist wardrobe—effectively acting as a personal 'uniform'—presents a significant opportunity to fundamentally reshape daily consumption habits.

Objectives:

The present research study aims to examine the significance and value additions due to the growth of fast fashion culture.

- To examine the psychological and behavioral factors that influence Indian consumers' willingness to adopt fashion detox and minimalist wardrobes.
- To study current trends of consumer purchasing behavior.

Methodology Used

Sample size and Sampling Technique:

Sample size for this research is 102 respondents and Convenient Sampling technique is used for collecting data.

Sources of Data Collection:

Both primary and secondary data has been used to gather information.

Primary data:

In order to achieve the objectives of the study, 120 people in Mumbai city were approached for the survey through google form and out of that 102 sample respondents were received and found as valid ones. Data was collected through a structured questionnaire consisting close-ended questions. A quantitative method of survey is used for this purpose.

Secondary Data:

Secondary data is gathered from several relevant research papers, journals, newspapers, published and unpublished sources, etc. The research methodology for this research paper is descriptive and has been conducted to gain insights on how conscious wardrobe management can drive sustainable consumer transformation.

Limitations of the Study

1. As the sample size is only Mumbai so it cannot depict the opinions and preferences of a large population and is limited.
2. Increased reliance on clothing consumption can lead to higher levels of textile waste which pose disposal and environmental challenges.

Hypothesis

Hypothesis considered for testing:

H0 - People are not willing to adopt fashion detox and minimalist wardrobe for sustainable consumption.

H1 - People are willing to adopt fashion detox and minimalist wardrobe for sustainable consumption.

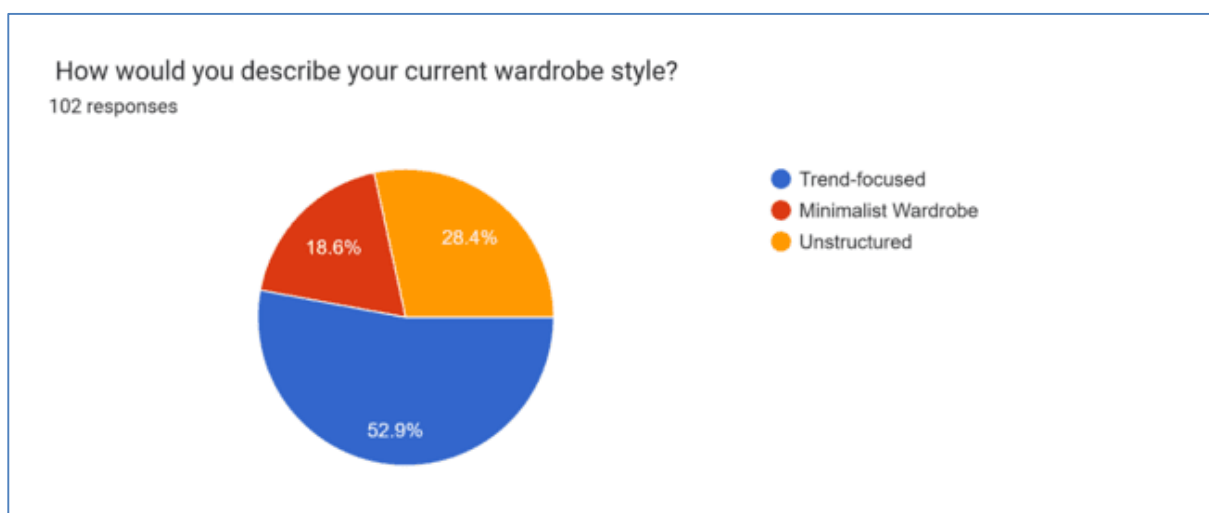
For the above hypothesis, Chi square test was performed on the data collected based on age of the respondents. The χ^2 value is found to be 0.000211129. As the p value is less than 0.05. Hence, we reject the null hypothesis H_0 - People are not willing to adopt fashion detox and minimalist wardrobe for sustainable consumption and we conclude that respondents are willing, especially youngsters.

Data Analysis and Interpretation:

The questionnaire we designed consists of 12 questions: 2 demographic questions and 10 close-ended questions, aimed at receiving honest responses from our target respondents. The questions are organized into five sections to collect specific opinions:

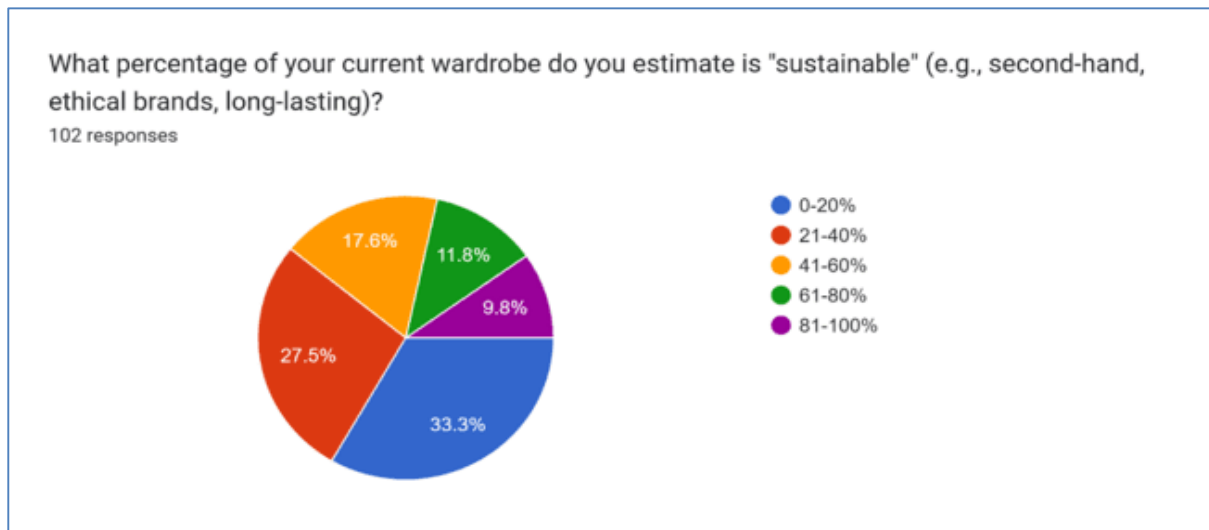
- **Section 1** - Demographics: Age and Gender
- **Section 2** - Description of Wardrobe Style & Use
- **Section 3** - Description of Clothing Purchasing Behavior
- **Section 4** - Description of Clothing Disposing Behavior
- **Section 5** - Willingness for Transformation towards Fashion Detox & Minimalist Wardrobe

Following is the analysis of the data obtained:

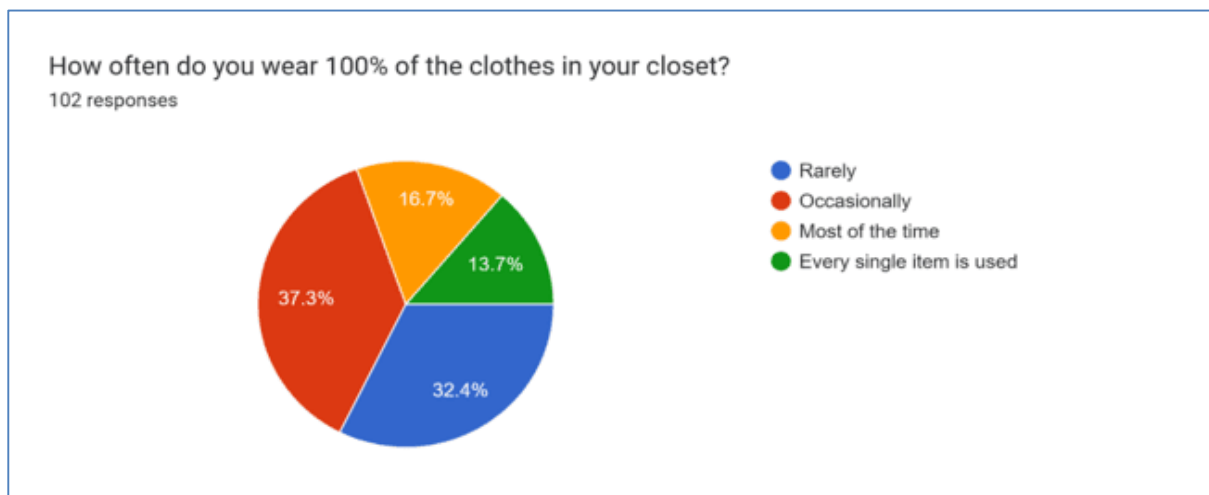


This pie diagram depicts that 52.9 % of the respondents admit that their current wardrobe style is trend focused. 28.4 % of the respondents say it is unstructured. 18.6 % of the

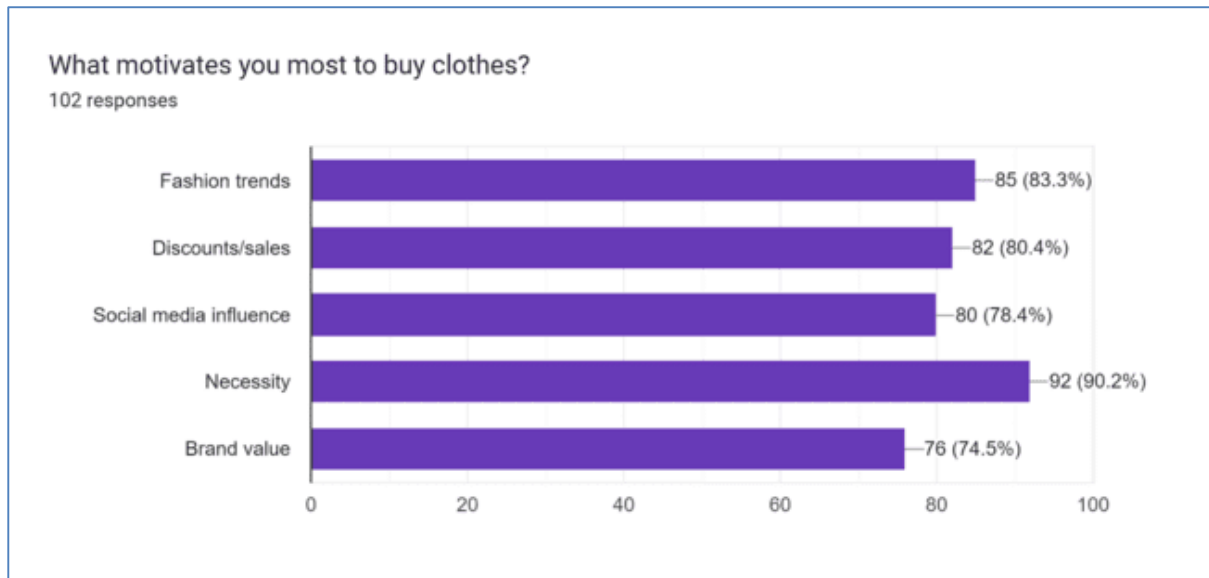
respondents admit that their current wardrobe style is minimalist.



Above pie chart shows that, 33.3 % of the respondents categorised 0-20 % of their current wardrobe is sustainable. 27.5 % of the respondents categorised 21-40 % of their current wardrobe is sustainable. 17.6 % of the respondents categorised 41-60 % of their current wardrobe is sustainable. 11.8 % of the respondents categorised 61-80 % of their current wardrobe is sustainable. 9.8 % of the respondents categorised 81-100 % of their current wardrobe is sustainable.



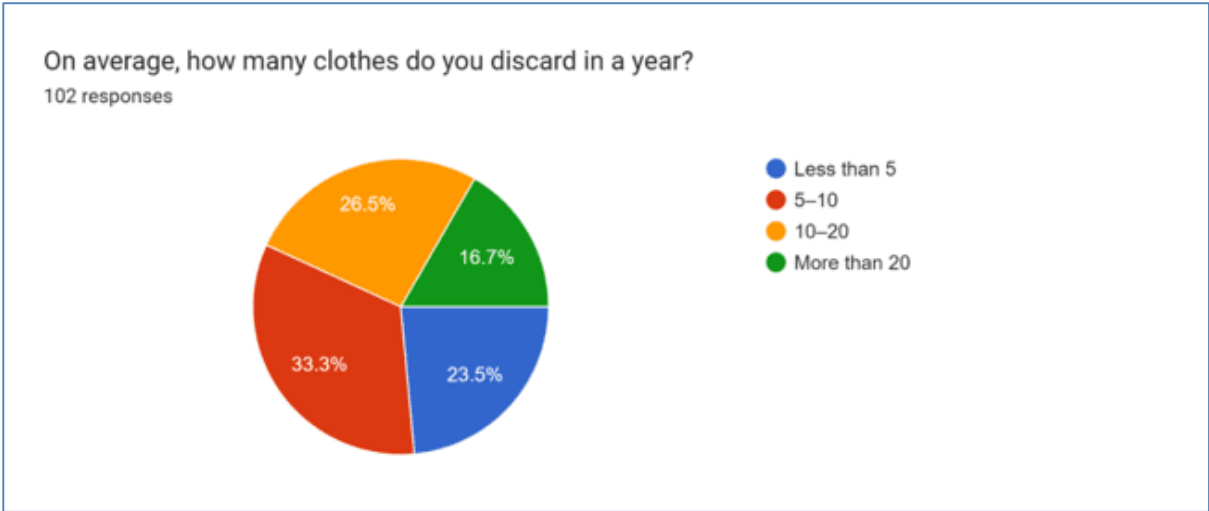
This pie diagram tells, 37.3 % of respondents wear occasionally 100 % of the clothes from their closet. 32.4 % of respondents wear rarely. 16.7 % of respondents wear them most of the time. 13.7 % of respondents wear them every single time.



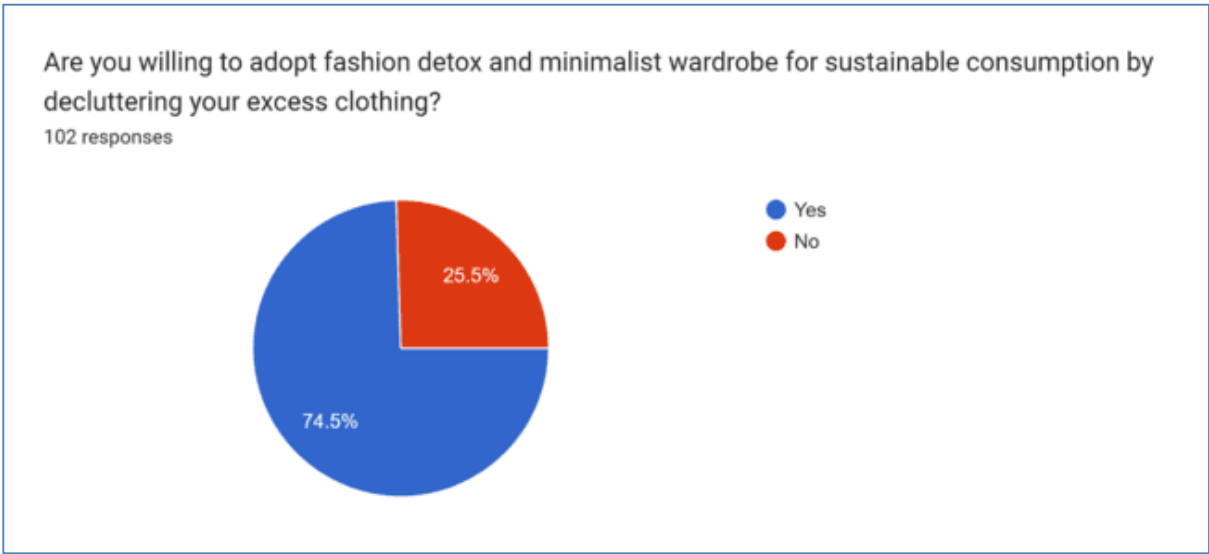
In this bar chart, 83.3 % of the respondents feel that they are motivated by fashion trends to buy clothes. 80.4 % of the respondents feel that they are motivated by discounts/sales to buy clothes. 78.4 % of the respondents feel that they are motivated by social media influence to buy clothes. 90.2 % of the respondents feel that they are motivated by necessity to buy clothes. 74.5 % of the respondents feel that they are motivated by brand value to buy clothes.



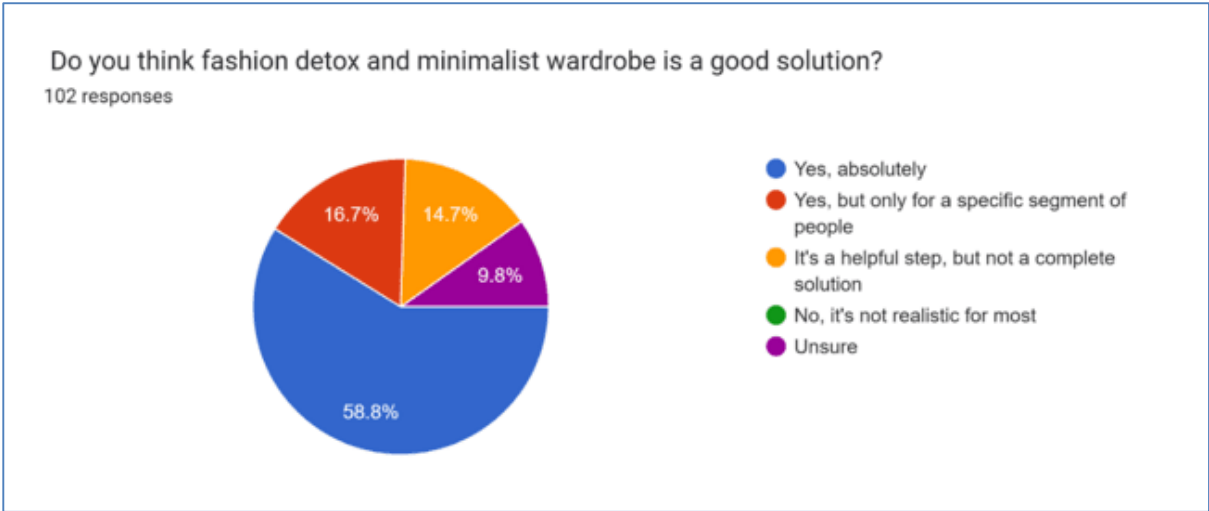
This pie chart tells the clothing purchase of the respondents on a weekly basis is 21.6 %. The clothing purchase of the respondents on a monthly basis is 45.1 %. The clothing purchase of the respondents on a quarterly basis is 12.7 %. The clothing purchase of the respondents on a yearly basis is 10.8 %. The clothing purchase of the respondents on a rare basis is 9.8 %.



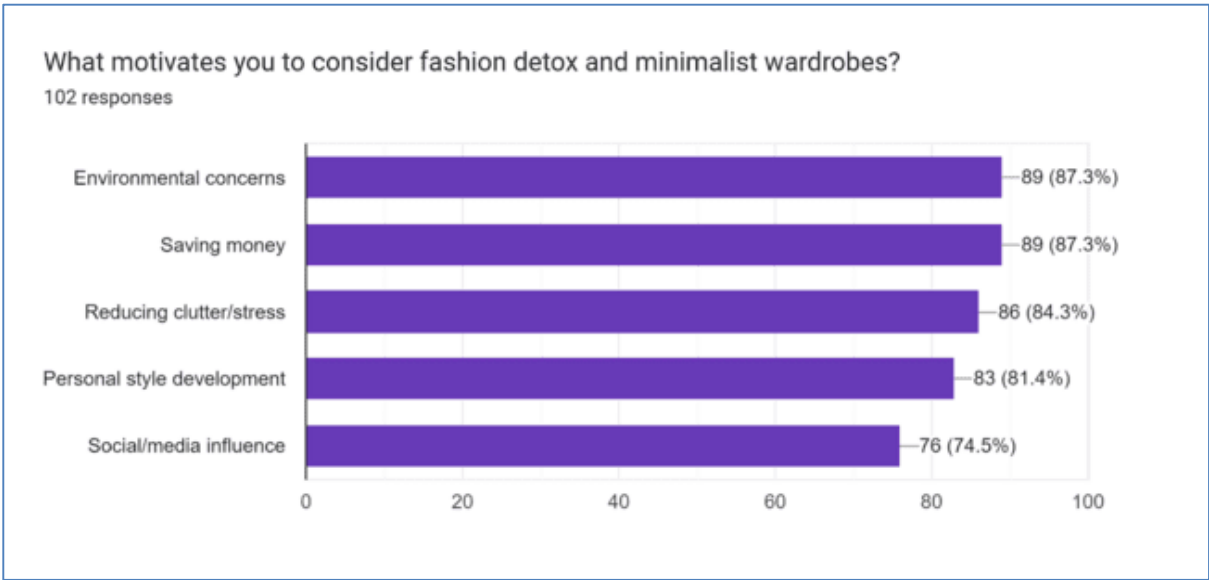
The respondents have categorized that 33.3 % of them discarded their clothing 5-10 times annually. 26.5 % of them discarded their clothing 10-20 times annually. 23.5 % of them discarded their clothing less than 5 times annually. 16.7 % of them discarded their clothing more than 5 times annually.



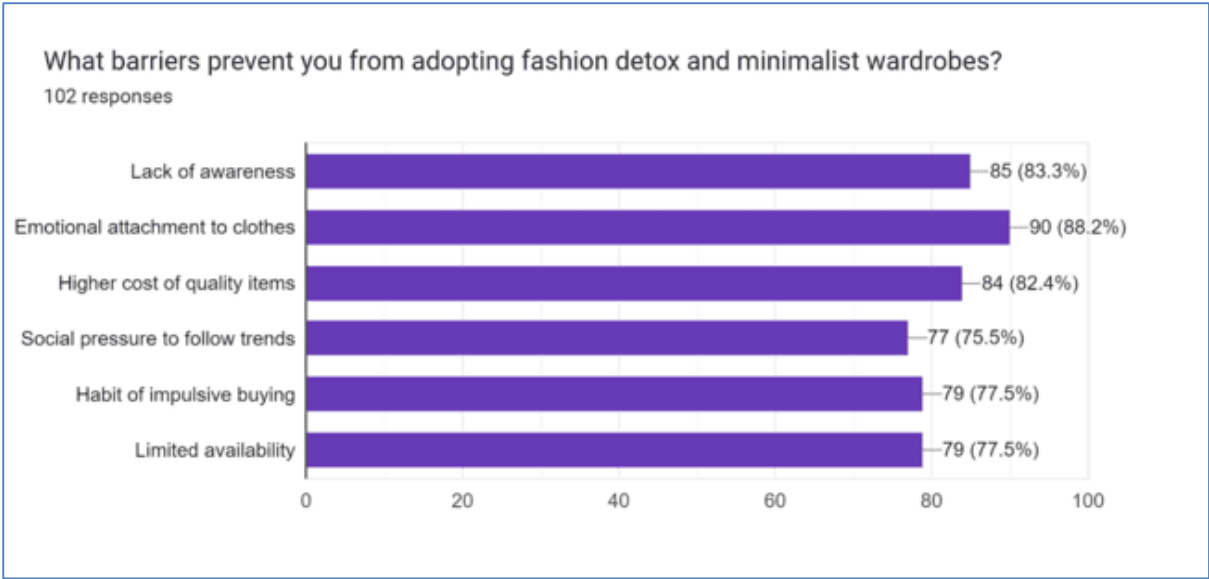
As you can see, 74.5 % of the respondents are willing to transition themselves by decluttering and switching to fashion detox and minimalist wardrobes but 25.5 % of them are reluctant.



As you can see, 58.8% of respondents also think that adoption of fashion detox and minimalist wardrobe is a good solution for them. 16.7% believed it but only for a specific segment of people. 14.7% found it a helpful step, but not a complete solution. 9.8% were unsure.



The above bar chart showcases the motivating factors are environmental concerns and saving money for 87.3 % respondents to consider fashion detox and minimalist wardrobe. For 84.3 % respondents it is reducing clutter or stress. 81.4 % of respondents it is personal style development. 74.5 % of respondents say it is social media influence.



This bar diagram shows for 88.2 % of the respondents, a barrier for adoption of fashion detox and minimalist wardrobe is emotional attachment to clothes. Another obstacle is lack of awareness as indicated by 83.3%. Additionally, 82.4% perceive the higher cost of quality and sustainable items. Limited availability of minimalist or sustainable fashion options and the habit of impulsive buying were each reported by 77.5%. Furthermore, 75.5% acknowledged social pressure to follow fashion trends as a discouraging factor.

Statistics

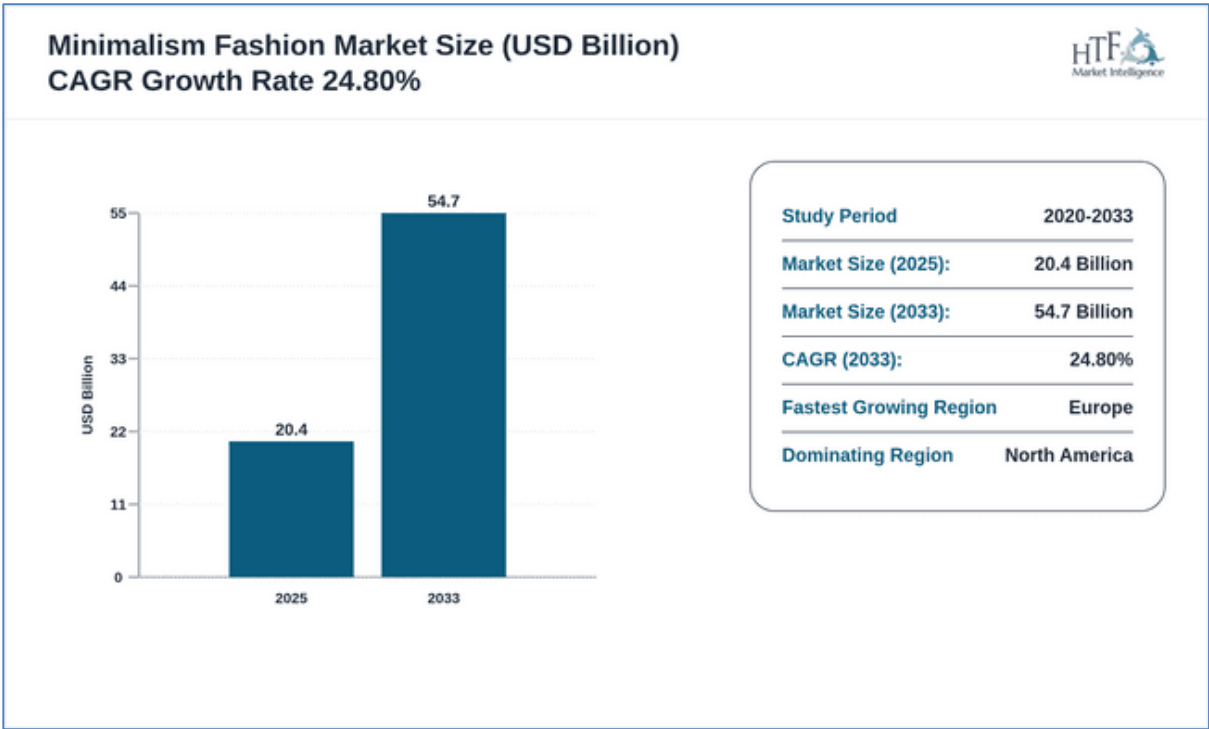
According to a Down to Earth Report, India generates an estimated 7,800 kilo tonnes of textile waste each year and the global textile industry generates 92 million tonnes of waste a year.

As per Quantis Report, 2018, the textile value chain uses 215 trillion litres of water per year. Even, 2017 Global Fashion Agenda Report stated that the fashion industry's environmental impact is substantial, with a single T-shirt requiring approximately 2,700 liters of water and as per United Nations Environment Program, jeans needing 3,781 liters of water during production.

In fact, as per the Waste and Resources Action Programme Research, extending the use of a garment by just 9 months can cut its water, waste and carbon footprint by 20–30% saving 5 billion annually.

The Young India Fashion Survey 2025 have noted that, only 15% of urban Indians

maintain capsule wardrobes due to cultural maximalism and affordability barriers. According to HTF Market Insights in 2025, the Minimalism Fashion market is projected to grow significantly with a CAGR of 24.80% from 2025 to 2033, showing an 18.30% Year-on-Year growth, driven by consumer preference for quality, versatility and sustainable, simple styles.



Source: HTF Market Insights

Conclusion

This research study affirms that Fashion Detox, realized through the adoption of a minimalist wardrobe, provides a powerful, actionable remedy to India's spiralling textile waste crisis and the entrenched fast fashion culture. It moves the consumer past the superficial "attitude-behavior gap" by grounding sustainability in personal finance and mental well-being—principles. Minimalists often experience positive emotions from having fewer possessions. Especially among educated urbanites, minimalism represents pushing back against India's culture of gift-giving and status dressing. For example, the woman now asks family to give cash instead of gifts and sees her simpler lifestyle as "intentional elegance". Conversely, social pressures can hinder minimalism – some women feel confident speaking out only if society's expectations change. Minimalist practices also influence broader cultural

shifts, challenging ideas of happiness tied to excess and instead centering fulfilment and ecological balance. However, transformation is not automatic. If enough people embrace these changes, society benefits on multiple fronts: less pollution, stronger local economies (through crafts and circular businesses) and a healthier cultural relationship with clothing.

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A Study on Pay Uniformity of Gig Workers Across Different Platforms in the Quick Commerce Industry

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Abstract:

Quick commerce platforms rely heavily on gig delivery partners, yet pay systems differ widely. This study combines application-level compensation data and a 50-respondent survey to assess pay uniformity, income stability, and perceived transparency across Zepto, Swiggy Instamart, Blinkit and Zomato. Earnings were standardised to effective hourly rates: Zepto (₹50–240/hr), Swiggy Instamart (₹30–360/hr), Blinkit full-time (₹107–128/hr) and part-time (₹88–110/hr), and Zomato (≈₹102/hr). Range analysis shows much higher dispersion under per-order models (Swiggy range ≈₹330; Zepto ≈₹190) versus time-linked pay (Blinkit range ≈₹21–22). Survey results reveal limited clarity and predictability: only 28% reported complete clarity on pay components, 52% said base pay changes occasionally or frequently, 60% felt compensation was only partly or not fair, and 66% support a minimum standardised pay. The evidence indicates pay outcomes are platform-dependent rather than task-dependent, underscoring calls for greater transparency and baseline standardisation to improve fairness and income predictability.

Key words: Gig Economy; Quick Commerce; Compensation Structure; Earnings Dispersion; Income Stability; Pay Transparency; Standardisation; Delivery Partners; Quick Delivery Platforms.

1 Introduction:

The recent growth of the gig economy in India has led to the emergence of platform based work and especially quick commerce, where many of the delivery partners are the backbone of these platforms (Zepto, Blinkit, Swiggy Instamart and Zomato).

There are significant differences in how each platform pays its delivery partner due to differences in base pay, incentives, surge pricing and location specific policies. These differences can create inequality in wages for the same number of hours worked and amount of effort required, creating questions about wage fairness and transparency.

There has been research on the growth of the gig economy and algorithmic management, however, there has been limited empirical research into whether there is wage fairness between the quick commerce platforms, or if gig workers feel that their compensation is fair and transparent.

Considering this background, the current study will analyse the compensation structures of several large quick commerce platforms, compare wages using standardized metrics, and analyse gig worker's perceptions of fairness, transparency, and need for standardized wage structures.

2 Objectives:

- 2.1 To examine the compensation structure and it's key components for Gig Workers in the Quick Commerce Industry.
- 2.2 To determine the uniformity in earnings of gig workers across different platforms in the Quick Commerce Industry.
- 2.3 To understand Delivery Partners' perceptions of fairness and transparency in terms of their earnings.

3 Hypothesis:

Ho: There is no significant variation in the earnings of gig workers across different quick

commerce platforms.

H1: There exists a significant variation in the earnings of gig workers across different quick commerce platforms.

4 Review of Literature

The *NITI Aayog (2022) - India's Booming Gig and Platform Economy Report* has analysed the platform-based gig economy in India, noting that gig economy workers receive payment through task-based and algorithmically driven pay systems. It is also found that there is considerable variation in how much money workers can earn depending on the incentive

structure of their platform and the amount of demand to perform work at the time it is offered. The study also identified that there is no standardization with respect to the compensation of gig workers and that the earnings determination process is opaque. As a result, workers who provide the same services may be paid differently depending upon the platform they are using. This study represents a relevant context for assessing the issue of pay uniformity and compensation practices within the quick commerce industry.

The *Centre for Responsible AI at IIT Madras (2023) – The Algorithmic Human Manager: AI, Apps, and Workers in the Indian Gig Economy Report*, undertook an analysis of the use of Algorithmic Management (AM) by the gig economy and its impact on the earnings of workers. It states that all three main platforms (BlinkIt, Zepto and Instamart) use opaque algorithms to assign jobs/orders to workers, determine whether a worker is eligible for incentives and rank workers using a variety of performance measures; including but not limited to acceptance rate, delivery time, and customer ratings. The also suggests that changes in platform incentive rules, surge pricing, and performance thresholds significantly affect the "take home" earnings of workers, even when they work the same number of hours and deliver to the same distance. It states that the workers do not have visibility into how their earnings are determined or what factors are used in determining AM decisions.

Bornali Bhandari et. al (2023) - Tenure, Earnings and Productivity of Platform Delivery: Evidence from India, contains primary survey data of 924 delivery workers across multiple

Indian cities. It investigates how tenure influences both earnings and productivity. The report finds that each year of tenure generates an increase of 3.7% in monthly gross earnings and 4.9% in monthly net earnings; and, each year of tenure generates an increase of 5.6% in daily deliveries. In addition to documenting the fact that earnings growth is attributable to the structural aspects of the food delivery company's incentive system and algorithmic management including the specific tasks assigned to workers and the time spent by workers on the platform, the writers demonstrate significant earnings instability due to periodic changes in the incentives eligible to be earned and the thresholds required to earn these incentives.

5 Research Methodology:

The methodology used for this research uses an empirical and analytical method. Data collection came from the responses to a questionnaire administered via Google Forms to collect working hours, perceptions on fairness, transparency of compensation of delivery partners. A total of 50 valid responses were collected from delivery partners working in major quick commerce platforms.

Direct observation and documenting of compensation structure at the platform level was the second source of primary data. To achieve this objective, the researcher registered as a delivery partner with quick commerce delivery apps like Blinkit Delivery Partner, Zepto Delivery, Zomato Delivery Partner and Swiggy Instamart Delivery Partner. This registration process required the researcher to complete the required onboarding processes and provide verification of their Aadhaar number and PAN prior to paying an onboarding fee, wherever applicable. Information about pay components like joining bonus, incentives, non-monetary benefits, etc. were collected from each of the apps. Additionally, this research uses a non-probability convenience sampling frame.

6 Empirical Analysis

6.1 Profile of Respondents

The following section provides information about the demographic and professional characteristics of the delivery partners who participated in our research survey.

Table 6.1.1 Platform Association of Respondents

Quick Commerce Platform	% (n=50)
Blinkit	28
Swiggy Instamart	33
Zepto	30
Zomato	7
Eat Club	2

Concerning their experience working on these platforms, 30% of the respondents said they have less than six months of experience; 18% have six to twelve months of experience; 24% have one to two years of experience, and 28% have more than two years of experience. It represents an element of relatively inexperienced and of more experienced delivery partners in the sample.

Concerning their number of hours of work per day, the largest group of delivery partners stated that they work from 6 to 8 hours per day. In greater detail, 34% of the respondents state that they work 4-6 hours per day, and 38% of the respondents say they work 6-8 hours per day. 8% of the respondents stated that they work fewer than 4 hours per day, while 20% of the respondents said that they work more than 8 hours per day.

Regarding their primary source of income, 78% of the delivery partners said that their gig income was their only income source; 22% said that they earn from a combination of gig work and another job.

Lastly, when asked if they used more than one platform at the same time, 78% of the respondents stated that they did not do so; 22% stated that they did so.

6.2 Analysis of Compensation Structure

6.2.1 Zepto

Per-Order

Pay

Zepto has a per-delivery pay structure, with a minimum base pay of ₹25 – ₹60 per order. The actual amount earned per order depends on various elements that include but not be limited to the length of delivery, the time it takes to complete, and available incentives, therefore there will be a great deal of variability in what you actually earn for each individual delivery.

Location-Based Joining Bonuses

Table 6.2.1.1 Area wise joining bonus offered by Zepto.

Joining Bonus Amount (₹)	Delivery Areas / Networks
7000	Koparkhairne Sector 4A
4000	Jogeshwari East, BKC NW New, Malad Network 2, Bhandup Network 2, Parel SS, Parel, Waghle Estate, Mumbai Central, Waghle Estate Network, Parel Network 2, Girgaon, Airoli, Mira Road
3000	Andheri East, Santacruz, Lokhandwala, Marol, Malabar Hill, Vashi Network 2, Kalwa, Nerul
2000	Andheri West Network, Marol Network 2, Lower Parel New, Worli, Vashi New, Naupada
1000	Park Road, Bandra, Mulund East, MHB Colony, Ashok Van, Borivali, Airoli SS, Waghbil Network 3, Colaba
Nil	Vile Parle, Chakala, Four Bungalows, Andheri East, Andheri West, Marol Network, BKC SS, Marol SS, Bhandup SS, Borivali West, Borivali SS, Koparkhairne New, Shivai Nagar, Vashi Network, Seawoods, Kasarvadavali

These geographic variations indicate that the company is using different compensation strategies, dependent upon where a rider works.

Fees For Onboarding and Equipment

Onboarding fees do not apply to all delivery areas. Select service stations have a very low onboarding fee of ₹199, these include: Andheri East, Marol SS, BKC SS, Borivali SS, Kothari Compound SS, Vashi SS, and Seawoods.

All delivery partners must purchase an onboarding kit costing ₹1500. It contains necessary

delivery equipment.

Joining Incentive

In addition to the joining bonus, Zepto offers a one-time joining incentive of ₹10,000; this joining incentive usually requires the delivery partner to complete a certain number of deliveries over a set timeframe before receiving payment.

Non-Monetary Component of Compensation Package - Insurance Coverage

Zepto provides delivery partners with an insurance plan worth up to ₹13 lakh, that covers both the delivery partner, and their family. This insurance coverage is part of the overall compensation package.

6.2.2 Swiggy Instamart

Swiggy Instamart employs a hybrid compensation strategy that includes per-order compensation, a minimum guaranteed earnings, daily flat incentives, and a spatially variable surge mechanism.

Variable Per-Order Compensation

The compensation for each delivery from Swiggy Instamart varies, generally, from around ₹15 to ₹90 per delivery. The compensation depends on the length of the delivery route, type of delivery, time of delivery and geographic location. Delivery demand at peak hours, zone- specific surges in the price of delivery and multiplier incentives can substantially affect what riders will earn per hour.

Guaranteed Earnings Minimums (Geographic Zone)

Another element of Swiggy Instamart's compensation strategy is the delivery area-based earnings minimum guarantee. These guarantees come in two forms: minimum monthly guarantees, and weekly earnings maximums.

Table 6.2.2.1 Geographic Zones with Minimum Guaranteed Earnings

Earning Guarantee Structure	Geographic Zones
₹17,500 minimum monthly guarantee and up to ₹15,000 weekly earnings	Kurla, Marol–Sakinaka, Andheri East, Vile Parle, Santacruz–Bandra East, Powai, Juhu, Ghatkopar–Vikhroli, Chembur, Bandra West, Jogeshwari East, Jogeshwari West, Matunga–Sion, Bhandup, Mahim–Dadar, Mulund, Parel, Malad Kan East, Lower Parel–Worli, Vashi, Thane Panchpakhadi, Byculla, Borivali, Mahalaxmi–Malabar Hill, Thane, Kalwa, Bhayandar, Fort–Colaba, Ulwe, Mira Road, Kamothe, Dombivli, Panvel, Kalyan, Ulhasnagar, Badlapur, Virar, Ambernath
₹12,600 minimum monthly guarantee and up to ₹13,000 weekly earnings	Andheri West, Thane Hiranandani estate
₹12,600 minimum monthly guarantee and up to ₹12,600 weekly earnings	Andheri West, Malad Kan West, Airoli, Dahisar, Nerul, CBD Belapur, Kharghar, Palava City, Vasai
Up to ₹13,000 weekly earnings	Thane Hiranandani Estate, Chowpatty
Up to ₹8,000 weekly earnings	Nala Sopara
Up to ₹6,250 weekly earnings	Karjat

Onboarding Fee and Registration Charge

If the registration occurs during a promotional offer time frame, the nominal onboarding fee is ₹1, and if it does not occur during the promotional time frame, the standard onboarding fee is ₹1,600.

Flat Pay and Per-Order Incentive Payments

In addition to per-order payments, Swiggy Instamart pays its delivery personnel flat daily incentives when they meet order-completion thresholds.

Table 6.2.2.2 Flat Incentive on Delivery Threshold

Orders/Day	Flat Pay/Day
1	₹100
15	₹550
25	₹900

Also, a flat payment of ₹100 is paid on the first delivery.

Insurance Coverage

The platform offers delivery personnel an insurance policy that covers them and their families up to ₹12 lakh, another non-monetary component of the total compensation package.

6.2.3 Blinkit

Earning Structure based on Time Commitment

Blinkit Delivery Platform communicates projected monthly earning amounts for delivery partners based on how many hours they work per week.

Delivery partners working 8–10 hours per day for six days a week are offered indicative monthly earnings in the range of ₹25,000–₹30,000.

Delivery partners working 6–8 hours per day, primarily as part-time riders on weekdays after 6 p.m. and full-time on weekends, are offered indicative monthly earnings of ₹16,000–₹20,000.

Both of these projected monthly earnings amounts are indicative, as communicated by the application, and can vary depending on the number of deliveries, area, and if the delivery partner is eligible for incentives.

Per-Delivery Payment

Blinkit utilizes a per order, distance-based payment system. The base per delivery payment is between ₹15 - ₹25 for orders that are delivered within ~1km. Orders that are

delivered further than that have an additional payment of around ₹10 - ₹14 per km added. As such, final earnings per order will vary depending on the distance of the delivery, and the location where the rider is assigned to make the delivery.

Location-Based Joining Bonus (Area Specific)

There is substantial variation among different areas for the joining bonus offered to new delivery partners.

Table 6.2.3.1 Location-Specific Joining Bonuses

Joining Bonus Amount (₹)	Delivery Areas
8000	Mazgaon, Vashi South, New Parel, Super Store Malad East, Goregaon JP Nagar, Super Store Borivali East, Super Store Chembur West, Vikhroli
6000	Nalasopara West, Goregaon East (Churiwadi), Marol, Amruthnagar, Ghatkopar
5000	Dadar TT Circle, Electronic Store Kharghar
3000	Grant Road, Vile Parle West, Mahim, Santacruz, Jogeshwari West, Ram Mandir, GTB Nagar, Vile Parle East, Vasai, Borivali West, Wadala, Mahakali Caves, Mira Road (Ghoddev), Andheri Kurla Road, Thakur Village, Saki Vihar Road, Mira-Bhayandar, Chandivali, Tilak Nagar, Govandi-Chembur
2100	Lower Parel ES, Electronic Store Koparkhairne Sector 7
1500	Dadar East, Andheri West (Juhu), Govind Nagar, Kurla West, Dahisar Maratha Colony, Fertilizer Colony
Nil	Girgaon, Madh Island, Lower Parel Lodha, Colaba, Tardeo, Agripada, Marine Lines, Bandra West, Khar-Bandra, Jankalyan Nagar, Andheri RTO Road, Charkop Estate, Kandivali Ganesh Nagar, Alibaug, Lower Oshiwara, New Charkop, Virar, Azad Nagar Andheri, Virar Peninsula, Orlem Malad, Goregaon Belwalkar, Bandra East, Virar Viva College, Charkop Sector 3, Andheri East, Vakola, Kandivali, Nalasopara, BKC Kalina, Golani Naka Vasai, Shell Colony, Mira Road Ramdev Park, Vinay Nagar

Social Security and Welfare Provisions

Blinkit pays for insurance costs associated with being a delivery partner. These include – Accident Insurance up to ₹10 lakh, ₹1 lakh Medical Cover, ₹5,000 OPD Cover, Loss-of-Pay Compensation up to ₹50,000 and Maternity Benefits up to ₹40,000.

As for the non-wage welfare measures that Blinkit offers to its delivery partners, there are several that may help support delivery partners' overall wellbeing. Some of the non-wage welfare measures offered by Blinkit include – Two Paid Period Rest Days Per Month for Female Delivery Partners, Income Tax Filing Assistance, National Pension System Enrollment Support and an Emergency SOS feature available directly through the delivery partner application.

6.2.4 Zomato

Hourly Rates and Estimated Monthly Wage

The company reported in 2025, that Zomato delivery partners earned an average hourly wage of ₹102/hour, based on the number of logged-in hours. With an estimated 10 hours/day x 26 days/month = 260 hours logged in, the estimated average gross monthly wage is ₹26,500.

Estimated that the delivery partner spends approximately 20% of his/her gross wages on operational costs (i.e., gas/vehicle maintenance), the estimated net monthly wage would be approximately ₹21,000.

Customer Tipping Income and Incentives

Zomato delivery partners earn 100% of customer tips. The platform offers a "tip" interface, where the customer can choose from ₹20, ₹30, ₹50 or enter a custom tip amount. The most common tip amount chosen was ₹30, as per Zomato Application. Although customer tipping occurs on only a small percentage of orders, it adds positive income to the total wages.

Work Hours, Delivery Penalties and Safety

Zomato does not penalize delivery partners for late deliveries. The company provides

on-road safety education and first-responder training programs to improve the safety of delivery partners while they are on the job.

Insurance and Employee Protection

All active Zomato delivery partners have access to platform-funded employee-protection insurance; including death, disability and temporary lost-wage protection due to illness that prevents working for up to 10 days. Insurance information is provided to delivery partners in multiple regional languages during onboarding, and employees can file claims directly through the delivery-partner application. The value of all claims filed in favor of delivery partners has increased significantly in recent years; with many of these claims resulting from medical expenses incurred as a result of illness or injury unrelated to accidents.

Employee Health, Wellness and Non-Monetary Employee Benefits

Zomato occasionally hosts free health clinics for delivery partners in conjunction with local community health organizations, to encourage delivery partners to obtain medical examinations. Additionally, the company periodically sends wellness-related messages (including guidelines regarding fatigue, taking regular breaks, and working safely in adverse weather conditions) to delivery partners via in-app notification in multiple languages.

Employee Benefits by Gender

Female delivery partners are granted two paid menstrual cycle days per month, during which time they will receive their average daily earnings for that week. Zomato also provides female delivery partners with maternity-benefit insurance.

Retirement Savings and Long-Term Financial Planning

Zomato has partnered with HDFC Pension to offer its delivery partners access to a National Pension System (NPS) Platform Worker Model; a relatively rare benefit offered to workers in the gig economy, whereby delivery partners may elect to contribute to retirement savings and long-term financial planning.

6.3 Earnings Comparison Across Platforms

6.3.1 Standardisation of Earnings Measures

To allow for a meaningful comparison of earnings it is necessary to standardize these earnings figures using a common metric.

Standardization of earnings was conducted using effective hourly earnings (₹ per hour). All tips, surge pricing and incentives are excluded from the base standardization to allow for conservative estimates that can be compared across platforms.

Assumptions

1. Working days per month = 26 ($\approx 6 \text{ days/week} \times 4.33 \text{ weeks}$).
2. Sample average hours per day (numbers taken from survey collected) — computed using mid-points:
 - $<4 \text{ hours} = \text{assumed } 3 \text{ hours.}$
 - $4 - 6 = \text{midpoint } 5 \text{ hours.}$
 - $6 - 8 = \text{midpoint } 7 \text{ hours.}$
 - $8 = \text{assume } 9 \text{ hours.}$
3. Compute average hours/day:
 - $0.08 \times 3 = 0.24$
 - $0.34 \times 5 = 1.70$
 - $0.38 \times 7 = 2.66$
 - $0.20 \times 9 = 1.80$
 - Total = 6.40 hours/day
 - Sample average monthly hours = $6.40 \times 26 = 166.40 \text{ hours/month.}$

Standardisation of Earnings (Platform-wise)

Zepto

Zepto's per-delivery compensation structure base pay ranges from ₹25 to ₹60 per order. To convert per-order earnings into hourly earnings, a conservative range of 2–4 orders per hour is assumed.

Under these assumptions, estimated hourly earnings from base pay range between ₹50 per hour ($₹25 \times 2$ orders) and ₹240 per hour ($₹60 \times 4$ orders).

Swiggy Instamart

Based on per-order payments ranging from ₹15 to ₹90 per delivery, and assuming 2 – 4 orders per hour, implied hourly earnings from per-order pay range from ₹30 to ₹360 per hour.

Blinkit

For delivery partners working 8 – 10 hours per day for six days a week, with a midpoint of 9 hours/day (234 hours/month), reported monthly earnings of ₹25,000 – ₹30,000 translate to effective hourly earnings of approximately ₹107 – ₹128 per hour.

For part-time delivery partners working 6 – 8 hours per day, with a midpoint of 7 hours/day (182 hours/month), reported monthly earnings of ₹16,000 – ₹20,000 correspond to effective hourly earnings of approximately ₹88 – ₹110 per hour.

Zomato

The average hourly wage as reported by Zomato is ₹102/hour.

Table 6.3.1.1 Summary of Average Effective Hourly Earnings Across Platforms

Platform	Estimated Average Hourly Earnings (₹/hour)
Zepto	₹50 – ₹240
Swiggy Instamart	₹30 – ₹360
Blinkit (Full-time)	₹107 – ₹128
Blinkit (Part-time)	₹88 – ₹110
Zomato	₹102

6.3.2 Earnings Dispersion and Variability

Earnings dispersion is examined using range-based measures, which are appropriate given the structure of the available data.

6.3.2.1 Minimum and maximum estimated hourly earnings across platforms along with the corresponding earnings range.

Platform	Minimum (₹)	Maximum (₹)	Range (₹)
Zepto	50	240	190
Swiggy Instamart	30	360	330
Blinkit (Part – Time)	88	110	22
Blinkit (Full – Time)	107	128	21
Zomato	~102	~102	~0*

**Zomato reported an average hourly rate, hence dispersion not disclosed due to absence of publicly available data.*

As observed from Table 6.3.2.1 that there is a significant difference in the dispersion of hourly earnings among platforms. Platforms that provide workers with per-order compensation (Zepto, Swiggy Instamart) have much greater variability in earnings compared to other platforms. Swiggy Instamart has the greatest dispersion of earnings, ranging approx ₹330 per hour; Zepto follows at a distance with a range of approximately ₹190 per hour. The high ranges of hourly earnings illustrate how sensitive worker earnings are to the number of deliveries completed, the orders assigned to them and their specific geographic location.

On the other hand, those platforms that pay workers based on the amount of time worked (Blinkit), tend to have much lower variability in hourly earnings. The part-time and full-time earning structures for Blinkit present narrow hourly ranges of ₹22 and ₹21, respectively, demonstrating that the earnings of its workers are somewhat predictable when they commit to work specific hours.

The data demonstrate that there is considerable difference in the variability of worker earnings among platforms; the per-order compensation platforms (Zepto, Swiggy Instamart) having much greater variability in worker earnings than the time-based (Blinkit) platforms.

6.4 Perception of Fairness and Transparency

The 50 delivery partners who took part in this research provided information about how fairly, clearly, and transparently they felt their earnings were distributed.

Clarity and Transparency of Pay Structures

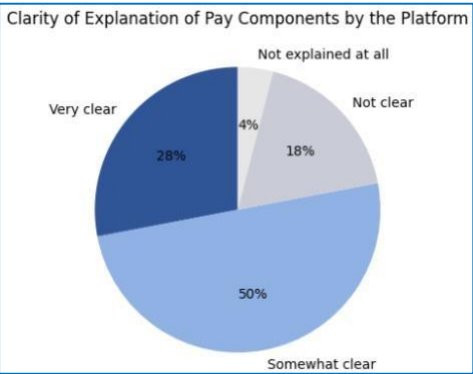
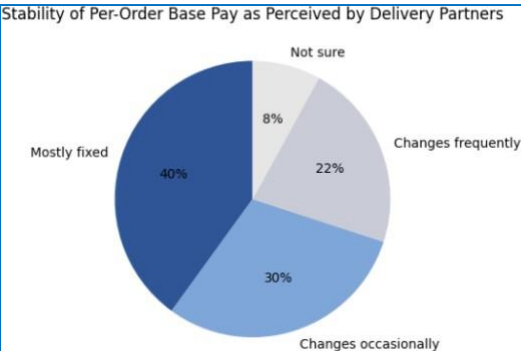


Figure 6.4.1 illustrates delivery partners’ perceptions regarding the clarity of earnings calculation. While a majority of respondents reported that earnings calculation was either not clear or somewhat clear, only 28% indicated complete clarity. Notably, 22% of respondents reported that earnings calculation was unclear or not explained at all, highlighting gaps in transparency and understanding of pay determination mechanisms.

Stability of Earnings and Predictability

Figure 6.4.2 indicates limited predictability in earnings. While 40% of respondents perceive



per-order base pay as mostly fixed, a majority (52%) report that base pay changes either occasionally or frequently. A further 8% remain unsure, suggesting opacity in pay determination. Such variability contributes to uncertainty in expected earnings and weakens perceptions of pay transparency.

Perceived Fairness of Earnings



Figure 6.4.3 illustrates mixed views on whether the effort and time delivery partners invest in their jobs is fairly compensated through their job earnings. While 40% of participants believe they are fairly paid for their effort and time investments, the majority number of participants (60%) believed they were either somewhat fairly

paid or not at all fairly paid. This suggests many delivery partners feel there is an imbalance between the rewards and the efforts they put into their job.

Perceived Uniformity and Need for Standardisation

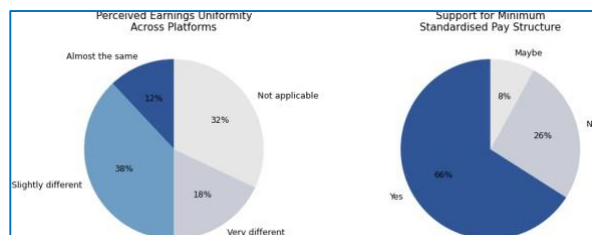


Figure 6.4.4 shows significant beliefs in variations of earnings as perceived by respondents. Only 12 percent of respondents who have used multiple platforms believed that earnings for similar hours worked are very

nearly the same; however, a substantial portion (56%) of this group indicated they believe their earnings varied slightly or greatly from one platform to another. Similarly, 66% of respondents believed there should be a minimum standardised pay rate on all platforms, demonstrating a belief that there is a need for more consistent earnings and greater income stability.

7 Findings:

- 7.1 The standardized hourly earnings comparison among quick commerce platforms shows large variations in earning across platforms. The per-order payment models employed by Swiggy Instamart and Zepto display extreme variance in earnings, whereas the time based model in Blinkit displays small and predictable earnings bands. This indicates that platform-specific compensation design plays a decisive role in determining worker income.
- 7.2 The dispersion analysis further demonstrates that per-order compensation models exhibit significantly larger earnings volatility. Swiggy Instamart displays the largest earnings dispersion (₹330/hour) followed by Zepto (₹190/hour). The factors contributing to this large variance include order allocation algorithms, delivery density, time of work and geographic area. Thus, although workers may be putting forth an equal amount of effort and working the same number of hours, their earnings will be highly unpredictable.
- 7.3 Time-Based Pay Structures Provide Greater Income Stability. On the other hand, Blinkit's earnings structure, which is tied to time worked rather than the volume of deliveries completed, provides much smaller earnings dispersion (the range of earnings

is ₹21– ₹22/hour). Therefore, time-based compensation models appear to provide greater predictability and income stability for delivery partners as well as less financial uncertainty compared to per-order systems.

- 7.4 According to survey responses, only 28% of the respondents indicated complete clarity about the understanding of their earning components and how their earnings were being calculated, while a sizeable portion of the respondents were unsure or believed that the process was only somewhat clear. Therefore, the lack of transparency in the algorithmic pay mechanism prevents workers from understanding how their effort equates to their earnings.
- 7.5 Unstable base pay reduces earnings predictability. While 40% of delivery partners perceive that their base pay is mostly fixed, however, 52% of delivery partners also report that base pay changes from time to time or often. The findings indicate that earnings are unstable and difficult to estimate, particularly on platforms with dynamic pricing and incentive-based compensation structures.
- 7.6 Discrepancy Between Effort and Compensation Perception. According to the perception analysis, 60% of the respondents believe that they are either only somewhat fairly compensated or not fairly compensated at all. This indicates a disparity between the time and efforts required to perform work and the compensation received, particularly on platforms with fluctuating earnings despite similar levels of work intensity.
- 7.7 Demand for Minimum Standardisation Reflects Broader Worker Discontent. Many workers in the quick commerce industry support some form of standardised (minimum) payment levels across all delivery platform companies. 66% supported the introduction of a standardized minimum pay rate; this is consistent with the strikes and protests that have been happening at gig work companies across India and are related to the issues of low pay, arbitrary incentive changes, lack of income stability etc. A call for some sort of "standard" is therefore an attempt by workers to find some measure of 'fairness', 'predictability' and 'protection'.

7.8 Rejection of the Null Hypothesis. The results are sufficient to show that there is a statistically significant difference in the way that earnings vary among different quick commerce platforms.

8 Suggestions/Recommendations:

8.1 There needs to be a standardized minimum wage or hourly wage established and implemented across all of the quick commerce platforms. The standardization of an hourly wage or delivery wage will provide gig workers with a stable level of income regardless of which platform they are working on, what algorithms the platform is utilizing, where the gig worker is located, or when there is fluctuation in demand. This will reduce the wide spread income disparity that currently exists.

8.2 Quick commerce platforms need to disclose to gig workers the basis of pay calculations (base pay, distance calculation, surge pricing, and the criteria used to qualify gig workers for incentives). Providing gig workers with a clear and understandable breakdown of the factors used to determine their earned income through their delivery partner application.

8.3 Due to the significant role that algorithmic management plays in determining the gig worker's earned incomes, regulatory agencies shall require that all platforms utilize periodic audits to review their algorithms that are used to determine gig worker's earned incomes.

8.4 Platforms that utilize per delivery compensation programs should establish guaranteed minimum earned income programs, especially during periods of low demand. This will guarantee stability in earnings and decrease the economic insecurity faced by the workers who primarily rely on this type of employment.

8.6 In addition to providing monetary compensation to gig workers, platforms should expand their non-monetary compensation programs, such as health insurance, paid rest days, medical support, and income-loss protection. The provision of uniform social security benefits across platforms will increase the overall quality of life of gig workers and bring gig work closer to being considered a "decent" job.

8.7 Government agencies should develop a much needed enactment or specific guidelines for gig workers in the quick-commerce industry, focusing on minimum payment rates, disclosure of how payments are made, and mandatory social-security contributions.

9 Conclusion:

The research shows that wages in the quick commerce gig economy vary greatly, based on the platform being used, despite delivery partners performing similar jobs for similar periods of time. In addition, the data collected indicated that time based payment provided better earnings consistency than per order payment.

In addition to hours worked and effort, the results suggest that the structure of a particular platform's algorithm (i.e., how earnings are determined), the rules for accessing incentives, and the way deliveries are geographically allocated to drivers all have an impact on earnings. As a result, many delivery partners are unaware about how much they will earn at the end of each day and feel their income is unfair.

Delivery partner survey respondents reported most often, a lack of understanding of their earning components and how their earnings are determined. Many also supported a minimum standard of earnings for delivery partners across all platforms. This is due to the fact that the issue is more about having a stable income base, rather than the level of pay.

Ultimately, this research suggests that wage disparity in quick commerce is systemic, rather than a matter of chance, and is directly related to the design of the compensation system, rather than worker performance. To address these disparities, there needs to be greater transparency and standardization in base earnings for gig workers to provide fairness and predictability in their earnings.

10 Limitations of the study:

First, the sample size was restricted to 50 delivery partners, therefore limiting the statistical generalizability of the results to a larger group of gig workers in India.

Additionally, the utilization of nonprobability convenience sampling may generate a selection bias, because delivery partners responding to the survey may not have been representative of all groups of delivery partners.

Second, the wage estimates were developed from both survey responses that are reported by the respondents and information on compensation provided by the platforms, however, these can be affected by time, location, and changes in the algorithms used by the platforms. Because of the frequent revisions to the platform's compensation plans and incentives, the results represent a snapshot of wage levels at one point in time (particularly around the period of Jan'26 to Feb'26).

Third, the study utilized calculated standardized hourly wage estimates, as opposed to verifiable income data. While this method will allow for comparisons of wages across platforms, it does not capture the potential short-term fluctuations (e.g., due to demand spikes, order cancellations, or operational disruptions) of the actual income of an employee. Fourth, the analysis focused on select quick commerce platforms that operate primarily in urban settings. Therefore, the findings may be less applicable to those living in rural settings or to other types of gig work prevalent in the gig economy.

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12 Appendix

Questionnaire:

Set A

1. Which quick commerce platform do you currently work with? Blinkit, Zepto, Swiggy Instamart, Zomato, Others
2. How long have you been working as a delivery partner on this platform? Less than 6 months, 6–12 months, 1–2 years, More than 2 years
3. On average, how many hours do you work per day? Less than 4, 4 – 6, 6 – 8, More than 8
4. What is your primary source of income? Only gig work, Gig work + another job
5. Do you work with more than one delivery platform simultaneously?
Yes, No

Set B

Objective 1

1. How clearly are the pay components explained to you by the platform?
Very clear, Somewhat clear, Not clear, Not explained at all
 2. Does the per-order base pay remain the same, or does it vary frequently? Mostly fixed, Changes occasionally, Changes frequently, Not sure
- ##### Objective 2
3. If you have worked on multiple platforms, how would you compare overall earnings for similar working hours?
Almost the same, Slightly different, Very different, Not applicable
 4. For similar delivery distance and time, do platforms offer comparable

pay? Yes mostly uniform, Somewhat uniform, Highly inconsistent, Cannot say

5. Do you believe there should be a minimum standardized pay structure across quick commerce platforms?

Yes, No, Not sure

Objective 3

6. How fair do you think your earnings are in relation to the effort and time you invest?

Very fair, Fair, Unfair, Very unfair

7. How transparent is the earnings calculation shown on the app?

Very transparent, Moderately transparent, Poorly transparent, Not transparent

8. Have you ever felt that earnings were reduced or changed without proper explanation?

Often, Sometimes, Rarely, Never

A Study On Wage Equity and Compensation Management Practices in The Indian Hospitality Industry

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Abstract:

This research report aims to investigate the current state of wage equity and compensation management practices in the Indian hospitality industry, with a specific focus on the city of Mumbai. The study seeks to explore the extent to which wage equity exists in the industry, the factors that influence compensation decisions, and the impact of these decisions on employee satisfaction, motivation, and retention. By examining the perspectives of employees, this research aims to provide valuable insights into the complexities of wage equity and compensation management in the Indian hospitality industry. The findings of this study are expected to contribute to the development of more effective compensation strategies that promote fairness, equity, and employee well-being in the industry. The study highlights the importance of adopting fair, transparent, and structured compensation management systems to promote wage equity. Ensuring equitable compensation not only enhances employee morale and productivity but also contributes to improved service quality and organizational sustainability. The research provides practical insights and recommendations for hospitality organizations and policymakers to develop more equitable and effective compensation practices.

Introduction:

The Indian hospitality industry is a major employment-generating sector within the service economy and contributes significantly to national income, foreign exchange earnings, and skill development. Despite its rapid growth, concerns related to wage equity and compensation management remain widespread. Employees, particularly at entry-level and

operational positions, often experience wage disparities, limited benefits, and a lack of transparent compensation structures.

The industry is labour-intensive and comprises of a diverse workforce across various skill levels and establishments, ranging from luxury hotels to budget accommodations and standalone restaurants. In metropolitan cities such as Mumbai, this diversity has led to complex and inconsistent compensation practices, resulting in persistent pay inequities across job roles and employment types.

Post-pandemic recovery, globalization, and digital transformation have further influenced compensation dynamics, increasing pressure on organizations to balance cost efficiency with fair remuneration. Inequitable compensation practices adversely affect employee motivation, retention, and service quality. This paper critically examines wage equity and compensation management practices in the Indian hospitality industry, with particular reference to Mumbai, and identifies key challenges and areas requiring policy and managerial intervention.

Overview of the Hospitality Industry in Mumbai

Mumbai's hospitality industry includes luxury and mid-tier hotels, budget accommodations, restaurants, café chains, and informal eateries, each operating under distinct business and compensation models. The sector employs a diverse workforce comprising permanent, contractual, and casual workers, with a significant proportion of migrant labor. Seasonal demand fluctuations lead to increased reliance on temporary and outsourced employees. Combined with Mumbai's high cost of living, this workforce diversity poses challenges for equitable compensation. Additionally, disparities between organized establishments with formal HR policies and unorganized units with informal employment practices further intensify wage inequities across the sector.

Objectives of the Study:

1. To examine the existing compensation management practices prevailing in the Indian hospitality industry across various categories such as hotels, resorts, and food service establishments.

2. To analyse the extent of wage equity in the hospitality sector with respect to gender, job roles, skill levels, experience, and organizational hierarchy.
3. To identify key factors influencing wage disparities, including contractual employment, tipping culture, working hours, and regional variations within the Indian hospitality industry.
4. To critically evaluate the effectiveness of current wage policies and regulatory frameworks, including minimum wage laws and labour regulations, in ensuring fair compensation.
5. To assess the relationship between wage equity and employee outcomes, such as job satisfaction, motivation, retention, and performance in hospitality organizations.
6. To suggest strategic recommendations for improving wage equity and designing fair, transparent, and sustainable compensation systems in the Indian hospitality industry.

Review of Literature:

This review of literature is based on a thematic and narrative analysis of existing secondary sources, including prior research studies, academic journals, industry reports, and government publications related to wage equity, compensation management, and labour regulations in the hospitality industry. The review synthesizes key findings from previous scholars rather than focusing on a single author's work, in order to identify common themes, gaps, and trends relevant to the present study.

1. Concept of Wage Equity:

Wage equity refers to fair remuneration for employees performing similar work or contributing comparable value to an organization. Existing studies indicate that wage equity positively influences employee morale, commitment, and productivity. In the hospitality industry, however, wage inequity is commonly observed between frontline and managerial employees, as well as between organized and unorganized establishments. Research highlights that many hospitality employees earn wages close to statutory minimum levels, with limited benefits and increments. Gender-based pay gaps and contractual employment further intensify wage inequities.

2. Compensation Management in Hospitality Industry:

Literature suggests that compensation in hospitality comprises fixed and variable components, including wages, incentives, service charges, and non-monetary benefits. While effective compensation systems are intended to attract, motivate, and retain employees, studies reveal

significant shortcomings in practice. Lack of standardization, limited transparency, and inconsistent performance-linked pay systems are prevalent across the industry. Operational employees often face slow wage progression despite their critical role in service delivery, whereas senior management receives disproportionately higher compensation. Such imbalances negatively affect employee motivation, satisfaction, and retention, contributing to high attrition rates.

3. Legal and Regulatory Framework:

India's wage-related labour laws, including the Minimum Wages Act, Payment of Wages Act, and the Code on Wages, aim to ensure fair remuneration and protect employee rights. However, literature indicates weak enforcement of these regulations within the hospitality sector. Heavy reliance on informal employment, contractual labour, and outsourcing dilutes regulatory accountability. Issues such as unpaid overtime, long working hours, and irregular service charge distribution further undermine wage protection. Scholars emphasize the need for stronger enforcement mechanisms and greater employee awareness to improve wage fairness and workforce stability.

4. Summary of Literature Insights:

- A report by the *Tourism and Hospitality Skill Council in collaboration with PricewaterhouseCoopers (2024)* revealed that the median monthly wage for entry-level employees in the Indian hospitality sector is approximately ₹13,000. The study further highlighted issues such as extended working hours without proportional overtime compensation, informal employment arrangements, and lack of structured pay systems. These findings indicate persistent wage disparities and reinforce the need for standardized and transparent compensation frameworks to ensure wage equity and workforce stability in the hospitality industry.
- A study by *Sengupta and Mohsin (2023)* examined wage equity in the Indian hotel sector and found that pay disparities exist across employee levels, gender, and job roles. The study emphasized that fair compensation strategies are essential for employee well-being, motivation, and organizational performance. The authors concluded that structured wage policies and transparent compensation systems are necessary to ensure fairness and reduce inequality in the hospitality sector.

- Overall, the literature reveals that wage inequity in the hospitality industry is driven by structural inefficiencies, informal employment practices, and weak regulatory implementation. Existing studies consistently highlight the need for transparent, standardized, and performance-oriented compensation systems to enhance employee satisfaction.

Research Methodology:

1. Research Design

The study adopts a descriptive and analytical research design to examine wage equity and compensation management practices in the Indian hospitality industry. The descriptive approach helps understand existing wage structures, while the analytical approach examines wage disparities and their impact on employee outcomes such as job satisfaction and retention.

2. Nature of Data

The study is based on primary and secondary data. Primary data was collected through a structured questionnaire administered to employees working in various segments of the hospitality industry. Secondary data was sourced from academic journals, government reports, labour law publications, industry reports, and prior research studies related to wage equity and compensation management.

3. Population and Sample Design

The population of the study includes employees working in hotels, restaurants, cafés, and allied hospitality establishments across organized and unorganized sectors. A non-probability convenience sampling technique was adopted due to accessibility constraints. A sample size of 50 respondents was selected to ensure representation across different job roles and employment types.

4. Data Collection Instrument

Primary data was collected using a structured questionnaire consisting of sections related to demographic profile, compensation practices, wage equity, factors influencing wage disparities, and employee outcomes. Most questions were measured using a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree to facilitate quantitative analysis.

5. Variables of the Study

- Independent Variables: Compensation practices, wage equity, employment type, working hours, tipping culture, regional factors, and regulatory framework.
- Dependent Variables: Job satisfaction, employee motivation, retention, and performance.
- Control Variables: Gender, age, education, experience, job level, and nature of organization.

6. Reliability and Validity of the Instrument

Content validity was maintained through an extensive literature review and alignment of questions with research objectives.

7. Tools and Techniques for Data Analysis

The collected data was analyzed using MS Excel / Google forms.

8. Ethical Considerations

Participation was voluntary, confidentiality and anonymity of respondents were ensured, and data was used strictly for academic purposes.

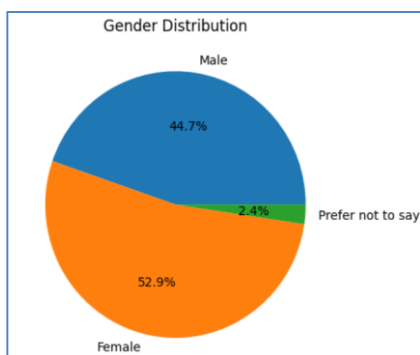
9. Limitations of the Study

The study is limited by a small sample size, use of convenience sampling, and reliance on self-reported data, which may involve subjective bias.

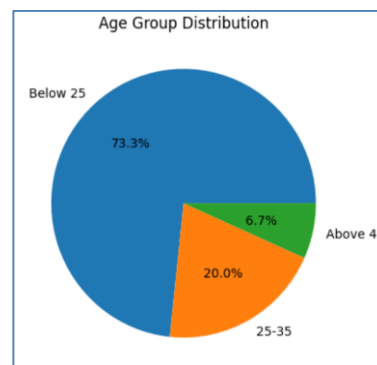
10. Scope of the Study

The study provides insights into wage equity issues and compensation management practices in the Indian hospitality industry and may assist HR professionals and policymakers in promoting fair wage systems.

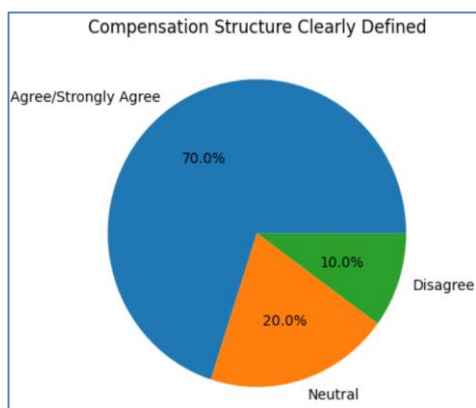
Data Analysis and Interpretation:



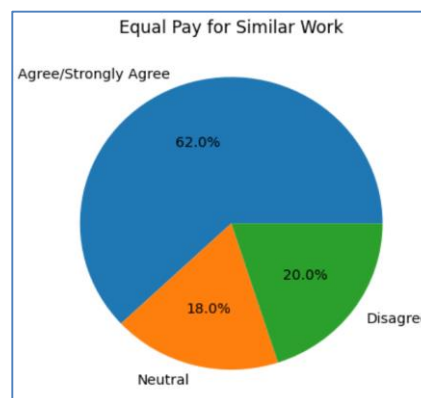
The pie chart indicates a fairly balanced gender distribution among respondents, with a slight predominance of female employees.



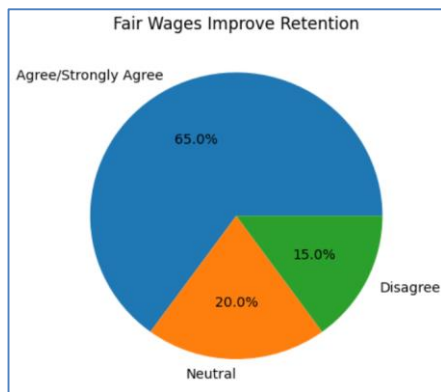
The pie chart reflects a predominantly young workforce, with most respondents below 25 years of age. This suggests high entry-level participation in the hospitality industry, which may influence perceptions of wages, career growth, and employee retention.



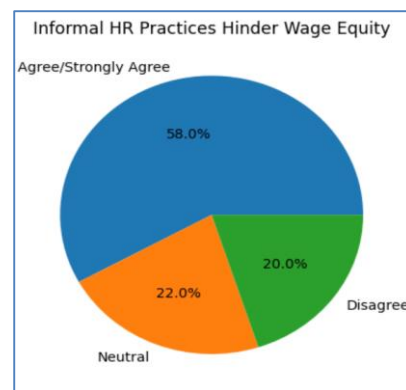
The pie chart indicates that most respondents perceive their organization's compensation structure as clearly defined. However, neutral and disagreeing responses suggest existing gaps in clarity and communication, highlighting the need for improved transparency in compensation policies.



The pie chart shows that while most respondents perceive equal pay for similar work, a notable proportion remains neutral or disagrees. This indicates that wage equity exists to some extent but requires stronger standardization and monitoring to address perceived pay disparities.



The pie chart indicates that a majority of respondents believe fair wages significantly improve employee retention. This underscores the importance of equitable compensation in reducing employee turnover in the hospitality industry.



The pie chart shows that most respondents perceive informal HR practices as a barrier to wage equity. This highlights the need for formalized HR policies to ensure transparency and fair wage distribution.

Findings of The Study:

- The study highlights that wage equity and compensation management remain key challenges in the Indian hospitality industry, particularly in Mumbai.
- While many organizations have formal compensation structures, gaps persist in transparency, consistency, and equitable implementation across job roles and employment types.
- Although most respondents perceive compensation structures to be clearly defined and believe that equal pay for similar work exists, a notable proportion still reports wage disparities.
- These disparities are largely influenced by employment type, contractual arrangements, informal HR practices, and reliance on tips.
- Contractual and casual workers are especially disadvantaged in terms of wage levels and access to benefits.
- The findings also indicate that informal and unstructured HR practices significantly hinder wage equity, particularly in unorganized establishments.
- Weak enforcement of labour regulations further contributes to inconsistent wage practices.

- Importantly, the study establishes a strong link between fair wages and positive employee outcomes, including higher job satisfaction, motivation, and retention. Inequitable compensation was found to negatively affect morale and contribute to high employee turnover.
- Overall, the study confirms that wage inequity in the hospitality industry is a structural and managerial issue rather than an isolated compensation concern.
- Strengthening formal HR systems, improving transparency in wage policies, and ensuring fair and standardized compensation practices are essential for enhancing employee well-being, service quality, and long-term organizational sustainability.

Suggestions / Recommendations:

- Based on the findings of the study, hospitality organizations should adopt transparent and standardized compensation structures that clearly define pay components, increments, and incentive criteria across all job roles.
- Improved communication of compensation policies can reduce ambiguity and enhance employees' understanding of wage determination processes.
- To address wage disparities, especially among contractual and casual employees, organizations should implement uniform wage benchmarks for similar roles, irrespective of employment type.
- Equal pay for equal work should be actively monitored through periodic wage audits and job evaluation systems.
- Introducing structured HR policies, documented wage frameworks, and performance appraisal systems can significantly improve wage equity and reduce perceptions of favoritism or bias.
- Given the strong link between fair wages and employee retention, organizations should align compensation with performance and experience, ensuring timely increments and performance-based incentives for frontline and operational employees who contribute directly to service quality.
- Stronger compliance with labour laws and wage regulations is essential. Hospitality employers should ensure adherence to minimum wage provisions, overtime compensation, and statutory benefits, while policymakers should strengthen enforcement mechanisms to reduce informal wage practices.

- Overall, adopting fair, transparent, and equitable compensation management practices can enhance employee motivation, reduce turnover, improve service quality, and support the long-term sustainability of the hospitality industry.

Conclusion:

Wage equity and effective compensation management play a vital role in ensuring the sustainable growth and long-term viability of zclearly demonstrates that persistent wage disparities, inequitable pay structures, and limited access to benefits—particularly for operational and frontline employees—remain widespread challenges. Despite being central to service delivery and customer satisfaction, these employees often experience low wages, minimal career-linked salary progression, and inadequate recognition for their contributions. The findings suggest that existing compensation systems are frequently characterized by structural inefficiencies, lack of transparency, and disproportionate rewards for managerial and executive roles. Such imbalances contribute to employee dissatisfaction, high attrition rates, and recurring skill shortages, ultimately affecting service quality and organizational performance.

Without addressing these underlying issues, hospitality organizations risk undermining workforce stability and weakening their competitive position in an increasingly service-driven market.

Addressing wage inequity requires a strategic and balanced approach to compensation management. Implementing equitable pay structures, standardized job evaluation systems, transparent compensation policies, and performance-based incentives can significantly enhance employee motivation, engagement, and loyalty. Moreover, aligning compensation practices with legal standards and long-term human resource strategies can foster a fairer work environment and support organizational sustainability. Ultimately, a well-designed and inclusive compensation framework benefits not only employees but also strengthens service excellence, brand reputation, and the long-term competitiveness of hospitality organizations in India.

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Appendix

RESEARCH QUESTIONNAIRE

Section A: Demographic & Employment Profile

1. Gender
☐ Male ☐ Female ☐ Prefer not to say
2. Age Group
☐ Below 25 ☐ 25–35 ☐ 36–45 ☐ Above 45
3. Educational Qualification
☐ Up to 12th ☐ Diploma ☐ Graduate ☐ Post-graduate
☐ Professional Course
4. Type of Establishment
☐ Hotel ☐ Resort ☐ Restaurant ☐ Café
☐ Other (Specify) _____
5. Job Level
☐ Entry-level ☐ Supervisory ☐ Managerial ☐ Senior Management
6. Years of Experience in Hospitality Industry
☐ Less than 1 year ☐ 1–3 years ☐ 3–5 years ☐ More than 5 years

Section B: Compensation Structure & Practices

(Objective 1 & 6)

1. My organization follows a clearly defined compensation structure.
2. Salary components (basic pay, allowances, incentives) are clearly communicated.
3. Compensation is linked to job role and responsibilities.
4. Performance-based incentives are fairly determined.
5. Compensation practices are consistent across similar job roles.

Section C: Wage Equity & Fairness

(Objective 2)

1. Employees performing similar work receive equal pay.
2. There is no gender-based pay discrimination in my organization.
3. Experience and skills are fairly rewarded in wage determination.
4. Promotions lead to proportional salary increments.

Section D: Factors Influencing Wage Disparities

(Objective 3)

1. Contractual employees receive lower wages than permanent employees for similar work.
2. Tips form a significant part of total earnings in my role.
3. Long working hours are not adequately compensated.
4. Regional location affects wage levels in the hospitality industry.
5. Informal employment practices contribute to wage inequality.

Section E: Wage Equity & Employee Outcomes

(Objective 5)

1. I am satisfied with my current compensation.
2. Fair wages motivate me to perform better.
3. Wage fairness influences my decision to stay with the organization.
4. Inequitable pay practices reduce employee morale.
5. Fair compensation enhances overall job satisfaction.

Section F: Challenges in Implementing Wage Equity

(Objective 7)

1. Lack of transparency is a major challenge in compensation management.
2. Cost constraints prevent fair wage distribution.
3. High employee turnover affects wage standardization.
4. Informal HR practices hinder wage equity.

Hidden Risks in Compensation Management: Bonus Accruals and Deferred Pay

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Abstract:

Compensation management plays a critical role in aligning organizational performance with employee expectations. Among the various components of compensation structures, bonus accruals and deferred pay have become increasingly important tools for rewarding performance, retaining talent, and managing long-term financial commitments. However, these mechanisms may also involve hidden financial and behavioral risks that can affect both organizational stability and employee satisfaction.

The present study aims to examine the compensation management system with particular reference to bonus accruals and deferred compensation practices. It seeks to identify potential financial risks such as inaccurate estimation, misreporting, and future financial strain on organizations. Further, the study analyzes employee-related concerns including lack of transparency, limited understanding of policies, reduced trust, and dissatisfaction arising from complex or unclear compensation structures.

The research is based on primary data collected through a structured questionnaire administered to students, interns, employees, and managerial personnel across different sectors. The survey evaluates awareness levels, perception of fairness, and opinions regarding the effectiveness of communication and policy clarity in compensation practices.

The study indicates that while bonus accruals and deferred pay are designed to support strategic human resource objectives, gaps in planning and communication can create

significant risks.

Keywords: Compensation Management, Deferred Pay, Bonus Accruals, Employee Perception, Financial Risks, Transparency, Organizational Liability, Pay Communication

Introduction:

Compensation management is a fundamental element of human resource management that directly influences employee motivation, organizational performance, and financial sustainability. It involves the design and administration of salary structures, incentives, bonuses, and long-term reward mechanisms aimed at attracting, retaining, and rewarding talent. In recent years, organizations have increasingly relied on performance-linked payments such as bonus accruals and deferred pay to align employee contributions with strategic objectives and future growth.

Bonus accruals refer to the estimation and recognition of employee bonuses in advance of actual payment, based on expected performance outcomes. Deferred pay, on the other hand, represents compensation that is earned in the present but scheduled to be paid at a future date, often as a retention or motivational tool. While these practices provide flexibility in financial planning and help organizations manage cash flows, they also introduce complexities in accounting, reporting, and communication.

If not designed or communicated properly, bonus accruals may lead to inaccurate financial estimation, unexpected liabilities, or even misrepresentation of an organization's financial position. Similarly, deferred compensation can create long-term obligations that affect future profitability and budgeting decisions. Beyond financial considerations, these mechanisms may also influence employee perceptions. Limited understanding of how bonuses are calculated, uncertainty about payment timelines, and lack of clarity in policy terms can reduce trust in management and lead to dissatisfaction or demotivation.

In a competitive and transparent work environment, employees increasingly expect fairness, clarity, and timely communication regarding their earnings. Any gap between expectations and actual outcomes can create risks not only for workforce morale but also for

organizational reputation and governance. Therefore, it becomes essential to examine the hidden dimensions of compensation strategies, particularly those that may not be immediately visible in routine payroll operations.

The present study seeks to explore these concerns by analyzing the financial as well as behavioral risks associated with bonus accruals and deferred pay. By understanding employee awareness, perceptions of transparency, and views on policy effectiveness, the research attempts to provide insights into how compensation systems can be strengthened to achieve a better balance between organizational goals and employee expectations.

Review of Literature

Many researchers have studied compensation management to understand how bonus systems and delayed payments influence organizations and employees. Over time, studies have shown that while such practices are useful for motivating performance and retaining talent, they can also create financial and behavioral challenges if they are not handled carefully.

Cheng (2019) examined how deferred bonus payments affect managerial decisions. The study found that when a portion of the bonus is kept for future payment, managers tend to focus more on long-term benefits rather than short-term gains. This means deferring pay can encourage better future planning. However, it also makes compensation systems more complex and requires proper monitoring.

Holthausen, Larcker, and Sloan (1995) studied the relationship between bonus schemes and financial reporting. Their research showed that when bonuses depend heavily on accounting profits, managers may try to adjust or manipulate earnings in order to reach bonus targets. This highlights the risk that incentive plans can sometimes influence how financial results are presented.

Similarly, Healy's earlier work on bonus plans suggested that managers often make accounting choices based on how those choices affect their incentives. If earnings are close to the level required for receiving a bonus, there may be pressure to change estimates. Such

practices can reduce transparency and create concerns for investors and regulators.

Research on deferred compensation in the banking sector has provided another important perspective. Studies observed that when executives know part of their pay will be received in the future and depends on continued performance, they become more cautious in taking risks. This shows that deferred pay can help in controlling aggressive decision-making, but at the same time it creates long-term financial commitments for the organization.

Apart from financial reporting issues, scholars have also emphasized the importance of employee perception. Literature repeatedly points out that compensation systems are effective only when employees clearly understand how they work. Lack of communication about bonus calculation, payment timelines, or conditions attached to deferred pay can lead to confusion, mistrust, and dissatisfaction.

Although previous studies have explored either financial reporting risks or motivational aspects, fewer studies have combined both views to examine the hidden risks that arise simultaneously for organizations and employees. Therefore, there is a need to study how bonus accruals and deferred pay influence not only financial planning but also employee trust and satisfaction. The present research attempts to contribute to this area.

Research Methodology:

The study adopts a descriptive research design to examine hidden risks in compensation management with special reference to bonus accruals and deferred pay. The research focuses on understanding how individuals perceive compensation practices, their awareness of policies, and the potential financial and behavioral concerns associated with such systems.

The research is primarily based on primary data collected through a structured questionnaire. A Google Form was prepared containing close-ended questions to ensure uniformity and ease of response. The questionnaire was divided into different sections covering respondent profile, awareness and understanding, financial risks, employee-related concerns, and views on overall effectiveness of compensation policies.

A total of 42 responses were received from students, interns, employees, and managerial personnel belonging to different sectors. The participants were selected on the basis of convenience sampling, depending on accessibility and willingness to respond within the available time frame.

The collected data was compiled and analyzed using simple statistical techniques, mainly percentages and graphical representation. This approach helped in identifying common patterns, levels of awareness, and major risk perceptions among respondents.

The study has certain limitations. The sample size is limited and may not represent the views of all industries or employee groups. Further, since the data is perception-based, responses depend on the individual understanding of compensation systems. However, the survey provides practical insight into how bonus accruals and deferred pay are viewed by different participants.

Analysis and Interpretation of Data:

The present study examines the hidden risks in compensation management, with particular emphasis on bonus accruals and deferred pay. The analysis is based on primary data collected through a structured questionnaire administered to 42 respondents. The questions were designed to assess employee awareness, perceptions, and concerns related to bonus accrual practices, deferred compensation, transparency, financial risk, and employee satisfaction.

The responses were analyzed systematically by identifying dominant trends, variations in perception, and areas of divergence, followed by interpretation in relation to compensation management risks.

Demographic Interpretation

The majority of respondents belonged to the 22–25 years age group, followed by respondents aged 18–21 years, indicating that a significant portion of the sample consisted of interns and early-career employees. This demographic profile is particularly relevant, as

individuals at early stages of employment are often more vulnerable to misunderstanding complex compensation structures.

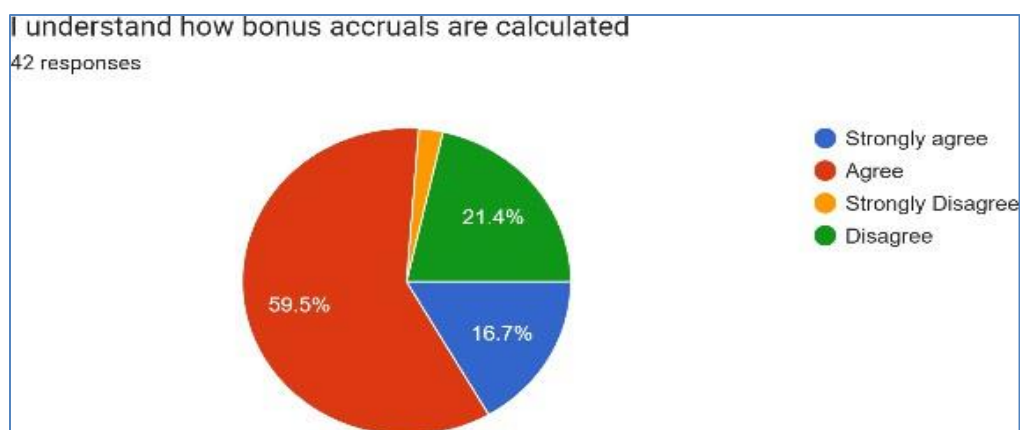
Respondents were drawn from multiple sectors and organizational roles, including interns, full-time employees, and individuals in supervisory or managerial positions. This diversity strengthens the analysis by capturing perceptions from different levels of organizational exposure to compensation policies.

Interpretation of Awareness and Understanding of Bonus Accruals

Responses indicate that while a majority of employees believe they understand how bonus accruals are calculated, a noticeable proportion expressed disagreement or uncertainty. This disparity suggests that understanding of bonus accrual mechanisms is not uniform across employees.

This lack of complete understanding represents a hidden operational and behavioral risk. Employees who do not fully understand how bonuses are accrued may develop inflated or inaccurate expectations regarding payouts. When actual bonuses differ from expectations, dissatisfaction and mistrust may arise, even if calculations are technically accurate.

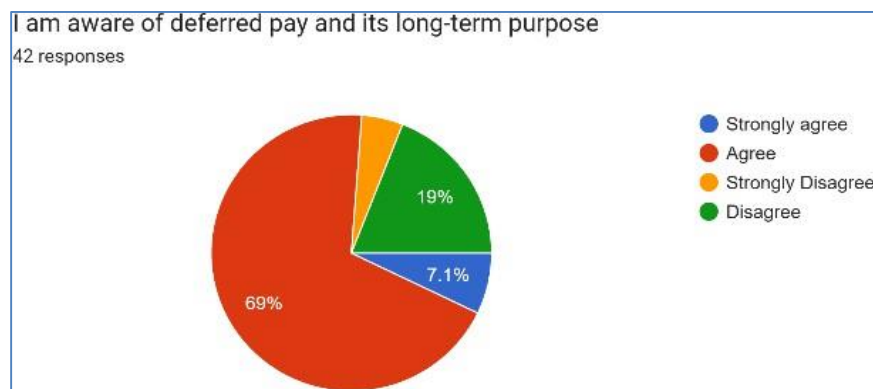
Thus, the findings suggest that bonus accruals, when not adequately explained, can undermine the motivational purpose of performance-linked pay.



Interpretation of Awareness of Deferred Pay

The majority of respondents reported being aware of deferred pay and its long-term nature. However, the presence of neutral and negative responses indicates that awareness does not necessarily translate into detailed understanding.

Deferred pay involves delayed gratification and conditional payouts, which require a higher level of clarity. Partial awareness can create a situation where employees acknowledge deferred pay in theory but fail to fully comprehend vesting conditions, timelines, or performance linkages. This gap increases the risk of future dissatisfaction and disengagement, especially when payouts are postponed or forfeited.



Interpretation of Communication of Compensation Policies

A significant proportion of respondents agreed that their organizations communicate bonus and deferred pay policies clearly, while a substantial minority disagreed. This variation highlights inconsistencies in how compensation policies are communicated or interpreted within organizations.

The findings indicate that the existence of formal compensation policies alone is insufficient. Ineffective communication can result in employees relying on informal assumptions rather than official guidelines, thereby increasing the risk of confusion, misinformation, and perceived unfairness.

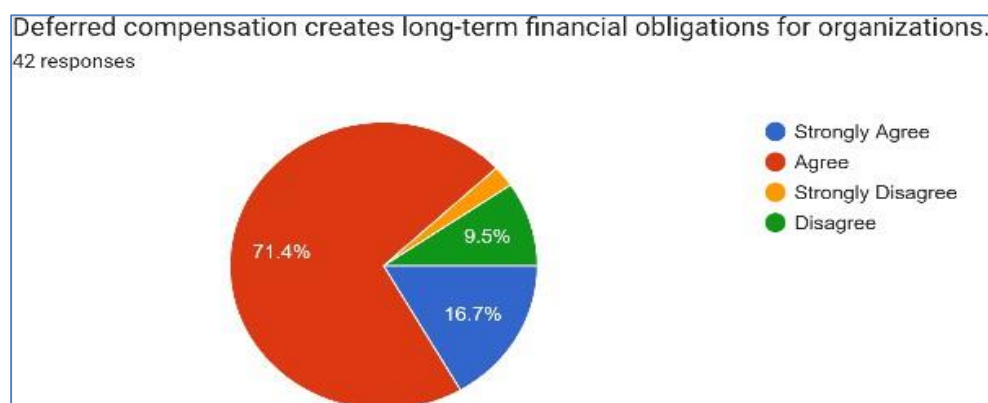
This inconsistency in communication constitutes a hidden managerial risk, as it weakens employee confidence in compensation systems.

Interpretation of Financial Risks Associated with Bonus Accruals

A strong majority of respondents agreed that inaccurate bonus accruals can lead to financial misreporting. This demonstrates a high level of awareness among employees regarding the accounting implications of bonus estimation.

Bonus accruals are based on forecasts and assumptions. If these assumptions are flawed, they may distort profit figures and financial statements. The responses clearly indicate that employees recognize bonus accruals as a potential financial risk, rather than merely an HR practice.

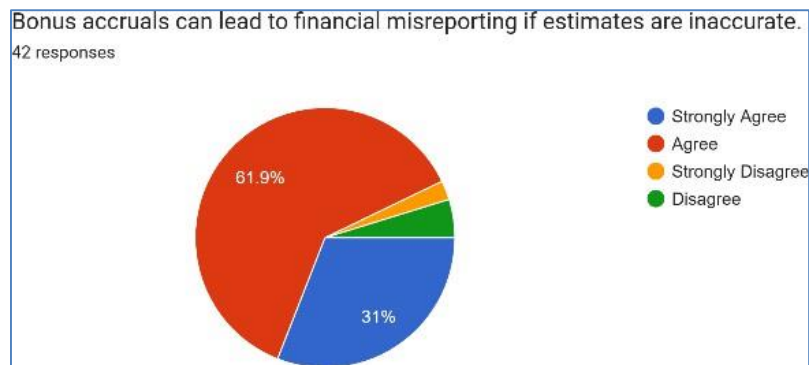
Additionally, most respondents agreed that poor planning of bonus accruals can strain organizational finances, reinforcing the view that compensation decisions directly impact financial stability.



Interpretation of Long-Term Risks of Deferred Compensation

Most respondents agreed that deferred compensation creates long-term financial obligations for organizations. This reflects an understanding that deferred pay represents a future liability rather than an immediate expense.

Such obligations can limit financial flexibility, particularly during periods of economic downturn or organizational restructuring. The findings suggest that deferred compensation, if not carefully planned and periodically reviewed, can become a latent financial burden.



Interpretation of Transparency and Employee Trust

One of the strongest findings of the study is the high level of agreement that lack of transparency in bonus accruals reduces employee trust. This indicates a clear relationship between transparency and employee confidence in management.

When bonus calculations and payout conditions are not transparent, employees may perceive favoritism or manipulation, even in the absence of actual bias. This erosion of trust represents a significant behavioral risk, as trust is central to employee engagement and retention.

Interpretation of Employee Dissatisfaction Related to Deferred Pay

Most respondents agreed that deferred pay can lead to dissatisfaction if expectations are not met. This suggests that deferred compensation can act as a double-edged sword—while intended to promote retention, it may instead increase frustration if outcomes differ from expectations.

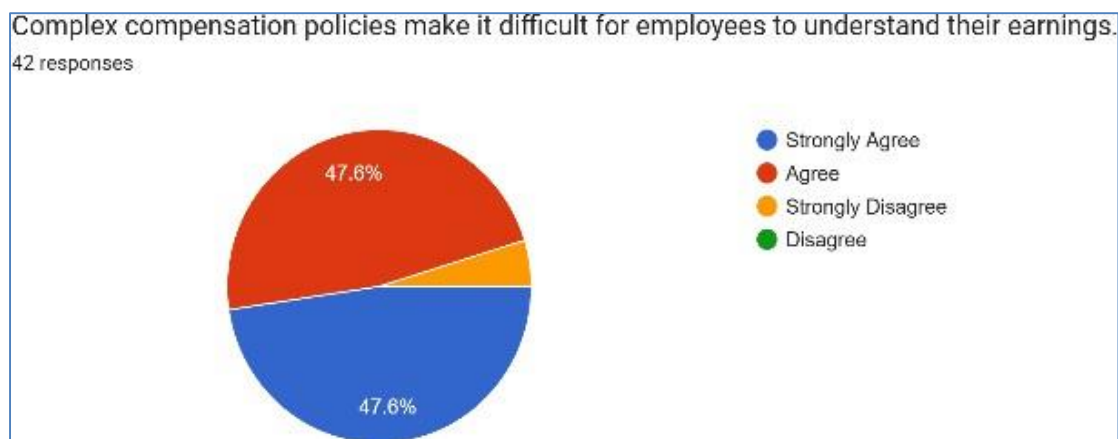
Unclear timelines, changing policies, or unmet performance conditions can intensify dissatisfaction, making deferred pay a potential risk factor for reduced morale and increased turnover.

Interpretation of Complexity in Compensation Policies

A strong majority of respondents indicated that complex compensation policies make it difficult for employees to understand their earnings. This highlights complexity itself as a

hidden risk.

When employees cannot easily comprehend how their compensation is structured, the motivational value of bonuses and deferred pay diminishes. Complexity also increases dependence on managerial interpretation, which can lead to inconsistencies and mistrust.



Interpretation of Risk Mitigation through Transparency and Review

Most respondents agreed that transparent compensation policies reduce financial and behavioral risks, and that clear communication regarding deferred pay improves employee satisfaction.

Furthermore, respondents strongly supported the view that bonus accruals and deferred compensation should be regularly reviewed. This reflects an understanding that compensation systems are dynamic and require continuous monitoring to remain effective and fair.

Overall Interpretation

The analysis reveals that although employees generally recognize the importance of bonus accruals and deferred pay, significant hidden risks persist due to gaps in understanding, communication, transparency, and complexity.

Financial risks such as misreporting and long-term liabilities coexist with behavioral

risks including reduced trust, dissatisfaction, and confusion. The findings emphasize that effective compensation management requires not only well-designed policies but also clear communication, transparency, simplicity, and regular review.

Recommendations:

In accordance with the received responses to the obtained survey, it is evident that the compensation systems based on the bonus accrual and a deferred payment need even more essential communication and reinforcement of constant monitoring.

Although number of respondents who showed that they are generally aware of these, there was a very high percentage who showed that they were not sure about the ways of calculating, as well as long term implications.

Organizations should thus strive to streamline policy formations and just clarifying them in a manner that other employees with diverse background contribute easily to the understanding.

Among the key issues that have been noted as a result of the study concerns the issue of transparency. When the employees know how they were arrived at, the conditions involved, and when they will get payments, they feel more relaxed and confident. The companies may want to conduct regular briefings or even provide explanatory notes or even have digital access to the breakdowns of compensation. Misunderstandings and dissatisfaction can be avoided through effective communication.

Another aspect of the survey that indicates that the respondents are aware of the financial exposure associated with improper estimation of bonus accruals. To cope with it, the organization must enhance the management review procedure and realistic forecasting when establishing incentive targets.

The concept of constant review will assist organizations to stay on track as far as rewards to the employees and financial sustainability is concerned. On balance, compensation plans must strive at fair, transparent and uniform. The incentives will be more effective as the

motivational purpose of such tools will be reached when employees are informed and confident about the system.

Conclusion:

The research has endeavored to analyze latent risks in compensation management that particularly dwells on the aspects of bonus payment and the deferred payment. The survey of 42 respondents who had diverse background and worked in different sectors made the research about the awareness levels, their perception on financial impact, and their attitudes towards transparency and communication.

These results show that although most of the respondents recognize the role that should be played by performance-based and future-based compensation, there is still uncertainty about how individuals should calculate them as well as their organizational promises.

There was more or less concurrence among the respondents that poorly estimated information may pose financial reporting risks and that unclarity may negatively affect employee trust.

Simultaneously, it is believed that these challenges can be greatly minimized through the improvement of communication and open policies. Bonus accruals and deferred pay, therefore, are very good managerial tools, their success will not be determined by their characteristics, but rather by how responsibly they are developed and communicated.

They can create undeserved and unintended financial burden and discontent within the workforce unless they are understood fully and frequent redressing is performed.

Finally, the compensation management also falls into both an accounting and a trust issue between the organization and employees. Ensuring the enhanced transparency and planning will be able to assist in turning the risks, which might have been present, into the benefits of the long-term stability and enhanced worker relationship.

Annexure



Google Form



Responses

Compensation Expectations vs Reality Among Interns Entering The Workforce

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Abstract:

The transition from academic life to professional employment represents a critical phase in an individual's career development, particularly with respect to compensation expectations. Interns often enter the workforce with preconceived salary expectations influenced by academic performance, institutional reputation, peer comparisons, industry perceptions, and digital media exposure. However, the actual compensation offered during internships or entry-level positions may differ significantly from these expectations. This study examines the extent of the gap between compensation expectations and the reality experienced by interns entering the workforce. Using primary data collected through structured surveys, the research analyzes key factors shaping expectations, evaluates variations across sectors, and assesses the psychological and professional implications of expectation–reality discrepancies. The findings highlight the need for improved transparency, career guidance, and communication between educational institutions and employers to facilitate more realistic compensation awareness among emerging professionals.

Keywords: Internship remuneration, Early career outcomes, Salary expectations, Labor market entry, Organizational compensation practices, Career readiness.

Introduction:

Entering the workforce for the first time is a significant milestone in a student's life, and internships often serve as the bridge between academic learning and professional practice. Along with the excitement of gaining real-world exposure, interns carry certain expectations regarding their roles, responsibilities, growth opportunities, and most importantly, compensation. These expectations are rarely formed in isolation. They are influenced by campus placement trends, discussions with classmates, family opinions, social media narratives about “high-paying internships,” and the perceived value of one's degree or skills. As a result, many students begin their internships with a particular idea of what their work should be worth in monetary terms.

However, the reality of compensation during internships and entry-level positions does not always align with these beliefs. Some interns receive stipends lower than anticipated, while others may encounter unpaid opportunities justified by the promise of experience or exposure. This gap between expectation and reality can lead to disappointment, reduced motivation, or a reassessment of career plans. In some cases, it may also shape long-term attitudes toward employers and the labor market as a whole. Understanding this mismatch is important because it affects not only individual career satisfaction but also organizational engagement and retention at the early stages of employment.

This research aims to explore the nature and extent of the difference between compensation expectations and actual earnings among interns entering the workforce. By examining the factors that influence these expectations and analyzing the experiences of interns across different sectors, the study seeks to provide a clearer picture of how early compensation experiences shape professional outlook and career decisions.

Research Objectives:

- Objective 1: To examine compensation (stipend) expectations of the interns before entering the workforce.

- Objective 2: To analyze the gap between expected compensation and the actual stipend received by interns.
- Objective 3: To study the factors influencing compensation expectations among interns

Literature Review:

The issue of compensation expectations among interns entering the workforce has gained increasing attention in studies related to early career development and human resource management. Research suggests that students often form salary expectations based on academic performance, campus placement trends, peer discussions, and the perceived market value of their degree. These expectations are further influenced by social media portrayals of successful career beginnings and publicly shared salary figures, which may not always reflect average market conditions. As a result, many interns develop optimistic assumptions about the level of financial reward they will receive during their initial professional experiences.

On the other hand, literature examining internship compensation highlights that organizations frequently structure internships as short-term training opportunities rather than fully productive employment roles. Employers may offer modest stipends, performance-based incentives, or in some cases unpaid positions, emphasizing skill development and industry exposure as non-monetary benefits. Studies in organizational behavior indicate that when there is a significant gap between expected and actual compensation, interns may experience reduced job satisfaction, lower engagement levels, and uncertainty about their career choices. This expectation–reality mismatch can also influence their perception of fairness and organizational trust.

Additionally, labor market research shows that compensation outcomes vary across industries, geographic regions, and economic conditions. Interns in sectors such as finance, technology, or consulting often report higher stipends compared to those in social services, creative fields, or small-scale enterprises. Despite these variations, limited research has directly measured the difference between what interns expect to earn and what they actually receive at the point of entering the workforce. Therefore, examining this gap in a focused manner contributes to a better

understanding of how compensation perceptions are formed and how they affect early career attitudes and decisions.

Research Methodology:

This study follows a descriptive research design to examine the gap between compensation expectations and the actual remuneration received by interns entering the workforce. The objective is to compare what interns expect to earn with what they actually receive and to understand the factors influencing this difference.

Primary Data:

Primary data was collected through a self-administered questionnaire from a sample of 40 interns belonging to different academic streams and industries. Convenience sampling was used, as respondents were easily accessible and either currently interning or had recently completed internships. The questionnaire included:

- Multiple-choice questions
- The survey focused on:
 - Expected stipend/salary before joining the internship
 - Actual compensation received
 - Factors influencing expectations (peers, social media, placement statistics, industry trends)
 - Level of satisfaction with current compensation

This method provided first-hand insights into interns' real experiences and perceptions.

Secondary Data:

Secondary information was collected from:

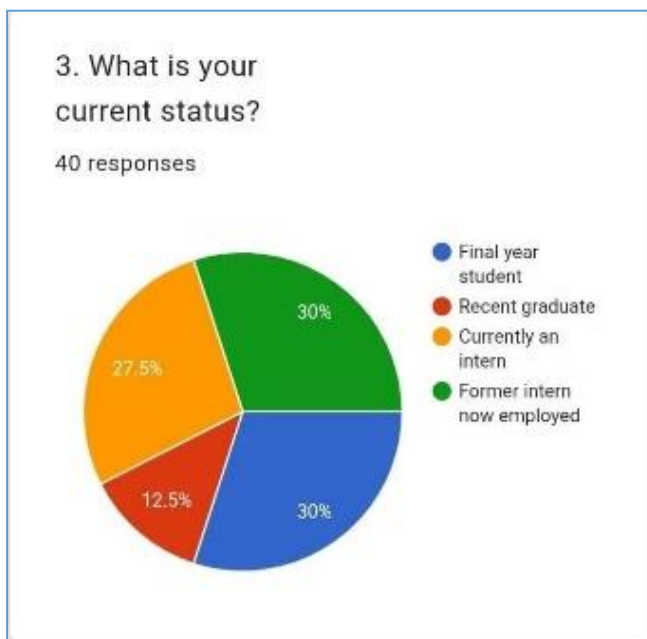
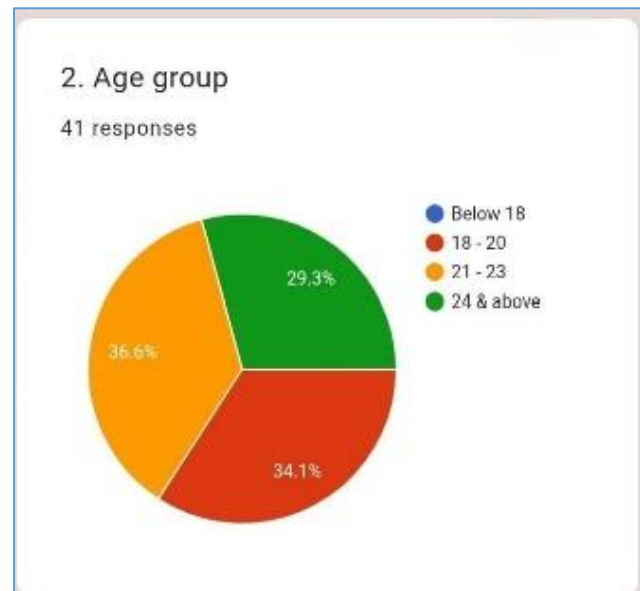
- Textbooks on Compensation Management and Human Resource Management
- Scholarly research articles
- Industry reports on entry-level salary trends
- Reputable online HR and professional publications

Data Analysis and Interpretation:

Q2. Age Group (41 responses)

- 21–23 years: 36.6% (15 respondents)
- 18–20 years: 34.1% (14 respondents)
- 24 and above: 29.3% (12 respondents)
- Below 18: 0% (0 respondents)

Interpretation: Most respondents (15 out of 41) fall in the 21–23 age group, followed closely by 14 respondents in the 18–20 category. This shows that the majority of participants are young individuals at the early stage of their career, making the study relevant to interns entering the workforce.



Q3. Current Status (40 responses)

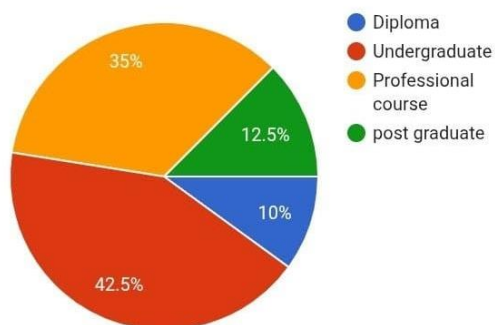
- Final year student: 30% (12 respondents)
- Recent graduate: 12.5% (5 respondents)
- Currently an intern: 27.5% (11 respondents)
- Former intern now employed: 30% (12 respondents)

Interpretation: There is equal representation of final year students and former interns now employed (12 each). This balance helps compare expectations (students) with real experiences (working individuals). The presence of 11 current interns adds practical

insight into ongoing compensation realities.

4. What is your highest educational qualification?

40 responses



Q4. Highest Educational Qualification (40 responses)

- Diploma: 10% (4 respondents)
- Undergraduate: 42.5% (17 respondents)
- Professional course: 35% (14 respondents)
- Post graduate: 12.5% (5 respondents)

Interpretation: The majority of respondents (17) are undergraduates, followed by 14 from professional courses. This indicates that most participants are still building their careers and

may form compensation expectations based on academic exposure and peer influence.

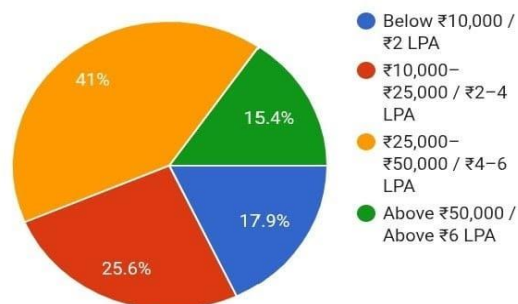
Q5. Expected Compensation (39 responses)

- Below ₹10,000: 17.9% (7 respondents)
- ₹10,000–₹25,000: 25.6% (10 respondents)
- ₹25,000–₹50,000: 41% (16 respondents)
- Above ₹50,000: 15.4% (6 respondents)

Interpretation: The highest number of respondents (16 out of 39) expected compensation in the ₹25,000–₹50,000 range. Only 7 expected below ₹10,000. This shows that a significant portion of interns entered the workforce with moderate to high salary expectations.

5. Before starting your internship or first job what was your expected compensation range?

39 responses

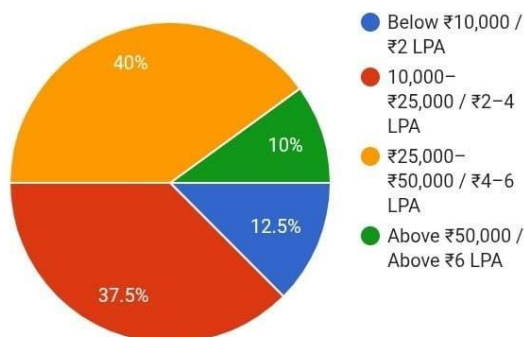


Q6. What was the actual compensation offered during your internship or first job? (40 responses)

- Below ₹10,000 / ₹2 LPA: 12.5% (5 respondents)
- ₹10,000–₹25,000 / ₹2–4 LPA: 37.5% (15 respondents)

6. What was the actual compensation offered during your internship or first job?

40 responses



- ₹25,000–₹50,000 / ₹4–6 LPA: 40% (16 respondents)
- Above ₹50,000 / Above ₹6 LPA: 10% (4 respondents)

Interpretation: This shows that most interns actually received compensation in the mid-range category. When compared with the expected compensation data, it suggests that while many students expected ₹25,000–₹50,000, a significant portion ended up receiving slightly lower packages in the ₹10,000–₹25,000 range. This difference helps highlight the expectation–reality gap that the study aims to examine.

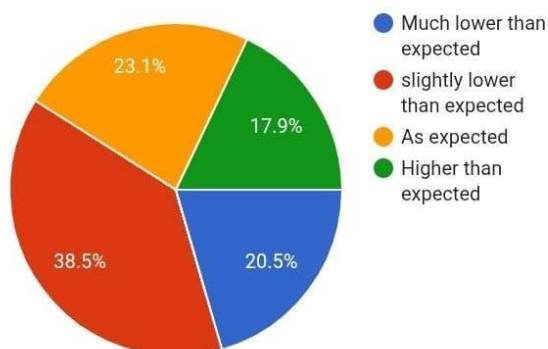
Q7. Gap Between Expected and Actual Compensation (39 responses)

- Much lower than expected: 20.5% (8 respondents)
- Slightly lower than expected: 38.5% (15 respondents)
- As expected: 23.1% (9 respondents)
- Higher than expected: 17.9% (7 respondents)

Interpretation: The majority of respondents (15) stated that their actual compensation is slightly lower than expected, followed by 8 who feel it is much lower than expected. This indicates that a significant portion of participants are not fully satisfied with their current pay and experience a gap between expectations and reality. However, 9

7. How would you describe the gap between your expected and actual compensation?

39 responses

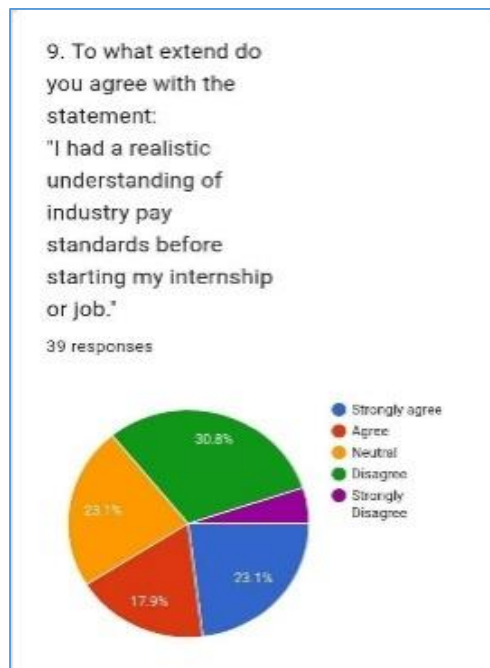
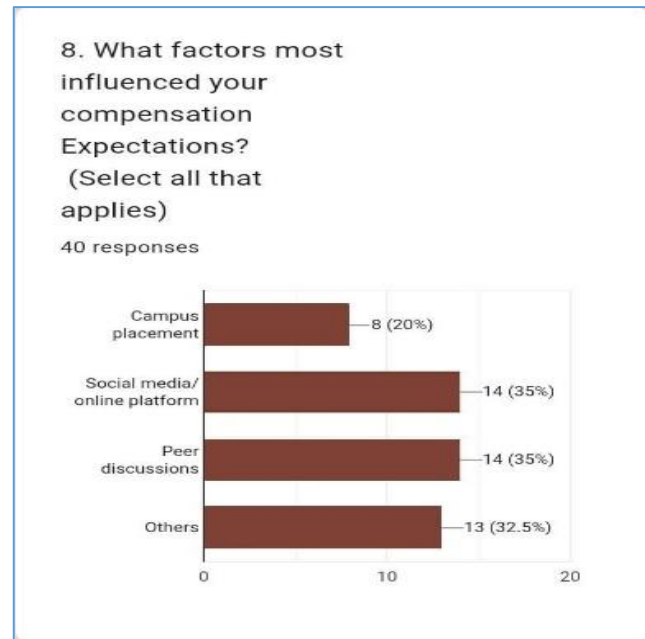


respondents feel their compensation meets expectations, and 7 reported earning higher than expected, showing that while dissatisfaction exists, a reasonable number of participants are either satisfied or positively surprised with their compensation.

Q8. Factors Influencing Compensation Expectations (40 responses)

- Campus placement: 20% (8 respondents)
- Social media/online platforms: 35% (14 respondents)
- Peer discussions: 35% (14 respondents)
- Others: 32.5% (13 respondents)

Interpretation: The most influential factors are social media/online platforms and peer discussions (14 respondents each), followed closely by other sources. Campus placement has comparatively less influence. This shows that digital platforms and peer networks play a major role in shaping compensation expectations.



Q9. Realistic Understanding of Industry Pay Standards (39 responses)

- Strongly agree: 23.1% (9 respondents)
- Agree: 17.9% (7 respondents)
- Neutral: 23.1% (9 respondents)
- Strongly disagree: 5.1% (2 respondents)

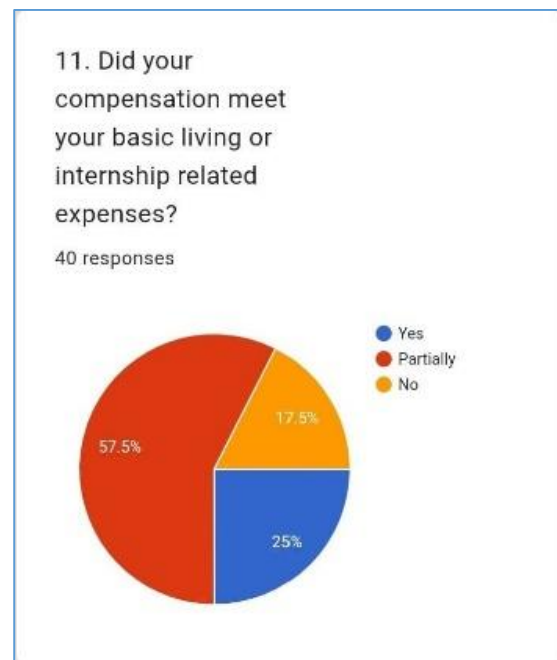
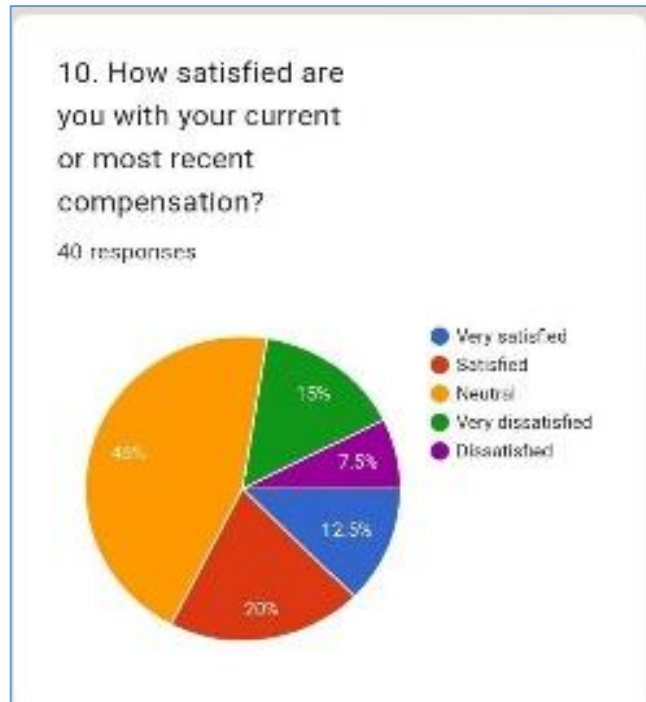
Interpretation: The majority of respondents (12) disagreed that they had a realistic understanding of industry pay standards before starting their internship or job. While 16 respondents agreed or strongly agreed, a significant portion were either neutral or disagreed,

indicating that many participants may not have had clear or accurate knowledge about industry compensation standards beforehand.

Q10. Satisfaction with Current or Most Recent Compensation (40 responses)

- Very satisfied: 12.5% (5 respondents)
- Satisfied: 20% (8 respondents)
- Neutral: 45% (18 respondents)
- Very dissatisfied: 15% (6 respondents)
- Dissatisfied: 7.5% (3 respondents)

Interpretation: The majority of respondents (18) feel neutral about their current or most recent compensation. While 13 respondents are satisfied or very satisfied, 9 respondents expressed dissatisfaction. This indicates that most participants neither feel strongly positive nor negative, but a noticeable portion are not fully satisfied with their compensation.



Q11. Compensation Meeting Basic Living or Internship-Related Expenses (40 responses)

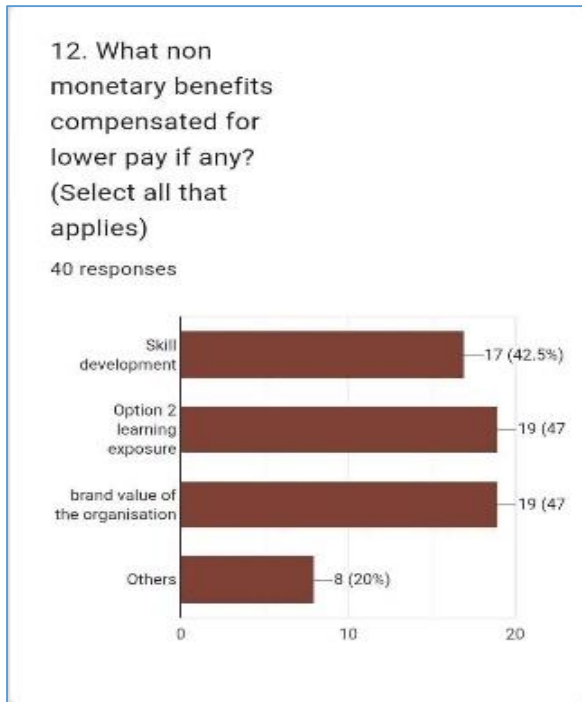
- Yes: 25% (10 respondents)
- Partially: 57.5% (23 respondents)
- No: 17.5% (7 respondents)

Interpretation: The majority of respondents (23) stated that their compensation only partially meets their basic living or internship-related expenses. While 10 respondents reported that their compensation is sufficient, 7 indicated that it does not meet their expenses at all. This suggests that for

most participants, compensation is not fully adequate to cover essential costs.

Q12. Non-Monetary Benefits Compensating for Lower Pay (40 responses)

- Skill development: 42.5% (17 respondents)



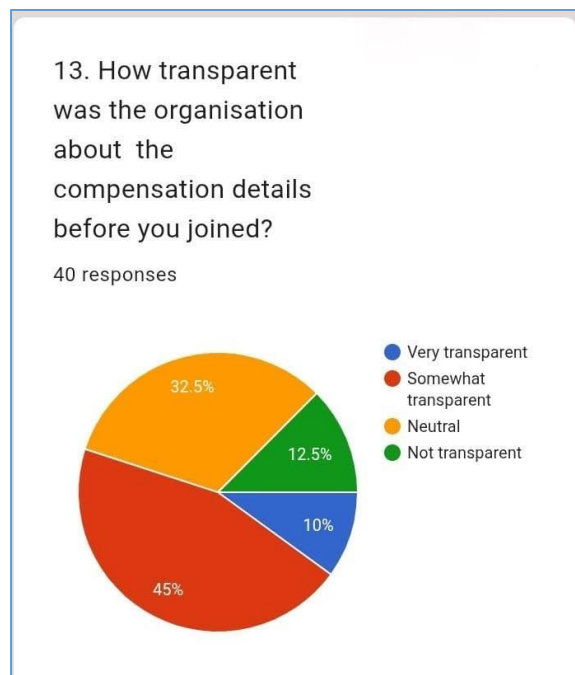
- Learning exposure: 47.5% (19 respondents)
- Brand value of the organisation: 47.5% (19 respondents)
- Others: 20% (8 respondents)

Interpretation: The most valued non-monetary benefits are learning exposure and brand value of the organisation (19 respondents each), followed by skill development. This indicates that many participants are willing to accept lower pay in exchange for career growth opportunities and association with reputed organisations.

Q13. Transparency of the Organisation About Compensation Details (40 responses)

- Very transparent: 10% (4 respondents)
- Somewhat transparent: 45% (18 respondents)
- Neutral: 32.5% (13 respondents)
- Not transparent: 12.5% (5 respondents)

Interpretation: The majority of respondents (18) felt that the organisation was somewhat transparent about compensation details. However, a considerable number remained neutral, and 5 respondents believed the organisation was not



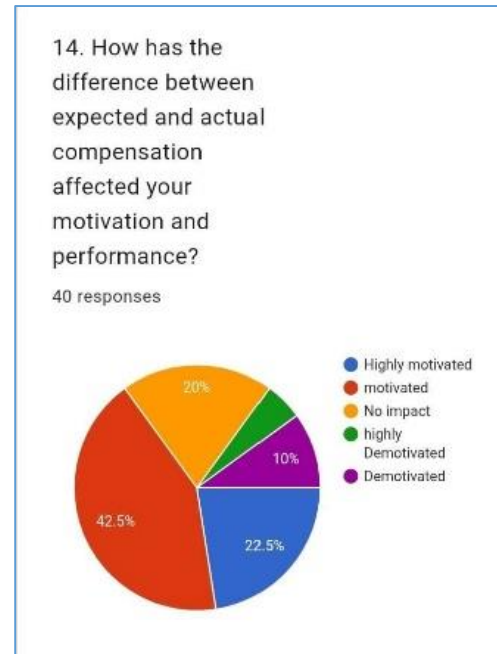
transparent. This suggests that while partial transparency exists, there is still scope for clearer communication regarding compensation details.

Q14. Impact of Compensation Gap on Motivation and Performance (40 responses)

- Highly motivated: 22.5% (9 respondents)
- Motivated: 42.5% (17 respondents)
- No impact: 20% (8 respondents)
- Highly demotivated: 5% (2 respondents)
- Demotivated: 10% (4 respondents)

Interpretation: The majority of respondents (17) reported feeling motivated despite the difference between expected and actual compensation, followed by 9 who felt highly motivated. However, 6 respondents

experienced demotivation. This suggests that while the compensation gap affects some individuals negatively, most participants remain motivated in their roles.



Conclusion:

The findings of the study clearly indicate that a noticeable gap exists between what interns expect to earn and what they actually receive during their entry into the workforce. Compensation expectations are often shaped by peer discussions, campus placement figures, social media influence, and assumptions about industry standards. However, the real market scenario, organizational budgets, and the perceived value of entry-level roles frequently result in lower-than-expected remuneration. This mismatch not only affects satisfaction levels but can also influence motivation, commitment, and early career confidence.

Interns who experienced a significant difference between expectation and reality reported feelings of disappointment, though many also acknowledged the importance of gaining experience. This shows that while financial compensation is important, clarity and transparency play an equally crucial role in shaping positive early work experiences.

Suggestions and recommendations:

- Educational institutions should provide realistic salary insights through career guidance sessions, industry interactions, and transparent placement data to help students form practical expectations.
- Organizations should communicate compensation structures clearly during the recruitment stage to avoid misunderstandings and build trust from the beginning.
- Employers can consider offering structured growth plans, performance-based incentives, or non-monetary benefits (such as skill development opportunities and mentorship) to balance financial limitations.
- Interns should be encouraged to research industry standards independently and evaluate internships not only on pay but also on learning outcomes and long-term career value.
- Regular feedback mechanisms between interns and employers can help identify dissatisfaction early and improve overall internship experiences.
- In conclusion, bridging the gap between compensation expectations and reality requires shared responsibility from students, educational institutions, and employers. Greater transparency, awareness, and open communication can significantly reduce dissatisfaction and create a smoother transition from academic life to professional employment.

Limitations and Future Scope:

Limitations of the Study:

- The study is based on a small sample size of 40 interns, which may not fully represent the broader population of interns entering the workforce.
- Convenience sampling was used for data collection, which limits the generalization of findings to all interns across different institutions and industries.
- The research relies on self-reported responses collected through questionnaires, which may include personal bias, inaccurate recall, or socially desirable answers.
- The study does not provide a deep comparative analysis of compensation differences across specific industries, company sizes, or geographic regions.

- Variations in internship duration, job roles, and organizational policies were not examined in detail, which may influence compensation structures.
- Time constraints restricted the possibility of conducting interviews or collecting detailed organizational salary data for deeper validation.
- External economic conditions and market fluctuations at the time of data collection were not separately analyzed, though they may impact compensation levels.

Future Scope of the Study:

- Future research can include a larger and more diverse sample size covering multiple cities, universities, and industries for broader applicability.
- Comparative studies can be conducted between different sectors such as finance, IT, marketing, manufacturing, and social services to understand sector-specific compensation trends.
- A longitudinal study can be undertaken to track how early compensation experiences influence long-term career growth, job satisfaction, and retention.
- Further research can analyze the impact of demographic variables such as gender, educational qualification, specialization, and socio-economic background on compensation expectations.
- Qualitative research methods such as interviews or focus group discussions can be incorporated to gain deeper insight into interns' emotional responses to expectation–reality gaps.
- Future studies may also examine the role of institutional career guidance programs in shaping realistic salary expectations among students.
- Research can explore the effectiveness of transparent communication by employers in reducing dissatisfaction related to compensation differences.

Bibliography:

Primary Research –

Questionnaire survey conducted among 40 interns to examine expected versus actual compensation at the time of workforce entry.

Secondary Research –

- Academic articles on salary expectations and early career satisfaction
- Reports on entry-level and internship compensation trends
- Studies on expectation–reality gap in employment
- Industry publications discussing stipend structures and graduate hiring practices
- Online HR journals and professional magazines covering youth workforce transition

Annexure – Survey Questionnaire

Title: A Study on Compensation Expectations and Realities Among Interns Entering the Workforce

Q1. Name of respondent

(Open-ended response)

Q2. Age group

- a. Below 18
- b. 18 - 20
- c. 21 - 23
- d. 24 and above

Q3. What is your current status?

- a. Final year student
- b. Recent graduate
- c. Currently an intern
- d. Former intern now employed

Q4. What is your highest educational qualification?

- a. Diploma
- b. Undergraduate
- c. Professional course
- d. post graduate

Q5. Before starting your internship or first job what was your expected compensation range?

- a. Below ₹10,000 / ₹2 LPA
- b. ₹10,000–₹25,000 / ₹2–4 LPA
- c. ₹25,000–₹50,000 / ₹4–6 LPA
- d. Above ₹50,000 / Above ₹6 LPA

Q6. What was the actual compensation offered during your internship or first job?

- a. Below ₹10,000 / ₹2 LPA
- b. 10,000–₹25,000 / ₹2–4 LPA
- c. ₹25,000–₹50,000 / ₹4–6 LPA
- d. Above ₹50,000 / Above ₹6 LPA

Q7. How would you describe the gap between your expected and actual compensation?

- a. Much lower than expected
- b. slightly lower than expected
- c. As expected
- d. Higher than expected

Q8. What factors most influenced your compensation Expectations? (Select all that applies)

- a. Campus placement
- b. Social media/online platform
- c. Peer discussions
- d. Others

Q9. To what extent do you agree with the statement:

"I had a realistic understanding of industry pay standards before starting my internship or job."

- a. Strongly agree
- b. Agree
- c. Neutral
- d. Disagree
- e. Strongly Disagree

Q10. How satisfied are you with your current or most recent compensation?

- a. Very satisfied
- b. Satisfied
- c. Neutral
- d. Very dissatisfied
- e. Dissatisfied

Q11. Did your compensation meet your basic living or internship related expenses?

- a. Yes
- b. Partially
- c. No

Q12. What non-monetary benefits compensated for lower pay if any? (Select all that applies)

- a. Skill development
- b. Option 2 learning exposure
- c. brand value of the organisation
- d. Others

Q13. How transparent was the organisation about the compensation details before you joined?

- a. Very transparent
- b. Somewhat transparent
- c. Neutral
- d. Not transparent

Q14. How has the difference between expected and actual compensation affected your motivation and performance?

- a. Highly motivated
- b. motivated
- c. No impact
- d. highly Demotivated
- e. Demotivated

Laws And Regulations In Compensation Management

Authors: Aditya Rajani, Abhinav Agal

Class: TYBCom

**College: SVKM's Narsee Monjee College of
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Abstract:

This study investigates the implementation and effectiveness of laws and regulations in compensation management within an organizational context. Analyzing a sample size of 40 participants across various job levels— primarily entry-level (70%)—the research assesses key compliance areas including overtime benefits, statutory social security (PF, ESIC), and non-discriminatory practices. The data reveals that while 70% of respondents agree that compensation decisions are free from discrimination, only 47.5% agree that statutory social security benefits are provided without delay. The research concludes that while foundational legal compliance is strong, consistency in the timely delivery of benefits is essential for optimal employee trust.

Introduction and Background:

Compensation management refers to the systematic approach adopted by organizations to provide financial and non- financial rewards to employees in exchange for their work contribution. It includes wages, salaries, bonuses, incentives, benefits, and statutory provisions. In modern business environments, compensation management is not only a strategic HR function but also a legal responsibility governed by labour laws and government regulations.

The primary objective of compensation laws is to ensure fairness, equity, and protection of employee rights while maintaining organizational accountability. Regulatory frameworks establish standards for minimum wages, overtime compensation, social security benefits, gratuity, bonus payments, and protection against discrimination. Compliance with these laws is essential for avoiding legal penalties, maintaining organizational reputation, and

fostering a healthy work environment.

Literature Review:

Compensation management has been widely studied as an essential component of human resource management that influences employee motivation, job satisfaction, and organizational performance. Researchers and HR experts emphasize that compensation systems must be designed not only to attract and retain talent but also to comply with legal and ethical standards established by labour laws.

Key Objectives:

1. To understand the concept of compensation management and examine its importance within modern human resource management practices.
2. To study the laws and regulations governing compensation management, including statutory wage provisions,
3. To analyze organizational compliance with compensation-related laws such as overtime payment, statutory benefits (PF, ESIC, gratuity, bonus), and documentation practices.

Research Methodology:

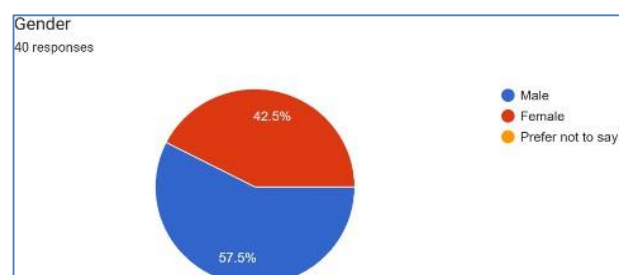
The research is descriptive in nature.

Primary data was collected using questionnaires distributed among the employees and secondary data was obtained from journals and websites.

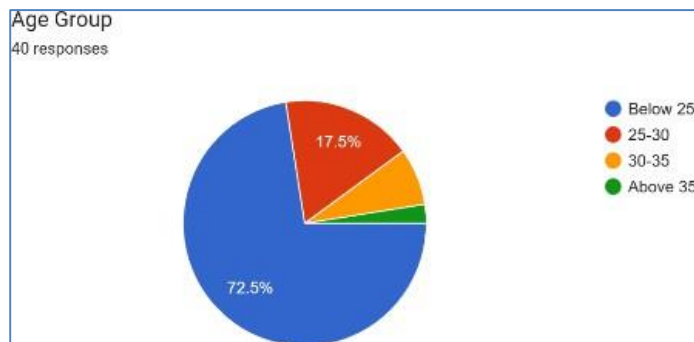
A sample size of 40 employees was considered using convenience sampling technique.

Data Analysis and Interpretation:

Out of the total respondents (40), male participants formed a slightly higher proportion compared to female participants. This indicates that the findings represent views from both genders, ensuring balanced

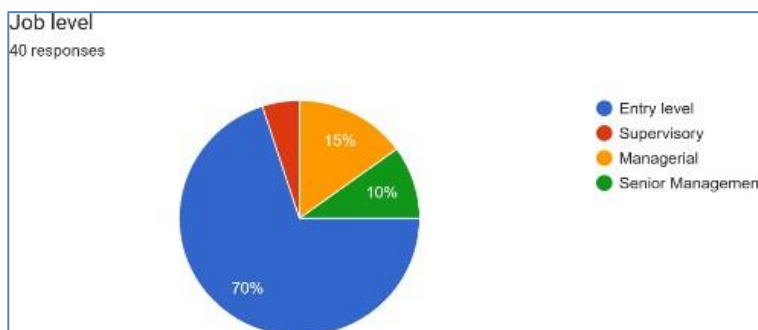
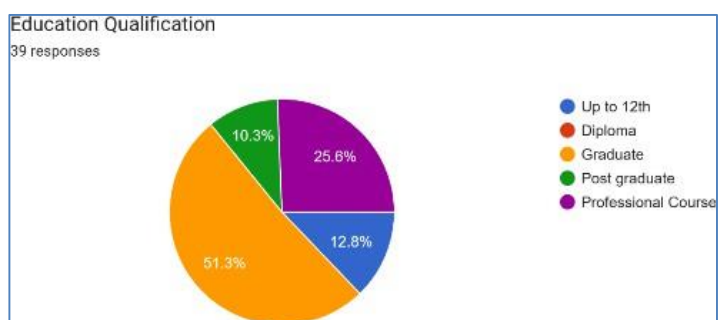


insight into compensation management practices.



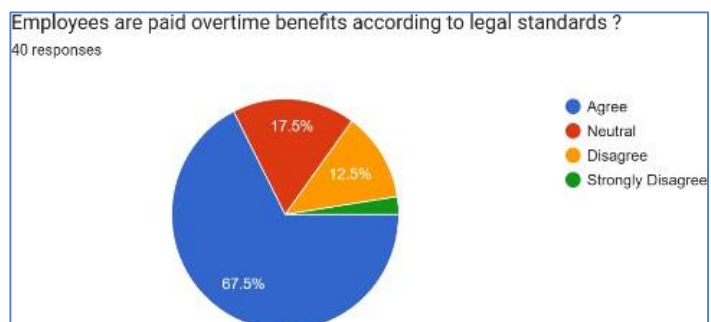
The majority of respondents belong to the younger age category (below 25 years). This suggests that the research mainly reflects the perception of early-career professionals who are directly impacted by structured compensation policies.

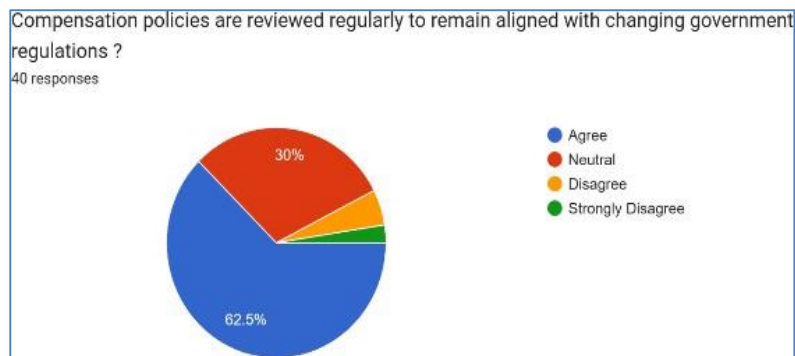
Most respondents are graduates or professionally qualified individuals. This indicates that participants possess adequate educational understanding to evaluate compensation laws and organizational compliance practices effectively.



A large proportion of respondents are at entry-level positions, followed by managerial and senior-level employees. This shows that the study primarily captures experiences of employees who directly receive compensation under organizational policies.

A majority of respondents (around 70– 80%) agreed or strongly agreed that overtime benefits are paid according to legal standards, while a smaller percentage remained neutral or disagreed. This indicates strong compliance with overtime laws in most organizations.

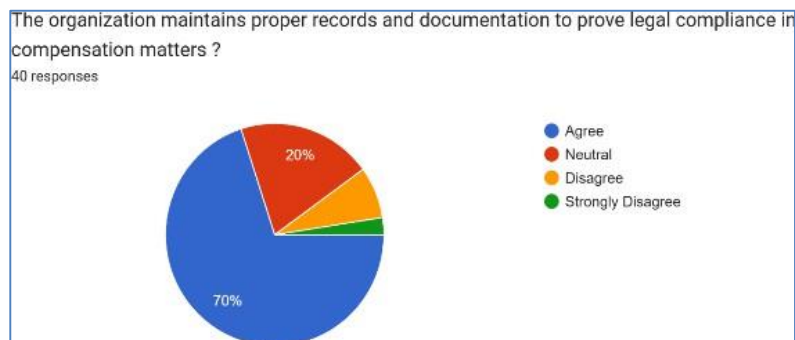
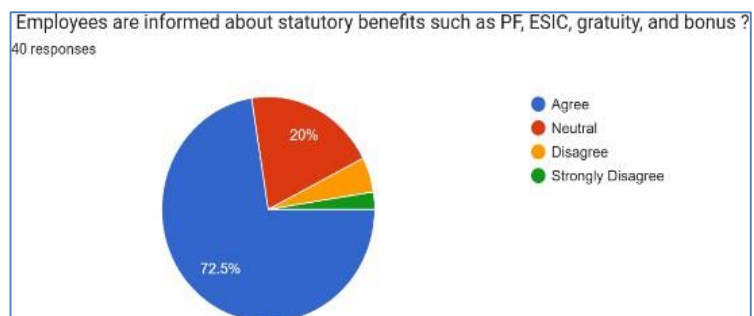




Approximately three-fourths of respondents confirmed that compensation policies are periodically reviewed. This reflects that organizations actively monitor and update their compensation systems to

meet legal requirements.

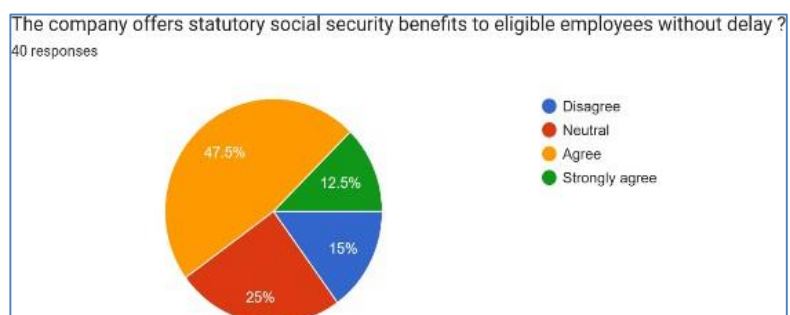
A clear majority of respondents reported awareness of statutory benefits, with only a small number indicating lack of information. This shows that organizations generally communicate legal benefits effectively.



Most respondents agreed that documentation and records related to compensation are properly maintained. This suggests that organizations understand the importance of documentation in audits and

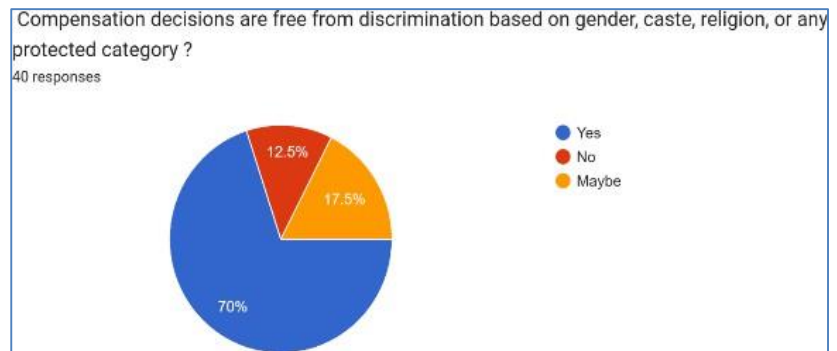
legal verification.

While more than half of respondents agreed that benefits are provided on time, a noticeable percentage selected neutral or disagreement options. This



indicates that although compliance exists, delays in benefit delivery may occur in some cases.

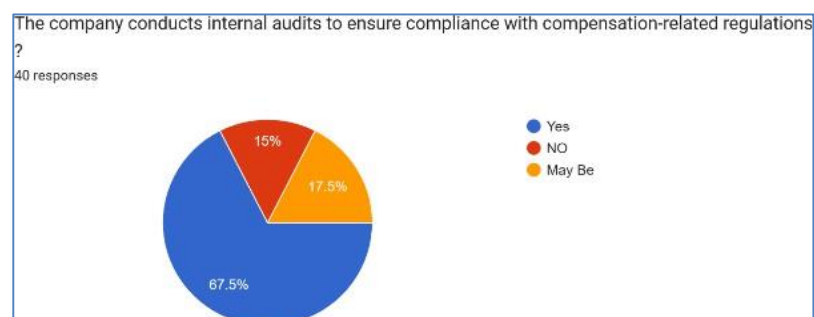
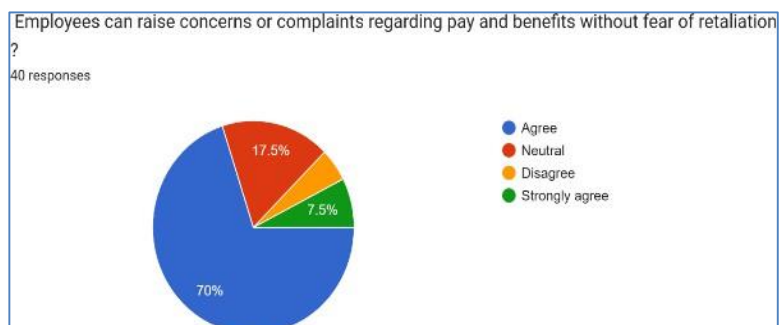
A significant majority agreed that compensation decisions are fair and non-discriminatory, showing that organizations generally follow equal pay principles and legal requirements against discrimination.



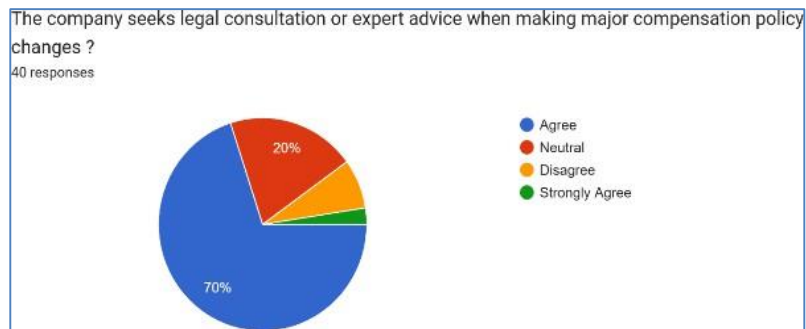
Most respondents confirmed that HR personnel receive training related to compensation laws. This suggests that organizations invest in improving HR knowledge

to ensure legal compliance.

A high proportion of respondents agreed that employees feel comfortable raising compensation concerns. This reflects a supportive organizational culture and transparent grievance mechanisms.



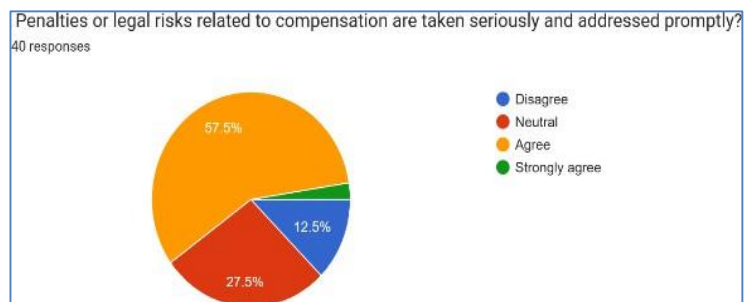
The majority response confirms that internal audits are conducted, demonstrating proactive monitoring of compensation systems to reduce legal risks.



A majority of respondents indicated that organizations consult legal experts before implementing major policy changes, showing a preventive and compliance-

focused approach.

Most respondents agreed that organizations take legal risks seriously and act promptly, though some neutral responses suggest varying levels of effectiveness across organizations.



Findings:

The study on laws and regulations in compensation management reveals important insights into how organizations implement legal requirements related to employee compensation. Based on the survey responses collected, it is evident that the majority of participants perceive their organizations as maintaining a reasonable level of compliance with compensation-related laws and regulations.

The demographic data indicates that the respondents represent different gender groups, educational backgrounds, and job levels, with a larger proportion belonging to younger age groups and entry-level positions. This suggests that the findings primarily reflect the perceptions of employees who are directly affected by compensation policies and organizational practices.

Conclusion:

The study highlights the critical role of laws and regulations in ensuring effective and ethical compensation management. Survey findings demonstrate that most organizations

actively comply with legal standards by providing statutory benefits, paying overtime wages, maintaining documentation, and conducting compliance audits. Employees generally perceive compensation policies as fair and transparent, indicating positive organizational practices.

However, continuous efforts are required to improve employee awareness regarding legal benefits and strengthen regular policy reviews to adapt to evolving regulations. Organizations must also prioritize legal training for HR professionals and seek expert consultation when implementing major compensation changes.

Limitations and Future Scope:

Limitations:

1. The primary constraint of this study was the sample size; 40 respondents provide a valuable insight but not represent the global corporate landscape
2. Additionally, the reliance on self-reported survey data introduces potential subjective bias.
3. The research also focused heavily on general corporate roles, potentially overlooking specific nuances in niche or industries or specialized technical fields.

Future scope:

Future research should aim for longitudinal study to track the long-term impact of specific laws policies. Expanding the demographic to include a broader range of senior executives would provide deeper insights because of their experience.

Bibliography:

Primary research- Abhinav Agal and Aditya Rajani

Secondary research- Past research paper readings World Economic Forum

Excel sheet Data



Questionnaire Data



Acceptability of Monthly Menstrual Leave Among Working Women

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Abstract:

The purpose of the study is to find out how Indian working women feel about taking time off during their periods. Moreover, it looks at the idea of menstrual leave and how it affects workplace equity, satisfaction of female employees, and organisational efficiency. The study investigates how menstrual symptoms affect productivity. The study highlights the significance of creating an inclusive workplace culture while addressing potential issues like taboo and unfair treatment. The goal of this research project is to positively influence the future developments of inclusivity of Indian workplaces.

Keywords: Menstrual leave; Working women in India; Workplace inclusivity; Menstrual health; Presenteeism; Gender equality; Flexible work arrangements; Employee wellbeing.

Introduction:

Menstrual leave refers to a policy that allows women to take time off from work during their menstrual cycles. Menstrual leave is not yet covered by Indian law; however, some businesses have voluntarily implemented such programs. From a niche cultural practice in East Asian nations like South Korea and Japan, it has developed into a global discussion on gender and labour rights.

A large percentage of the workforce suffers from dysmenorrhea, or painful menstruation, which is a physical fact that makes such a policy necessary. Many women also suffer from hormonal disorders such as Polycystic Ovary Disorder (PCOD) and Endometriosis causing additional stress. In addition to physical discomfort, presenteeism, the practice of employees being physically present but unable to perform at their best beside of health concerns, also has an economic consequence. This leads to hidden productivity losses that often exceed those caused by genuine absenteeism.

Even though the proportion of women in the workforce is increasing, corporate structures are still mostly based on a “biological neutral” template that disregards menstrual health.

The biological requirements of female employees and the expectation of the workplace today are significantly at odds. The purpose of this study whether the business climate of today is prepared to close this gap or whether ingrained stigmas still deny as obstacles to the acceptance of menstruation leave.

Research Objectives:

To provide a structured analysis of this issue, this paper aims to:

- Assess the general degree of working women’s awareness about and support for menstrual leave policy.
- Identify the primary socio-cultural and professional concerns (e.g., career progression, stigma) that influence the acceptability of these leaves.
- Analyse the preference for alternative workplace accommodations, such as hybrid working arrangement or flexible hours, versus dedicated leave days.

Research Methodology:

This study examines the attitudes of working women toward menstruation leave using a qualitative methodology. The information was collected through an online survey from 61 educated, employed women in Indian cities between the ages 18 and 45. As they are currently

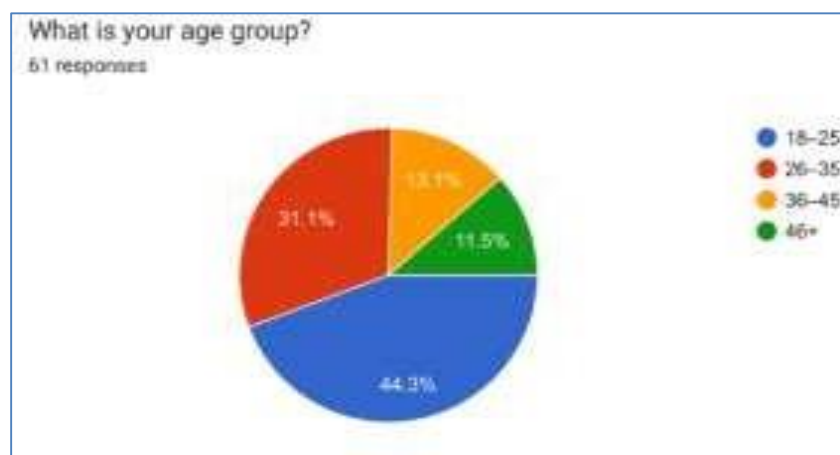
employed and are most likely to be impacted by changes in office leave regulations, this particular group was selected.

The survey consisted of 18 questions divided into 3 parts. First, it asked for basic personal details like age and job type. Second, it used a “scale” system where women could rank how big they agreed or disagreed with certain statements. Finally, it included an open-ended question where participants could share their personal opinions on workplace stigma and other concerns.

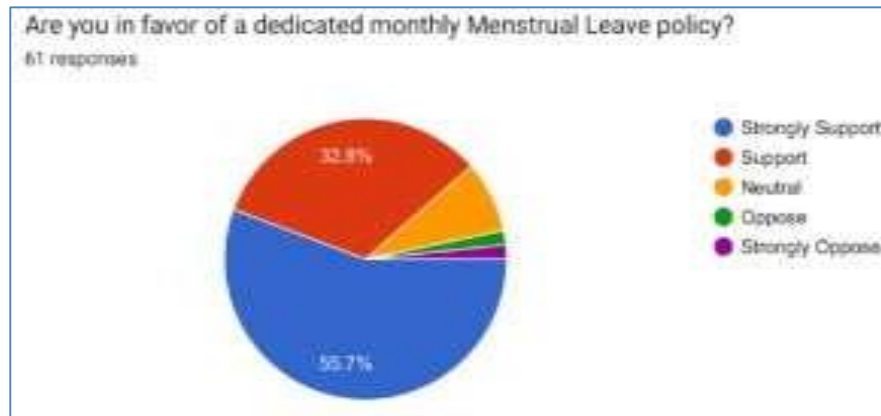
Participation was entirely voluntary, and the information gathered was used only for this research project. Results are presented as a whole so that no individual person can be identified.

Data Analysis and Findings:

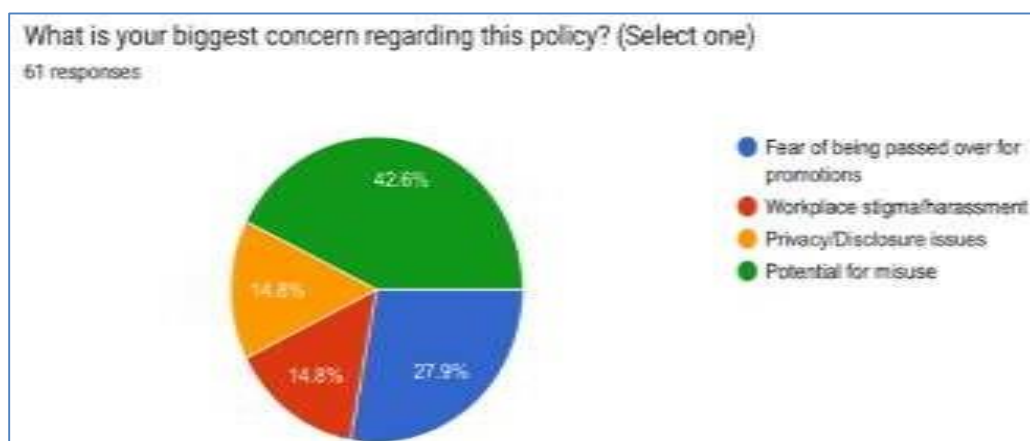
The survey collected responses from 61 working women across different age groups, employment types, and industries, providing a diverse sample for analysis. The demographic distribution shows that 44% of the respondents were aged between 18-25, followed by 31% aged between 26-35, with smaller representation from ages 36-45 (13%) and 46+ (11%). In terms of employment type, the sample was dominated by full time employees, which was about 75%, with the remainder consisting of freelance/contractual (15%) and part time workers (10%). Respondents came from varied domains, with the strongest representation from education, manufacturing, and finance roles, indicating cross industry relevance of the topic.



Support and acceptability levels for menstrual leave were notably high. A combined 88.5% of respondents either “support” or “strongly support” a dedicated menstrual leave policy, with 55.7% strongly supporting it. Only about 3.3% expressed opposition, while roughly 8% remained neutral. This indicated a broad acceptance of the policy concept among working women. Likelihood-of- usage ratings also tended toward the higher end, suggesting that support is not merely theoretical but reflects expected usage.



The data also reveals meaningful workplace barriers and concerns. The most often cited concern was potential misuse of the policy (42.6%), followed by the fear of being passed over for promotions (27.9%). Other concerns included workplace stigma or harassment (14.8%) and privacy or disclosure issues (14.8%). This indicates that while policy support is high, a significant share of respondents are hesitant about career penalties and bias. The leading perceived benefit of menstrual leave was better physical and mental health (54.1%), followed by normalizing menstrual health disclosure (23%), suggesting both wellbeing and cultural recognition motives behind policy support.



Discussion:

The findings highlighted strong policy acceptability amidst persistent socio-cultural and organisational barriers. Socio-culturally, Menstrual health remains a sensitive subject in my workplaces, and the data on concerns about stigma and promotion bias supports the idea that the “period taboo” continues to influence employee behaviours. Even when sick leave is taken due to menstrual pain, disclosure rates tend to be low, suggesting discomfort and fear of judgement. This implies that policy introduction alone is insufficient, cultural normalization and confidentiality safeguards are equally necessary.

From a workplace dynamics perspective, introducing menstrual leave could significantly reshape employee and HR relationships. If implemented with transparency and confidentiality, it may increase trust, improve morale and psychological safety. However, if poorly implemented, for example, with unwanted verification or informal manager discretion, it could worsen bias and reinforce gender stereotypes. The relatively high percentage of respondents worried about misuse also suggests that organizations will need clear eligibility criteria and communication frameworks to maintain fairness and credibility.

Many earlier studies similarly concluded that acceptance is strongest when leave is optional, confidential, and flexible rather than rigid and highly tracked.

Recommendations and Conclusion:

Based on the survey evidence, a menstrual leave policy appears both acceptable and desired by majority of the respondents, but its design must prioritize flexibility, privacy and anti-bias safeguards, the companies can consider implementing policies such as allowing 1 to 2 days optional days per month that can be taken as paid wellness leave or converted into remote work days. The strong concern about misuse suggests that organizations should embed the policy within a broader wellness or flexible leave structure rather than isolations it in a way that invites scrutiny or judgement.

Options such as work from home settings, flexible hours, or task output adjustments can provide relief without requiring full day leave in every case. This hybrid approach

addresses both employee health needs and employer efficiency concerns, and it aligns well with modern flexible work models already present in many organizations.

In conclusion, the survey indicates that the workforce particularly younger and full-time employees are largely welcoming menstrual leave as a formal workplace policy, with nearly nine out of every ten respondents supporting it. However, reduced is conditional on thoughtful implementation. The most successful approach will commode flexibility, confidentiality, and cultural sensitization. When supported by HR safeguards and inclusive communication, menstrual leave can function not only as a health accumulation but also as a signal of progressive and responsive workplace policy.

References & Appendices:

- Sanjana V Marathe and V John Paul Raj (2020): *Perceptions of Menstruation Leaves Between Genders among The Future Workforce*
- Sowmuki P (2025): *Periods and Paychecks: Navigating Menstrual Leave in Modern Employment*
- Divyani Datta (2023): *Work Place Menstrual Leave in India: An Exploratory Study on Employees' Perception in Urban Kolkata*
- Adrija Bhattacharya, Stotram Kumar and Amarendra Pattnaik (2021): *Menstrual leave at workplace: Employees' point of view*
- Bhaghamma G. and Prof. (Dr.) Ramesh (2024): *Addressing Menstrual Stigma: The Case for Implementing Menstrual Leave as a Legal Provision in India*

Questionnaire:

Section 1: Demographic & Professional Profile

1. **What is your age group?**
 - ☐ 18–25
 - ☐ 26–35
 - ☐ 36–45
 - ☐ 46+
2. **What is your current Employment Type?**
 - ☐ Full-time
 - ☐ Part-time
 - ☐ Freelance/Contractual
3. **What is the primary industry you work in?**

- Short Answer: e.g., IT, Healthcare, Education,
 - Manufacturing)
4. **What is your typical Work Arrangement?**
- Work from Office
 - Remote
 - Hybrid
5. **What is your Marital Status?**
- Single
 - Married

Section 2: Personal Menstrual Health & Work Impact

6. **How would you describe your typical menstrual symptoms? (Select all that apply)**
- Mild discomfort
 - Severe cramps
 - Fatigue/Weakness
 - Mood swings/Irritability
 - Migraines/Headaches
 - Nausea
7. **On average, how many days of pain do you experience per cycle?**
- 0 days
 - 1 day
 - 2–3 days
 - 4–6 days
 - 6+ days
8. **In the last 12 months, have you taken sick leave specifically due to menstrual pain?**
- Yes
 - No
9. **If you answered 'Yes' above, did you disclose the true reason (menstrual pain) to your employer?**
- Yes
 - No
 - Prefer not to say
10. **Rate the impact of menstrual symptoms on your work productivity:**
- (Scale: 1 [No impact] to 5 [Severe impact, unable to work])

Section 3: Attitudes Toward Menstrual Leave Policy

11. **Are you in favor of a dedicated monthly Menstrual Leave policy?**

- Strongly Support
 - Support
 - Neutral
 - Oppose
 - Strongly Oppose
12. **If you had access to Menstrual Leave, how likely are you to use it?**
- (Scale: 1 [Not likely] to 5 [Very likely])
13. **In your opinion, what is the ideal duration for menstrual leave per month?**
- Half day
 - 1 day
 - 2 days
 - More than 2 days
14. **Should this leave be:**
- Paid
 - Unpaid
 - Subsidized (e.g., Work-from-home option instead)
15. **Would you be comfortable providing a one-time medical certificate to enroll in this policy?**
- Yes
 - No
 - Only if kept strictly confidential

Section 4: Benefits, Concerns & Feedback

16. **What do you see as the primary benefit of Menstrual Leave? (Select one)**
- Better physical/mental health
 - Increased long-term productivity
 - Normalizing menstrual health discourse
 - Improved workplace inclusivity
17. **What is your biggest concern regarding this policy? (Select one)**
- Fear of being passed over for promotions
 - Workplace stigma/harassment
 - Privacy/Disclosure issues
 - Potential for misuse
18. **Suggestions/Comments, if any:**
- (Open-ended response)

Scan to see all Responses:



Gender Pay Gap Evaluation Over The Years In Corporate Sector: (Mumbai Region)

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Abstract:

This research paper seeks to examine the gender pay gap and its progression over time. The gender pay gap is a significant factor influencing employee's motivation, as it has a direct effect on the job satisfaction and morale. The study adopts a descriptive research approach using both primary and secondary sources of data. The results indicate that fair and unbiased compensation practices contribute to improved employee well-being, stronger engagement levels, and overall organisational development.

Keywords: Gender Pay gap, Wage inequality

Introduction:

The gender pay gap refers to the difference in earnings between men and women performing similar work or holding comparable positions. Even with legal provisions that promote equal pay, wage differences continue to exist in the organisations due to factors such as job roles, levels of experience etc.

Over the years, several initiatives such as corporate diversity programs, policy reforms, and increased participation of women in education and employment have aimed to narrow this gap. This ongoing disparities highlights the need for continuous evaluation, even though it is a metropolitan city like Mumbai

Literature Review:

Previous research indicates that gender pay gap still exists, and it continues to exist despite the introduction of the equal pay laws and organizational diversity initiatives. Several studies attribute this disparity to occupational segregation, career interruptions, unequal growth opportunities, and limited female representation in leadership roles. Scholars consistently emphasize on regular measures

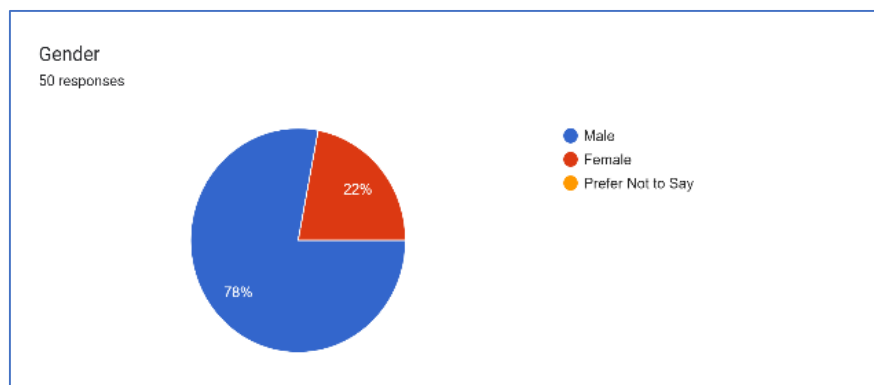
Key Objectives:

1. To examine the trend and extent of the gender pay gap over recent years
2. To analyse the relationship between employee characteristics and perceived pay disparities
3. To assess employee awareness, attitudes, and perceived effectiveness of equality policies

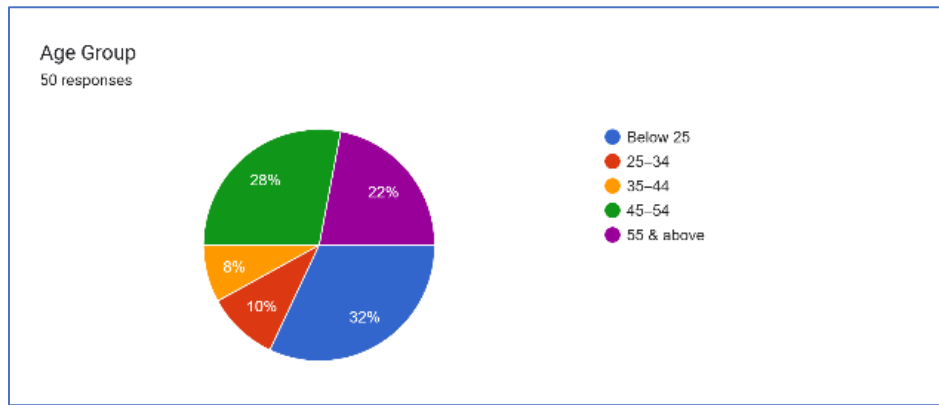
Research Methodology:

The research is descriptive in nature. Primary data was collected using questionnaires distributed among the employees and secondary data was obtained from journals and websites. A sample size of 50 employees was considered using convenience sampling technique.

Data Analysis and Data Interpretation:

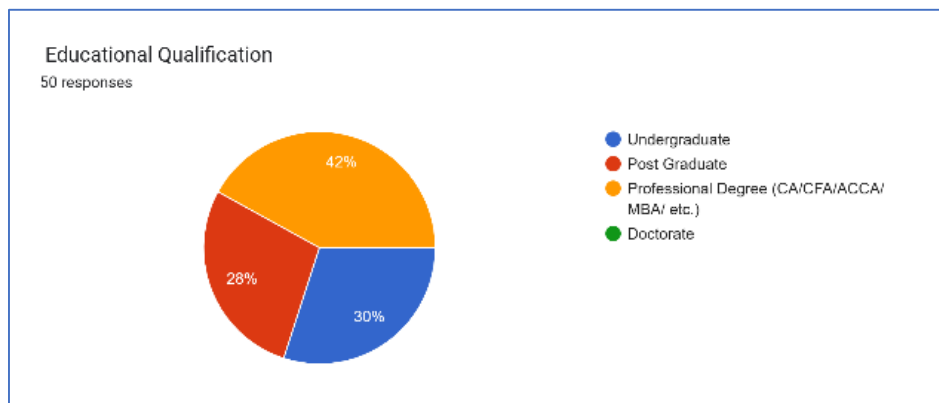


The survey is male dominated with only 22% of the females. This skewness may slightly influence the overall interpretations but that doesn't mean it doesn't provide insights about the gender pay gap.

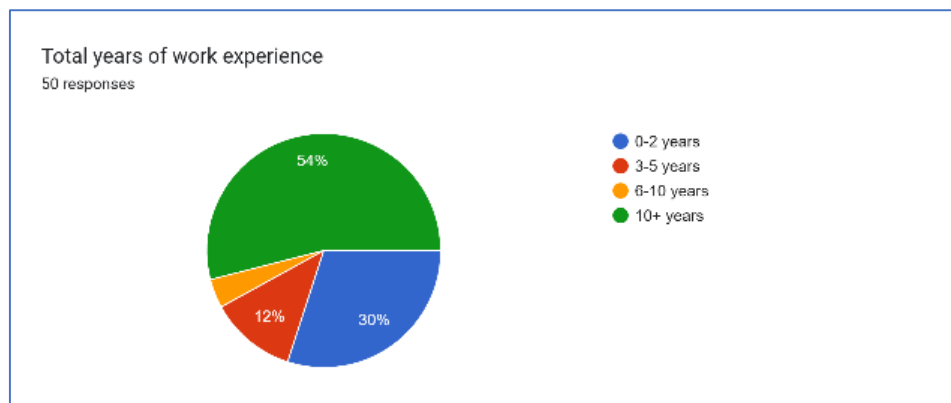


The respondent pool is largely composed of young professionals below 25, along with a significant share from 45-54.

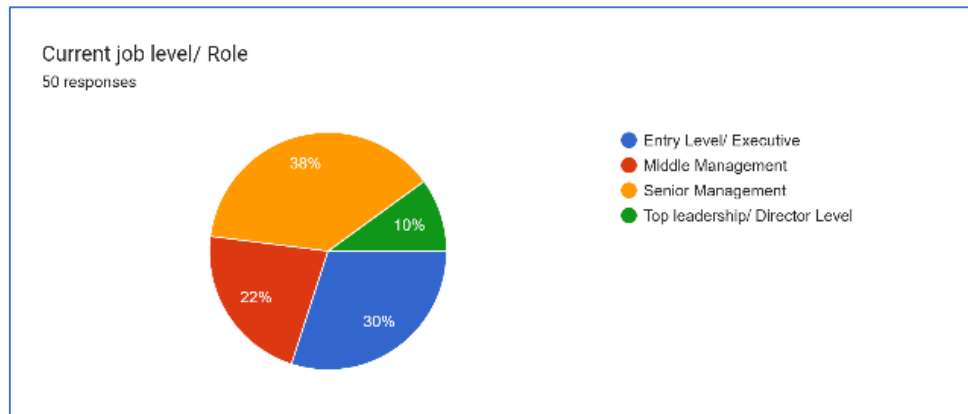
This mix of career and highly experienced individuals can ensure varied perspectives on the study.



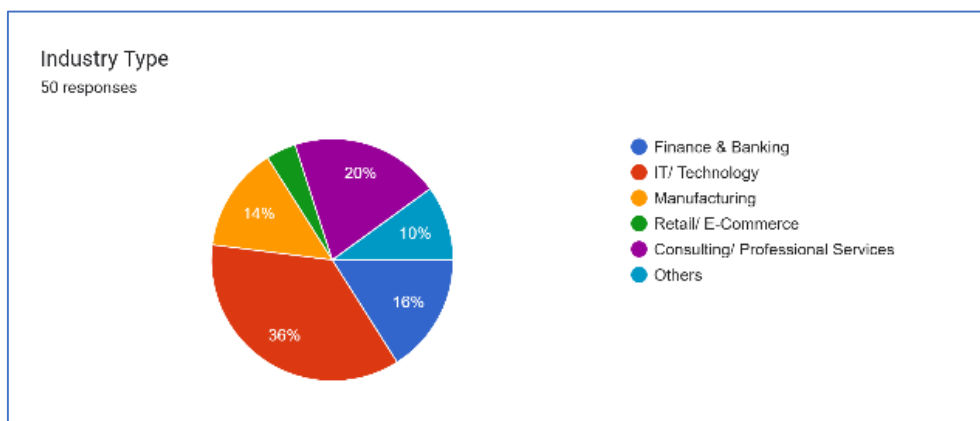
Most respondents possess a professional degree, followed by undergraduates and post graduates. This indicates a well-educated sample organization thereby honest insight is provided.



A majority have over 10 years of experience, while a good proportion are entrants. This blend captures both, long term and short-term perspectives of the sector.

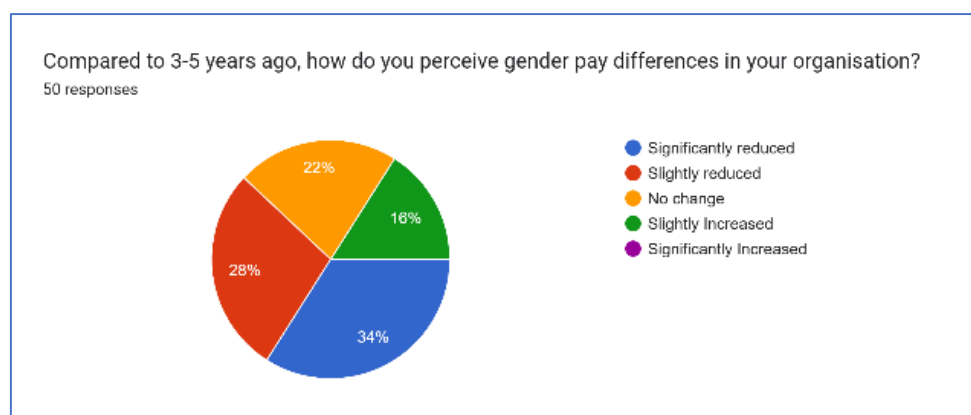


The highest representation comes from the senior management and entry level employees, with fewer in top leadership. This suggests that the insights are mainly drawn from operational as well as managerial viewpoints.

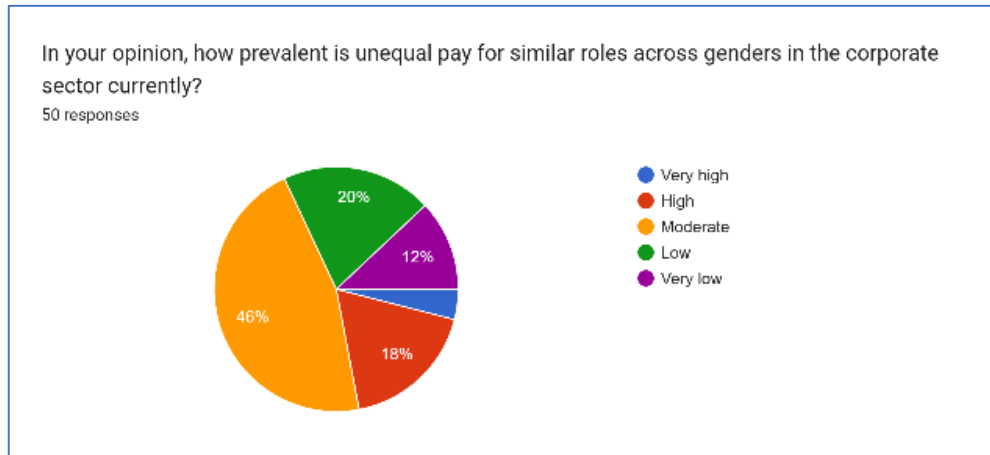


Most participants belong to IT/Technology and consulting, followed by Finance and Manufacturing. This study shows that it is more reflective of corporate sectors. Results may be less representative of traditional sectors.

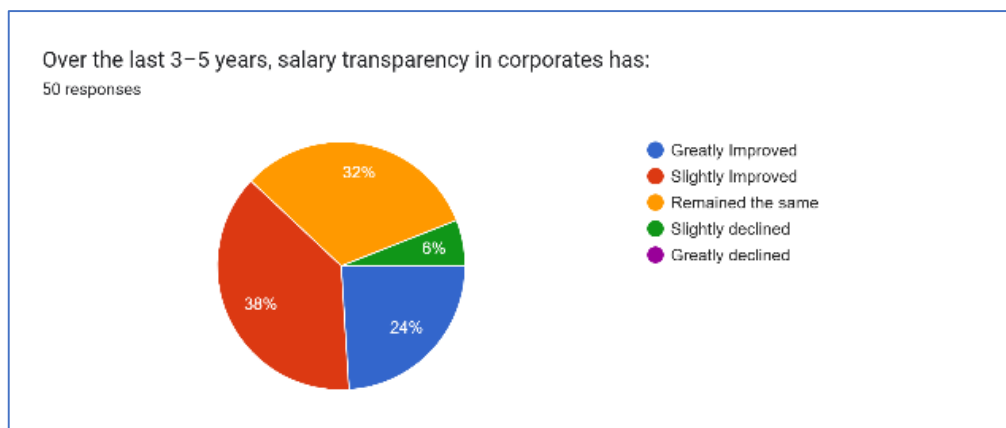
Objective 1: To examine the trend and extent of the gender pay gap over recent years



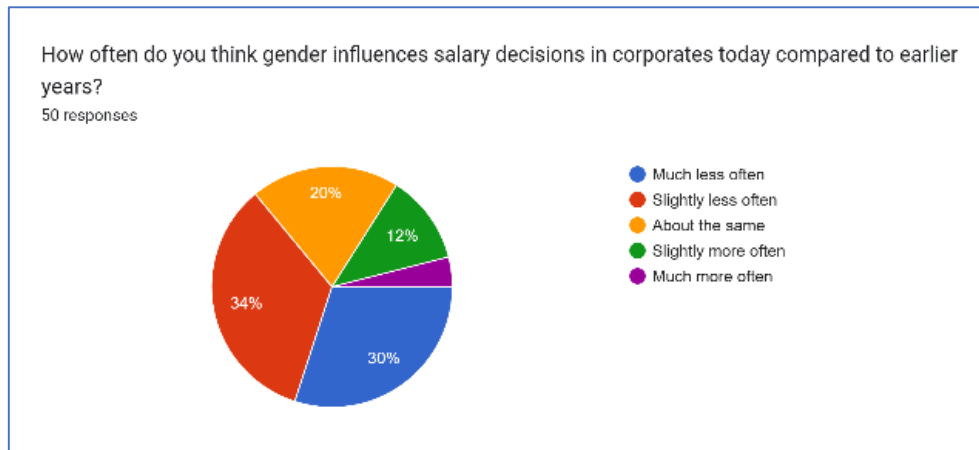
A larger share believes that the gender pay gap has reduced, while some observe no change or a slight increase. This indicates gradual improvement but not complete elimination of the disparities.



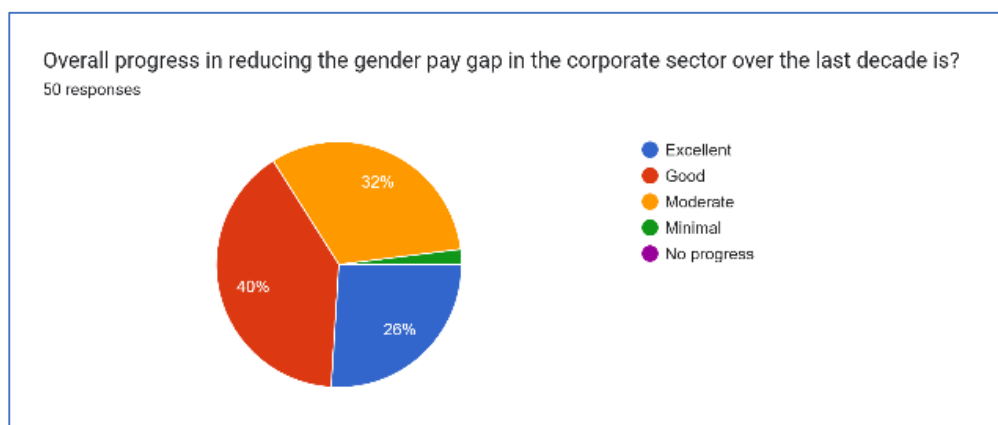
Most respondents rate unequal pay as moderate, with fewer marking it as a very high or very low, which suggests that pay inequality still exists but it is not universally extreme.



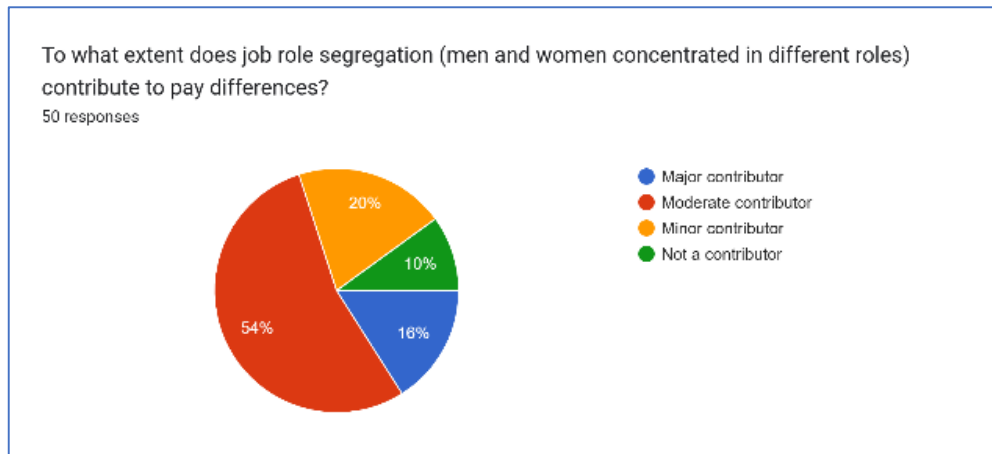
Most respondents feel that salary transparency has improved to some extent, with only small proportion believing it has declined. However a considerable share still perceives no major change.



A larger percentage believes that gender now influences the salary decisions less frequently than before. Yet, some respondents still think that the influence still remains the same or has slightly increased, indicating that the bias is still reduced but not disappeared entirely.

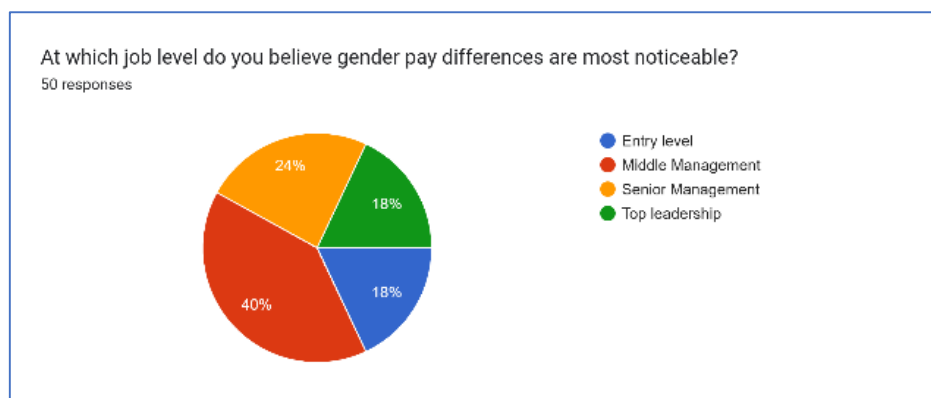


The majority rate progress as good as moderate, while the smaller group considers it excellent. Very few view the improvement as minimal, reflecting general optimism but recognition that full equality is still in progress



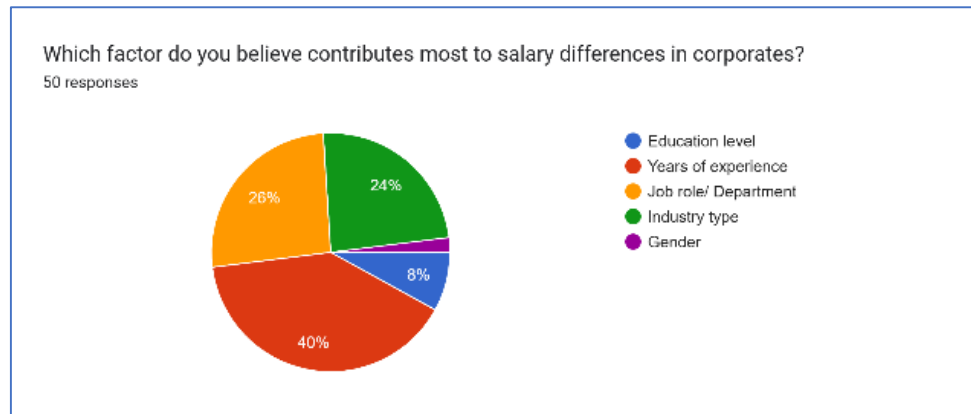
Most respondents identify job role segregation as a moderate measure of factor behind wage disparities. This implies that the concentration of men and women in different types of roles continues to structurally influence salary gaps.

Objective 2: To analyse the relationship between employee characteristics and perceived pay disparities.

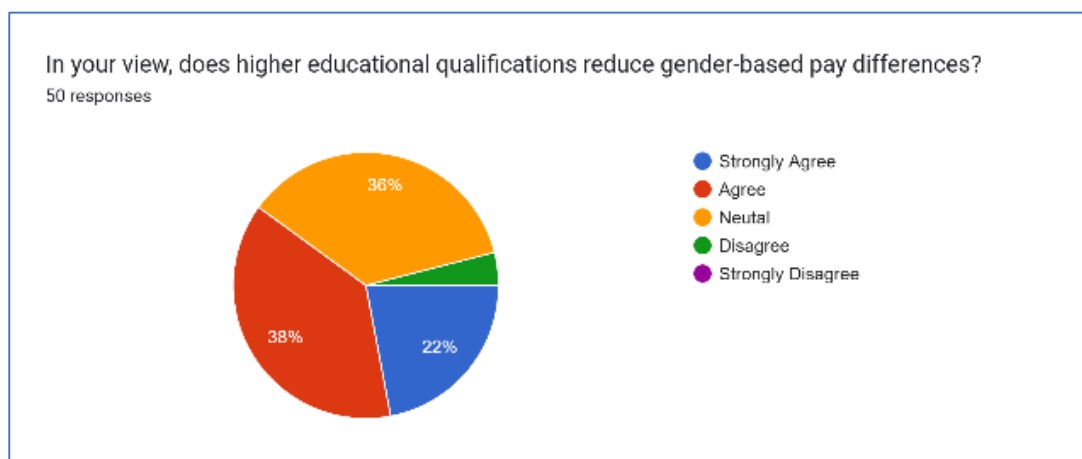


Participants largely believe that pay differences are most visible at middle management levels, with fewer pointing to senior or entry positions.

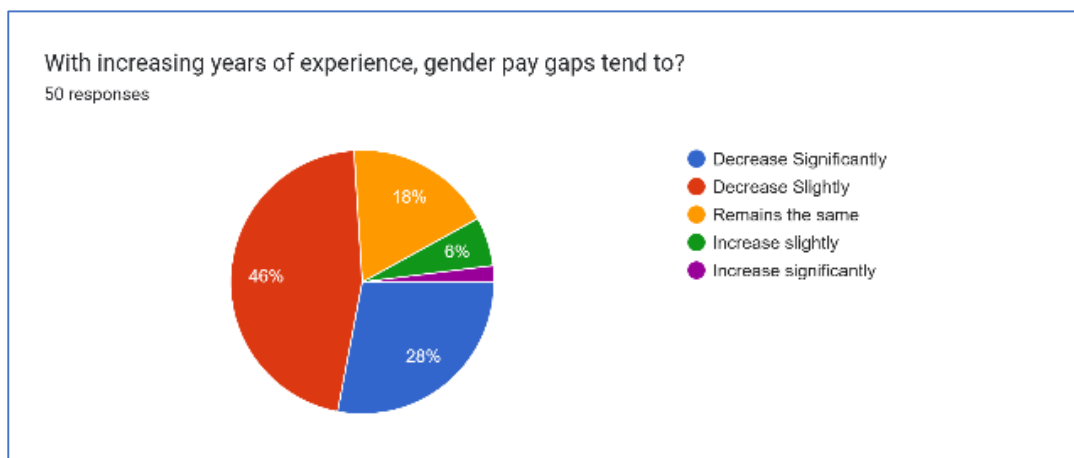
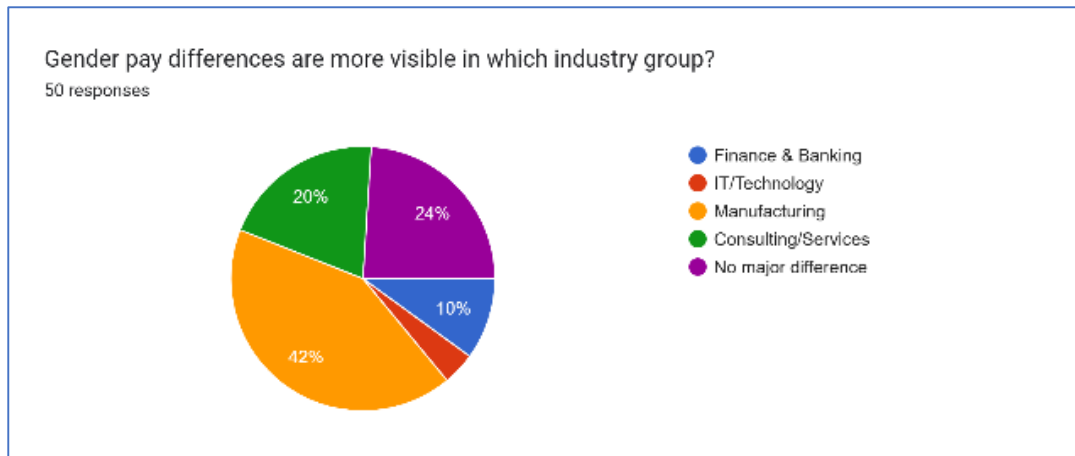
This indicates that inequality is perceived to intensify during mid- career stage rather than at the beginning or very top of the organizational hierarchies.



The largest portion of respondents identifies years of experience as the primary drivers of salary differences in corporate settings. This suggests that while roles and industries vary, tenure is perceived as the most influential variable in determining an individual's compensation.



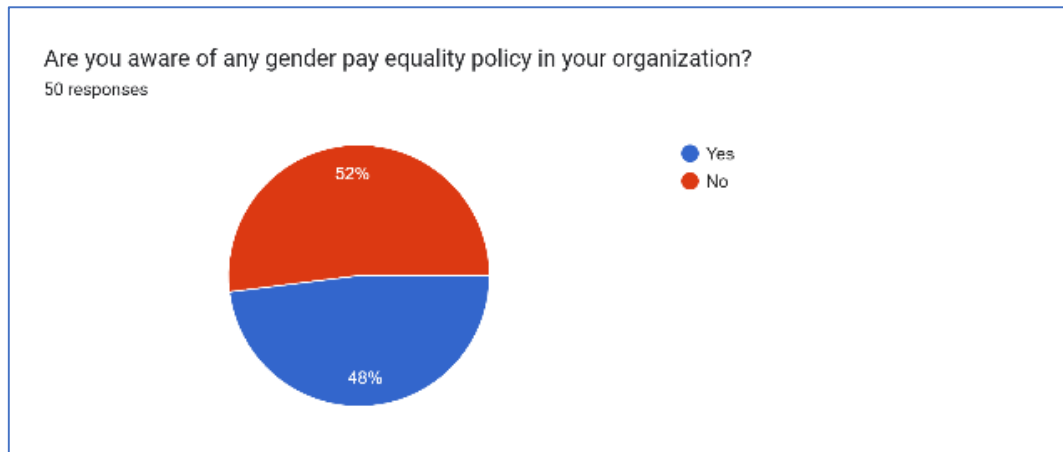
A combined participants agree or strongly agree that the higher educational qualifications help to reduce the gender-based pay gaps. This indicates that standardised academic credentials act as a leveler providing a more objective basis that can bypass gender bias.



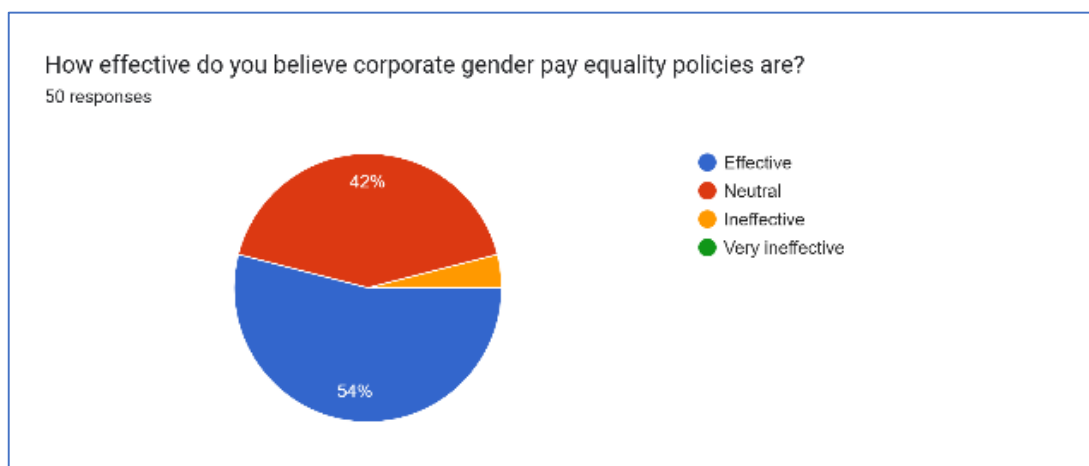
Manufacturing is viewed as the industry where gender pay differences are most visible by 42% of the respondents. This highlights a perception that traditional industrial sectors face greater challenges with pay transparency and equality compared to modern fields like IT or Finance.

A significant majority believe that gender pay gaps actually decrease as employees accumulate more years of experience. This implies that “proven” expertise is seen a way to eventually bridge initial pay disparities, though the gap remains a concern for those with fewer years in the field

Objective 3: To assess employee awareness, attitudes, and perceived effectiveness of equality policies



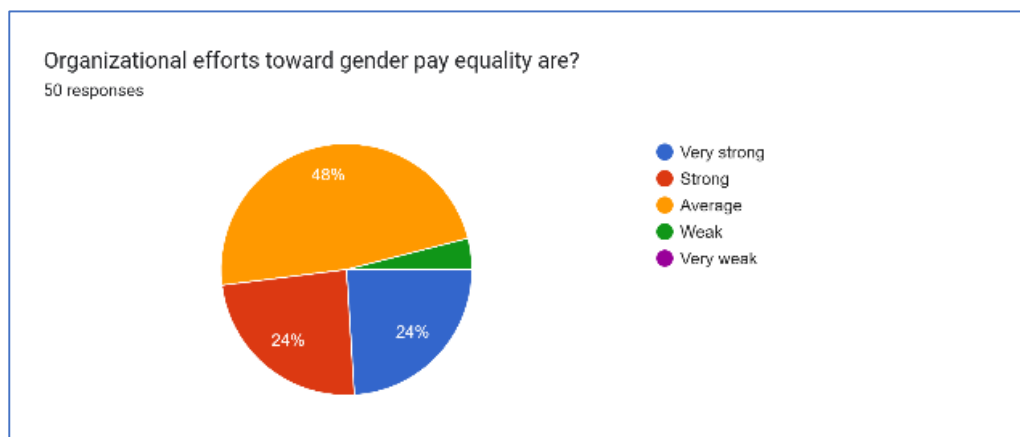
Awareness of gender pay equality policies is almost perfectly split, with 52% of them which are unaware as they state, of such initiatives in their organization. This point reveals a significant communication gap; even if the policies exist, they aren't being effectively promoted.



Among all those who are aware, 54% believe that the policies are effective and the others believe that its neutral. The high percentage of neutral policies are a positive step, many employees have yet to see tangible, measurable evidence of these rules changing their actual take-home pay.



Transparency remains a hurdle, as only 34% of employees feel comfortable to actually speak or discuss their equality issues. With 48% remaining neutral suggest that maybe they don't want to disclose about it as it remains a sensitive topic always.



With 48% of the respondents state that their organisations efforts are strong or very strong. This data reflects a workforce that sees their companies as meeting basic standards, but identifies a clear opportunity for more proactive, high level commitment.

These are the interpretations of all the questions that we asked the employees in the questionnaire.

The final question was open-ended and asked what business groups could do to close the gender gap.

In summary, the respondents replied that their must be proper audits, ensure transparent salary bands, and base pay decisions on role, performance and experience rather than negotiation. They should promote fair hiring and promotion practices, provide equal growth

and leadership opportunities, support flexible work policies, and hold leaders accountable for closing pay gaps. Changing the mindset and believing that no difference or few exceptions related to manufacturing are hard or harsh work.

Findings:

- Occupational segregation: Women are frequently concentrated in lower-paying administrative roles, while high earning still is dominated by males.
- Transparency gaps: A lack of standardized salary bands allows unconscious bias and subjective negotiations to drive pay disparities
- Industry perceptions: In sectors like manufacturing, harsh environments are often used to justify existing inequalities
- Need for audits: Data suggests that regular pay audits must be conducted to ensure smooth functioning of compensation and employee satisfaction
- Also for the city like Mumbai, which is a metropolitan city, the gender pay gap still exists.

Conclusion:

In conclusion, this research concludes that while the gender pay gap in Mumbai's corporate sector is narrowing, it remains a persistent challenge driven by systematic barriers rather than simple skill deficits. By achieving the study's objectives, the findings confirm that occupational segregation is the primary driver of wage disparity. The data highlights a critical disconnect, while organisations have equality policies, their impact is often neutralized by a lack of transparency and unconscious bias in promotions. Ultimately, closing the gap requires shifting from passive compliance to active accountability through standardized pay structures and a merit-driven corporate culture

Suggestions:

1. Implement transparent salary bands
2. Conduct regular pay audits
3. Neutralize recruitment and promotions
4. Normalize flexible work policies
5. Foster leadership inclusion

Limitations and Future Scope:

Limitations:

1. The primary constraint of this study was the sample size; 50 respondents provide a valuable insight but not represent the global corporate landscape
2. Additionally the reliance on self-reported survey data introduces potential subjective bias.
3. The research also focused heavily on general corporate roles, potentially overlooking specific nuances in niche or industries or specialized technical fields.

Future scope:

Future research should aim for longitudinal study to track the long-term impact of specific DEI policies.

Expanding the demographic to include a broader range of senior executives would provide deeper insights because of their experience

Bibliography:

Primary research- Aarvi Chhadwa & Aarav Bhatia research paper

Secondary research-

Past research paper readings

World Economic Forum

ILO

Appendix:

Questionnaire-

A: Demographic Profile

1. Name
2. Email
3. Gender
4. Age group
5. Educational Qualification
6. Total years of work experience
7. Current job level
8. Industry type

B: Questions

1. Compared to 3-5 years ago, how do you perceive gender pay differences in your organisation?
 - Significantly reduced
 - Slightly reduced
 - No change
 - Slightly increased
 - Significantly increased
2. In your opinion, how prevalent is unequal pay for similar roles across genders in the corporate sector currently?
 - Very high
 - High
 - Moderate
 - Low
 - Very low
3. Over the last 3–5 years, salary transparency in corporates has?
 - Slightly improved
 - Greatly improved
 - Remained the same
 - Slightly declined
 - Greatly declined
4. How often do you think gender influences salary decisions in corporates today compared to earlier years?
 - Much less often
 - Slightly less often
 - About the same
 - Slightly more often
 - Much more often
5. Overall progress in reducing the gender pay gap in the corporate sector over the last decade is?
 - Excellent
 - Good
 - Moderate

- Minimal
 - No progress
6. To what extent does job role segregation (men and women concentrated in different roles) contribute to pay differences?
- Major contributor
 - Moderate contributor
 - Minor contributor
 - Not a contributor
7. At which job level do you believe gender pay differences are most noticeable?
- Entry level
 - Middle management
 - Senior level
 - Top management
8. Which factor do you believe contributes most to salary differences in corporates?
- Education level
 - Years of experience
 - Job role/department
 - Industry type
 - gender
9. In your view, does higher educational qualifications reduce gender-based pay differences?
- Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree
10. Gender pay differences are more visible in which industry group?
- Finance & banking
 - IT/Technology
 - Manufacturing
 - Consultancy/ services
 - No major difference

11. With increasing years of experience, gender pay gaps tend to?

- Decrease significantly
- Decrease slightly
- Remains the same
- Increases slightly
- Increase significantly

12. Are you aware of any gender pay equality policy in your organization?

- Yes
- No

13. How effective do you believe corporate gender pay equality policies are?

- Effective
- Neutral
- Ineffective
- Very ineffective

14. How comfortable are employees in your workplace discussing salary equality issues?

- Very comfortable
- Comfortable
- Neutral
- Uncomfortable
- Very uncomfortable

15. Organizational efforts toward gender pay equality are?

- Very strong
- Strong
- Average
- Weak
- Very weak

16. In your opinion, if there is a gender pay gap, what measures should organisations take to reduce it?

This was an open-ended question for the respondents

Compensation management as a tool for attracting and retaining Gen-Z and millennial

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Abstract:

The concept of compensation management has evolved beyond a simple fixed pay system to a more comprehensive concept of total rewards. Most of the employees in the current workforce consist of Gen Z and Millennials, though their expectations towards compensation systems are rather different. In this paper, we are going to discuss compensation management as a strategy to attract and retain Gen Z and Millennial employees through the perspective of three key topics: replacing fixed pay with total rewards, work-life balance benefits and customized compensation packages.

My primary data is gathered by use of a structured questionnaire were provided by 44 Gen Z and Millennial respondents. The findings demonstrate that Gen Z is more interested in flexibility, work-life balance and individualized rewards, whereas Millennials give a preference to structured total rewards, consistent income, and long-term benefits. The paper concludes that firms should employ alternative remuneration policies to effectively attract and retain both generations.

Introduction:

Compensation management simply refers to planning, execution as well as overseeing both cash and benefits that companies pay their employees to perform their duties. Today, it is

not just a fixed pay anymore, employers are providing incentives, benefits, flexibility, recognition and alternative ways to develop a package of total rewards in a nutshell.

The primary take on the job market are Gen Z and Millennials, the ones that are influencing the way companies design pay. Although they desire fair, competitive figures, they differ in the things they value. The millennials are more or less stability-seeking, incrementally raising pay checks and strong long-term benefits, whereas Gen Z prefer flexibility, immediate gratification, and adequate work-life balance.

Attempting to make a compensation plan that fits everyone is an enormous task as it causes one of the two categories of people to feel disappointed and unsatisfied and some to quit. This paper, which is essentially an exploration of our work conducted in the course of this semester, examines compensation as a strategic tool to attract and retain Gen Z and Millennial talent by comparing their preferences in three areas.

Review of Literature:

The recent literature shows there is a marked movement away of fixed pay systems to total rewards systems. Researchers stress that, by integrating salary and bonuses along with benefits, recognition, and work-life perks into a single package, a company increases the motivation and involvement of the employees.

It has been argued in the literature that millennial employees react well to well-organized compensation schemes offering long-term financial stability, professional-level incentives, and stability. They like compensation plans which are conducive to long term professional and personal development.

Conversely, research indicates that Gen Z workers appreciate flexibility and customization in wages. Gen Z values work-life benefits like flexible hours, hybrid work arrangements, and wellness programs more than generalized benefits. The research shows also that Gen Z wants to have customized compensation plans that would address individual needs instead of fixed benefits.

Research on compensation management and generational workforce dynamics indicates that compensation preferences vary significantly between Gen Z and Millennial employees. Sehgal (2025) demonstrates that retention drivers such as equitable compensation and flexible benefits are more influential for Gen Z compared to traditional loyalty frameworks preferred by Millennials. Mabaso and Mathebula (2025) identify remuneration, well-being, development, and recognition as key rewards for attracting and retaining Millennial talent, stressing the need for holistic total rewards strategies. In another study, Mabaso (2025) highlights Gen Z's preference for a balance of extrinsic rewards like compensation and intrinsic motivators such as personal growth and purpose. Shahi et al. (2025) further confirm that compensation and flexible work practices significantly enhance job satisfaction among Gen Z employees. Research also shows that compensation transparency and employer branding influence Gen Z's attraction to employers, emphasizing the need for competitive and clear reward communication. A systematic literature review by Fuchs et al. (2024) reinforces that generational differences in compensation and career priorities necessitate adaptive HRM practices.

The available sources confirm that one compensation model cannot be effective in managing different generational expectations. Nonetheless, fewer studies directly compare Gen Z, as well as millennials, using distinct aspects of compensation in the Indian context, which this study seeks to fill.

Research Methodology:

To write this paper, we have been working on the effective research methodology that will provide us the way. We will collect and analyse data to achieve my research objectives. It will describe the research design, data collection methods, sampling methods, data analysis instruments as well as limitations of the study. The approach to be adopted is a specific one that suits my aim to study how compensation management will attract and retain Gen Z and Millennial workers and compare the two groups side by side.

Primary Data: The primary data was collected through a self-administered questionnaire. The questionnaire will be geared to seek information about:

- Fixed pay preference vs. total rewards.

- Value of work-life balance benefits.
- Favor of customized pay plans. .

The types of questions are multiple-choice based and ranking based to ease of understanding and solving. Gathering of primary data would provide me with a first-hand experience of what is expected by Gen Z and Millennials under their pay package.

Secondary Data

- Textbooks on compensation and human resource management.
- Scholarly articles and studies.
- Generational workforce trend articles and reports.
- Internet HR and professional magazines.

Analysis and Interpretation of the Data:

The primary data collected by me in the research project in this semester consisted of 44 classmates (17 Gen Z employees and 27 Millennial employees). We were interested in understanding how compensation management relates to their attraction and retention at the workplace particularly by examining three areas namely the transition to fixed pay to total rewards systems, the role of work-life balance perks, and whether they are attracted by personalized compensation plans.

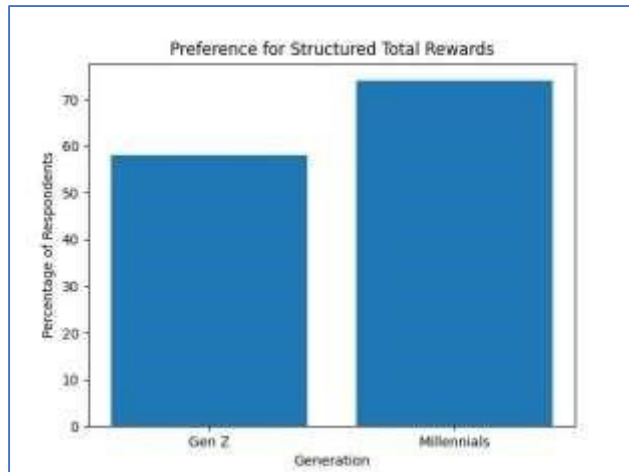
Fixed Pay to Total Rewards.

Millennial respondents would like to see a systematic system that involves a predetermined pay, performance-driven incentives and long-term benefits. In their case, total rewards are financial stability, continuity in their careers, and consistent growth. They prefer compensation systems, which assure of long term values instead of the short-term gains and losses.

On the contrary, GenZ agreed with total rewards but was not as dependent on a strict framework. They preferred alternating elements such as bonuses, incentives, and recognition

rewards as opposed to a fixed salary. To them, compensation must change with performance and skills and not remain fixed.

Therefore, when Millennials see total rewards as a long-term safety net, GenZ regards them as an adaptable, performance-based choice.



Interpretation: As the chart indicates, Millennials are more likely to find structured total rewards preferable to Gen Z. This supports the assumption that Millennials are more concerned with stability and long-term benefits, and Gen Z is more willing to work in flexible and variable systems.

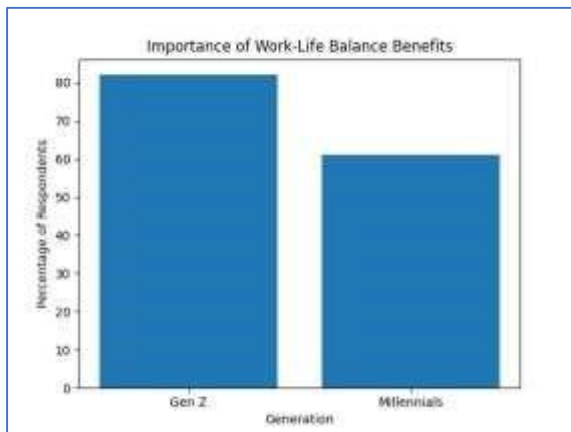
Work-Life Balance Benefits.

We established that the work-life balance is among the largest attractors among both generations, but Gen Z favored it more.

The majority of Gen Z participants asserted that the benefits of work-life balance are exceedingly vital. Flexible work hours, working remotely, and assistance in maintaining mental health are the main components of their job satisfaction and reasons to continue working in the company. Most Gen Z respondents even indicated that they would accept a slight less pay to have better work life balance.

Work-life balance is also of interest to millennials, although their perception was more balanced. They preferred paid leaves, health coverage and regular schedules that accommodate family and individual needs. Millennials regard work-life balance as a supplement to their financial compensation rather than an alternative.

The results indicate that work-life balance is a better attraction and retention factor among Gen Z than Millennials.



Interpretation: Gen Z responders attach a great level of importance to the benefits associated with work-life balance than the Millennials do, which is understandable given their preferences in flexibility and well-being-focused pay structures.

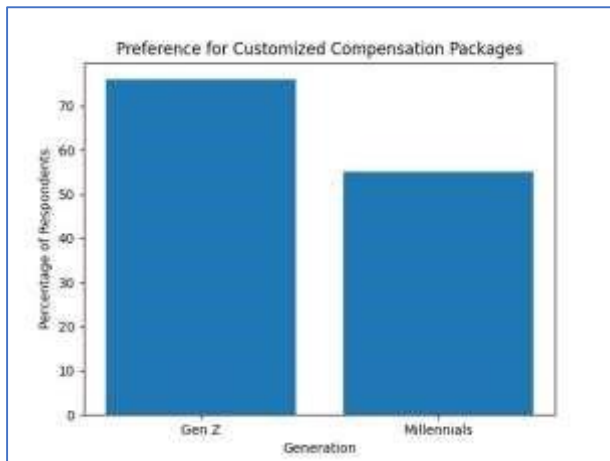
Customised Compensation Packages:

Compensation customization emerged to be one of the fundamental differences between Gen Z and Millennials.

The majority of Gen Z respondents desired individualized remuneration packages. They appreciate the fact that they can choose benefits that accommodate them, such as learning and development, the possibilities of a flexible work schedule, or wellness benefits. To them, individually tailored compensation will be a sign of organizational support and considerations of individual needs.

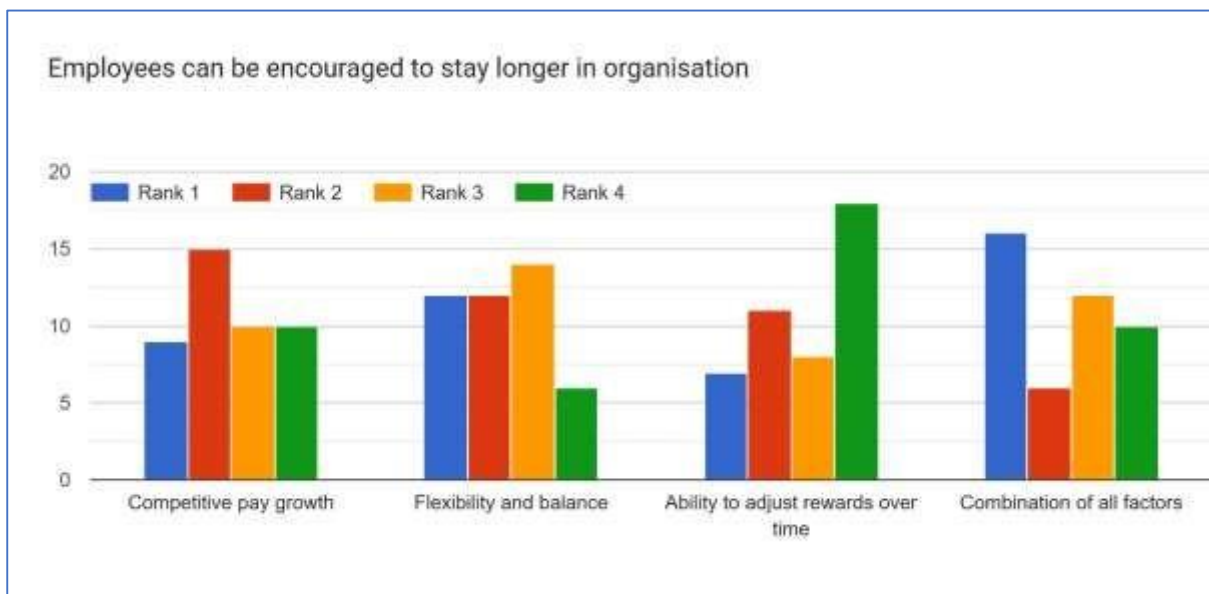
Millennials also valued a certain degree of customization but they liked it in the framework of a structure. They were willing to apply more standardized compensation plans with less flexibility as opposed to fully customized packages. Regularity and coherence of remuneration were also matters of concern to Millennials.

Therefore, customization plays a larger role in motivating and retaining Gen Z workers as compared to Millennials.



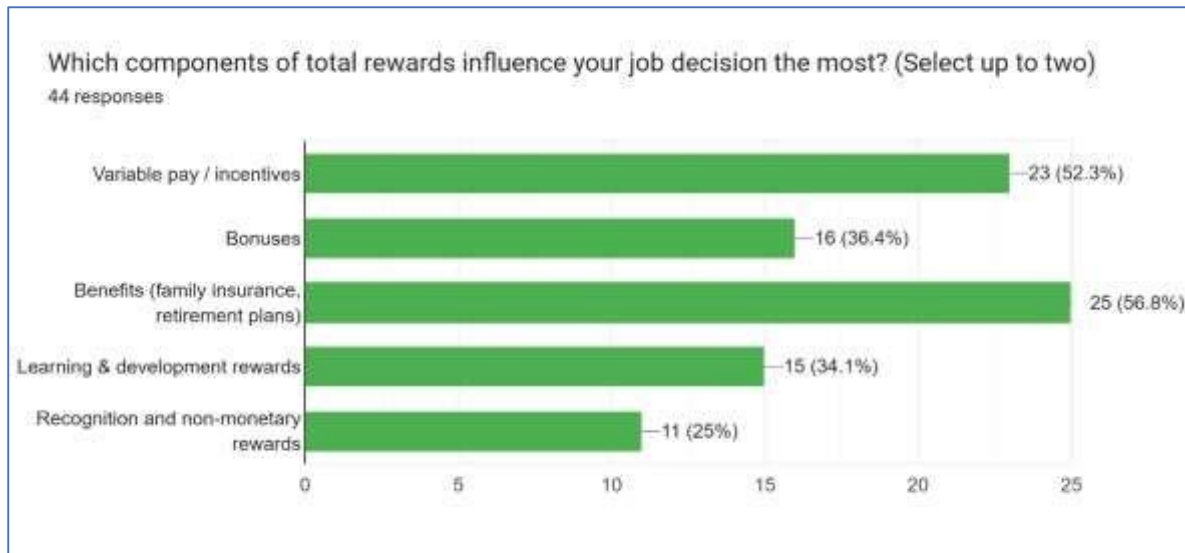
Interpretation: As the chart indicates, Gen Z has a higher preference of personalized compensation packages than Millennials, which supports a conclusion that Gen Z is better responding to personalized and flexible reward systems.

General Assessment of Results



The in-depth review reveals that compensation management contributes significantly to attracting and retaining Gen Z as well as Millennial employees. But the effect that it has on each of them varies:

- Gen Z is motivated by the flexibility and work life benefits and personalized compensation.
- Millennials prefer systematic overall compensation, predictable salaries, and extended benefits.



The findings indicate that a uniform method of remuneration does not work. A company capable of generating generation-sensitive compensation plans is prone to have a greater employee satisfaction, employee engagement and retention.

Suggestion and Conclusion:

Suggestions:

We believe that organizations must abandon the one-size-fits-all compensation and proceed to more compensation systems that are truly flexible.

- Work-life balance benefits should be made a conventional element of the remuneration package, particularly to Gen.Z.
- it would be interesting to provide custom-designed compensation packages that strike the varying employee needs.
- Millennials would enjoy explicit career trajectory of pay increase and good benefits in their package over time.

Staff members should be provided with regular feedback, which might stimulate more intelligent policy changes in the long run.

Conclusion:

The study indicates that effective compensation management can assist in attracting and retaining GenZ and Millennial employees. Their desires are fairly different when considering total rewards and work-life balance benefits as well as custom packages. Gen-Z are most

gravitated towards the flexible, customized, and balance-oriented compensation arrangements whereas Millennials tend to gravitate more towards coding of rewards that offer long-term benefit and structure. By identifying these areas and aligning your pay with each category, then you stand a better chance of improving satisfaction, retention, and overall performance.

Annexure:

1. Name
2. Gender
3. Age Group
4. Employment Status
5. Industry You Work / Wish to Work In

1. A good compensation for me is _____

- High monthly salary
- Balanced pay with useful benefits
- Flexibility and time freedom
- A mix that can change over time

2. According to you, job offer is to be best compared with _____

- salary
- By benefits (non - financial)
- lifestyle fit and flexibility
- current priorities

Section B: Shift from Fixed Pay to Total Rewards

3. Which part of a total rewards package matters most to you right now?

- Cash pay (salary, incentives)
- Learning and skill development
- Benefits and perks
- Recognition and growth opportunities

4. How do you feel about performance-linked or variable pay?

- I find it motivating
- I like it only with a stable fixed salary

- I feel neutral about it
- I prefer fixed pay

5.What makes a compensation package feel “worth it” to you?

- Clear growth in income
- Balance between money and life
- Freedom to choose benefits
- Feeling valued by the employer

Section C: Work–Life Balance Expectations

6.For me work–life balance is ____

- Flexible work hours
- Ability to work remotely
- Time for personal interests
- Balance depends on life phase

7. Which benefit would you personally prioritize if offered a choice? (Individual ranking 1-5)

- Flexible working hours
- Work-from-home / hybrid work
- Extra paid leaves
- Wellness or mental health support

8.In your opinion; Employees are okay to compromise on salary for better work life balance.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Section D: Customised Compensation Packages

11.Employees compensation priorities change ____

- Very often
- Occasionally
- Rarely
- Almost never

Section E: Attraction & Retention Factors

12. Employees can be encouraged to stay longer in organisation (Individual ranking 1-5)

- Competitive pay growth
- Flexibility and balance
- Ability to adjust rewards over time
- Combination of all factors

13. flexible compensation and benefits will make employee feel ____

- More valued
- More motivated
- More secure
- Neutral

14. Organisations should revisit employee compensation preferences ____

- Annually
- Every few years
- Only during promotions
- Rarely

15. Which components of total rewards influence your job decision the most? (Select up to two)

- Variable pay / incentives
- Bonuses
- Benefits (family insurance, retirement plans)
- Learning & development rewards
- Recognition and non-monetary rewards

16. The shift from fixed pay to total rewards has made compensation ____

- More transparent
- More complex
- Both
- Neutral

17. On what basis would you prefer your compensation appraisal?

- Seniority basis
- Performance basis
- Incentive basis
- Skill based

18. According to you, AI-enabled performance tracking makes variable pay ____

- Fairer and more objective
- More stressful due to constant monitoring
- Both
- Neither

19. How would you prefer an organization to acknowledge growth in your income or performance?

- Through higher fixed compensation
- Through a structured mix of pay and future benefits
- Through enhanced flexibility and personal time benefits
- Through a combination of financial and non-financial rewards



Compensation To The Indian Armed Forces

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Abstract:

This research project explores the evolving landscape of compensation management within the Indian Armed Forces, with a primary focus on the transformative Agnipath Scheme. As the traditional “lifelong service” model shifts towards a learner, short-tenure recruitment strategy, the study examines the socio- economic implications of the new financial structures including the Agniveer Corpus Fund, the absence of traditional pension benefits, and post-service exit policies. Through a primary survey of 51 respondents, the research analyzes public and professional perceptions regarding the adequacy of military pay, risk-based allowances, and the effectiveness of transitional “safety nets” such as CAPF reservations and skill certifications.

Keywords: Compensation to the Indian Armed Forces, Agniveer

Introduction:

The Indian Armed Forces are among the largest and most disciplined standing armies in the world. Traditionally, a military career was seen as a lifelong commitment. It was associated with the “Old Pension Scheme” (OPS), which provided financial security through lifelong pensions, medical coverage, and canteen services. This payment system was important to the “izat” (honor) and social contract between soldiers and the state.

However, as militaries around the world modernize to become learner and more tech-

savvy, the rising national defense pension bill which increased by over 160% in the last decade led the Government of India to introduce the Agnipath Scheme in June 2022. This major reform replaced the traditional permanent recruitment model with a four-year short term contract for “Agniveers”.

Feature	7th CPC (Regular Cadre-Sepoy)	Agniveer (Customized Package)
Basic Pay	₹21,700 - ₹69,100 (Level 3)	Fixed : ₹30,000 (Year 1) to ₹40,000 (Year 4)
Annual Increment	3% of Basic Pay	10% (Fixed annual increase in package)
MSP	₹5,200 per month	None
DA	50% of Basic Pay (Revised biannually)	None
Retirement Benefit	Lifelong Pension & Gratuity	Seva Nidhi Package (Lump Sum)

This change has significantly shifted how the armed forces handle compensation. The move from a rank- and-tenure pay system to a Customized Monthly Package has sparked heated discussions about whether the financial rewards are enough to match the risks involved in service. The scheme offers the Seva Nidhi, a tax- free lump-sum payment, but removes traditional security measures like lifelong pensions and the Ex- Servicemen Contributory Health Scheme (ECHS) for most recruits.

The success of any military organization depends on the morale and motivation of its members. These factors are closely tied to their pay and security after service. If financial incentives seem low compared to the risks, it could lead to recruitment issues or a drop in the quality of new personnel. On the other hand, a well-designed pay structure linked to performance could foster a motivated, youthful, and skilled force.

Against this backdrop, this research paper seeks to evaluate the current state of compensation within the Indian Armed Forces. By analyzing the evolution of pay structures

and the implementation of post- retirement benefits, this study assesses how these changes impact the attractiveness of military service as a career choice.

Literature Review:

- **Evolution of Pay:**

The transition from the 7th Central Pay Commission (CPC) regular skeleton pay to the Agniveer tailored Monthly Package represents a shift from a long-term, allowance-heavy career structure to a fixed-term, consolidated compensation model.

Under the 7th CPC, a regular dogface's pay is erected on a "Pay Matrix" (Level 3 for Sepoys) with lifelong benefits. In discrepancy, the Agnipath scheme uses a "Tailored Package" designed for a 4-time term, fastening on a duty- free terminal severance.

- **Pay Structure Comparison:**

The most significant change is the simplification of the monthly earnings. While regular soldiers receive a Basic Pay that attracts Dearness Allowance (DA) and Military Service Pay (MSP), Agniveers receive a fixed composite amount.

- **The Agniveer Compensation Model:**

The Agniveer compensation model is a abecedarian departure from the traditional endless commission structure of the Indian Armed Forces. Introduced under the Agnipath Scheme (2022), it prioritizes immediate liquidity and an immature profile over long-term pensionary benefits.

The package is divided into three main pillars yearly payment, the Seva Nidhi Package, and Risk & Death/ Disability Compensation.

- **Monthly Breakdown:**

Agniveers receive a "Customized Monthly Package" that increases annually. However, unlike regular soldiers, they do not receive Dearness Allowance (DA) or Military Service Pay (MSP).

Year	Total Package	In- Hand	Contribution to Corpus
1 st Year	₹30,000	₹21,000	₹9,000
2 nd Year	₹33,000	₹33,100	₹9,900
3 rd Year	₹36,500	₹25,550	₹10,950
4 th Year	₹40,000	₹28,000	₹12,000

Upon completion of 4 years, the accumulated corpus (approx. ₹5.02 Lakh) plus the government's matching contribution and interest results in a one-time Seva Nidhi payment of approximately ₹11.71 Lakh (Income Tax Exempt).

- **The Seva Nidhi Package (Exit Benefit):**

The Seva Nidhi Package is the financial exit benefit provided to recruits under the Agnipath Scheme in the Indian Armed Forces. It is Designed to provide “Agniveers” with a substantial financial cushion after completing their four-year engagement period.

How the Package is built:

The Seva Nidhi Package is a contributory scheme, meaning both the individual and the government contribute equally to the fund.

- **Monthly Contribution:** Every month, 30% of an Agniveers customized package is deducted.
- **Government Matching:** The Government of India contributes an equal amount to the Agniveers's corpus.
- **Interest:** The total amount accumulates interest based on applicable rates (similar to the Public Provident Fund).

Financial Breakdown (Approximate):-

Component	Amount over 4 years
Agniveer Contribution	₹5.02 Lakh
Government Contribution	₹5.02 Lakh
Total (excluding interest)	₹10.04 Lakh

Key Benefits:

- **Tax-Free:** The entire Seva Nidhi Package (including the interest earned) is exempt from Income Tax.
- **Post-Service Support:** It is intended to help individuals either start a small business, pursue higher education, or undergo further vocational training.
- **Life Insurance:** While in service, Agniveers are provided non-contributory life insurance cover ₹48 Lakh.

- **The Philosophy Shift:**

This point highlights the strategic and structural shift in how the Indian government manages its human resources and budget. It is essentially moves away from the “Soldier for Life” philosophy toward a “Budget-Optimized Youthful Force” model.

- **Fiscal Shift:**

The most significant driver is the soaring cost of military pensions. Under the 7th CPC (Regular Cadre), the government is obligated to pay pensions to soldiers for decades after they retire.

- **The Problem:** Currently, nearly 25-30% of the entire Defense Budget goes toward pensions rather than modernization or new equipment.

- **The Evolution:** Because Agniveers (except for the 25% who are retained) do not receive a lifelong pension, the government drastically reduces its long-term financial liability, freeing up funds to buy advanced technology and weaponry.

- **Youth Focus:**

The “Evolution” changes the timing of when a soldier receives their wealth.

- **Regular Cadre:** Wealth is accumulated slowly through a monthly salary, with a “safety net” (pension) provided later in life.

- **Agniveer:** The model assumes the individual will leave at age 21-25. Instead of a pension, they are given “Seed Capital” (The Seva Nidhi package of ₹11.71 Lakh).

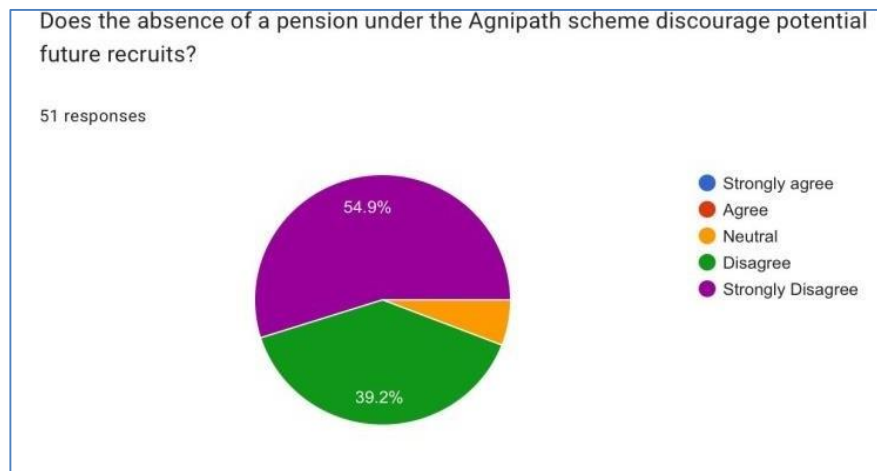
- **The Goal:** The intent to provide a young person with enough liquid cash to start a business, pay for higher education, or settle a home loan immediately upon existing the service.
- **Cadre Distinction:**
This is a critical “fine print” evolution. By labeling Agniveers as a distinct cadre, the government legally separates them from the rules of the 7th CPC.
- **The "Rank" Difference:** In the regular army, a Sepoy’s pay is dictated by “Levels” and “Cells” in a matrix. Agniveers are not placed on this matrix.
- **The 25% Bridge:** Only the 25% of Agniveers who are selected to stay after 4 years will “evolve” back into the 7th CPC system. At that point, their pay is recalculated based on regular scales, though their 4 years of Agniveer service may not count toward their pensionable service (under current rules).

Summary Table:

Feature	Old Evolution (7 th CPC)	New Evolution (Agnipath)
Primary Goal	Lifetime Career & Social Security	Short-term Service & Skill Building
Financial Focus	Deferred Pay (Pension)	Immediate Liquidity (Seva Nidhi)
Budget Impact	Increasing Pension Debt	Increasing Modernization Fund)

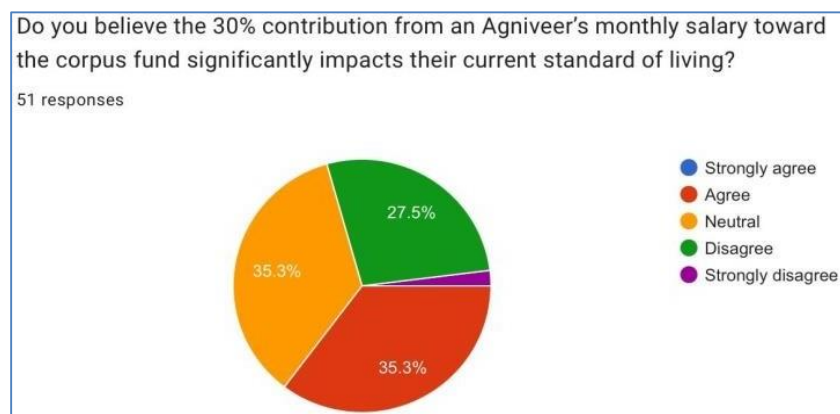
Data Analysis and Findings:

The primary objective of this section is to decode, process, and interpret the data collected through the primary research survey. Having gathered 51 diverse responses based on a structured questionnaire of 12 targeted questions, this chapter aims to provide a comprehensive analysis of the prevailing sentiments and factual understanding regarding the compensation structures of the Indian Armed Forces.

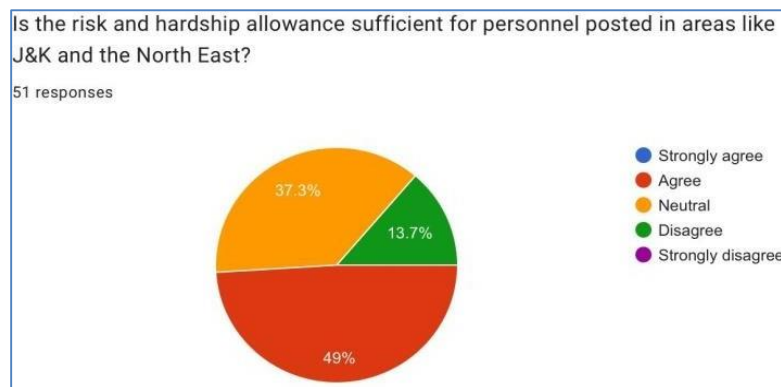


The provided chart illustrates a strong consensus regarding the Agnipath scheme, with a combined 94.1% of respondents disagreeing that the lack of a pension acts as a deterrent for potential recruits. Specifically, 54.9% of participants “Strongly Disagree” and 39.2% “Disagree” with the premise that the absence of a pension discourages future service members. This data suggests that among the surveyed group, the traditional incentive of a lifelong pension is no longer viewed as the primary motivator for military enlistment, or perhaps that other benefits within the new scheme are seen as sufficiently compensatory.

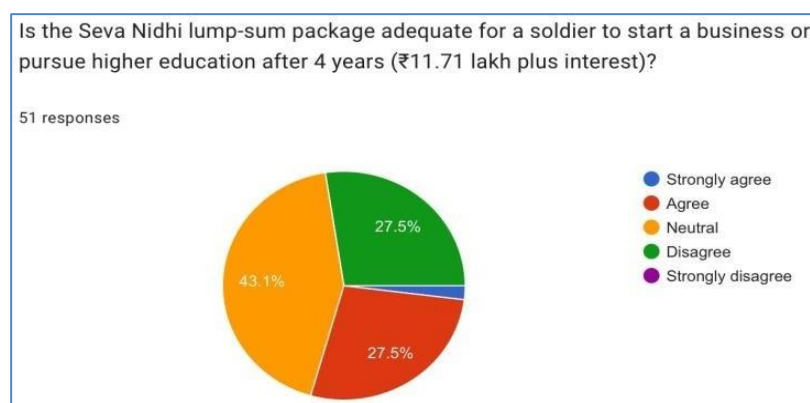
The total absence of any “Agree” or “Strongly Agree” responses (0%) indicates a highly polarized and unified perspective within this sample of 51 respondents. This suggests a significant shift in the perceived “value proposition” of the Indian Armed Forces, moving away from long-term social security toward a model that may prioritize immediate financial corpora (like the Seva Nidhi Package), skill acquisition, or shorter – term national service. For your analysis, this point highlights that the “Agniveer” model is perceived by the public as having enough intrinsic or alternative value to maintain recruitment interest despite the structural change in recruitment benefits.



The chart shows much higher levels of concern regarding the current economic well-being of serving personnel, with 35.3% of respondents agreeing that the mandatory 30% salary contribution significantly impacts an Agniveer's standard of living. When combined with the 35.3% who remain neutral, it becomes clear that the immediate financial pressure of a reduced monthly salary is viewed with far more skepticism than the lack of a future pension. This suggests a potential policy gap: while the "Agniveer" brand remains strong enough to attract talent, the perceived daily financial strain of a high- deduction salary model could affect morale or the perceived value of the tenure while in service.

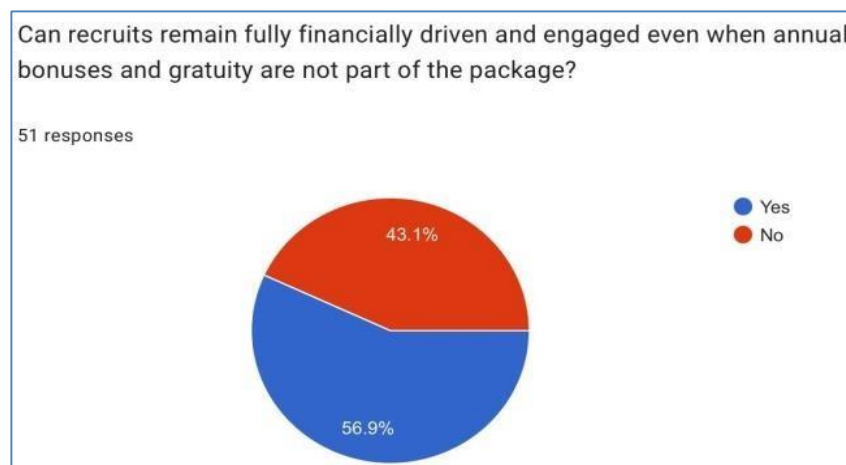


Regarding specialized compensation for hazardous duties, the data shows a leaning toward satisfaction, though it remains far from a consensus. Nearly half of the respondents (49%) agree that the risk and hardship allowances for personnel in sensitive areas like J&K and the North East are sufficient, while 37.3% hold a neutral stance. Only a small minority (13.7%) outright disagree with the adequacy of these allowances. Collectively, these findings suggest that while the 'entry-level' appeal of the armed forces remains strong regardless of pension status, the specific mechanics of monthly deductions and the precision of field-based allowances are areas where the public perceives a tighter financial reality for serving personnel.



The provided pie chart illustrates public perception regarding the adequacy of the Seva Nidhi lump-sum package (₹11.71 lakh plus interest) for soldiers transitioning to business or higher education after four years of service. Based on 51 responses, the largest segment of participants, 43.1% remains Neutral on the matter, suggesting a significant level of uncertainty or wait-and-see approach toward the financial viability of the package.

The remaining sentiment is perfectly polarized between optimism and skepticism. Exactly 27.5% of respondents Agree that the amount is sufficient, while an identical 27.5% Disagree. A very small fraction of the group (approximately 2%) “Strongly Disagree”. Overall, the data indicates that there is no clear consensus, as a majority of respondents either feel the amount is inadequate or are unsure if it can truly cover the high costs associated with starting a modern business or pursuing quality higher education.

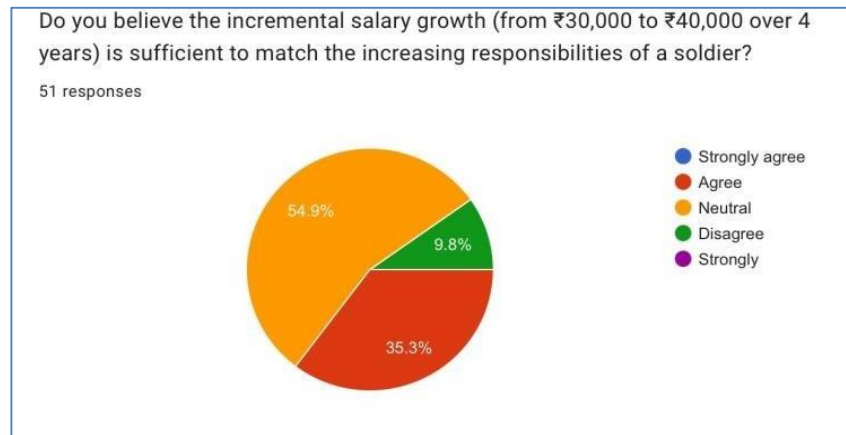


The provided pie chart analyzes the financial motivation and engagement of recruits in the absence of traditional benefits like annual bonuses and gratuity.

Based on the 51 responses, a majority of 56.9% (represented in blue) believe that recruits can remain fully financially driven and engaged even without these standard components in their packages. This suggests that for more than half of the respondents, the core salary or the prospect of the final lump sum payout is a sufficient driver for performance and commitment during the service period.

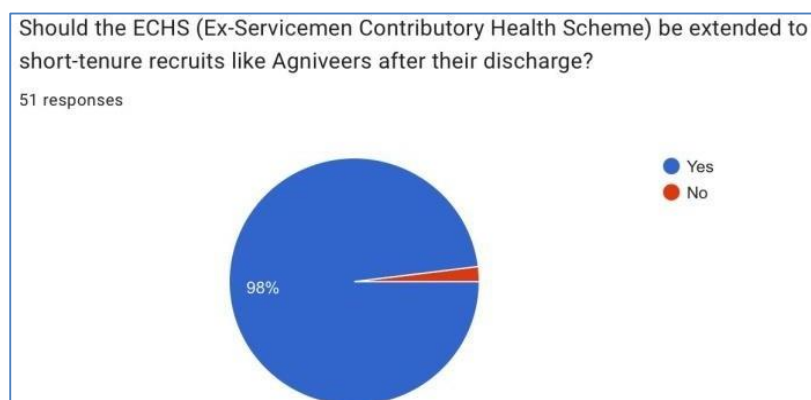
Conversely, a significant minority of 43.1% (represented in red) feel that the lack of bonuses and gratuity would negatively impact a recruit’s financial drive. This indicates that nearly half of the surveyed group views this traditional long-term benefits as essential tools

for maintaining high level of engagement and workforce stability. Overall, while the majority leans toward a positive outlook, the narrow margin suggests a dividend opinion on how the removal of traditional “safety net” benefits affect morale.

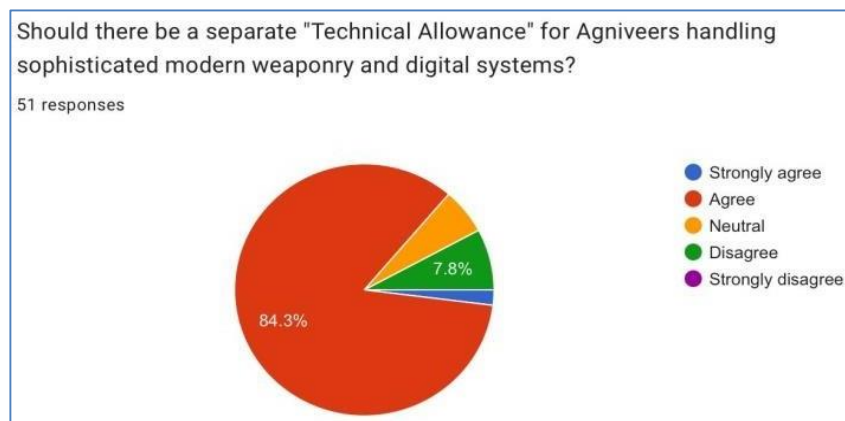


The provided pie chart evaluates public perception regarding whether the incremental salary growth (from ₹30,000 to ₹40,000 over 4 years) is sufficient to match the increasing responsibilities of a soldier. Based on 51 responses, the majority of participants, 54.9%, chose a Neutral stance, indicating a widespread uncertainty or lack of consensus on whether the pay scale adequately reflects the physical and professional demands of the role.

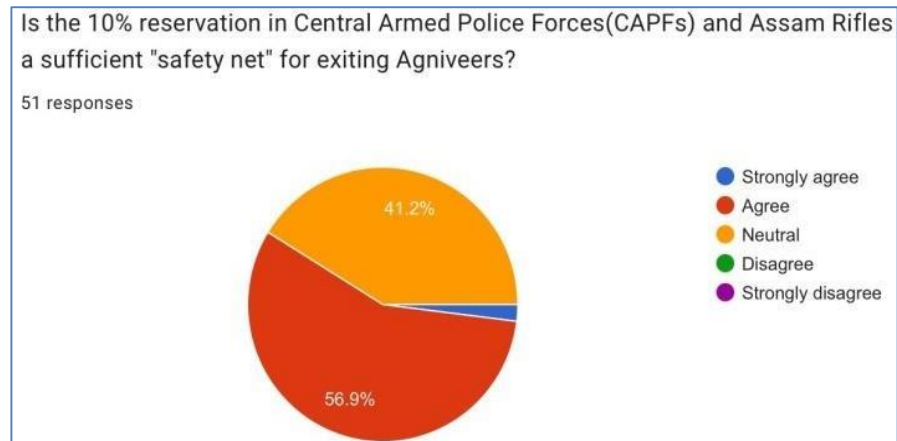
Among those with a definitive opinion, the sentiment leans toward the positive, with 35.3% of respondents stating they Agree that the salary growth is sufficient. In contrast, only 9.8% of participants expressed that they Disagree with the adequacy of the incremental growth. Overall, while the largest segment of the group is undecided, significantly more people believe the salary progression is fair than those who do not, though very few respondents opted for the “Strongly Agree” or “Strongly Disagree” categories.



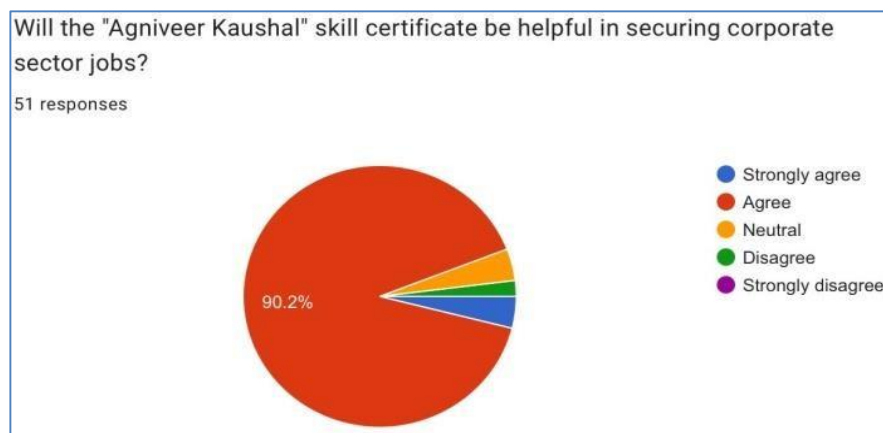
The pie chart indicates a near-unanimous consensus regarding the extension of the Ex-Servicemen Contributory Health Scheme (ECHS) to short-tenure recruits. A staggering 98% of the 51 respondents answered “Yes”, supporting the idea that Agniveer should remain eligible for these medical benefits even after their discharge. This overwhelming majority suggests a strong public or participant belief that healthcare security is a fundamental right earned through military service, regardless of the length of the tenure. The negligible 2% who voted “No” highlights that the exclusion of Agniveers from long-term contributory health schemes is viewed as a significant gap in the current compensation and welfare model, indicating that respondents prioritize post-service medical stability as a key component of military compensation.



The pie chart reflects a strong consensus regarding the specialized nature of modern warfare, with a dominant 84.3% of respondents agreeing that Agniveers should receive a separate “Technical Allowance” for handling sophisticated weaponry and digital systems. When including those who “Strongly Agree”, it is clear that the vast majority of the 51 participants recognize the specialized skills required in today’s military and believe the compensation structure should evolve to reward technical expertise. This finding suggests that respondents view the Agniveer role not just as general labor, but as a technically demanding position that warrants additional financial recognition to match the high level of responsibility and skill involved in operating advanced military technology.

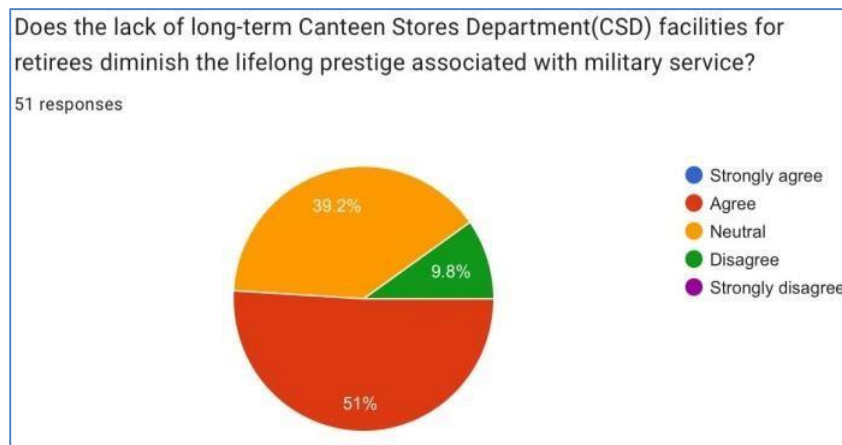


The survey results regarding the 10% reservation for exiting Agniveers in the Central Armed Police Forces (CAPFs) and Assam Rifles indicate a generally positive, albeit cautious, reception of this “safety net”. A majority of 56.9% of respondents agree that this reservation is a sufficient measure for post-service employment, while a significant 41.2% remained neutral, suggesting some uncertainty about its practical effectiveness. The minimal presence of “Strongly Agree” responses indicates that while the reservation is seen as a beneficial step toward career security, it is not universally viewed as a complete solution for the thousands of personnel exiting the scheme annually. This finding highlights a public perception that while the government has provided a foundational framework for transition, the adequacy of this safety net may still be subject to real-world outcomes and potential future expansion.

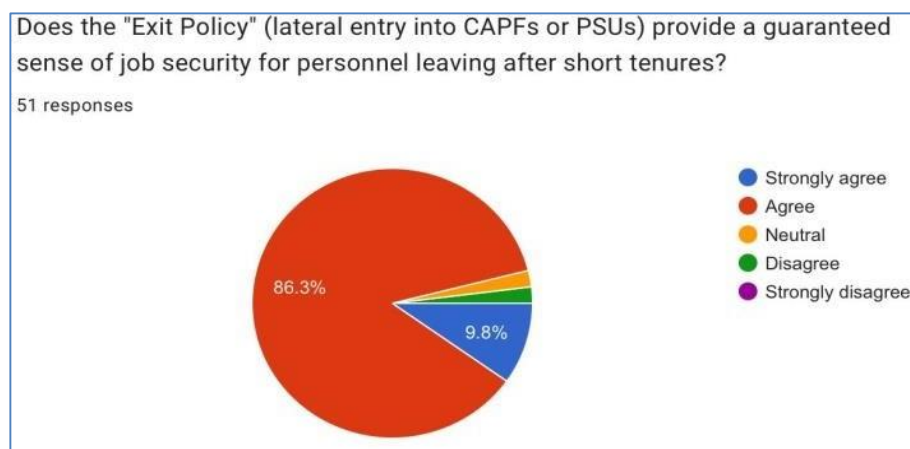


The survey data regarding the “Agniveer Kaushal” skill certificate reveals an overwhelming positive outlook on its utility for post-service employment, with 90.2% of respondents agreeing that the certification will be helpful in securing jobs in the corporate sector. When combined with the “Strongly Agree” portion of the chart, nearly all participants acknowledge the value of formalizing the skills acquired during military tenure for the

civilian job market. The minimal representation of neutral and disagreeing voices indicates a strong public belief that the specialized training and discipline gained as an Agniveer when backed by a recognized certificate provide a significant competitive advantage for transitioning into professional corporate roles.



The survey data regarding Canteen Stores Department (CSD) facilities reveals a significant concern for the long-term status of military personnel, with 51% of respondents agreeing that the lack of lifelong canteen benefits for retirees diminishes the prestige of military service. When combined with the 39.2% who remained neutral, it is evident that a vast majority of participants perceive these “soft benefits” as a core component of the military’s social identity and lifelong value proposition. The small minority who disagreed (9.8%) suggests that for most, the loss of these institutional privileges is not just a financial issue, but a symbolic one that could potentially impact how the enduring “prestige” of the uniform is viewed by the veteran community and society at large.



The survey results regarding the “Exit Policy”, which involves lateral entry into Central Armed Police Forces (CAPFs) or Public Sector Undertakings (PSUs), indicate a high

level of confidence in the program's ability to provide future employment stability. A significant majority of respondents, totaling 996.1% support the policy's effectiveness, with 86.3% agreeing and 9.8% strongly agreeing that it offers a guaranteed sense of job security for personnel leaving after short tenures. The minimal presence of neutral or disagreeing voices suggests that the public perceives these structured transition pathways as a vital and successful component of the Agnipath scheme's long-term value proposition.

Conclusion:

On the basis of the research, two different conclusions can be drawn. First from the perspective of the Indian Government and second from the perspective of the Indian Armed forces.

The Indian Government prefers the new Agnipath Scheme as a strategic shift to modernize the nation's defense while addressing several fiscal constraints. The primary is the 'Fiscal Shift' as the national defense pension bill has surged by over 160% in the last decade, with approximately 25-30% of the entire defense budget currently consumed by pensions rather than modernization or new equipment. By moving away from the 'Soldier for Life' philosophy towards a 'Budget Optimized Youthful Force' model, the government can drastically reduce long term financial liabilities and redirect those funds towards advanced technology and weaponry. Furthermore, the policy aims to create a more 'tech savvy' and lean military while providing young recruits with 'Seed Capital' through the tax free Seva Nidhi package (approximately ₹ 11.71 lakh) to start a businesses or pursue education immediately upon exiting at age 21-25. This approach essentially changes the timing of wealth accumulation, providing immediate liquidity for a younger workforce instead of deferred pensionary benefits.

From the perspective of many recruits and the general public, the new policy is viewed with skepticism due to loss the of lifelong financial and social security. While recruitment interest may remain strong because of the inherent value of service, there are significant concerns regarding the 'tight financial reality' created by mandatory 30% salary towards the corpus fund. Survey data shows 35.3% of respondents believe this deduction impacts an Agniveer's current standard of living, with many viewing this immediate pressure

with more skepticism than the lack of future pension. Furthermore, there is an overwhelming belief that medical benefits like ECHS should be extended to short tenure recruits after the discharge, indicating a perceived gap in post service welfare.

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Scan to see all the responses:



Climate-linked compensation: Adjusting Pay Based on Organisation's Environmental Working Conditions

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Abstract:

Climate change and environmental conditions are increasingly affecting the way organisations function. Employees working in extreme temperatures, polluted environments, or climate-sensitive industries often face health risks, stress, and reduced productivity. This research paper studies the concept of climate-linked compensation, where employee pay or benefits are adjusted based on environmental working conditions. The study explores how organisations can use compensation as a tool to support workers exposed to harsh or risky environmental factors. It also examines the importance of fairness, employee well-being, and sustainability in compensation policies. By analysing business practices and environmental challenges, the research highlights that linking pay with environmental conditions can improve employee motivation, safety, and organisational responsibility toward both workers and the environment.

Introduction:

In recent years, climate change and environmental issues have become major concerns across the world. Rising temperatures, air pollution, extreme weather, and poor environmental conditions are not only affecting nature but also the workplace. Many employees work in environments where heat, dust, pollution, humidity, or other climate-related factors directly affect their health, comfort, and productivity. Industries such as construction, manufacturing, agriculture, mining, and even delivery services are especially influenced by environmental working conditions. Traditionally, employee compensation has been decided based on factors like job role, skills, experience, performance, and market standards. However, environmental

conditions in which employees work are now being recognized as an important factor that can impact their well-being and efficiency. Workers exposed to harsh climates or unhealthy surroundings often face physical strain, health risks, and mental stress. Despite this, such environmental challenges are not always reflected in their pay structure.

The concept of climate-linked compensation suggests that organisations should adjust salaries, allowances, or benefits based on environmental working conditions. This approach connects human resource practices with environmental realities. It supports the idea that employees working in tougher environmental conditions deserve additional financial support or protective Benefits.

This not only promotes fairness but also shows that the organisation values employee safety and sustainability. This topic is important in the field of commerce and business management because modern organisations are expected to be socially responsible. Linking compensation with environmental factors can improve employee motivation, reduce health-related issues, and help organisations build a responsible image. The objective of this research is to study the idea of climate-linked compensation, understand its importance, and examine how it can be applied in organisations facing environmental challenges.

Objectives:

- To understand the concept of climate-linked compensation in organisations.
- To examine how environmental working conditions affect employee health and productivity.
- To identify the need for adjusting pay or benefits based on workplace environmental risks.
- To analyse the role of organisations in ensuring fairness and employee well-being through compensation policies.
- To study how climate-linked compensation can contribute to sustainable and responsible business practices.

Research Methodology:

This study is based on primary data collected through a structured questionnaire using Google Forms. The survey was conducted among 40 respondents to understand their views on environmental working conditions and the idea of linking compensation with climate-related factors. The research follows a descriptive method, as it focuses on analysing opinions, experiences, and awareness of employees. The collected data is presented and interpreted using simple analysis for better understanding.

Questionnaire:

Part A – General Questions

1. Are you currently employed?
2. Do you think environmental conditions are an important part of any workplace?
3. Do you believe workplace surroundings can influence employee health?
4. Should organisations be responsible for providing safe working environments?
5. Should employee well-being be a priority for every organisation?

Part B – Specific Questions

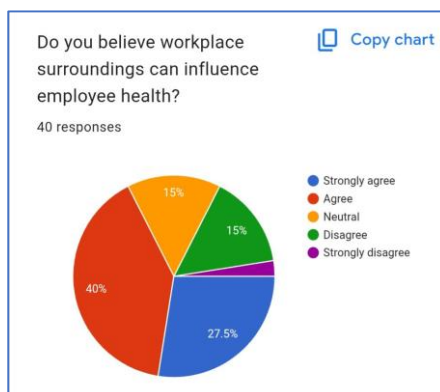
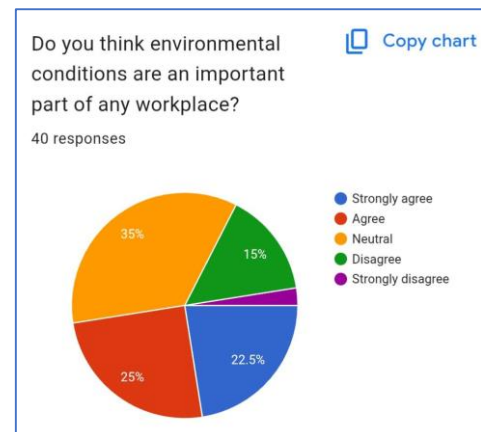
1. Do environmental conditions at your workplace affect your work performance?
2. Do poor environmental conditions increase stress and fatigue during work?
3. Do employees working in harsh environmental conditions deserve extra compensation?
4. Is linking salary or allowances with environmental working conditions a fair practice?
5. Does your organisation provide adequate protection from environmental risks?
6. Would extra compensation motivate employees to work better in difficult environmental conditions?
7. Should environmental risks be considered while deciding employee salaries?
8. Do you support the idea of climate-linked compensation in organisations?

Findings/Analysis:



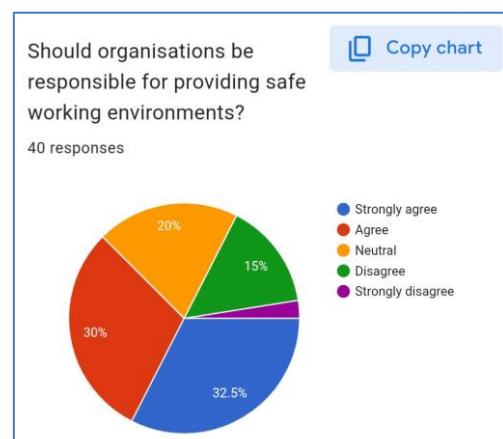
Since 100% of respondents are employed, the data is fully relevant to working individuals. This ensures that the responses reflect real workplace experiences related to environmental conditions and compensation.

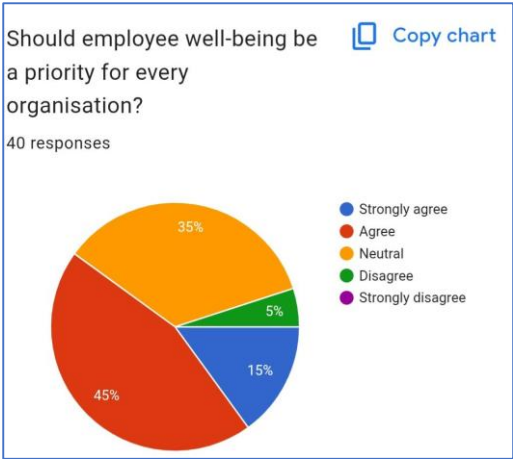
A combined 47.5% of respondents agree that environmental conditions are an important part of the workplace, showing moderate awareness among employees. However, the high neutral response (35%) indicates that many employees are still unsure or do not strongly consider environmental factors as a workplace priority. This suggests a need for greater awareness about how environmental conditions influence work and employee well-being.



A strong majority, 67.5%, agreed or strongly agreed that workplace surroundings affect employee health. This highlights clear awareness that air quality, lighting, temperature, and cleanliness directly impact physical and mental well-being. Only 17.5% disagreed, while 15% stayed neutral, suggesting that most employees understand the health consequences of environmental conditions.

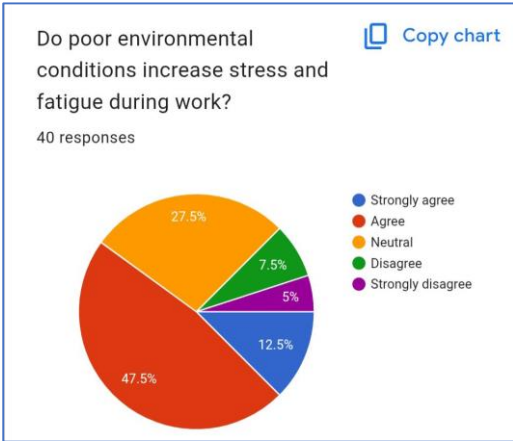
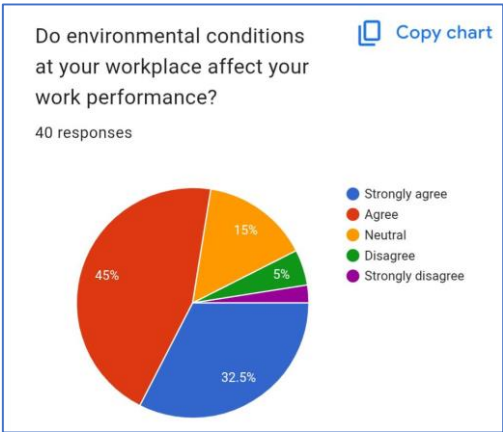
About 62.5% of respondents agreed that organisations are responsible for providing safe work environments. This shows employees view safety as an employer's duty rather than a personal responsibility. A smaller group remained neutral or disagreed, but overall the data confirms that safety expectations from employers are strong.





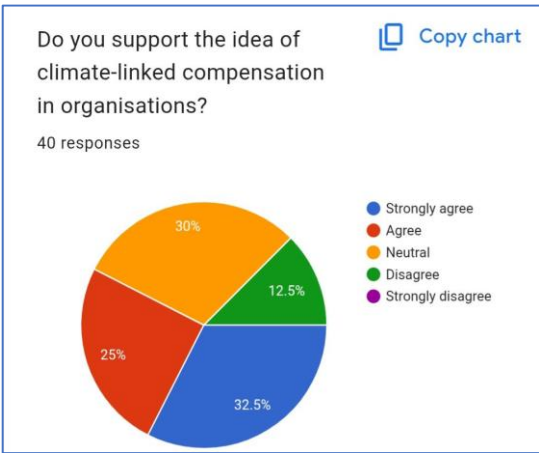
Nearly 60% agreed that employee well-being should be a priority for organisations. However, a significant 35% neutral response suggests that while people support the idea, they may not always see it fully practiced. Very few disagreed, meaning most workers believe companies should actively care about employee health and comfort.

A very strong 77.5% agreed that environmental conditions influence performance. This is one of the highest agreement levels in the survey, showing employees clearly link comfortable surroundings with higher productivity, better focus, and fewer errors.

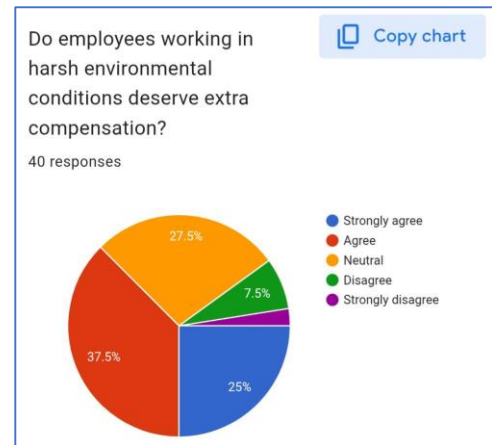


About 60% agreed that poor environmental conditions cause stress and fatigue. This shows employees recognize the psychological and physical strain of working in uncomfortable environments. A moderate neutral group indicates some variability in experiences, but overall the trend supports this connection.

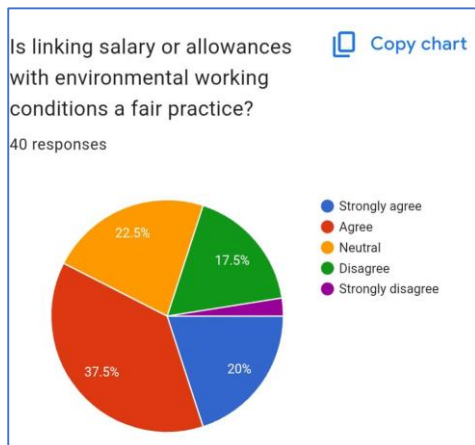
Around 57.5% supported climate-linked compensation, while many remained neutral. This shows the concept is gaining acceptance but is still relatively new and evolving in understanding.



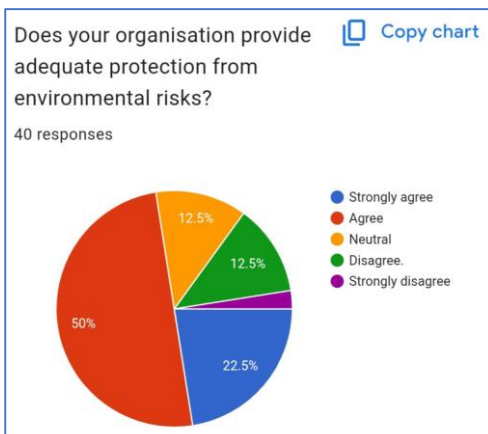
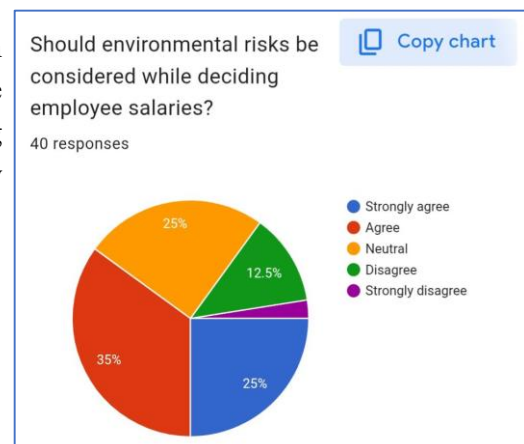
A majority of 62.5% supported extra compensation for employees working in harsh environmental conditions. This shows acceptance of the concept of hardship allowances and recognition that difficult environments deserve financial reward.



About 62.5% agreed that extra compensation improves motivation when working in difficult conditions. This confirms that financial incentives are seen as an effective motivational tool.

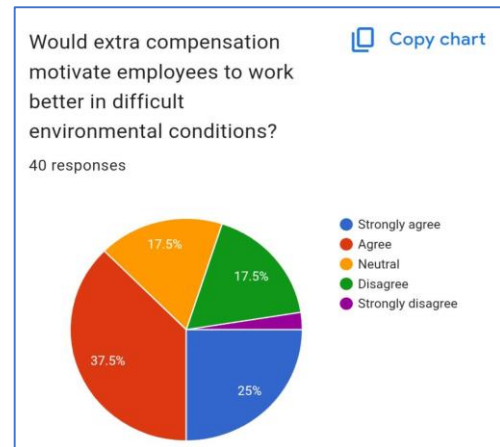


Around 57.5% agreed that linking salary with environmental conditions is fair. However, some respondents disagreed or stayed neutral, suggesting that while the idea is accepted, it remains slightly controversial and not universally supported.



A strong 72.5% agreed that their organisation provides adequate protection from environmental risks. This reflects a generally positive perception of safety measures and compliance within workplaces.

Nearly 60% agreed that environmental risks should influence salary decisions, supporting the idea that risk exposure deserves financial consideration.



The survey findings clearly indicate that Employees recognize the strong connection Between workplace environmental Conditions, health, performance, and Compensation. A majority of respondents Agreed that workplace surroundings Influence employee well-being, increase Stress when poor, and directly affect Productivity. There is also significant Support for organisational responsibility in Providing safe working environments and Prioritising employee well-being. Importantly, many participants believe that Employees working in harsh or Environmentally risky conditions deserve Additional compensation, and that Environmental risks should be considered in Salary decisions. Although some neutral Responses suggest that awareness is still Developing, the overall trend supports the Concept of climate-linked and environment-Based compensation. The results show that Employees value healthy, safe, and Sustainable workplaces and accept the idea That environmental factors should play a Role in organisational policies and pay Structures. Based on a very basic statistical Observation (majority percentage Method) and simple psychological Interpretation, the overall results indicate A clear positive trend toward recognizing The importance of environmental Conditions in the workplace. Since 100% Of respondents are employed, the data is Fully relevant and reliable for workplace-Based conclusions. More than half of the Respondents (around 60–67.5%) agree That environmental conditions affect Employee health, performance, stress Levels, and overall well-being. Psychologically, this shows strong awareness that Physical surroundings such as temperature, air Quality, lighting, and safety directly influence Mental state, motivation, and productivity. The Majority also believe that organisations are Responsible for providing safe environments and Prioritizing employee well-being, reflecting an Expectation of employer accountability and care. Further, most respondents (around 57–62.5%) support linking compensation with Harsh or risky environmental conditions, And agree that extra financial incentives Can improve motivation. From a Psychological perspective, this

aligns with Motivational theories suggesting that Financial rewards act as positive Reinforcement, especially in challenging Work conditions. Although a notable Neutral group (around 30–35%) indicates Moderate uncertainty or lack of strong Opinion, the overall percentage trend Clearly leans toward agreement. Therefore, Using simple majority analysis without Formal hypothesis testing, the conclusion is That employees generally acknowledge the Impact of environmental conditions on Health and performance and moderately Support the idea of climate- or risk-linked Compensation, viewing it as fair and Motivating.

Suggestions and Recommendations

- Organisations should recognise environmental challenges faced by employees and include them in compensation policies.
- Companies can provide extra allowances, incentives, or benefits for employees working in harsh or risky environmental conditions.
- Regular health check-ups and safety measures should be implemented for employees exposed to extreme weather, pollution, or hazardous conditions.
- Awareness programs should be conducted to educate employees about environmental risks and precautions at the workplace.
- Climate-linked compensation policies should be fair, transparent, and standardized to motivate employees and ensure organisational responsibility.
- Businesses should adopt sustainable practices to reduce environmental risks and create a healthier working environment for employees.
- Organisations should encourage employee feedback regarding workplace environmental conditions to improve policies.
- Training sessions can be provided to teach employees how to handle extreme environmental conditions safely.

Conclusion:

This research on climate-linked compensation demonstrates that environmental conditions in the workplace play a significant role in employee well-being, productivity, and overall job satisfaction. The study shows that factors such as heat, pollution, humidity, and other climate-related challenges are experienced by a considerable number of employees and

can affect both physical and mental health. While not all employees reported severe effects, the survey highlights that nearly half or more of the respondents feel that environmental conditions impact their performance, motivation, or comfort at work. This emphasizes that organisations cannot ignore the role of the work environment when planning employee welfare or compensation strategies.

The study also indicates strong support among employees for linking pay or benefits with environmental working conditions. Most respondents agreed that employees working in harsh or risky conditions deserve higher compensation and that additional allowances or incentives would increase motivation. This finding points to an evolving understanding among employees that compensation is not just about job responsibilities or experience, but also about the challenges posed by the working environment. It also reflects a broader expectation of fairness, care, and social responsibility from organisations.

Climate-linked compensation emerges as a practical solution to address these concerns. Organisations that adopt such policies demonstrate concern for employee safety, health, and overall well-being, which can reduce absenteeism, stress, and workplace dissatisfaction. Moreover, linking compensation with environmental conditions encourages employees to continue performing effectively even under challenging circumstances, creating a positive impact on productivity and organisational growth.

Beyond immediate financial support, climate-linked compensation reflects an organisation's commitment to sustainability and ethical business practices. By recognising the effects of environmental conditions, companies can plan safer workspaces, implement necessary protective measures, and promote awareness about environmental risks. This approach not only benefits employees but also strengthens the organisation's reputation as socially responsible, attracting talent and enhancing employee loyalty.

In conclusion, climate-linked compensation is more than just an incentive; it is a necessary step toward creating safer, fairer, and more sustainable workplaces. The study shows that employees are aware of the impact of environmental factors and strongly support compensation policies that address these challenges. Organisations that integrate climate-linked compensation into their human resource strategies can improve employee satisfaction, motivation, and health while demonstrating a responsible and forward-thinking approach to

modern business management. Such practices are likely to become increasingly relevant as climate change continues to influence work environments worldwide, making this concept an essential consideration for organisations aiming to balance productivity, fairness, and sustainability.

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A Study To Understand The Perspective Of Employers With Respect To Maternity Leave In The Private Sector

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Abstract:

In recent times, the number of women entering the labor market has been increasing, and the new regulations of maternity leaves made it an essential aspect of company policies in the private sector. This study examines how employers think about maternity leave, the financial and operational costs, and the challenges they encounter in implementing the policies. Using a structured questionnaire, we obtained the information relating to the attitude of employers and company policy concerning maternity leave. The results imply that a balanced combination of strategic planning of workforce, favorable government regulations, and effective HR practices is the key to making maternity leave beneficial to the employees and employers in the corporate world.

Key words: maternity leave, attitude of employers, private sector, financial and operational costs, challenges, HR practices, maternity leave policies

Literature Review:

1. Pregnancy and Maternity at Workplace: A Qualitative Study to Know the Employers' Perspective

Akhtar et al. (2023)

Akhtar et al. (2023) examined how employers view pregnancies at work by interviewing them. Employers often thought pregnancy would be expensive for their business, including the cost of

hiring someone to cover for the pregnant woman while she was on leave, training the new employee, and losing productivity because of having too many people absent from work. The authors also discovered that all businesses have difficulty managing maternity leave; however, small- and medium-sized businesses experience much greater challenges than large corporations do when dealing with employee absence due to maternity leave. Employers also tended to be less willing to hire women who could potentially become pregnant because of the cost associated with replacing an employee who has taken maternity leave, as well as tension with human resources over the number of women they have hired or will hire. The authors conclude that the lack of a good understanding of the impact of maternity leave on the business, along with the lack of a methodical and well-structured way of reaching an agreement, are the main contributors to the negative attitude. Therefore, this paper by Akhtar et al. strongly supports the argument that how employers perceive maternity leave will ultimately impact how maternity leave policies are implemented in practice.

2. Critical Analysis of the Indian Maternity Benefits Act and How It Has Improved Workplaces for Female Workers

Author: Ansari, A. (2025)

The purpose of this thesis is to conduct an in-depth examination of the Maternity Benefits Act, along with the additional 2017 amendment, which increased female workers' paid maternity leave from 12 weeks to 26 weeks. The Maternity Benefits Act reform is identified as progressive; however, there exists evidence of unintended consequences arising from the employer-payment-only funding model.

This research demonstrates that by forcing the entire financial burden of parental leave upon employers, hiring discrimination (the motherhood penalty) and a lowering of female participation in the formal workforce have manifested. Furthermore, this research suggests a social security or a shared cost-based funding model to mitigate employer bias against hiring mothers and eliminate the detrimental effects of the existing model.

Finally, the author finds that there exists substantial theoretical and policy-level rationale for including the perspectives of employers operating in a private sector context in this area of study.

3. The Impact of Required Maternity Leave Laws on Employment Outcomes in India

Ghosh et al., (2025)

This study provides empirical evidence on the effects of the maternity leave reform of 2017 using a large-scale worker-employer dataset. The investigators found that, after the reform took effect,

there was a 6% decline in the number of female workers (as a percentage) in the workforce within six months following the reform and a 10% decline after four years post-reform.

The bulk of layoffs of women occurred in the 18-35 age range, with the report of no decrease in wages by female workers; hence, it appears that adjustments were made via decreases in hiring versus decreases in wages. The study also included evidence of lower rates of promotion and occupational downgrading for women aged 18-35.

In conclusion, this study suggests that prolonged mandated maternity leave may lead to unintended consequences within the labor market, i.e., when costs associated with lower numbers of female workers and decelerated rates of promotion and occupational downgrading are only funded by the employer.

4. Influence of Paid Maternity Leave on Return to Work after Childbirth

Vargas-Prada et al. (2018)

The relationship between maternal employment & paid maternity leave following childbirth (Vargas-Prada et al., 2018). Cohort data was utilized to investigate whether or not having access to paid maternity leave facilitated an employee's return to employment within twelve months of giving birth. Researchers concluded that mothers who received paid maternity leave were more likely than mothers who did not have paid maternity leave to still be employed one year postpartum.

This study implies that paid maternity leave provides mothers with greater job security and reduces the likelihood of not returning to employment after giving birth. These findings support the fact that paid maternity leave produces retention benefits yet brings about workplace challenges due to the short-term nature of implementation.

5. Maternity Benefit Act and the Private Sector: Implementation Issues

Nanda & Bose

The Maternity Benefit Act is subject to many different challenges in regard to its implementation. Implementation challenges relate to gaps in the enforcement of the law as well as non-compliance of employers with the legislation, e.g., women being laid off immediately before they are likely to claim maternity benefits. Other weaknesses relate to the structural aspects of the enforcement of the legislation, as the authors note that there is insufficient policy development without practical means of compliance. More specifically, there is an additional need to consider the behavior of employers at the organizational level.

6. The Impact of Paid Maternity Leave on Women's Employment: Evidence Using Firm-Level Survey Data from Developing Countries

Amin & Islam (2022)

This research study on the effects of paid maternity leave for women employed in developing nations, according to the findings of Amin and Islam, utilizes survey-sourced aggregated data from 111 developing and developed economies published by the World Bank. In most countries researched, and based upon prior research results, it has been expected that an increase in the length of paid maternity leave would increase the employment of females; however, when analyzing the employed, paid maternity leave length to female employment data, a statistically significant and positive correlation exists. Furthermore, it was observed in this research that government-funded paid maternity leave results in a much stronger correlation to increased female employment than employer-funded paid maternity leave contracts; therefore, it would appear that employers responded significantly to the length of paid maternity leave as well as to the method of funding. It would seem that the proper design of a policy will be important in determining employer response. Cost-sharing programs would appear to improve female employment rates with lower levels of employer resistance or reluctance to employ females.

Introduction:

Maternity leave is an important aspect of labor welfare regulations, which aim at protecting the employment rights and well-being of women employees during pregnancy and childbirth. In recent years, there has been increasing global attention on strengthening maternity leave policies to promote gender equality, improve maternal and child health, and encourage women's participation in the workforce. In India, the Maternity Benefit (Amendment) Act, 2017, extended paid maternity leave to 26 weeks for eligible women employees. thereby placing greater responsibility on employers, particularly in the private sector.

Maternity leave is viewed as a social welfare component of inclusive growth; however, it also raises several important operational and financial challenges for organizations. Private sector organizations, especially small and medium-sized enterprises, have difficulties with temporary staffing, the redistribution of responsibilities, training costs, regulatory compliance, and potential productivity losses resulting from an employee's absences for long periods of time. On the other hand, progressive maternity policies have the potential to improve the level of employee

satisfaction and retention, enhance an organization's reputation, and provide long-term stability to the workforce.

The objective of this study is to understand the employer's perspective on maternity leave in the private sector. The objective is to determine how employers perceive maternity leave in terms of a legal obligation, social responsibility, retention strategy, or financial burden, and how these perceptions affect the organization's policies and practices. This study will examine both the financial and operational aspects of the organization and the attitudes of employers towards maternity leave, thereby providing a holistic view of the issue from management's perspective.

Background:

Women's participation in the workforce has risen dramatically over the last several decades, making a substantial contribution to both economic growth and productivity in the workplace. However, balancing the demands associated with being a worker with becoming a mother continues to pose structural and organizational challenges. Many governments worldwide have implemented maternity protection laws to help protect women's employment during this period of rapid development. In India, the Maternity Benefit Act of 1961 (representing India's first maternity leave law) and its later amendment in 2017 made improvements to existing maternity rights by increasing the duration of time that women have access to paid leave and introducing new provisions, such as providing access to crèches (nurseries) in certain businesses.

These provisions are intended to provide support for working mothers; however, in India, the primary financial responsibility for paying for maternity leave is undertaken by private-sector employers. In contrast to those countries that have social insurance systems to help pay for maternity leave, Indian private sector employers must directly pay their employees' salaries and other costs associated with maternity leave during the leave period. This framework has led to debates regarding the economic impact of this obligation on businesses, especially small and medium-sized ones. Employers may incur various expenses associated with hiring temporary replacements, overtime payments, training costs, and possible short-term productivity losses caused by maternity leave. Employers also experience administrative complexities when they try to meet required legal statutes, documentation requirements, or updated policies related to maternity leave.

Research has also shown that organizations that provide supportive policies surrounding maternity leave can expect to see improvements in morale, loyalty, reduced turnover, and improved employer branding. As such, many organizations that successfully manage their business functions related to maternity leave often find themselves gaining long-term advantages through employee retention and more diverse employees.

Although maternity leave policies are highly significant from a policy perspective and have practical implications for the workplace, there has been relatively limited research that takes into account the employer's perspective within the private sector. Much of the available literature has focused on the welfare of employees and protecting rights, leaving far less emphasis on the managerial perspective and the challenges associated with the organization. Thus, the purpose of this study is to fill this gap through the examination of the following areas:

- The operational and financial impact of maternity leave on private sector organizations.
- The employer's perception of maternity leaves and organization policies related to maternity leave.
- The main challenges faced by organizations in implementing maternity leave provisions and the methods used to resolve these challenges.

By examining these areas of consideration, this research intends to develop a greater understanding of the implementation of maternity leave and its impact on private sector employers, thereby facilitating informed decision-making at both policy and organization levels.

enterprises.

From an organizational perspective, a mother's ability to take maternity leave has implications for workforce planning, operational continuity, cost structures, and human resource strategies.

Objectives:

1. Evaluating the implications of maternity leave for private-sector organizations from both operational and financial perspectives. Costs associated with not only maternity benefits but also temporary staffing, workload redistribution, revenue loss, and business continuity will all be investigated.

2. Evaluating employers' perceptions of maternity leave and their organizations' policies regarding maternity leave. Employers' views on whether maternity leave is a legally mandated right, based on long-term employee absence, an obligation to exercise social responsibility, a consideration of maintaining productivity, or an expense, will be explored, as will the current human resources support and policies available to employees.
3. Identifying the factors that employers in the private sector perceive to be major barriers to implementing maternity leave regulations. Employers cite issues related to regulatory compliance, financial constraints, lack of available workforce, administrative complexities, and other issues associated with how they will develop plans to provide for maternity leave.

Methodology:

This study used an analytical and descriptive model to evaluate private sector employers' opinions on maternity leave. Primary data was collected and analyzed using a quantitative methodology. The study is also cross-sectional in that it was conducted at one point in time using private sector employers from diverse industry sectors. The target population included employers, business owners, HR managers, and senior executives who were responsible for policy decisions within their organizations, for a total of 50 respondents, but due to time limitations and barriers to getting to the target population, the sample was chosen using a convenience sampling technique.

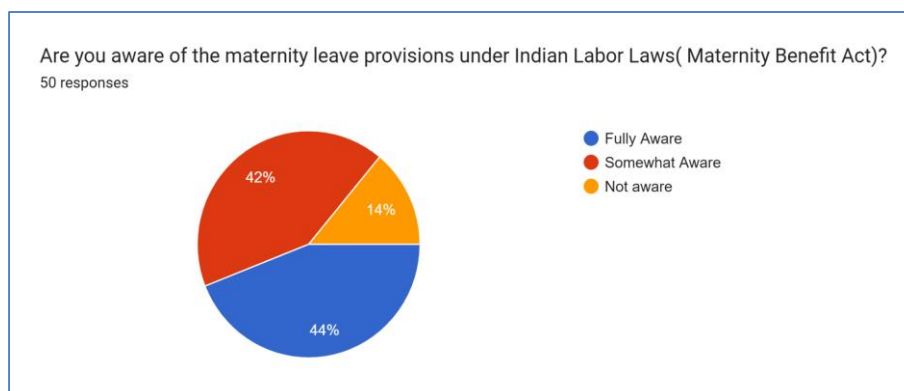
A structured questionnaire that was designed to meet the research objectives was used to collect primary data. The structured questionnaire included various sections such as organization profile, awareness of maternity leave provisions, employers' opinions regarding maternity leave, financial implications associated with providing maternity leave, operational challenges related to providing maternity leave, and the perceived effects of maternity leave on employee retention and morale. The perception-based statements included in the structured questionnaire were measured by a 5-point Likert scale—"Strongly Disagree" to "Strongly Agree." This allowed for a quantitative assessment of employers' attitudes towards maternity leave. Before distributing the structured questionnaire, it was reviewed for clarity, relevancy, and alignment with the research objectives to establish content validity.

Percentage technique, frequency distributions, and graphs were developed to show current trends and previous behaviors so that similarities could be observed by analyzing the data collected from employers. The analysis of the data collected showed the financial costs, operational impact, and compliance issues to be most common regarding implementations of maternity leave in the private sector. Overall impressions from employers were also examined.

Findings and Interpretation:

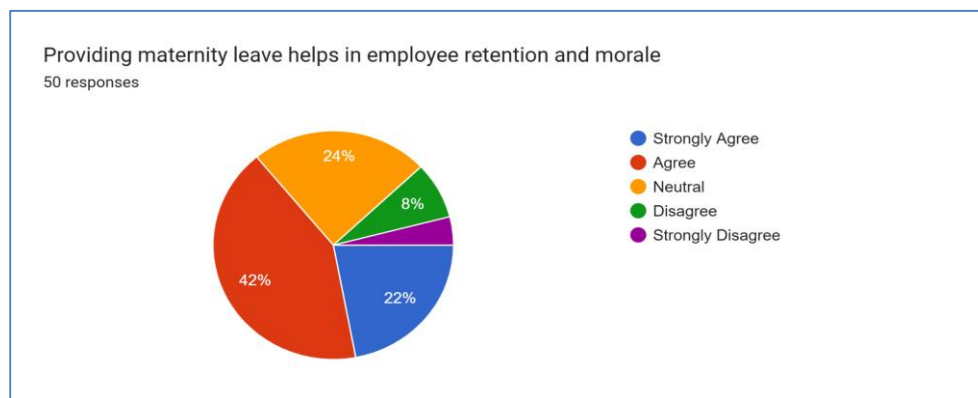
The analysis of 50 private sector employers' responses provides valuable insight into private businesses' attitudes towards maternity leave, statutory provisions, and implications. Almost all respondents (44% fully aware; 42% somewhat aware) indicated that they were aware of statutory requirements related to maternity leave, suggesting that the level of compliance awareness is not a problem for the private sector as a whole. Of the 14% of respondents who don't appear to have any awareness of maternity legislation, it is clear to see that this legislation has received a reasonable amount of publicity amongst employers.

On the financial side, a somewhat divided opinion exists regarding maternity leave being a financial burden to employers. Approximately 44% of respondents believe maternity leave is financially burdensome (30% agree; 14% strongly agree), while 34% of respondents have a differing opinion. The remaining 22% of the respondents provided a neutral response. This indicates that while there are concerns regarding costs associated with maternity leave, there is no universal agreement that this will be prohibitive in providing maternity leave. One possible interpretation is that financial strain may vary depending on organization size, revenue capacity, and workforce structure. For small/medium enterprises, the direct wage liability incurred during a maternity leave period, along with indirect costs such as hiring temporary workers or providing overtime pay to replace maternity leaves, could contribute to increased financial pressures.

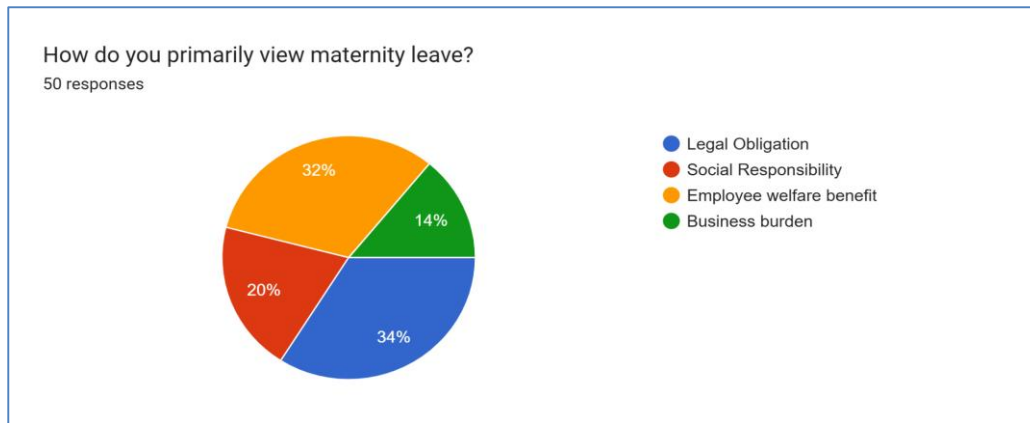


The operational impact associated with maternity leave was identified by respondents as being of moderate concern overall. Approximately 42% of participants have stated that maternity leave causes both workload redistribution and continuity issues in the workplace. Approximately 26% of respondents are indifferent toward operational disruption; 30% of respondents neither agree nor disagree with the occurrence of maternity leave and organizational disruption. Therefore, while maternity leave causes changes in workforce planning across organizations, a significant number of organizations are using adaptable human resource policies to manage temporary absences. The high percentage of neutral responses demonstrates variability in the impact of motherhood leave depending on the organization's preparedness and internal policies.

The most significant finding relates to employee retention and morale. The majority of respondents (64%) feel that maternity leave leads to greater employee loyalty and retention; only 12% disagree with this statement. Most organizations are now viewing maternity leave as a strategic investment instead of a mere requirement. However, the long-term benefits of maternity leave, such as decreased employee turnover, positive employer brand recognition, and increased stability in the workforce, are becoming recognized.



The results of this study indicate that while there is still concern regarding the financial or operational impact of providing maternity leave, the perception of maternity leave has increased in relation to legal obligations, social responsibility, and strategic workforce management. As a result, employers are increasingly accepting maternity leave provisions as part of sustainable organizational practice (versus only an expense).



Limitations and Future Scope:

While contributing valuable information concerning maternity leave from the viewpoint of private sector employers, there are limitations within this study that allow for future investigation. The study's participant pool consisted solely of 50 private employers which limits the extent that the findings can be generalized to all private employers throughout India. Additionally, because the respondents represent selected types of business (services, manufacturing, IT/ITES, retail, banks), sampling bias may occur limiting the participation of employers and the types of maternity benefits they offer to employees within other, less financially secure sectors with different organizational structures.

The data source for this study was based on a survey created by the researcher that asked private employers how they felt about their business's maternity leave policy. Therefore, employers may have provided responses that are perceived to be socially acceptable instead of reporting what is actually practiced by their business, which may have resulted in a response bias. In addition to the limitation of the sampling population, this study was conducted at one point in time (cross-sectional design), therefore it could not determine how employer feelings, their compliance, as well as the financial impact of the employer's maternity leave policy; therefore, no understanding of how these factors may change over time.

Lastly, this study examined only the employer's perspective and did not examine the opinion of the employees resulting in an incomplete picture of the implementation of maternity leave. In addition to this limitation, there was no consideration made to the geographical location

of the respondents in determining if and how the implementation of maternity leave varied across different states or cities.

Given these constraints, future studies should explore larger, more varied samples from various businesses and geographical areas to strengthen reliability and better reflect the overall picture. Studies comparing small businesses, medium-sized companies, and large corporations could produce additional empirical evidence regarding how an organization's size affects its ability to implement maternity leave policies and the financial burdens of implementing these policies. Longitudinal Methodology could also provide a means of evaluating the long term financial, operational, and productivity impacts of maternity leave on organizations and the employees affected by maternity leave. Future studies should also include working mothers' opinions on the organisation's support of them while on maternity leave; their satisfaction with returning to work after having a child; and the challenges they face when trying to return to work. Further assessment of the Maternity Benefit (Amendment) Act 2017; including continued progression of the Act over time; will aid in determining if employers comply; and; to track female employee participation rates. Using qualitative approaches to collect experience/expert opinions from working mothers through in-depth interviews and case studies, may help researchers gain valuable insight into the challenges encountered by working mothers when trying to return to work after having children; and; the ethical implications of the same; as well as; the strategic human resource changes made by organisations. Comparative research conducted globally regarding maternal leave will enable researchers to identify global best practices for implementing maternity leave in other countries; which could inform future improvements of maternity leave policies in the Indian private sector.

Conclusion and Implications:

This research examines the employment perceptions of maternity leave within the private sector following the implementation of the Maternity Benefit (Amendment) Act in 2017, which has resulted in the recognition of maternity leave not only as a compliance issue but also as a key element of a company's human resource management strategy.

Most employers do recognize their legal entitlement to grant paid maternity leave under the statutory scheme, although employers have legitimate concerns about the costs associated with making salary payments to a mother on maternity leave, the costs associated with locating a

temporary replacement during her leave, the training costs associated with locating a temporary replacement, and the anticipated short-term loss of productivity while a mother is on maternity leave. Also, employers experience operational issues related to redistributing employees' work during the maternity leave period; the need to develop continuity of operations plans while a mother is on maternity leave; and the fact that this issue is often raised by employers that fall within the definition of a small to medium-sized business.

While some companies also see challenges in providing maternity leave, most employers recognize that it provides long-term benefits. Providing maternity leave can help retain employees longer, making them more loyal to the employer and improving their overall morale. It can also help improve the employers' goodwill and reputation as a company. Therefore, maternity leave is becoming more of an investment by the employer in the stability of the company's workforce rather than just a cost of doing business.

From this research, it is evident that employers must take a proactive approach to plan for their workforce needs, establish a structured maternity policy, and introduce flexible work arrangements to minimize disruption to the business. In addition, policymakers can also look to create cost-sharing options or implement a form of social insurance for employers so that they do not face an undue financial burden for paying employees for time they are not working or so as to not create an unintentional bias toward hiring women of childbearing age. Ultimately, maternity leave when strategically utilized can contribute to the sustainability of the organization and the achievement of gender equity in the workforce.

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Annexure:

Scan this **QR** to get a detailed overview of the respondents' responses.



Gig Economy and Challenges in Compensation Management

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Abstract:

The gig economy is a very significant aspect of the current job market. Digital mediums provide an opportunity to provide flexible work arrangements in terms of tasks. Although these employment opportunities provide more freedom and alternative sources of earners to the workers, they also come with numerous predicaments particularly paying the workers. This paper examines the issues surrounding compensation of gig workers. We employed a structured questionnaire in collecting data. The questionnaire was filled by forty-seven gig workers employed by such platforms as blinkit, Zomato, Swiggy, Instamart and Zepto. Things we learned about them include their age and sex, the amount and manner of their payment, their payment procedures, their satisfaction with their payment, stability in their level of income, issues of late payment, prevalence and clarity of payment policies, benefits of them, fairness of their gains compared to regular employees, and the connection between pay and motivation. The findings indicate that the majority of the workers make less money.

The research states that in order to establish equitable and sustained job terms, we must have fair pay practices, transparency in the payment system, and adjustment of policies on the economic front.

Keywords: *Gig Economy, *Compensation Management, *Platform Workers, *Income Instability, *Pay Transparency, *Fair Pay Perception, *Social Security Benefits, *Job Satisfaction, *Performance-Based Pay, *Labor Policy & Regulation

Introduction:

Digital platforms and technology have contributed to the new reality in the labor market and made the economy a significant component, allowing flexible employment based on jobs, short-term employment, and temporary employment. As compared to the regular jobs, the gig work engages independent contractors, which receive payments regarding the work or number of hours or works rather than monthly salary. Gig work has increasingly become popular in India in the food delivery sector, grocery delivery and ride-hailing becoming some of the main incomes of many youths. The paper will examine the issues involved in remunerating gig workers and their remuneration in particular the amount they receive, the payment method, whether they are satisfied and benefit or not.

A high salary plays a vital role in ensuring that employees are motivated and happy as well as remaining in a job. In gig work, the remuneration is often determined on a per-task or per-performance basis, spontaneously causing skewed payment of earnings, as well as unpredictable earnings. Pay structure does not exist, payments are not brought on time, and regulations regarding bonuses and subtractions are not well defined. All that makes it difficult to afford gig workers. The gig workers most of the time lack standard benefits like healthcare, paid leave or social security so that they become financially independent. These issues leave the question of whether gig work is something fair and sustainable in the long term.

A structured questionnaire was employed in this study and was given to the gig workers in websites like blinkit, Zomato, Swiggy, Instamart and Zepto. We examine their pay issues concerning their demographics, income trends, their satisfaction, pay issues and fair pay perception. Our data will be compared with the current studies to present valuable ideas to enhance the pay practices within the gig economy.

Review of literature:

There has been a heavy concentration of studies on the gig economy since it modifies how individuals work normally. It is characterized as a work market where individuals undertake temporary contracts, work or gigs under the internet marketplace. According to the International Labour Organization, the gig economy allows workers to have flexible work

hours, freedom to work and numerous alternative jobs. ILO also states that gig work brings the risk of the lack of stable income or job security to the workers. The online environment has a potential to undermine the employer-employee relationship.

Research has examined the payment of gig workers. They discover that gig workers make money per task or production and this generates unstable income. Demand, work fluctuation, the platform, customer rankings and algorithms, among other factors, have an influence on the amount that gig workers earn. Since there is no minimum pay or certain wage and other conditions in gig jobs, they tend to earn less and irregularly compared to regular jobs, which means that their income is more unstable.

In other studies, the absence of employee benefits by gig workers is the subject matter. The majority of gig workers are not provided with health insurance, paid leave, bonuses or retirement benefits that regular employees are. This vulnerability renders them more economically and even socially defenseless particularly when they are ill, hurt, or inability to secure employment. There is also an issue of pay transparency as observed by researchers. The rules as well as the deduction in reward are complicated to grasp and may be poorly explained resulting in dissatisfaction among the workers.

The laws that regulate gig workers are discussed by many researchers in India. The 2020 Social Security Code is regarded as one of the significant advances towards acknowledging gig and platform workers. Nevertheless, research indicates that these laws are unlikely to be easy to implement and pay issues are still prevalent. The majority of reviewed literature recommends fair pay models, enhanced payment system and policy interventions. Although numerous research endeavours cover the gig economy, there is still a gap in the literature regarding the fact that limited research utilises real data to investigate pay issues faced by gig workers, which is why the research gap in this context must be addressed with new studies.

Research Methodology:

The descriptive research will expose more information about the management of payments within the gig economy to the researcher. The research will make use of new

information and existing information. Based on various areas, the questionnaire was prepared including age and employment platform, salary level, previous experience, calculating pay, their happiness with pay, pay change, pay delays, incentive comprehension, benefits provision and the pay change on motivation. The questionnaire was completed by the employees of Blinkit, Zomato, Swiggy, Instamart, and Zepto.

The study used 47 respondents. The type of sampling was convenience, due to the time constraint and reach constraint. The team consists of individuals of varying ages and work experience in the gig economy. The secondary data sources used consisted of books, research papers, and government reports concerning the gig economy and payment management.

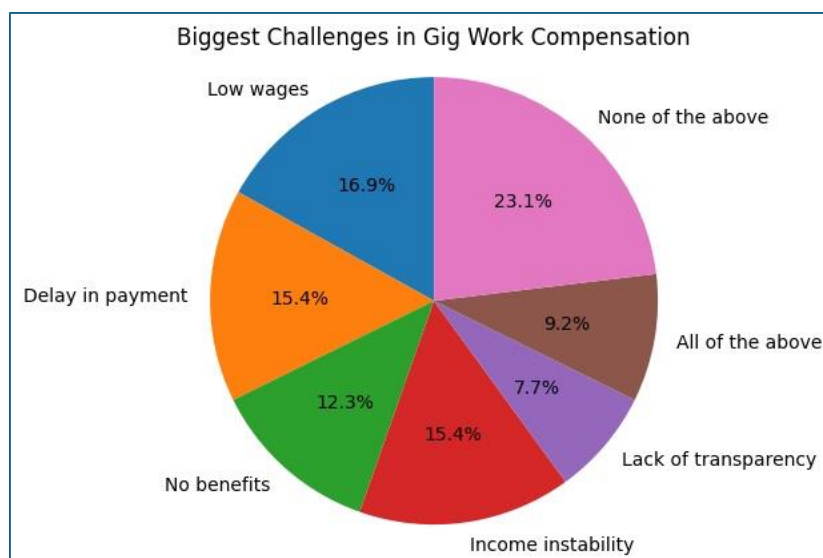
It has been coded and compiled into tables and examined with the help of basic statistical tools to make the primary data easier to comprehend. The research has a few limits:

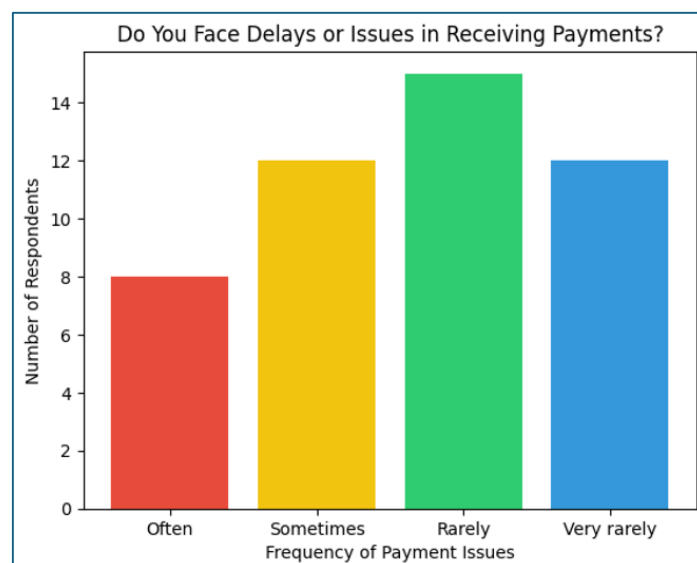
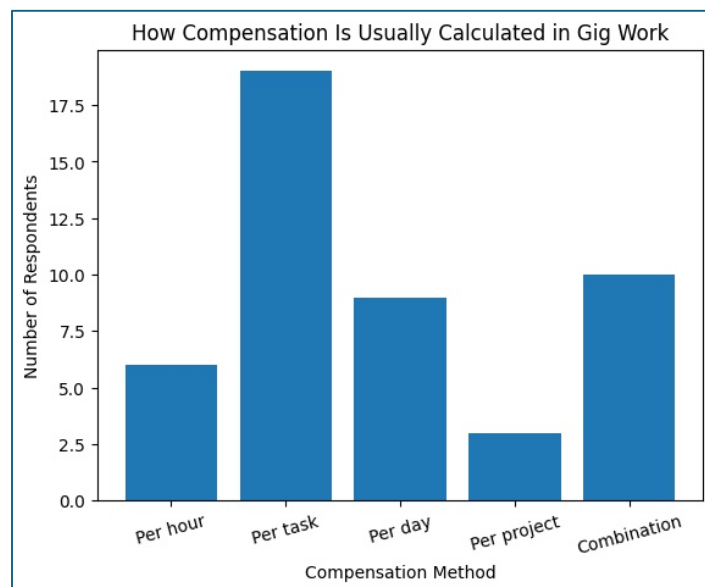
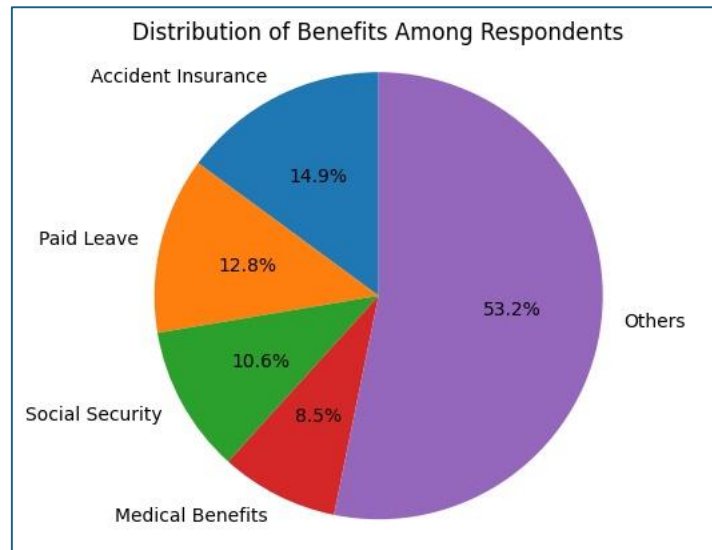
- Sample size
- Geographical scope
- Self-reported measures

Analysis and Interpretation of the Data:

- The primary information of 47 gig workers reflects essential trends regarding the manner, in which pay is handled. The majority of the respondents are between 18-30 or 31-40, which implies that younger active individuals are the key workers in the gig economy. They are mostly using Blinkit/Zomato or Swiggy/Instamart, some of them on Zepto and some on other platforms, indicating that the field of food and grocery delivery is the most active in terms of gig work.
- The majority of the respondents are workers with experience of 6 months up to 3 years, and some have less than 6 months at the start. This indicates that workers change their jobs and do not remain in a single job. Majority of the workers earn 10,000 to 20,000 in the course of a month. A profitable portion of the earnings are below 10,000 and few have more than 20,000. This implies that gig employment tends to be of middle or low wages and money security is an issue.

- Most of the respondents remain neutral or dissatisfied with their compensation. Few indicate that they like it. The payment is commonly per task or a combination thereof and not at a set or hourly rate. Discussing the question whether pay is equal to effort, the majority has answered No or Maybe as they disliked to observe that and understand there is injustice and certainty of unfairness. Income is also perceived to be volatile, indicating that the revenues of gigs are volatile.
- Numerous employees report that they have to wait to get paid, or they do it occasionally, which damages the credibility of the sites. Many of them claim that there is no clear explanation of bonuses, deductions and incentives indicating the lack of transparency. The majority believes that gig workers get to earn lower than regular workers to do the same, which encourages this inequality.
- The majority of workers report to receive no benefits and few have been reported to access limited ones such as accident insurances. This reveals that gig workers do not have benefits in social security. Groups Pay has a strong influence on motivation, the majority of workers confirm that it has a strong or even moderate impact on their desire to continue working. Most respondents when questioned about the largest pay issues, include low wages, income instability, late payments, lack of benefits, and lack of transparency as most pick all of the above. In general, the review indicates that payment issues have a massive impact on the satisfaction, motivation, and economic welfare levels of gig workers.





Suggestions and Conclusion:

The analysis indicates that the present situation of paying gig workers should be altered. The first one is to establish a minimum price to ensure that everyone receives good pay and reduced income shock.

- The calculation of payments, bonuses and deductions should be displayed in the platforms in order to assure workers the exact way they receive payment. It is also imperative that they provide simple benefits such as accident insurance, health cover, paid leaves and social security to secure the lives of workers in terms of money and job security.
- It is possible to motivate good performance with a combination of fixed salary and performance bonuses so that the income can be constant.
- Business enterprises and governments need to collaborate in implementing the law of labor and the social security. Workers will also be happier and trust the system when they pay different amounts of money depending on the skills they possess and have well-defined mechanisms of rectify the complaints.

To sum up, the gig economy represents a large novel practice of job-finding, chiefly amongst youths. Yet, according to the study, there is still a huge issue of payment with gig workers. Some of the issues are inadequate and random remunerations, ambiguity on payment regulations, delayed payments and absence of basic provisions. These are damaging money, motivation and job satisfaction of the workers. Gig work may put people in an unstable state, rather than a stable one unless good payment rules are in place and the regulators providing support. Thus, HITs, politicians, and so on should collaborate in order to develop equal, transparent and inclusive remunerative schemes. By rectifying such issues, gig work will become more beneficial to the employees and the gig economy will remain viable and sustainable.

References:

Systematic literature review — “Gig Economy Workers: A Systematic Literature Review” (2025)
Gig Workers and Performance Pay – EU study on productivity and incentive effects for gig pay models

The Gig Economy & Evolving Work in India (2025)

Annexure:

Questionnaire & Responses Overview:

Q1. Full name

Q2.Age

- 18-30
- 31-40
- 41-50
- 50+

Q3.Where are you employed at?

- Blinkit / Zomato
- Zepto
- Swiggy/ Instamart
- Others

Q4. How long have you been employed?

- Less than 6 months
- 6 months – 3 years
- More than 3 years

Q5. Monthly Income (estimate)

- Less than 10000
- 10000 – 20000
- More than 20000

Q6. Are you satisfied with the compensation you receive as a gig worker?

- Highly satisfied
- Satisfied
- Neutral
- Dissatisfied

- Highly dissatisfied

Q7. How is your compensation usually calculated?

- Per task
- Per hour
- Per project
- Combination

Q8. Do you feel your pay is fair compared to the effort you put into your work?

- Yes
- No
- Sometimes

Q9. How stable is your income from gig work?

- Very stable
- Stable
- Unstable
- Very unstable

Q10. Do you face delays or issues in receiving payments?

- Frequently
- Sometimes
- Rarely
- Never

Q11. Are incentives, bonuses, or deductions clearly explained by the platform/company?

- Always
- Sometimes
- Rarely
- Never

Q12. Do you receive any employment benefits (insurance, paid leave, social security)?

- Yes
- No

Q13. Do you think gig workers are paid less than regular employees for similar work?

- Yes
- No
- Not sure

Q14. Does compensation influence your motivation to continue working in the gig economy?

- Strongly influences
- Influences
- Slightly influences
- Does not influence

Q15. What is the biggest challenge you face regarding compensation in gig work?

- Low pay
- Income instability
- No benefits
- Lack of transparency
- Payment delay
- All of the above
- None of the above



Detailed Overview



Individual Performance Appraisal vs Group Performance Appraisal vs Hybrid Appraisal System

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Abstract:

Organizations utilize performance assessment as a methodical procedure to assess employee performance, productivity, efficiency, and contribution to company goals. By supporting decisions about pay, promotions, career development, training needs assessment, and organizational planning, it plays a critical role in human resource management. Traditional individual-based evaluation techniques have given way to more cooperative and team-based performance assessment methods in appraisal systems over time.

Three main appraisal systems are analyzed and contrasted in this research paper: hybrid, group, and individual performance appraisals. The study examines the answers of 120 participants, who were employers and workers from a variety of industries, including IT, manufacturing, and services. The findings indicate that while individual appraisal systems provide clarity and accountability, group appraisal systems enhance teamwork and organizational culture. However, hybrid appraisal systems that combine both approaches are perceived as the most effective and balanced method for evaluating employee performance in modern organizations.

Introduction:

One of the most important managerial instruments for gauging worker productivity and organizational contribution is performance evaluation. An organization uses this

methodical process to assess an employee's work performance and overall worth to the company over a given time frame. In the past, companies mainly relied on individual performance evaluation systems, in which workers were assessed only on the basis of their own output, goals, and accomplishments. The purpose of these systems was to identify underachievers, reward individual excellence, and encourage accountability. However, globalization, technological development, remote work models, and growing employee interdependence have all had a significant impact on the modern workplace. Work is rarely done alone these days. Coordination between teams, departments, and specialists is necessary for projects. As a result, instead of concentrating only on evaluating individual performance, organizations are increasingly using group performance appraisal systems. This change has sparked a discussion about the best appraisal technique. Group appraisals promote collaboration and lessen workplace rivalry, while individual appraisals guarantee equity and quantifiable results. As a result, a lot of businesses have started putting in place hybrid appraisal systems that incorporate both-strategies.

Organizations looking to maximize long-term growth, employee satisfaction, and productivity must know which system performs best. The purpose of this study is to thoroughly examine these appraisal techniques and identify the system that offers the best framework for evaluation.

Objectives of the study:

The following are the main goals of this study:

- To comprehend the idea behind and significance of performance evaluation systems
- To examine how each appraisal system operates.
- To assess group appraisal systems' efficacy
- To evaluate both strategies in terms of motivation, teamwork, productivity, and fairness.
- To examine the preferences of both employers and employees with regard to appraisal systems
- To determine if hybrid appraisal systems provide better outcomes.
- To suggest the best appraisal model for contemporary businesses

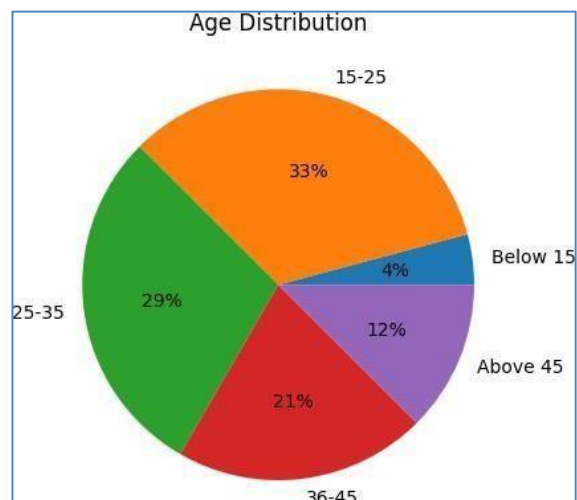
Research Methodology:

The descriptive study design that underpins this research aims to examine attitudes and preferences regarding performance evaluation systems. A structured questionnaire disseminated via an online survey platform was used to gather data. Both demographic and opinion-based questions gauging attitudes toward appraisal systems were included in the survey. 120 responders make up the sample size. Convenience sampling is the sample method used. Categories of Respondents: Workers and Employers Covered Industries: IT, Services, Manufacturing, and Others Percentage analysis and graphical representation methods like pie charts and comparative tables were used to examine the gathered responses. Simulated data has been used to illustrate statistical interpretation and analytical presentation because the study is academic in nature.

Demographic Analysis Interpretation:

Age Distribution Analysis

Most responders are between the ages of 15 and 25, with the 25– 35 age group coming in second. This suggests that the majority of the sample consists of younger professionals. Younger respondents' preferences for particular appraisal systems are influenced by their propensity to place a higher value on career advancement, growth opportunities, and recognition. Though they are less numerous, older respondents offer perspectives derived

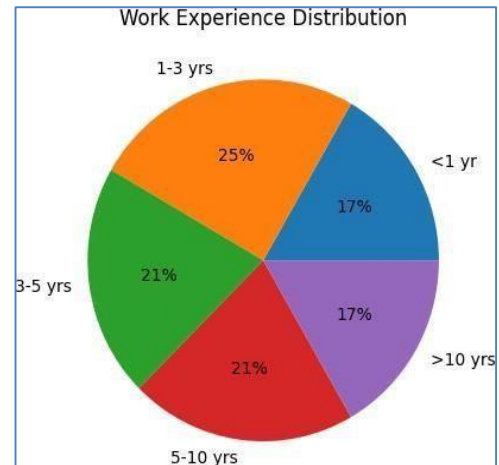


from managerial exposure and work experience. Their answers demonstrate long-term organizational knowledge and realistic workplace realities.

Work Experience Analysis

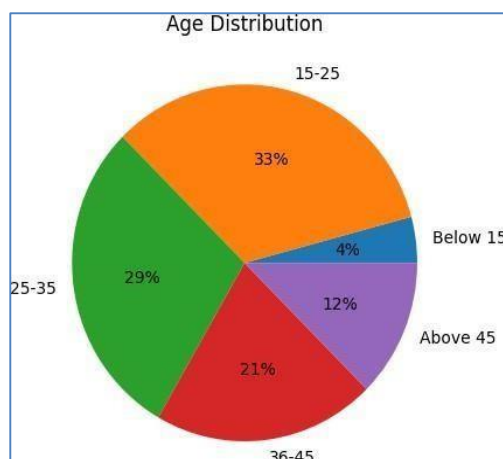
Participants in the sample range in experience from recent graduates to professionals

with over ten years of experience. Those with one to three years of experience make up the largest category, indicating that early-career professionals are quite interested in performance evaluation-systems. Because it enables them to stand out and show their individual skills, employees with little experience typically favor individual appraisal. On the other hand, because they understand the value of cooperation and shared accountability, seasoned professionals frequently choose group appraisal.



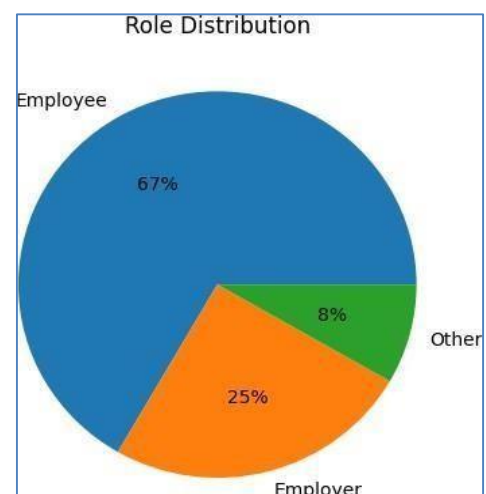
Organization Type Analysis

Most responders are between the ages of 15 and 25, with the 25– 35 age group coming in second. This suggests that the majority of the sample consists of younger professionals. Younger respondents' preferences for particular appraisal systems are influenced by their propensity to place a higher value on professional progression, growth prospects, and recognition. Though they are less few, older respondents offer perspectives derived from managerial exposure and work experience. Their answers demonstrate long-term organizational knowledge and realistic workplace reality.



Role Distribution Analysis

Instead of being employers, the majority of responders are employees. This guarantees that the study accurately reflects the opinions of the workforce about appraisal methods. Despite their smaller numbers, employers offer important insights into organizational evaluation standards and decision-making processes.



Detailed Comparative Analysis:

Individual Performance Appraisal

Employees are evaluated by individual performance appraisals, which only include their own performance measures, such as output, target attainment, timeliness, efficiency, and job quality. Positions where individual performance is readily measurable, such as sales roles and industrial settings, frequently adopt this technique.

Advantages

- Because employees can readily see how their performance is evaluated, individual appraisal methods provide a higher degree of transparency. Since incentives and promotions are directly tied to quantifiable outcomes, this clarity boosts motivation. Recognizing employees who perform very well boosts their confidence and job happiness.
- Additionally, managers can find areas for improvement, performance gaps, and training needs with the use of individual rating systems. Additionally, they enable firms to distinguish between high and low performers, which improves the objectivity of compensation decisions.

Disadvantages

- Employees may engage in unhealthy competition as a result of individual appraisals, despite their advantages. Employees may put their own success ahead of the success of the team, which might hinder cooperation. Employees may sometimes refrain from sharing information or refrain from assisting coworkers out of a concern of losing their reputation.
- It's also possible that this system won't recognize teamwork. Workers who help others behind the scenes might not be properly acknowledged if their contributions are not quantifiable on an individual basis.

Group Performance Appraisal

Group appraisal evaluates employees collectively based on team performance, project

outcomes, and shared goals. This method is widely used in project-based industries, consulting firms, and organizations where tasks require collaboration.

Advantages

- Group evaluation promotes cooperation and teamwork. When rewards are based on team performance, there is a greater chance of employee support and information sharing. This leads to stronger ties, better communication, and an improved business culture.
- Group structures also reduce professional rivalry and promote a sense of shared responsibility. Employees are motivated to work together toward common goals rather than competing with one another.

Disadvantage

- The problem of free riders is one of the main drawbacks of group evaluation. Some workers might delegate work to others and still get credit for it. This might lead to discontent and demotivate diligent workers.
- It also becomes challenging for managers to pinpoint individual contributions. It could be difficult to assign blame when a team performs poorly, which makes giving constructive criticism difficult.

Hybrid Appraisal System

Hybrid appraisal systems combine individual and group evaluation methods. Employees are assessed based on both personal performance metrics and team outcomes. For example, an employee's evaluation might consist of 60% individual performance and 40% team performance.

Advantages

- Hybrid systems provide an introduces balance by ensuring that employees are recognized for both their individual efforts and their ability to collaborate effectively. This approach promotes accountability while still encouraging teamwork.
- It also reduces bias, as performance is evaluated through multiple criteria rather than a single method. Organizations using hybrid systems often report higher employee

satisfaction, better productivity, and stronger organizational culture.

Disadvantages

- The main challenge of hybrid appraisal systems is complexity. Designing and implementing such systems requires careful planning, clear metrics, and trained evaluators. However, once showed, the benefits generally outweigh the difficulties.

Key Findings (Elaborated Interpretation)

The analysis of survey responses revealed several important patterns. A majority of respondents believe individual appraisal systems are fair because they directly link performance with rewards. Employees feel more motivated when they know their efforts will be recognized independently. At the same time, a significant percentage of respondents stated that group appraisal systems improve teamwork and communication. Employees working in collaborative environments appreciate evaluation methods that recognize collective achievements. Employers showed a strong preference for hybrid appraisal systems. Their responses suggest that organizations seek evaluation methods that encourage both productivity and cooperation. Employers recognize that modern work environments require both individual excellence and team collaboration. Another interesting finding is that preferences vary by experience level. Younger professionals prefer individual appraisal because they want recognition and career growth opportunities. Senior professionals, on the other hand, value group appraisal because they understand the importance of coordination and shared responsibility.

Discussion:

The results of the study clearly indicate that performance appraisal systems influence employee motivation, productivity, and workplace relationships. Individual appraisal systems are effective in roles where performance can be measured quantitatively. They are particularly useful in sales, manufacturing, and performance-driven environments. However, these systems may not be suitable for roles that require collaboration and knowledge sharing.

Group appraisal systems are effective in environments where teamwork is essential. They encourage employees to work together, support colleagues, and share information. However, they may fail to reward exceptional performers adequately, which can reduce motivation for high achievers.

The findings suggest that hybrid appraisal systems represent the most practical and balanced approach. They allow organizations to measure individual productivity while also evaluating teamwork. Such systems align individual goals with organizational objectives, leading to better overall performance.

Recommendations:

Based on the analysis, several recommendations can be made for organizations seeking to improve their appraisal systems:

1. Organizations should adopt hybrid appraisal systems that combine individual and group performance metrics.
2. Performance evaluation criteria should be clearly communicated to employees to ensure transparency and fairness.
3. Managers should be trained in performance evaluation techniques to minimize bias and subjectivity.
4. Feedback sessions should be conducted regularly rather than only annually. Continuous feedback helps employees improve faster.
5. Organizations should periodically review and update their appraisal systems to ensure they remain relevant in changing work environments.
6. Technology and data analytics should be used to track performance metrics accurately and objectively.

Employee participation should be encouraged in the appraisal process to increase acceptance and trust.

Conclusion:

This research demonstrates that performance appraisal systems play a vital role in

shaping employee behavior, motivation, and organizational effectiveness. Individual appraisal systems are highly effective for measuring personal productivity and rewarding high performers. Group appraisal systems are valuable for fostering teamwork and collaboration. However, relying solely on either system may create imbalance. Individual systems may reduce teamwork, while group systems may reduce accountability. Hybrid appraisal systems provide a balanced solution by integrating the strengths of both approaches.

Therefore, organizations seeking long-term success should adopt hybrid performance appraisal frameworks that recognize both individual achievements and collective contributions. Such systems not only improve productivity but also strengthen organizational culture and employee satisfaction.

Limitations of the Study:

- The data used in this study is simulated for academic purposes.
- The sample size is limited and may not represent the entire population.
- The research is cross sectional and does not analyse long term trends

References:

Armstrong, M. — Handbook of Performance Management Dessler, Gary — Human Resource Management
Aguinis, Herman — Performance Management SHRM — Performance Evaluation Research Reports
Harvard Business Review — Articles on Employee Performance Systems

Analysis of Artificial Intelligence in Reducing Pay-Bias and Wage Inequality in It and Finance Sector Employees

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Abstract:

Artificial intelligence (AI) integration in human resource management has made organisational activities, especially the decision-making process concerning compensation, easier. In particular, the research will attempt to establish the degree to which AI-based pay solutions provide fair wage distribution

*The primary data used in the research is based on a structured questionnaire with the help of convenience **sampling of 42 IT and Finance employees.***

The secondary data consists of research papers, articles and academic journals. The research results show the fact that AI is capable of assisting in decreasing biases in compensation through increasing transparency, constancy and objectivity. Nevertheless, such factors as the algorithmic bias, data transparency and data quality, among other ethical issues, which restrain AI are left.

Keywords: Artificial Intelligence, Human Resource Management, Compensation Management, Pay Equity, Algorithmic Bias, Ethical AI.

Introduction:

Over the past several years, companies have started to utilize AI in HRM, particularly to enhance the way they determine remuneration of employees. Compensation is turning out

to be the hot spot since companies are seeking to correct historic pay-biases and pay-inequality issues. The past decisions in pay were all haphazard, subjective assessments, implicit biases, and unequal evaluation criteria were a rule, therefore, wage disparities erupted. Today, AI-based pay tools are offering a more data-driven, transparent and standardized wage-setting system.

AI may be able to make compensation more equitable; however, individuals are still concerned with the potential of algorithmic discrimination, the quality of data, lack of transparency, and whether workers will trust it. This paper is exploring the potential of AI to decrease pay disparity and wage differentiation in Information Technology and Finance and the obstacles that could prevent it. The research will attempt to determine whether AI can truly assist us to achieve a more equitable wage distribution in organisations by seeking to have a read on employee perceptions.

Literature Review:

1. Lakhamraju, M. V. (2025). *AI-Driven Pay Equity: Enhancing Workforce Compensation through Artificial Intelligence*. In Next-Generation Computing: Trends and Challenges in Research (pp. 30–37) Journal of Business Management and Information Systems. Affiliation: CVS Health Corporation.

The paper explores the potential of artificial intelligence to identify and decrease compensation discrepancies in organizations. It shows that AI can analyze a lot of salary data to find bias, make salary decisions more uniform and make compensation systems clearer. The paper places AI-driven pay equity in the context of the digital transformation of HR. It suggests that the algorithmic tools can be used to achieve fairness, accelerate the work process and deliver data-driven decisions but the quality of data, the way the system is managed and algorithm bias are also the subjects of concern. Concisely, the paper contributes to new studies of AI in human resource management in that it demonstrates what AI can accomplish but also its boundaries in regard to fair pay practices.

2. Marler, J. H. (2024), *Artificial intelligence, algorithms, and compensation strategy: Challenges and opportunities*. *Organizational Dynamics*, 53(1), 101039.

The paper examines the benefits of AI and algorithms in strategic compensation management. It raises issues such as leaving the machines to make decisions instead of people, pay equity, make AI decisions visible, and keep everything in line with the company goals. The paper adds that although AI can help to improve pay strategies, businesses must address ethical considerations, explain how the technology will be used and consider how to implement it.

3. Chauhan, S., & Gupta, N. (2025). *AI in Compensation Management: Optimizing Pay Structures with Predictive Analytics*. *Iconic Research and Engineering Journals*, 8(11), 2330–2331.

The author examines how organisations can use predictive analytics to make smarter opinions about compensation. They point out that traditional compensation styles constantly calculate on outdated data, which can lead to erroneous pay structures. By using data-driven tools, companies can match hires to performance, request morals and business pretensions. The study highlights that analogous approaches not only make pay further accurate and fair but also help directors plan compensation strategies more effectively.

Research Methodology:

The current study takes a **descriptive and exploratory approach** to study the role of Artificial Intelligence in reducing pay bias and wage inequality. The descriptive aspect helps to get some insights into the perception of the employees on AI-based compensation systems and the exploratory aspect is to reveal the concerns and limitations that exist in the implementation of AI in the compensation management. The research is based on a quantitative approach, since it is aimed at quantifying and analyzing employee perceptions by using structured and objective answers on questionnaires. **Quantitative data** allow conducting a statistical analysis of tendencies associated with the role of AI in combating pay bias and wage inequality, which makes this method suitable in the current study. **The target audience is the employees working in the Information Technology and Finance sectors** since these two spheres are one of the first ones to implement AI in human resources management and compensation procedures.

1. Research Design:

This study adopts a descriptive and exploratory research design to analyze the role of Artificial Intelligence in reducing pay bias and wage inequality. The descriptive approach is used to understand employee perceptions regarding AI-driven compensation systems, while the exploratory aspect helps identify concerns and limitations associated with the use of AI in compensation management.

2. Research Approach:

The study follows a quantitative research approach, as it aims to measure and analyze employee perceptions using structured and objective questionnaire responses. Quantitative data enables statistical analysis of trends related to AI's role in reducing pay bias and wage inequality, making it suitable for this research.

3. Population and Sample:

The population for this study includes employees working in the Information Technology and Finance sectors, as these industries are among the early adopters of AI in human resource management and compensation processes.

A convenience sampling technique was used to select respondents due to time and accessibility constraints. A total of 42 employees from the IT and Finance sectors participated in the survey and provided primary data for the study.

4. Research Instrument and Questionnaire Design:

A structured questionnaire was used as the research instrument for collecting primary data. The questionnaire was designed based on the research objectives and insights from existing literature and industry reports. It consisted of two sections:

Part A: Demographic information such as age group, gender, education qualification, sector of employment, total work experience, job level and type of organization.

Part B: Objective and scale-based questions related to AI in compensation management, focusing on fairness, transparency, bias reduction, trust in AI systems and perceived challenges.

Most questions were multiple-choice and scale-based to ensure ease of response and facilitate quantitative analysis. The questionnaire was distributed online using Google Forms,

and respondents were allowed to remain anonymous to encourage honest and unbiased responses.

5. Data Collection Methods

(A) Primary Data

Primary data was collected through a structured questionnaire designed to capture employee perceptions of AI in compensation management. The questionnaire was distributed online, and responses were collected anonymously to encourage honest and unbiased answers.

The questionnaire included objective and scale-based questions to assess:

- i. Perceived fairness of AI-based wage systems
- ii. Transparency and objectivity in compensation decisions
- iii. Concerns related to algorithmic bias, data quality, and ethical issues

(B) Secondary Data

Secondary data was collected from six review research papers, academic journals and credible online sources. These sources provided theoretical and empirical insights into AI in compensation management, pay equity, and algorithmic bias, which helped support and interpret the primary findings.

6. Data Analysis Techniques

The collected data was analyzed using quantitative methods. Responses were tabulated and presented using percentages, charts, and tables to identify trends and patterns in employee perceptions. Secondary literature was analyzed qualitatively to compare findings with existing research and to identify gaps addressed by the present study.

Data was analyzed using pie charts generated through Google Forms.

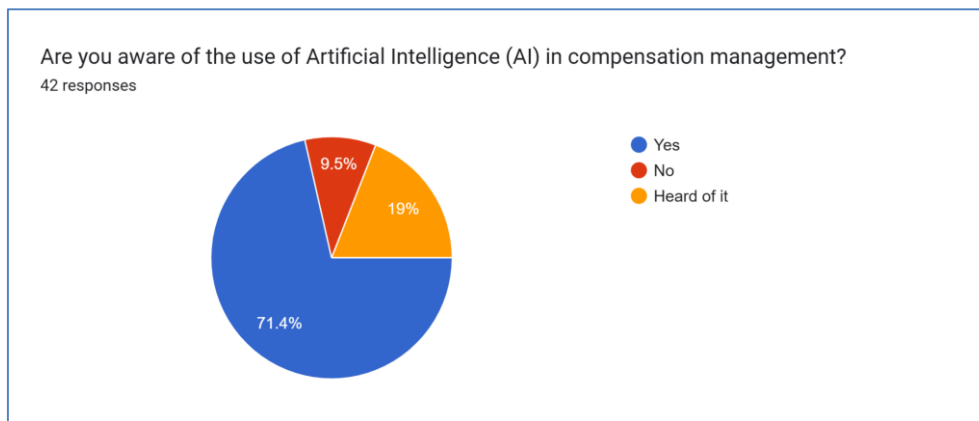
Objectives of The Study:

- i. To assess whether AI contributes to fairer & more equal wage distribution.
- ii. To critically analyze concerns that may limit AI's effectiveness in reducing pay discrimination.

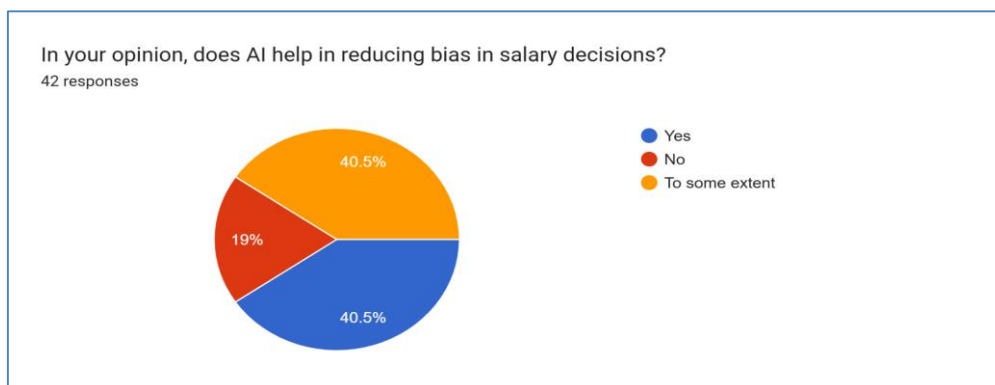
Data Interpretation and Analysis

We checked the interpretation and perception of AI-driven pay among people in IT and Finance. This analysis presents question-wise findings followed by an overall interpretation of the results.

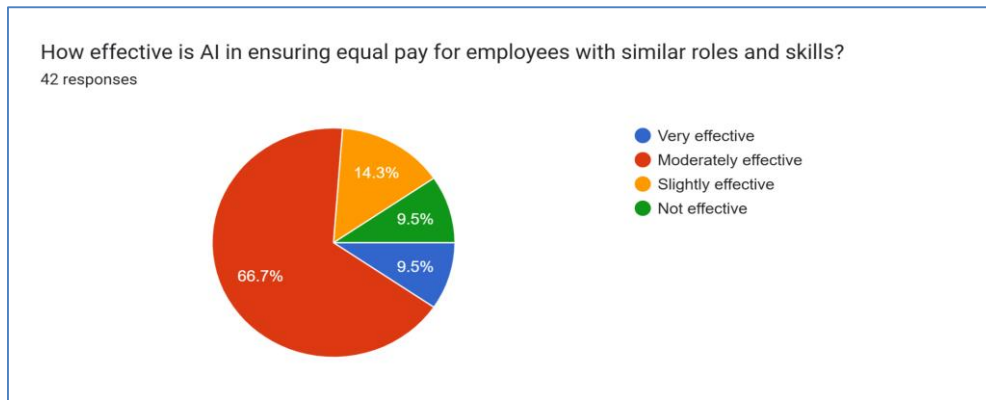
- a)** A majority, 71 percent, were aware of the fact and others had heard of it. Those with little knowledge were only 9.5%.



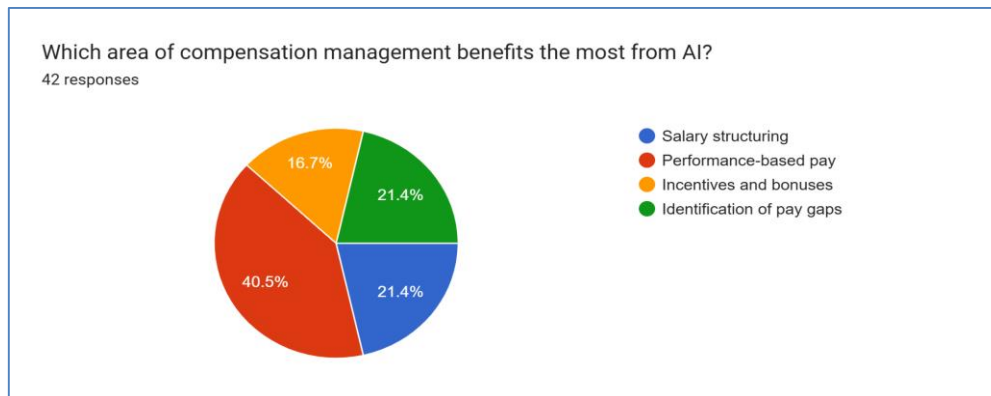
- b)** Approximately forty percent believed that AI decreases bias in salary decisions, and so did an equal percentage that believed AI does so to some degree. This indicates that employees are not completely convinced in AI.



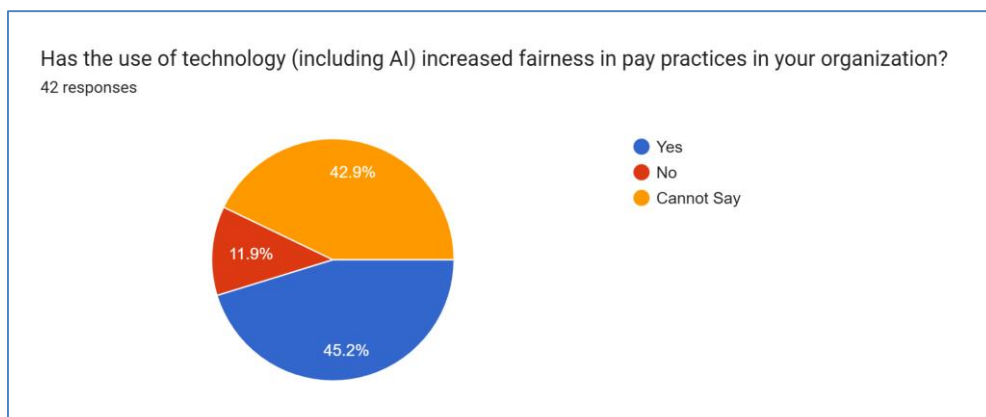
- c)** This question was regarding the effectiveness of AI in equal pay scale for employees with similar roles and skills. The response for which is answered as moderately effective by major respondents. Again responses for very high effectiveness and no effectiveness are equal and lowest. This indicates that employees are not fully confident with AI and its effectiveness.



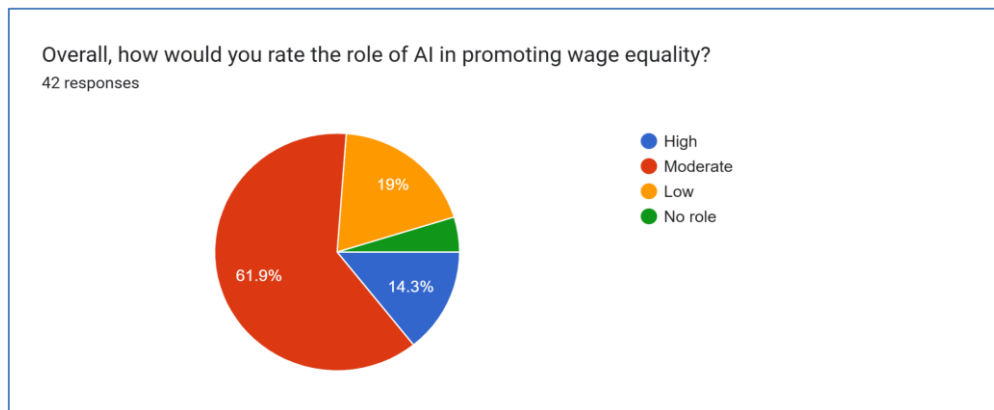
- d) In one question concerning where AI is most useful in pay, 40 percent responded that it is performance-based pay. 21.4 percent responded that it is pay-gap identification and salary structuring, and 16.7 percent answered that it is incentives and bonuses, the least used.



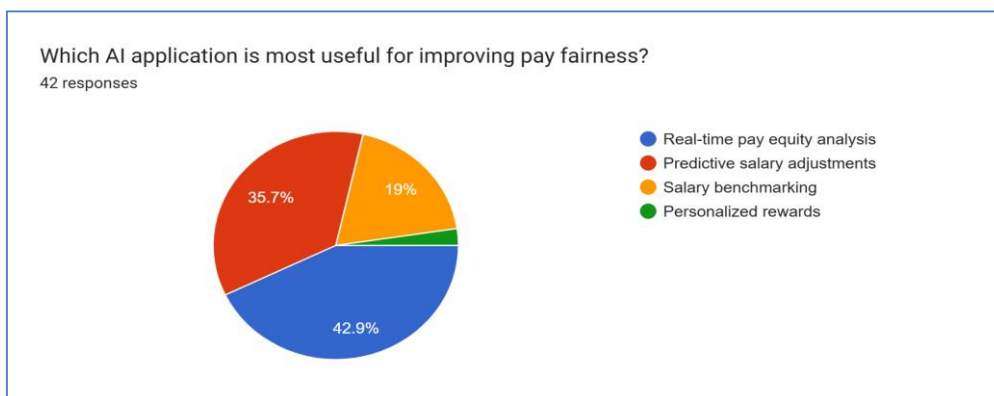
- e) Speaking of fair pay practices brought about by technology, and AI in particular, 45.2% responded with yes, claiming that AI has enhanced fairness. Only 11.9% answered no.



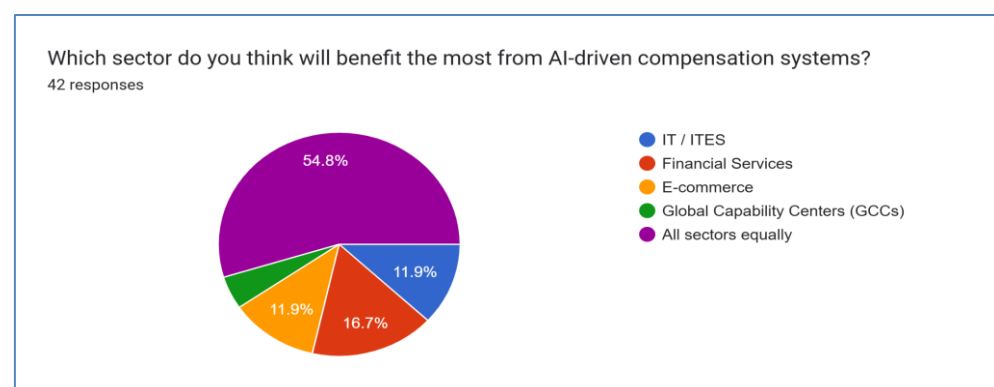
- f)** On the whole, approximately 62 percent believe that AI aids wage equality. Indicating, people believe that AI can promote wage equality moderately.



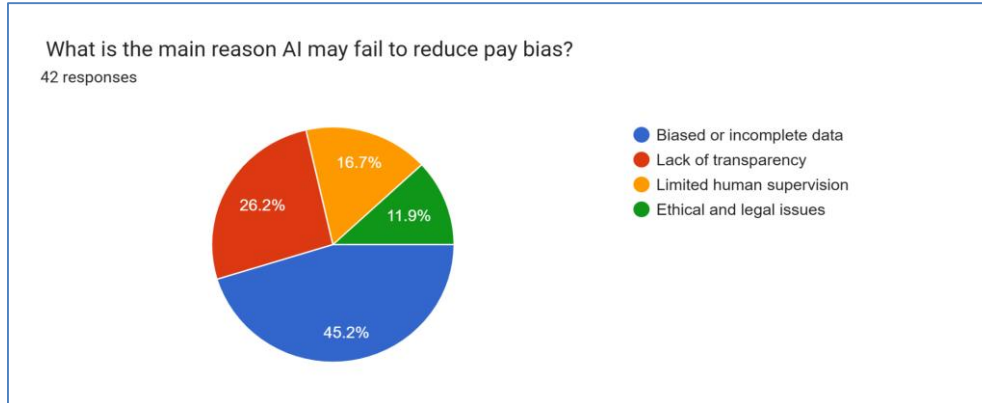
- g)** In context with the AI applications Real-time pay equity is the most number of responses 42.9% and then the second highest opted option is Predictive salary adjustments with 35% approximately. This indicates that these are the areas in which application of AI is most useful and increasing rapidly.



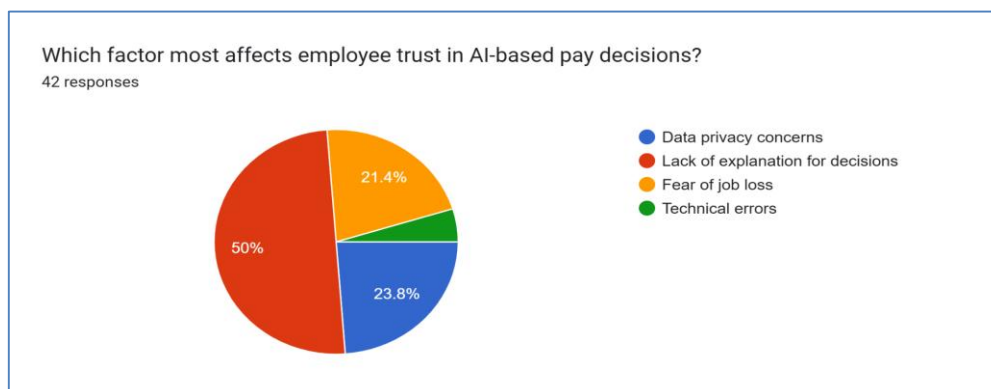
- h)** The outcome was unexpected given that it was the survey of only Finance and IT. The majority of the respondents were of the opinion that an AI-based pay system would equally benefit all the industries, and this is a good indication of AI in all industries.



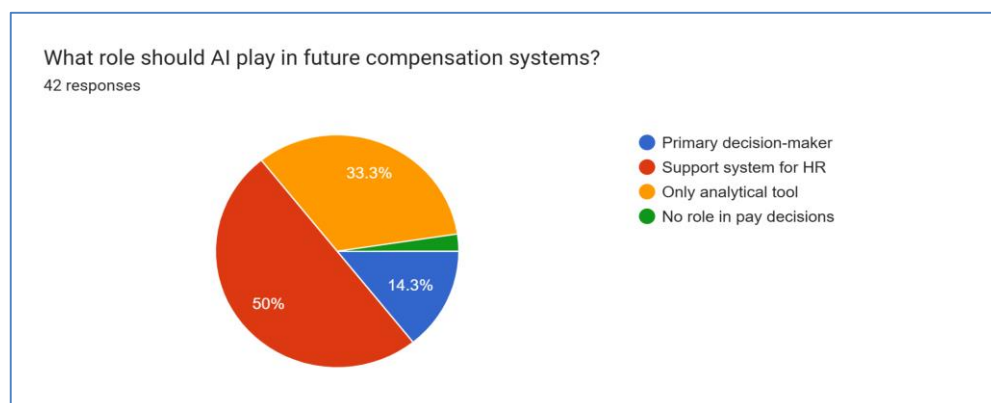
- i) The main reason opted by respondents is biased or incomplete data with a majority of 45.2%. The interpretation is that the major reason for failure is incomplete and biased data and then the rest such as - lack of transparency, limited human supervision and ethical issues.



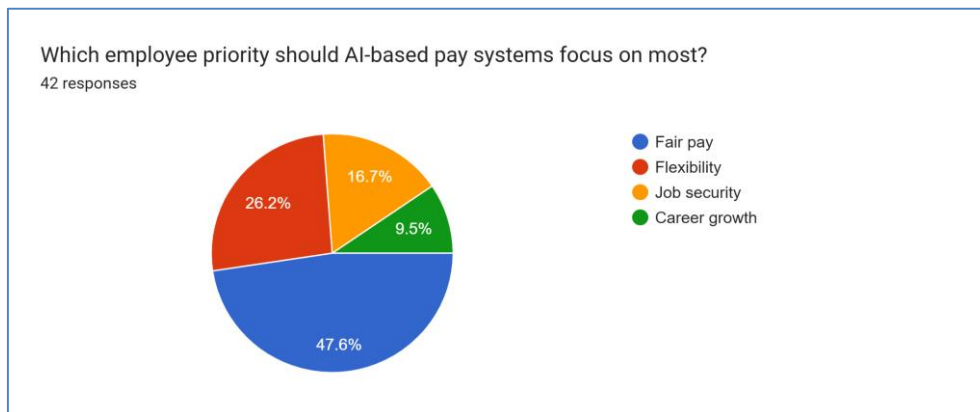
- j) In the absence of the explanation of the system, the employees are left feeling that the system is unfair, or biased, which limits their confidence.



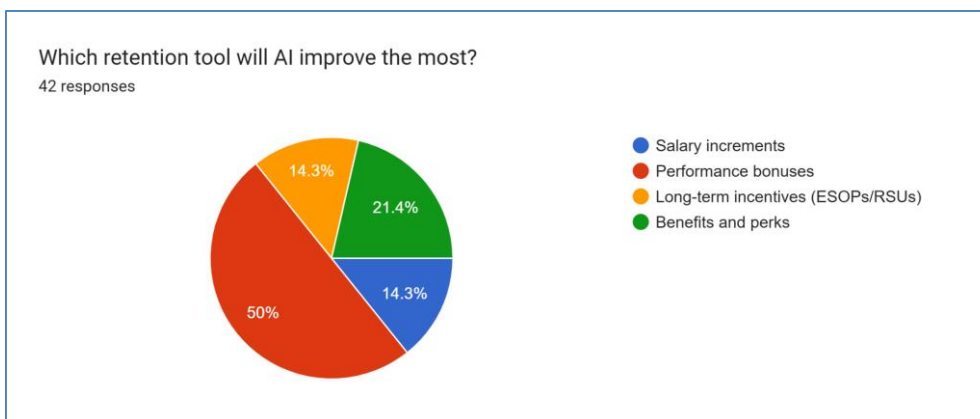
- k) The majority of respondents believe that AI is not supposed to replace HR, but rather assist it. They desire AI to inform judgements, but human beings ought to decide.



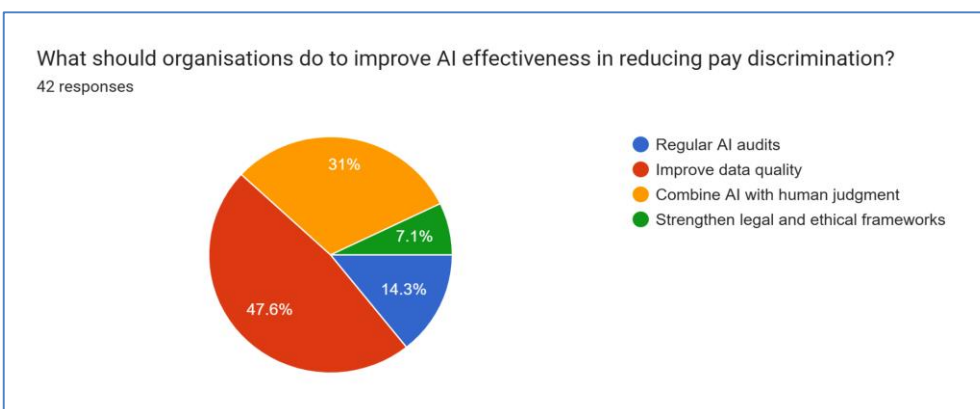
- l)** Nearly half the respondents feel AI should mainly ensure fair and equal pay, showing that equity matters more than speed or automation.



- m)** Respondents think AI can best improve performance-based bonuses, as it can link rewards more accurately to employee performance data.



- n)** Most people feel AI can only be fair if the data it learns from is clean and unbiased, so improving data quality is seen as the most important step.



Question-wise Data Analysis

1. Demographic Profile of Repliers

- Gender: There were both male and female respondents and females were a bit more prevalent in the 21 -30 age bracket.
- Age Group: The majority of the respondents were 21-30 years old, which demonstrates that the early-career professionals tend to use AI in HR.
- Education Level: The majority of the respondents were graduates/ post-graduates with a good number of them having professional degrees or undergrad qualifications.
- Work Experience: The majority of it had 1 -5 years' experience, followed by 5 -10 years meaning younger to mid-career opinions prevail in the data.
- Industry: The respondents were mostly those working in the Finance industry followed by the IT industry.
- Job Level: The majority of the respondents were in the Entry or Middle Level and few of them are senior.
- Type of Organization: The respondents had Indian companies, MNCs, start-ups and few of their own enterprises.

2. Knowledge on AI in Pay Decisions:

Most of them were aware that AI is applied to determine pay. Some believed it was very effective, others, a little, and some not at all. People are optimistic yet wary and have not put all their trust on it.

3. Attitude toward AI as an Effective Pay Decision-Maker:

The primary response was moderately effective. Meanwhile, a limited number believed that AI was highly effective, some believed it was slightly effective or not effective. This indicates that people are optimistic but cautiously so and do not depend on it wholly.

4. Compensation Areas of AI:

The most frequent response was - performance-based pay and salary structuring.

5. Impact of Perceived Fairness and Pay Equity:

The majority claimed that AI is useful in terms of fairness and equity at a moderate level; a few of them were extremely helpful. AI is perceived as being useful, but not entirely reliable to provide fair compensation.

6. Preferred AI Functions in Compensation:

The most used functionality was real-time pay equity analysis.

7. Sectoral Suitability of AI in Pay Decisions:

Most individuals had the notion that AI applies to every industry. Others identified Financial Services, IT/ITES, E-commerce and Global Capability Centres (GCCs).

8. Major AI Risks and Pay Decision Challenges:

Most commonly cited risks have been:

Biased or incomplete data - Lack of transparency in AI algorithms

Lack of explanation for AI decisions (black-box issue) - Data privacy concerns - Limited human supervision

Ethical and legal issues - Technical errors - Fear of job loss

9. Employee Involvement in AI-Based Pay Decision:

The majority responded that they had moderate to high involvement, and a few had little or no involvement. The involvement of employees in AI pay decisions is minimal.

10. AI use in Compensation Decisions:

AI was selected as a helper by most of them, rather than a decision-maker. Human control is necessary.

11. Compensation System Expectations by employees:

Fair pay and performance bonuses were the most crucial expectations.

12. Recommended AI advancements on Pay Decisions:

Better data quality was the most proposed improvement.

Overall Analysis

According to the survey, individuals are more familiar with AI in the area of pay management in IT and Finance. AI is regarded as slightly useful in designing pay and equity analysis, although such aspects as bias, transparency, privacy, and job security exist. Employees are not willing to have AI to make the decisions; they want it to aid in making the decisions. In general, AI has a future, but it is not entirely trusted with pay management.

Observation and Findings:

Based on the data received, we were able to make these findings:

1. Gender-wise perception

- **Female respondents:** The primary concern of women is biased or incomplete data and lack of transparency, in particular, 21-30 respondents. Their concern is also on privacy of data, particularly on entry and middle level in Finance and IT. The majority of women do not desire AI to take crucial decisions; they have confidence in HR still with some doubts.
- **Male respondents:** Men also perceive data bias as a challenge, although most of them are more concerned about ethics, legal concerns, technical malfunctions, and having sufficient human supervision. The mid-level and senior men are the ones who show greater willingness to AI autonomy as they are more interested in AI as a primary decision-making tool or analytical support.

2. Age Group and AI Effectiveness Perception.

- **21-30 Years:** This age category is the most educated and the most aware and uses AI in pay decisions. A majority of them expect AI to be moderately effective; some believe it to be very effective. Their primary interests include bias in data, transparency and employment.
- **31-40 Years:** This age group is less optimistic; some affirm that AI is not working or it is working minimally. They are more concerned with the absence of human control and morals.

- **41-50 Years:** There are also a lot of respondents about the helpfulness of AI, although older respondents continue to note ethical and legal concerns, along with the vague rationale of AI decisions.

3. Education Level and Trust in AI

- The vast majority of graduates and post-graduates believe that AI is effective in a moderate way. Post-graduates are more informed about pay attention and pay reviews in real time. Higher educational level is associated with increased consciousness of moral and legal hazards.

4. Experience and Disposition towards AI.

- **1-5 Years Experience:** This is the most huge group. They believe that AI is average in its efficacy and may be employed in the form of pay and performance bonuses. Their concern is very high regarding biased data, absence of clarification, and the risk of losing a job.
- **5-10 Years Experience:** These individuals are beneficial but ethical and transparency issues are concerned. Their desire is not to be decided by AI.
- **10-15 Years and Over:** Senior professionals are more cynical and reserved. They emphasize a human supervision absence, ethical issues and legal risk.

5. Industry-wise Differences (IT vs Finance)

- **Information Technology (IT):** - IT employees are more and better with AI compensation. The majority rates AI as moderately useful and prefer real-time pay forecasts and salary predictions. They are worried about data privacy, biased algorithms and no transparency.
- **Finance:** - Finance workers are more skeptical, some indicating that AI is quite ineffective or not effective at all. They pay more attention to morality, legal issues, transparency and professional stability. They vehemently desire human control over compensation.

6. Job Level and Confidence in AI Decisions.

- **Entry-Level Employees:** - They believe AI is medium efficient but are frightened because they can lose their jobs and have equity issues. They want AI to be a helper and not a decision maker.
- **Middle-Level Employees:** - They are less hesitant on the use of AI on performance pay and salary arrangement, yet state no explanation and data bias.
- **Senior-Level Employees:** - They tend to view AI as an analytical machine or primary decision maker, but emphasize ethics and legal regulations.

7. Type of Organization and AI Perception.

- **Indian Companies and Start-ups:** - Respondents report the moderate usage of AI and are divided in their opinions about its effectiveness. They are quite concerned about the quality of data and transparency.
- **MNCs:** - These businesses employ AI in compensation more and they have high sensitivity to data privacy and adherence to rules.

8. Demographic and Preferred AI Role in Pay Decisions.

- Younger and entry-level and graduate respondents desire AI to assist HR than have complete decision-making power.
- Middle and senior professionals, particularly men, are more willing to have AI make primary decisions or analyze data.
- No groups much appreciate full automation with no people.

The results indicate that perceptions of AI in pay decisions vary significantly across gender, age, education, experience, industry, and job level. The younger employees, IT employees, entry-level workers are more conscious and relatively optimistic about AI, whereas older employees and those in finance are more skeptical and concerned more with the question of ethics and legal challenges.

Women are more concerned about data bias and privacy, men are concerned with technical and governance issues. The board people by and large want AI to assist rather than totally remove the human decision making in pay. Accurate data, explicit rules, and human control can allow AI to enhance compensation.

To retain fairness, trust and accountability, organizations are advised to combine AI and human judgment. AI may become an effective means of HR pay management with appropriate regulations and continuous monitoring.

Conclusion:

This study examined whether Artificial Intelligence (AI) contributes to fairer wage distribution and analyzed the concerns that may limit its effectiveness in reducing pay discrimination. Based on responses from employees in the IT and Finance sectors, **AI is viewed as a supportive tool in compensation management**, particularly in performance-based pay structuring, salary benchmarking and pay gap identification. These functions enhance objectivity and structured decision-making.

However, concerns regarding data bias, lack of transparency, privacy risks and ethical implications limit complete trust in AI-driven compensation systems. **Respondents emphasized that AI should assist rather than replace human judgment.**

The study **successfully achieved both of its objectives** by demonstrating that while AI has the potential to promote wage equity, its effectiveness depends on responsible implementation, transparent practice and continuous human oversight. A balanced integration of technology and human decision-making is essential to ensure fairness and long-term sustainability in compensation management.

Recommendations:

- a) Use Clean and Unbiased Data:** As a lot of respondents were worried about biased or incomplete data, companies need to meticulously assess and refresh salary data before utilizing it in AI systems. AI is only fair if it's dependent on fair data, AI is only as fair and unbiased as the data it's learning from.
- b) Keep Human Intervention for Final Decisions:** The majority of respondents favoured AI as a supplement to their decision-making rather than a replacement. Therefore, HR managers should review AI driven decisions, and not completely depend on it.

- c) Conduct Regular Monitoring and Audits:** AI systems must be re-evaluated periodically to detect negative bias or technical failures. Ongoing monitoring will be necessary to ensure there is still fairness over the time.
- d) Protect Employee Data:** Given the focus on privacy, companies also need to make sure that there are strong data protection measures to maintain employee trust.
- e) Provide Awareness and Training Programs:** Organizations should educate employees about how AI works in compensation management. Better understanding can reduce resistance and misconceptions.

Limitations of The Study:

This study has a few limitations. The sample size is small with only 41 responders so the results may not fully represent all employees in the IT and Finance sectors. Time constraints also limited the number of responses and the analysis. The study is grounded to personal views and opinions.

Scope for Future Study:

More people and varying types of businesses can be worked with in the future to obtain results that have even broader applicability. Better statistical approaches also allow researchers to observe the impact of AI on wage disparities more intimately. Moreover, the subsequent research can focus on actual company examples to observe the way AI-based pay systems are established at real workplaces.

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Annexure:

Scan this QR code to get a detailed overview of the responses.



Impact of compensation on motivation and performance of contractual employees within the IT sector

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Abstract:

Compensation plays a crucial role in employee. This study examines the impact of compensation on the motivation and performance of contractual employees in the IT sector. It analyzes how financial rewards, benefits, and pay equity influence job satisfaction, work engagement, and productivity. The research highlights compensation as a critical factor in enhancing performance and retaining skilled contractual talent in competitive IT environments.

Introduction and Background

The introduction and background give the background information of the research topic. The Information Technology (IT) industry has experienced a high rate of increased use of contractual professionals in an era of fast changing digitalization and dynamic workforce market. Companies are also more inclined to hire contract workers as a way of achieving flexibility, ability to handle project-based assignments, lower fixed labor expenses, and access to specialized technical expertise.

Nonetheless, as much as contractual employment has operational benefits to a firm it also brings in significant questions on compensation structure and its effects on employee performance, motivation and commitment to an organization.

Human resource management (HRM) is an essential human resource process that involves paying people, but also compensation is a tool, which can be used strategically to

facilitate productivity and help people work in accordance with the organizational objectives. Behavior in the IT industry where innovation, efficiency, and performance are the main factors that determine the competitiveness of the industry. Since the contractual employees are not considered as permanent employees, there is a tendency of variations in pay structures, benefits, incentives, and job security which can affect the degree of engagement and final performance results.

The traditional systems of compensation concentrated mostly on fixed salary system and increment based on tenure. But even the contemporary IT organizations are progressively embracing the use of performance-based compensation, skill-based compensation, project bonus, and variable pay schemes in a bid to boost productivity. In the case of contractual employees of the organization, in particular, employees on short-term assignments, the issues of fairness, transparency, and competitiveness of compensation gain greater importance in defining job satisfaction and efficiency in their work. Poor or unfair pay can lead to a decline in motivation, productivity and turnover intentions. Moreover, the IT industry is very competitive and requires high standards of technical skills, ability to solve problems and inventiveness among those subjected to contracts.

Consequently, it is vital to learn the effects of compensation on their performance in order to come up with appropriate reward systems.

Properly designed compensation program can strengthen commitment, quality of work and make employees be more accountable and on the other hand, bad compensation can harm morale and productivity.

This paper aims at discussing the ethical linkage between compensation systems and the performance of contract workers in the IT industry. The study will help bring information on how organizations can optimally plan compensation policies to ensure maximum employee performance and organizational output by examining the role of salary element, incentives, benefits, and fairness in remuneration.

Research Objectives and Questions

The core aim is:

- To suggest suitable practices to improve employee motivation.
- To analyze the level of job satisfaction among contractual employees in relation to their compensation.
- To assess the impact of compensation management on contractual employees.

The research addresses these key questions

- Is compensation competitive with similar contractual roles in the industry?
- Is compensation stable despite being on a contractual role?
- Does organization ensure timely payment without discrimination against contractual staff?
- Is there a concern about income continuity due to the nature of temporary contract?

Literature Review

WHY Software Houses are moving towards contractual employment?

Information Technology (IT) industry is a very dynamic, innovative and project-based industry. The evolving demands of the clients, the current rapid pace of technology and the global competition have forced IT organization to implement flexible workforce. A major trend that has been experienced in the last few years is the current trend of depending on contractual workers as opposed to the old permanent employment systems. The change is a representation of strategic, financial and operational considerations.

The major causes of the change to contractual employees.

Cost Optimization

Cost reduction is also one of the main factors that IT companies are moving towards contractual employment. Long term financial obligations that permanent employees need include:

- Contributions in the provident funds.
- Health insurance

- Gratuity
- Paid leaves
- Bonuses and other benefits Contractual workers on the contrary can be brought in to do particular projects with minimal benefits, which drastically cuts down on the fixed overheads.

Example:

To manage the operating costs during unpredictable economic cycles, Infosys and TCS have been employing contract-led project professionals and lateral employees on short- term digital transformation projects.

IT Work is highly project based.

IT projects are normally temporary, customer- oriented, and time-sensitive. When a project is completed, there may be a reduction in the necessity of particular special skills.

Contractual employment enables companies to: Recruit dedicated technologies (e.g. AI, cybersecurity, cloud migration).

The amount of workforce will be increased and decreased with the project load.

Long-term liabilities do not benefit an organization.

Example:

The contractual cloud engineers or SAP consultants are employed by companies such as Accenture and Wipro to do client based work of 6-18 months.

Blistering Technological Evolution.

The IT business is changing rapidly with new emerging technologies like:

- Artificial Intelligence
- Blockchain
- Data Analytics
- Cybersecurity
- DevOps

Instead of spending a lot of money in retraining permanent workers, organizations tend to employ professional contractors with skills in new technologies.

Example:

To respond to urgent customer demands in telecommunication and digital solutions, Tech Mahindra has employed AI and 5G experts on contract basis.

Flexibility and Agility of the Workforce.

Flexibility is important in uncertain economic conditions. Contractual recruitment enables IT companies to:

- React fast to market dynamics.
- Staffing when times are lean.
- Eliminate employees without complicated legal documents.

Agile HR strategies based on the volatility of the business are supported by this model.

Example:

When the world slows down and companies restructure post-pandemic, IT companies were hiring more gigs and contract workers in order to keep things malleable.

Remote Work Trends and Globalization.

Remote working has become the rule so now, IT firms recruit contract workers anywhere in the world without the requirement of permanent employment.

This helps companies:

- Access global talent pools.
- Minimize the cost of relocation and permanent employment.
- Use cross-border freelancers and consultants.

Example:

Global contract developers and offshore consultants are increasingly being used by such companies as IBM and Capgemini when undertaking international client projects.

Compensation Models based on performance.

Contract jobs usually work on performance based compensation plans. This puts compensation in direct correlation with output, productivity and project success.

Such models:

- Promote increased efficiency.

- Promote accountability.
- Reduce complacency.

This applies especially in IT settings whereby measurable deliverables are vital.

Risk Management

Permanent workers are a long-term financial risk during economic recessions. Contract work minimizes organizational risk by minimizing the long term liability.

This is a risk management strategy that contributes to financial sustainability in very competitive markets.

Performance

Although the benefits of contractual employment are significant to the organization, it has an impact on the performance of an employee:

Positive Effects:

- Greater attention paid to deliverables. Performance-based motivation.
- Experienced skills that result in quality work.

Negative Effects:

- Job insecurity.
- Reduced organizational commitment. Conceived compensation differentiation with permanent employees.

In this way, the compensation design will play a key role in ensuring motivation and performance among the contractual employees.

To gain cost-efficiency, operational flexibility, and technological adaptability and reduce risks, IT firms are moving towards the use of contractual employment. Large companies like TCS, Infosys, Accenture, Wipro, Tech Mahindra and IBM have moved towards project based and contractual models of workforce to stay updated in the fast changing industry.

Nevertheless, as much as this model promotes agility in the business, it was also accompanied by the need to have well designed compensation systems in order to create a sense of fairness, motivation among contractual employees, as well as maintaining performance performance over a long time. Thus, the shift towards contractual employment

should be planned with sufficient compensation and non-discriminatory human resource strategies in order to maximize organizational performance.

Research Outcomes:

The article considers the role of compensation in the performance of contractual employees in the IT industry. The number of respondents who took part in the survey was 40. The results have significant patterns on areas of fairness, competitiveness, stability and psychological effects of compensation designs on performance.

Perceived Salary Fairness

On a question of whether the salary is reasonable based on the job duties, half of the responded with a yes or strongly yes and it was 45% with the other half being neutral and only 5% said no. This implies that most may view fairness but a large percentage of the people are unsure implying that there may be some ambiguity in the definition of roles or transparency of compensation.

Compensation Competitiveness.

There was a solid majority (60) in the agreement that remuneration is competitive with other similar contractual jobs in the industry. It was dissatisfaction at a percentage of only 12.5. This resonates with the fact that IT organizations are comparatively on par with the standards of the market which plays a positive role in talent retention and motivation.

Stability of Compensation

The answers related to the stability of compensation were mixed. Although 45% believed that even with the contractual status, compensation remains stable, 20% disagreed, with 35% taking the neutral position. This proves that contractual employment is still viewed as having a financial risk which can affect the long term performance commitment.

On-Time and Non-Discriminatory Remuneration.

Over half of the respondents (60% of the respondents) affirmed that the organization does not discriminate in paying them on time.

However, around 20% disagreed. This serves to underscore the fact that procedural

fairness prevails in most instances; however, inconsistencies can have some impact on the level of trust among the contractual employees.

Financial Security

Only a quarter of the respondents said they felt financially secure, with 42.5% of the respondents being neutral and 17.5% disagreeing. The neutrality is high which indicates the psychological insecurity associated with the contractual positions, despite the competitive remuneration.

Effect of Type of Contract on Performance.

Fifty percent (50) of the respondents said that they agree the nature of contractual employment influences their performance. This means that the engagement and the level of motivation is dependent on employment status itself.

Fairness as compared to Permanent Employees. Only 35 per cent thought that compensation is equitable with permanent workers doing the same job, with 30 per cent holding an opposing view. This suggests the feeling of inequity, and it may adversely affect morale and performance results.

Sufficient Rewards of Contributions.

Approximately 42.5% of them stated they are well rewarded and 37.5% were neutral. This implies that, though there may be the existence of compensation systems, there may not be a high perception of these systems being performance-oriented and rewarding enough.

Pay Gap Justification

Those who were not sure that the pay difference between contractual and permanent employees is justified were quite a large percentage of 32.5, with just 30 percent agreeing. This shows a worry on equity, which can lower the organizational dedication and work accord.

Pay Disparity and Workplace Raise.

There was a good level of consensus at 67.5 percent that the inequality related to compensation influenced the harmony at work. This is an important conclusion, which means that the pay differences have a direct impact on the team dynamics, cooperation, and morale within the IT organizations.

Feeling Valued

More than 52.5% of them felt valuable due to their remuneration though 35% of them were indifferent. This implies a medium level of emotional satisfaction and the opportunity to enhance recognition and rewards systems.

Compensations Tied to Performance.

This resulted in the most positive answer, 72.5% have agreed that incentives are closely associated with performance results. This implies that performance based pay systems are working and have a positive impact on productivity.

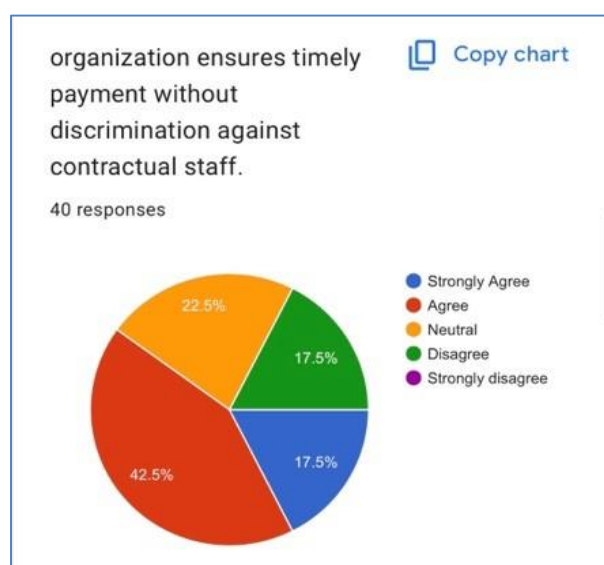
Research Methodology:

Primary Data collection

A survey of 40 respondents analysed salary satisfaction, tenure and behavioural insights. Key insights:

- 40.38% had less than 1 year of experience
- 67% showed negative satisfaction.

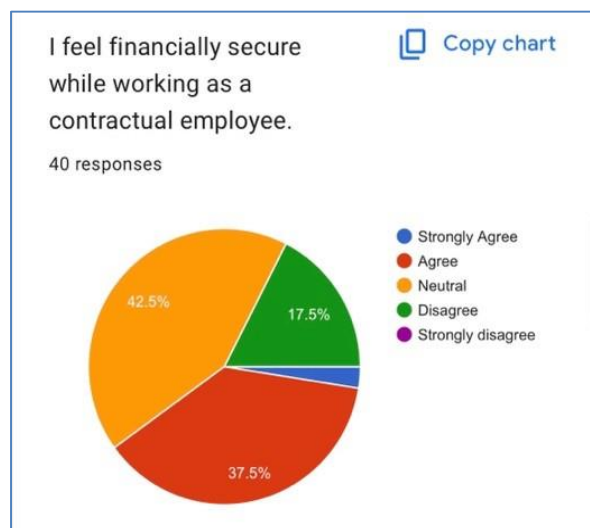
Data Analysis And Findings:



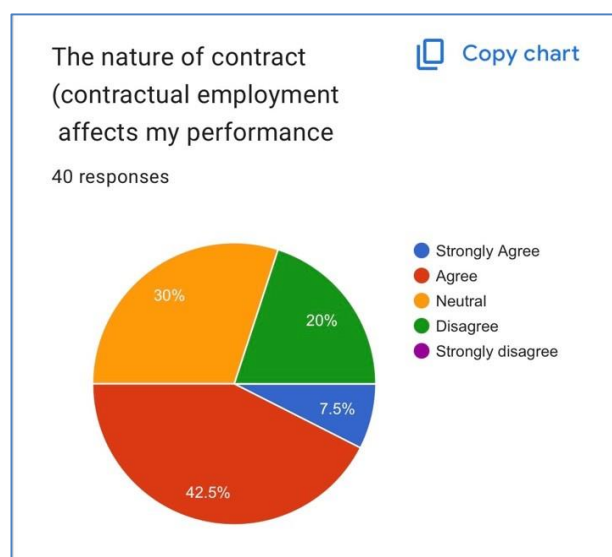
The responses indicate that 60% of employees perceive the organization as ensuring

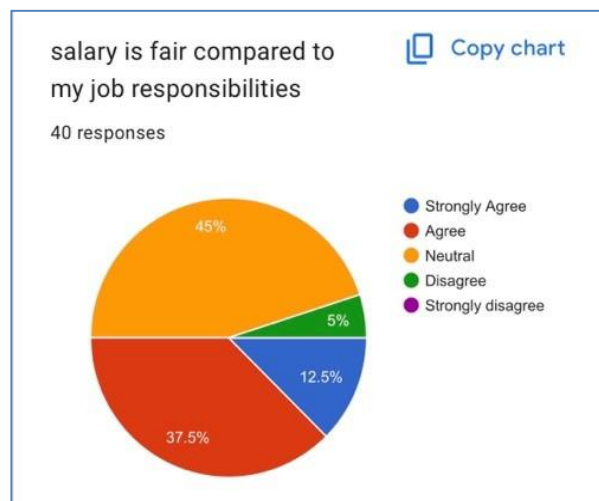
timely and non-discriminatory payment, with *42.5% agreeing* and *17.5% strongly agreeing.

Meanwhile, **22.5%* of respondents remain neutral, suggesting some uncertainty or mixed experiences. A notable *17.5% disagree*, highlighting concerns among a minority regarding payment practices. Overall, while perceptions are largely positive, the level of disagreement suggests a need for improved consistency and communication.

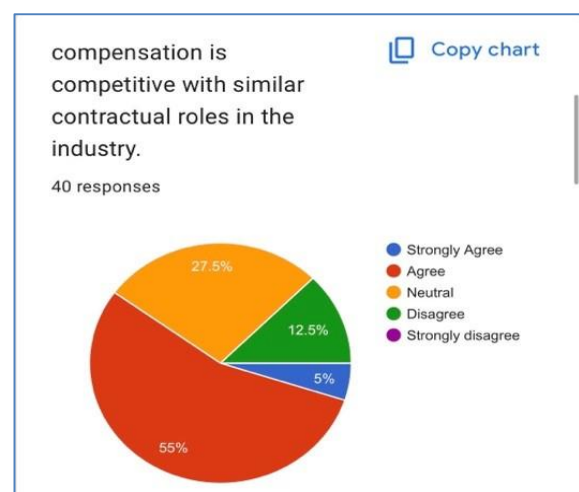
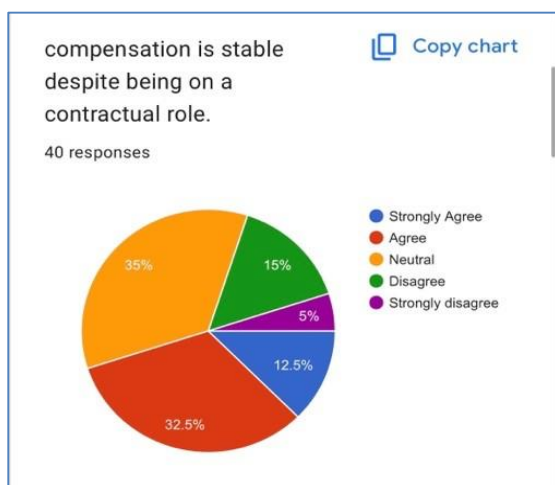


The findings indicate that *40% of respondents* feel financially secure as contractual employees, with *37.5% agreeing* and *2.5% strongly agreeing. However, a substantial **42.5% remain neutral, suggesting uncertainty about their financial stability. Meanwhile, **17.5% disagree*, reflecting concerns among a notable minority. Overall, the results point to moderate confidence in financial security, tempered by significant hesitation and concern.





The results show that *50% of employees* believe their salary is fair compared to their job responsibilities, with *37.5% agreeing* and *12.5% strongly agreeing*. However, a large portion (45%) remain neutral, suggesting uncertainty or lack of clarity around pay fairness. Only **5%* of respondents disagree, and *0% strongly disagree*, indicating minimal dissatisfaction. Overall, while perceptions are generally positive, the high neutral response highlights an opportunity to improve confidence in compensation practices.



Major Findings:

According to the analysis, the following important findings are made:

- The compensation in the IT sector is usually considered as competitive yet partially fair. Financial insecurity is an issue among the contractual workers.

- Contractual and permanent workers are perceived to be paid differently which has far reaching implications on morale and harmony at the workplace.
- Incentives based on performance have positive effects in motivating and increasing the productivity of employees.
- This situation is because the employment as such is contractual, which affects the level of psychological engagement and performance.

Conclusion:

Contractual employment has since become a strategic human resource approach in the modern IT industry, with its flexibility and cost efficiency to the organization. Nonetheless, the results of the present research prove that compensation is the key factor in defining the performance and engagement of hired workers.

Although most interviewees feel that their remuneration is fair and adequate, employees still feel that there are issues on the fairness of their pay against permanent workers as well as financial security. The statistics are clear that the inequality in compensation influences the harmony at work place, and can indirectly decrease the efficiency and motivation in the collaboration. In addition, the psychological insecurity of the contractual roles is an additional factor of the performance levels, which emphasizes the idea that the compensation is inadequate unless there is the sense of equity and stability.

Notably, performance-related rewards became one of the most powerful positive variables which implies that, when employees have a clear idea about the relation between work and the reward, productivity rises considerably.

Hence, IT organizations should embrace a balanced compensation scheme to remain competitive in the market, internal fairness, transparency and performance alignment.

In order to maximize performance of employees under contract, organizations ought to:

- Improve pay structures transparency.
- Keep to a minimum unfair pay differential between temporary and permanent

employees. Intensify performance based incentive systems. Offer increased stability of funds where possible.

- Develop non-discriminatory Hr policies.

The issue of compensation plays a significant role in the performance of contractual workers in the IT industry. Whereas competitive compensation motivates performance, a feeling of unfairness and financial instability may destroy commitment. A well-planned compensation system incorporating fairness, stability and performance pay plans are necessary to maintain a high performance and organizational effectiveness in the dynamic IT sector.

Scan to see all the responses:



A Comparative Analysis Between Variable Pay and Motivation Level Stress: Insights from Employees in the Electronics Sector

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Abstract:

This study examines the relationship between variable pay (performance-based compensation) and employee motivation and stress levels in the electronics sector. A primary survey was conducted among employees to understand their perceptions of variable pay. Data from a questionnaire administered that while variable pay is perceived as a motivational tool by a majority, it also contributes to stress, particularly through unrealistic targets. The findings suggest a trade-off: variable pay can enhance motivation but may negatively impact performance and well-being if not managed properly. Implications for HR practices in high-pressure industries like electronics are discussed.

Introduction:

Compensation management plays a crucial role in influencing employee motivation and performance. In recent years, organisations have increasingly adopted variable pay systems that link compensation to performance outcomes.

While such systems are intended to motivate employees, they often introduce stress due to uncertainty, high targets, and performance pressure. This paper conducts a comparative analysis of variable pay's impact on motivation and stress levels among employees in the electronics sector, a field characterised by rapid innovation, tight deadlines, and high-performance expectations.

Objectives of the Study:

1. To analyse employees' perception towards the variable, pay system.
2. To identify key factors contributing to stress in the variable pay system.
3. To examine the impact of stress on employee performance, job satisfaction, and work-life balance.

Research Methodology:

The present study is based on primary data collected through a structured questionnaire designed to understand employee perceptions regarding variable pay, motivation, and stress. The survey was conducted among 43 employees working in the electronics sector, including interns and early-career professionals.

The questionnaire consisted of close-ended questions based on a five-point Likert scale, ranging from Strongly Agree to Strongly Disagree. Convenience sampling was used due to time and accessibility constraints.

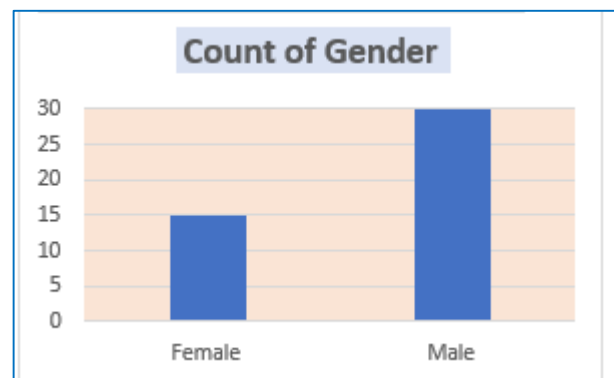
The collected responses were compiled and analysed using simple percentage and frequency analysis to interpret trends related to motivation, stress factors, and their impact on performance, job satisfaction, and work-life balance.

Data Analysis and Interpretation:

Total Respondents = 43

1. Demographic Profile – Gender Distribution

Gender	Frequency	Percentage
Male	28	65.1%
Female	15	34.9%
Total	43	100%

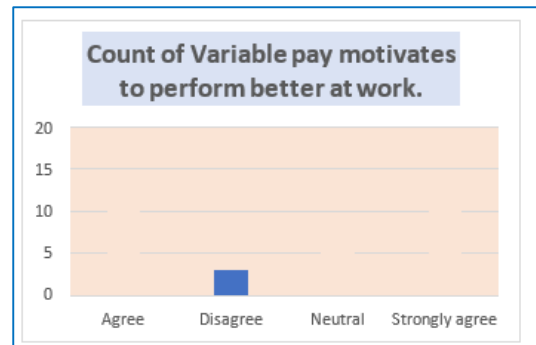


Interpretation:

The majority of respondents (65.1%) were male, while 34.9% were female. This shows that the electronic retail workforce in this study is male- dominated. However, responses from female employees also provide meaningful insights into stress and motivation levels.

2. Variable Pay Motivates Employees to Perform Better

Response	Frequency	Percentage
Strongly Agree	15	34.9%
Agree	15	34.9%
Neutral	10	23.3%
Disagree	3	7.0%
Total	43	100%

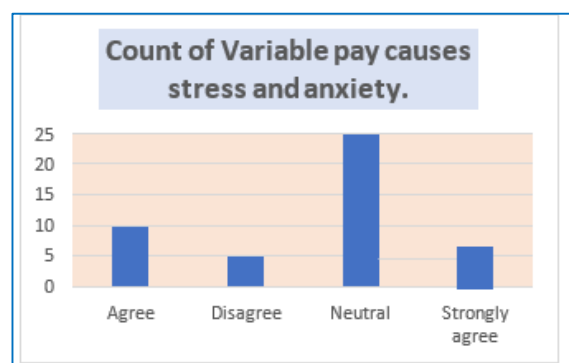


Interpretation:

Almost 70% of respondents agree that variable pay motivates them to perform better. This shows that variable pay is an effective motivational tool in the electronics sector.

3.Variable Pay Causes Stress and Anxiety

Response	Frequency	Percentage
Strongly Agree	7	16.3%
Agree	10	23.3%
Neutral	22	51.2%
Disagree	4	9.3%
Total	43	100%

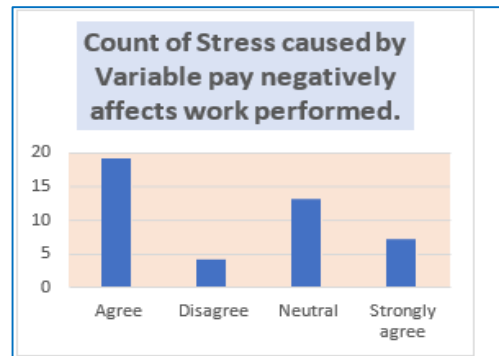


Interpretation:

About 39.6% agree that variable pay causes stress. However, more than half are neutral, which suggests that stress levels may vary depending on target pressure and individual performance.

4. Stress from Variable Pay Negatively Affects Work Performance

Response	Frequency	Percentage
Strongly Agree	7	16.3%
Agree	19	44.2%
Neutral	13	30.2%
Disagree	4	9.3%
Total	43	100%

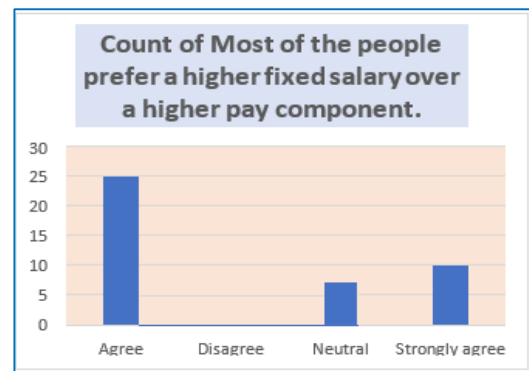


Interpretation:

More than 60% believe stress negatively affects their work performance. This indicates that stress can reduce productivity even though variable pay increases motivation.

5. Preference for Higher Fixed Salary over Higher Variable Pay

Response	Frequency	Percentage
Strongly Agree	10	23.3%
Agree	24	55.8%
Neutral	7	16.3%
Disagree	2	4.7%
Total	43	100%

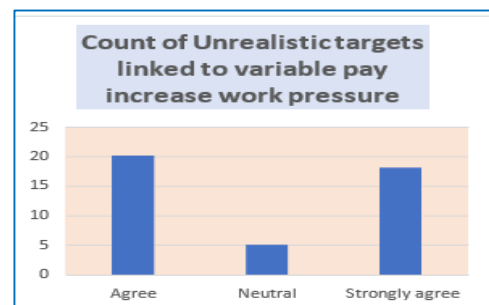


Interpretation:

Nearly 79% prefer a higher fixed salary. This shows that income stability is more important than uncertain incentive earnings.

6. Unrealistic Targets Increase Work Pressure

Response	Frequency	Percentage
Strongly Agree	18	41.9%
Agree	20	46.5%
Neutral	5	11.6%
Total	43	100%

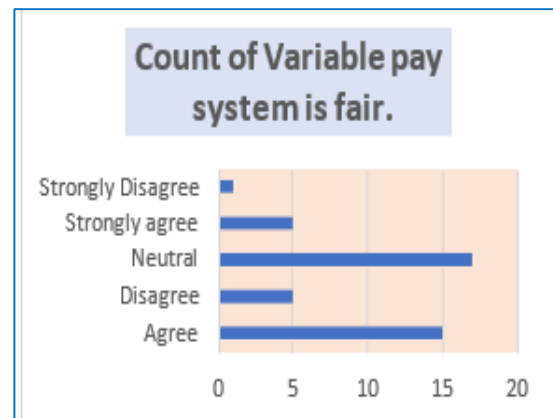


Interpretation:

Almost 88% agree that unrealistic targets increase pressure. This is one of the major stress-causing factors in the variable pay system.

7. Variable Pay System is fair

Response	Frequency	Percentage
Strongly Agree	5	11.6%
Agree	15	34.9%
Neutral	17	39.5%
Disagree	5	11.6%
Strongly Disagree	1	2.3%
Total	43	100%

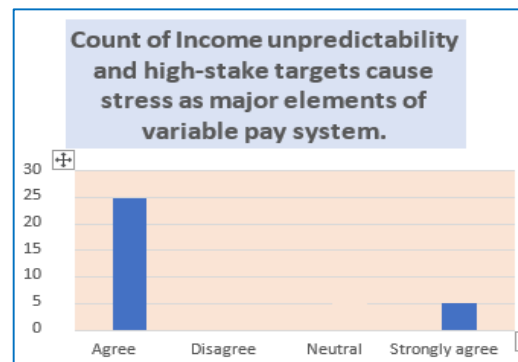


Interpretation:

Most respondents are neutral about fairness. This suggests moderate trust in the system but also some uncertainty about transparency.

8. Income Unpredictability & High Targets Cause Stress

Response	Frequency	Percentage
Strongly Agree	6	14.0%
Agree	24	55.8%
Neutral	10	23.3%
Disagree	3	7.0%
Total	43	100%

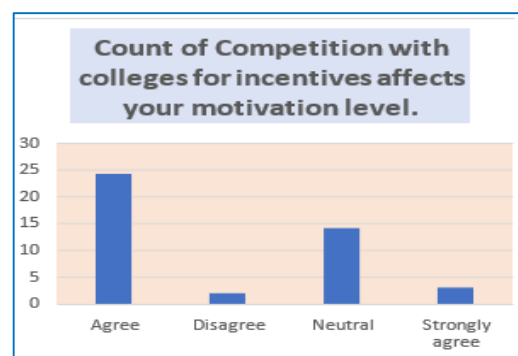


Interpretation:

Almost 70% agree that income unpredictability is a major stress factor. This clearly shows that uncertainty in earnings affects employees mentally.

9. Competition for Incentives Affects Motivation

Response	Frequency	Percentage
Strongly Agree	3	7.0%
Agree	24	55.8%
Neutral	14	32.6%
Disagree	2	4.7%
Total	43	100%

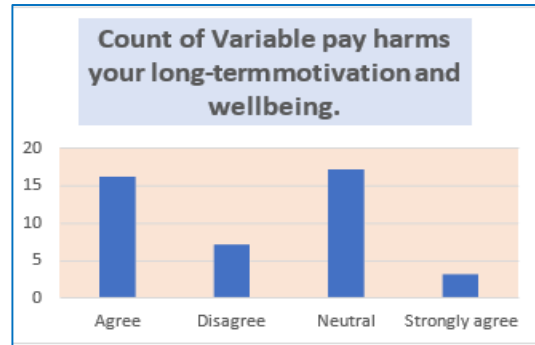


Interpretation:

More than half agree that competition affects motivation. While competition can improve performance, it may also increase pressure.

10. Variable Pay Harms Long – term Motivation and Well-Being

Response	Frequency	Percentage
Strongly Agree	3	7.0%
Agree	16	37.2%
Neutral	17	39.5%
Disagree	7	16.3%
Total	43	100%



Interpretation:

Employees are divided on this issue. While some feel it affects long-term well-being, many remain neutral. This suggests that long-term impact may depend on personal coping ability and organizational support.

Key Findings:

- Variable pay motivates employees in the electronics sector but does not guarantee satisfaction.
- Income uncertainty and unrealistic targets are major stress contributors.
- High stress levels negatively impact performance and job satisfaction.
- Employees prefer a stable fixed pay structure along with reasonable incentives.
- Excessive competition driven by incentives may affect workplace harmony.

Conclusion:

The study concludes that in the electronics sector, variable pay acts as a double-edged sword. While it encourages performance and efficiency, it also increases stress due to high targets and income unpredictability. Organizations in the electronics sector should design compensation systems that balance performance incentives with employee well-being.

Transparent communication, realistic goal setting, and a fair mix of fixed and variable pay can help sustain long-term motivation and productivity.

Recommendations (Students' Perspective):

Based on the findings of the study the following recommendations are suggested:

- Organizations should maintain a balanced mix of fixed and variable pay to ensure income stability.
- Performance targets linked to variable pay should be realistic, clearly defined, and achievable to reduce unnecessary stress.
- Transparency in the calculation and distribution of variable pay should be ensured to build trust among employees.
- Regular communication and feedback regarding performance and incentives can help reduce anxiety related to appraisals.
- Companies should introduce employee well-being initiatives such as stress management programs and flexible work arrangements alongside performance- based pay systems.

Limitations:

- The study is limited to electronic sector employees only.
- Small sample size restricts generalization of results.
- Responses are based on personal perceptions, which may involve bias.

Bibliography:

Primary research- Charvi Khandelwal & Urja Kakani research paper

Secondary research- Past research paper reading

Annexure:

1. Variable pay motivates to perform better at work
2. Most of the people prefer a higher fixed salary over a higher pay component
3. Variable pay causes stress and anxiety

4. Unrealistic targets linked to variable pay increase work pressure
5. Stress caused by Variable pay negatively affects work performed
6. Variable pay system is fair
7. Income unpredictability and high stake targets cause stress as major elements of variable pay system
8. Competition with colleges for incentives affects your motivation level
9. Variable pay harms your long term motivation and well being
10. Any suggestions/ comments to reduce stress or low motivation level caused by Variable pay system

Insurance - Based Compensation Benefits: A Public-Private Comparison Under 8th Pay Commission

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Abstract:

Insurance-based benefits are a major part of the modern compensation plan and provide financial safety against possible risks such as sickness, accidents, disability, and retirement. In India, the Pay Commission recommendations, which offer standardised and government-supported benefits, are the benchmarks of the compensation of the population. The companies in the private sector, in turn, provide flexible and performance-based insurance schemes and use market-based strategies.

This paper compares insurance-based compensation benefits in the public sector and the private sector organisations based on the 8th Pay Commission. It is based on the primary data collected with the help of a structured questionnaire on 43 participants. The focus of the study is on the coverage, flexibility, and efficacy with a special attention to such aspects as health, life, accident, disability, pension, and gratuity.

The findings indicate that the private sector offers more flexible and innovative benefits that vary across organisations, whereas the public sector utilises standardised programs in order to offer security and stability in the long run. To enhance the welfare of the employees, the study concludes by proposing a balanced approach that encompasses the flexibility of the practice in the private sector with the stability of those of the public sector.

Keywords: Insurance, Private sector, employee compensation

Introduction:

On the contemporary job market, pay has ceased to be confined to base wage and allowances. Companies are turning their attention toward the provision of insurance-based benefits that would ensure the financial and well-being of their workers are achieved. These are the health insurance, life insurance, accident cover, disability cover, and schemes including retirement. These types of provision help employees manage uncertainty and reduce financial strain, hence improving job satisfaction, performance, and commitment to a company in the long term.

The salary system of the employees of the Indian public service is typically guided by the suggestions of the Central Pay Commissions. These commissions are established with periodic intervals in order to examine the compensation structures, allowance, pensions, and the social security benefits of the government employee.

The changes in pay structures and insurance-related benefits are expected to lead to substantial changes in many employees of the many government departments, and the 8th Pay Commission is expected to be adopted. The public sector may not be that flexible but standardised government-supported insurance schemes usually provide stability and financial security in the long term.

The private sector organisations on the other hand base their compensation policies on the market. Insurance benefits are also commonly formulated in the private sector to attract and retain skilled employees in a ruthless market. The flexible and performance-related insurance packages that a business can offer are comprehensive health plans, a higher number of people taking life insurance, wellness programs, and optional insurance plans just to mention a few. These benefits, however, may vary greatly depending on the size of the business, its financial capabilities, and industry benchmarks.

This therefore makes it important to make comparisons of insurance-based compensation benefits in the government and the private sector and especially after the 8th Pay Commission. The research of the kind can help to better understand the differences in the coverage of the insurance benefits, their flexibility, and effectiveness and can provide

recommendations on how to improve the pay system to boost the wellbeing and economic sustainability of workers.

Background of The Study:

The concept of employee compensation has evolved in the last few years to be more than traditional compensation plans by including a multitude of insurance- based benefits. These are necessary in providing employees with social security and financial benefits in case of an unexpected event such as illness, accidents, disability, and retirement. Compensation through insurance is also becoming an important component of the total remuneration in both the government and non-government organisations because of the escalating living costs and medical costs.

The element of the Central Pay Commissions that are periodically set up to review and modify the pay scales, allowances, pensions as well as social security benefits of government workers plays a great role in influencing the compensation platform of the Indian public sector. In making the recommendations on how to improve them, every Pay Commission will consider the variables such as inflation, the economy as well as the welfare of the workers. It is estimated that 8th Pay Commission is bound to affect the lives of many employees of the federal and state governments that will likely see most changes implemented in the types of pay structures and insurance-related benefits. Public sector insurance benefits are usually standardised, government assisted and aimed to bring about long term financial stability however they may lack a lot of customisation and flexibility. Conversely, the private sector businesses are market-driven approaches towards pay and benefits. In the personal sector, pay developed using insurance is often established to attract, motivate, and retain employees in a ruthless corporate environment. The flexible and performance-based insurance packages that are commonly offered by businesses include group health insurance, life insurance, accident coverage and wellness programs just to mention a few.

These distinctions mean that a comparative analysis should be made between the insurance-based compensation benefits in the public and in the private sector organisations. This kind of study helps to understand the variations in the efficacy, adaptability, and coverage of insurance benefits especially with the 8th Pay Commission. It also provides insight into the

ways in which the pay plans can be enhanced to enhance the overall organisational success, financial stability, and employee welfare.

Statement of The Problem:

Insurance-based compensation benefits are critical towards providing financial security to the worker against such risks as sickness, accidents, disability and retirement. The way these advantages are established and implemented is however vastly different in organisations in the public and private sector. Even though they are not flexible, they are standardised and guided by Pay Commission, which ensures that there is a stability and a long-term security among the benefits of the public sector.

The enterprises of the private sector, in their turn, apply a market-oriented approach and provide various insurance benefits that are flexible and performance-related. Such discrepancy leaves inconsistency in the financial protection and coverage of employees. The 8th Pay Commission scenario needs a comparison study to understand the effectiveness, adequacy as well as fairness of the insurance-driven compensation in the two industries and also determine areas of correction.

Objectives of The Study:

1. To make a comparison on the insurance compensation benefits in government and non-government firms in the 8th Pay commission.

This goal is to compare insurance-based compensation benefits that are offered by government and non-governmental organizations as a part of the 8th Pay Commission. Health insurance, accident insurance, and life insurance are some of the insurance benefits that help the employees to be insured against financial risks and enhance job satisfaction and retention. The benefits are generally standardized in the public sector and are based on Pay Commission recommendations. The 8th Pay Commission is likely to present changes on the pay structures and social security benefits. Conversely, the insurance benefits in the private-sector firms are offered in accordance with market practices, performance, and organizational policies. This

research then aims at variation in coverage, elasticity, and efficiency of insurance benefits in the two industries.

2. To determine the kind of insurance benefits provided in the government sector as per the 8th Pay Commission system.

The second goal will be to establish the various forms of insurance benefits that various firms of the public sector have in relation to the frameworks of the 8th Pay Commission. The public sector organisations tend to offer insurance programs as standard and guaranteed insurance programs, which are typically government-wide, to the workers in order to bring financial stability and social security. These are normally benefits in terms of health insurance schemes that covers the hospitalization and medical bills, life insurance policies that provides money to the family of the employee in case of his or her death and accidental insurance that covers in case of medical accidents or disability. Moreover, the presence of other insurance-based types of compensation in the public sector such as disability cover, and other forms of retirement benefits such as pension, gratuities, and others. By discovering these benefits, the study will be aware of how broad, comprehensive and adequate the insurance covers are provided to the employees.

3. To determine issues and constraints of insurance-based compensation programs.

The third aim of the research will be to find out a comparative analysis of the structure, coverage and effectiveness of insurance-based compensation benefits in both the public and the private sector companies. The emphasis of the public sector is on uniformity, stability and long-term financial security using standard schemes, whereas the private sector is on flexibility, innovation and performance-related benefits. This goal will help it to assess the effectiveness of the insurance benefits provided to the employees by each sector in terms of financial security, access, and well-being, and to determine where it can be improved.

Scope of The Study:

The scope of the research defines the parameters in which the research has been conducted. Following the 8th Pay Commission, this research paper compares insurance-based

compensation benefits provided by Indian public and private sector businesses. The aim of the study is to understand the composition, scope, flexibility, and effectiveness of insurance-based benefits provided to the workers in both industries. It is based on secondary data collected in the form of scholarly studies, government reports, Pay Commission reports, company reports on compensation, and insurance reports.

1. Sectoral Scope

The study includes both government and non-government organisations. The public sector is regarded to include the undertakings of the state and federal governments, the departments of the state and federal governments as well as other government-controlled organisations. The pay arrangements of these organisations are influenced by the recommendations of the various Central Pay Commissions such as the forthcoming 8th Pay Commission. The private sector includes corporate organizations in an assortment of industries, such as manufacturing, services, IT, finance, and other businesses. Such businesses develop insurance benefits based on the policy of the business itself, the competitive circumstances, and they rely on market-oriented compensation methods. To understand the differences between insurance-based compensation plans, the paper analyses the two industries.

2. Conceptual Scope

The study concentrates on the aspect of insurance-based compensation benefits as a significant part of the employee compensation. The paper discusses some of the main aspects of insurance, such as:

- Health or medical insurance
- Life insurance
- Accidental insurance
- Disability coverage
- Pension and other retirement related benefits.
- Social security in the form of gratuity and others.

The paper looks at the character, format and scope of these benefits in the two industries. It also takes into consideration the areas of flexibility, standardization, funding patterns and the input of the 8th Pay Commission in influencing insurance of the public sector.

3. Analytical Scope

The researches compare and make the insurance types-based compensation benefits in significant dimensions, including:

- Insurance benefits that are offered.
- degree of coverage and economic security.
- Eligibility and benefit construction.
- Adaptability and tailoring of insurance policies.
- Contributions by the employers and funding mechanisms.
- Efficiency in terms of financial security of employees.

It is mostly a descriptive and comparative analysis based on the data gathered with the help of secondary sources, including the official reports, corporate documents, insurance business publications, etc.

4. Data Scope

The study is based on the totally secondary information collected through reliable sources. They are the government publications, the reports prepared by Pay Commissions, annual reports of companies, compensation surveys, annual reports of the insurance industry and the journals. The data is utilized to be familiar with the existing insurance-based compensation schemes in the two sectors, and to analyse how the 8th Pay Commission is bound to influence the benefits in the public sector.

5. Practical Scope

The results of this study can be applicable in:

- Policymakers and government authorities who were involved in decision-making.
- Pay Commission. Government agencies that analyse the employee benefits programs.
- Individual firms that have the goal of developing competitive insurance-based compensation packages.
- HR practitioners who want to enhance the welfare of employees and ensure their financial stability.
- Researchers examining the compensation systems and social security advantages in India.

The research yields information on the advantages and drawbacks of insurance-based remunerations in the two industries and recommends on areas that could be enhanced in ensuring equity, adaptability, and employee welfare.

Research Methodology:

Research Design

This is research that follows descriptive and comparative research design. It aims at comparing the insurance-based compensation benefits between the public and private sector companies and conducting a comparison. The design is directed at the conceptualization of the structure, coverage and efficiency of such benefits with the 8th Pay Commission in view.

Sources of Data

The sources of data used in the study include both the primary and the secondary sources of data.

Primary Data: This data is gathered referring to the application of structured questionnaire to collecting 43 respondents.

Secondary Data: It is a type of data that is collected using reputable sources. They include government publications, Pay Commission publications, annual reports of companies, publications of the insurance industry, compensation surveys and scholarly academic journals on employee benefits.

Sampling Method

The study follows a non-probability method of sampling, whereby the convenience sampling method is used. The respondents have been selected because they were convenient and willing to participate.

Sample Size

The sample size for this study is 43 respondents.

Research Instrument

The questionnaire in this study was structured and served as the primary research instrument. It was composed of close-ended questions and Likert-scale statements to gather the view of the respondents regarding the insurance-related compensation benefits in the public and privatized sector organizations. The questionnaire was about such aspects as the type of insurance, the extent degree, the flexibility, and employee satisfaction. It was simplified and made easy to understand to get plausible answers. Analytical comparison of data obtained was done.

Data Analysis Tools

The analysis of the responses obtained and analysed employed descriptive statistical tools that included:

- Frequency distribution
- Percentage analysis
- Mean score comparing (using Likert scale).
- Comparison of responses interpretation on value of insurance to the populace and the private sector.
- Thematic analysis of such key variables as coverage, flexibility, and staff satisfaction.

Literature Review:

The literature analysis gives the theoretical and research background to comprehend the insurance-based compensation benefits in the public and the private sector organisations. Its benefits like health insurance, life insurance, accidents cover and retirement are critical in providing financial stability and happiness among employees in regards to employment as past researches have demonstrated. The wage of the Indian population in the public sector is severely impacted by the suggestion of the Central Pay Commissions that attempt to sustain equality and stability in the benefits of the employees. The other is the market driven stance that is held by the companies working in the private sector that in most cases provide flexible and performance-based insurance benefits. The existing literature available in the market explains the disparity in terms of the insurance benefits cover and structure of the two sectors.

Key Studies and Findings:

The compensation benefits based on insurance and its impact on employee welfare, organization performance and compensation systems have been researched several times. Three studies discussed below indicate significant themes that are relevant to the present research.

Article 1: Sharma and Gupta (2018) - Employee Benefits and Job Satisfaction in Organizations in the Public Sector.

The study by Sharma and Gupta is founded on the implication of insurance and social security benefits on job satisfaction among Indian workers in the Indian government sector. Health insurance sponsored by the government, pension schemes and gratuity benefits were observed to have a significant benefit on the morale of the employees and long-term commitment to employment. The benefits mentioned by the research are that in the case of the public sector, workers are provided with financial security and uncertainty is reduced due to the existence of stable and standardised benefits. It did indicate, though, that such programs tend to be rigid and they fail to meet the various needs of different workforce in a manner that suits them.

Rao (2020) writes about Article 2: Pay Practices in Private Sector Organisations:

The authors of the study by Rao dealt with remuneration schemes of the firms in the private sector in the fields like manufacturing, banking and information technology. According to the study, the private businesses have used performance-based and flexible insurance plans as a means of attracting and retaining talent employees. These are the wellness programs, increased life insurance cover and personalized health insurance plans. The researchers decided that one of the distinctions between the benefits in the business sector and the ones in the private is that they are more creative and versatile, but they are diverse in nature, creating inequalities in the businesses in the sphere of financial stability and employee coverage.

Singh and Kaur (2022) Article 3: Compensation in the Public and Private Sector.

In their study, Singh and Kaur made a comparison of the Indian public and private sector companies in terms of pay structure. The research has discovered that pensions, government sponsored health plans which are insurance-based benefits are more predictable and stable to the public sector workers. The privatized workers on the other are usually more flexible and lucrative in the insurance schemes albeit less guaranteed in the long run. This analysis has

shown that the best plan of pay would be one that would combine the flexibility of the practices of the private sector and stability of the benefits of the public sector.

Thematic Findings

There are three key themes of analysis that appear in the reviewed studies:

- The benefits of insurance in financial well-being and work satisfaction. The insurance-based pay, according to all studies, is necessary to reduce financial stress among the employees and increase the morale and retention.
- Structural differences across sectors: Industrial, long-term, standardised, and safe benefits in the state sector. The main area of difference in the current study is the primary aspect of comparison: the flexibility, creativity, and result-oriented disposition of the various sector of the economy that is owned privately.
- There is a need of a hybrid or a balanced compensation plan. According to the literature, the responsiveness and flexibility of the practices of the private sector must be combined with the security of the benefits of the public sector in the form of an efficient compensation scheme.

Conclusion:

This research paper will end with the analysis of the composition and effectiveness of the insurance-based compensation in business within both the state and the privatized sector. It arrives at a conclusion that the benefits of the private sector are more flexible and performance-oriented, in contrast to those of the public sector, which are uniform and provide financial security over a long period of time. Nonetheless, the size of the difference in benefits across the organisations of the private sector is considerable whereas the programs of the public sector are often not tailored. The analysis highlights the merits and the demerits of the two systems. All in all, an effective compensation plan must be both flexible and stable like the private sector and the public sector.

Research Questions:

Insurance – Based Compensation Benefits in Private Sector Organisations:

- Q1. Insurance benefits are included as part of your total compensation package.
- Q2. Your organization provides group health/medical insurance.
- Q3. Life insurance coverage is provided by your employer.
- Q4. Accident insurance coverage is included in your compensation benefits.
- Q5. Your organization provides insurance coverage for family members/dependents.
- Q6. Payment of insurance premium is
- Q7. The health insurance coverage amount provided is adequate.
- Q8. Insurance benefits offered are competitive compared to other private companies.
- Q9. The insurance benefits meet the needs of employees at different job levels.
- Q10. You are well informed about the insurance benefits provided by your organization.
- Q11. The process of availing insurance benefits is simple and transparent.
- Q12. The insurance claim settlement process is timely and efficient.
- Q13. Cashless medical treatment facilities are easily available under the insurance policy.
- Q14. Insurance-based compensation reduces employees' financial burden during medical emergencies.
- Q15. Insurance benefits contribute positively to overall job satisfaction.
- Q16. Insurance benefits influence your decision to continue working in this organization.
- Q17. Private sector insurance benefits should be aligned with benefits recommended under Pay Commissions.
- Q18. The 8th Pay Commission will influence private companies to improve insurance benefits.
- Q19. Insurance coverage limits should be revised regularly to match rising healthcare costs.
- Q20. Overall satisfaction with insurance-based compensation benefits in your organization.

Insurance – Based Compensation Benefits In Public Sector Organisations:

- Q1. Insurance benefits are included as a part of your compensation package.
- Q2. Your organization provides group health insurance coverage to employees.
- Q3. Life insurance coverage is provided by your organization.
- Q4. Accident insurance coverage is provided by your organization.
- Q5. Family members/dependents are covered under the insurance policy.
- Q6. The insurance premium is paid by the employer.
- Q7. The current health insurance coverage amount is adequate for medical expenses.
- Q8. The insurance coverage provided meets the needs of employees at different levels.
- Q9. You are well informed about the insurance benefits provided by your organization.

Q10. The process of availing insurance benefits is simple and transparent.

Q11. The insurance claim settlement process is timely.

Q12. The insurance provider offers cashless treatment facilities.

Q13. Insurance benefits reduce employees' financial stress during medical emergencies.

Q14. Insurance-based compensation increases overall job satisfaction.

Q15. Insurance benefits influence employee retention in the organization.

Q16. Public sector organizations provide stable and structured insurance benefits to employees.

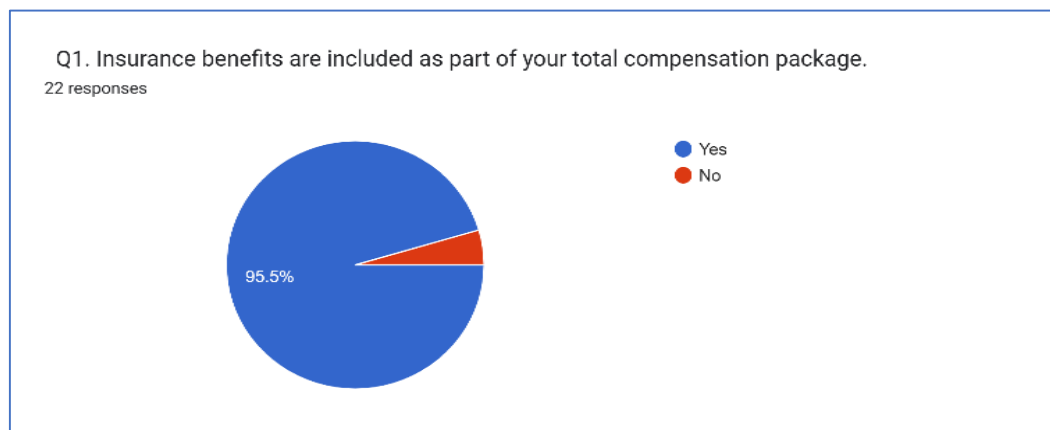
Q17. Public sector insurance benefits are more secure and reliable than those in the private sector.

Q18. The 8th Pay Commission should significantly improve insurance-based compensation benefits in the public sector.

Q19. Insurance coverage limits should be revised regularly to match rising healthcare costs.

Q20. Overall, you are satisfied with the insurance-based compensation benefits provided by your organization.

Responses for Private Companies:

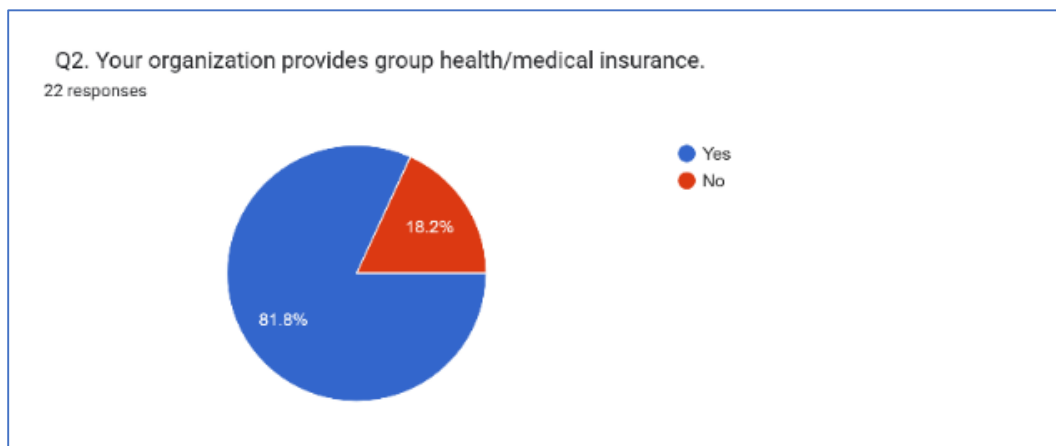


Yes: 21 (95.5%)

No: 1 (4.5%)

Analysis: Insurance benefits have become a standard part of compensation of the private sector with the vast majority of the respondents attesting that they form part of their compensation packages. This demonstrates how insurance is becoming an increasingly important component of general benefits as a tactical factor. Therefore, few organisations have not adopted comprehensive benefit structures as reflected by the very small number of people who are not

covered. Overall, it appears that the insurance benefits have been institutionalised in the private sector to a large degree.

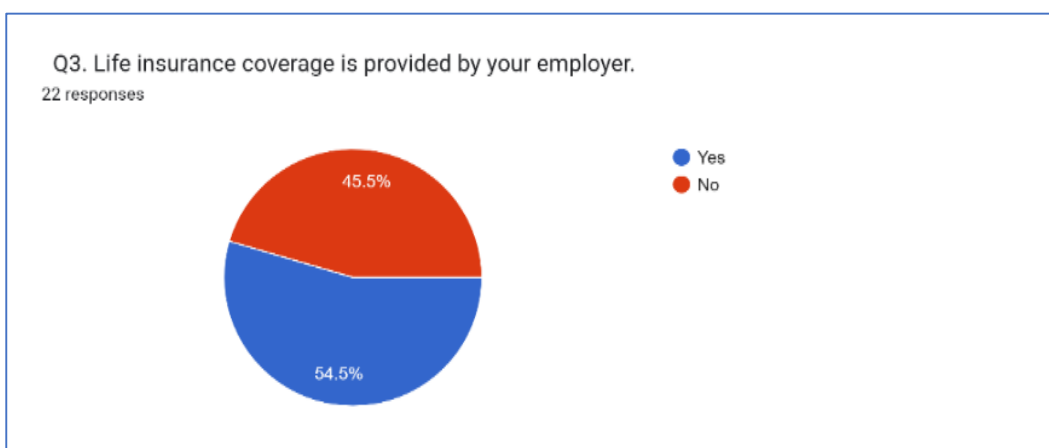


Yes: 18 (81.8%)

No: 4 (18.2%)

Analysis:

Since a large proportion of the respondents possess group health insurance, it can be concluded that medical care has become an important component of pay in the employee of the private sector. This is an example of how healthcare security is increasingly gaining importance in compensation programs. Nevertheless, nearly a fifth of the respondents were not covered, which means that organisational policy on employee welfare is inconsistent and implies organisational injustices, particularly in businesses that are smaller or price-sensitive.

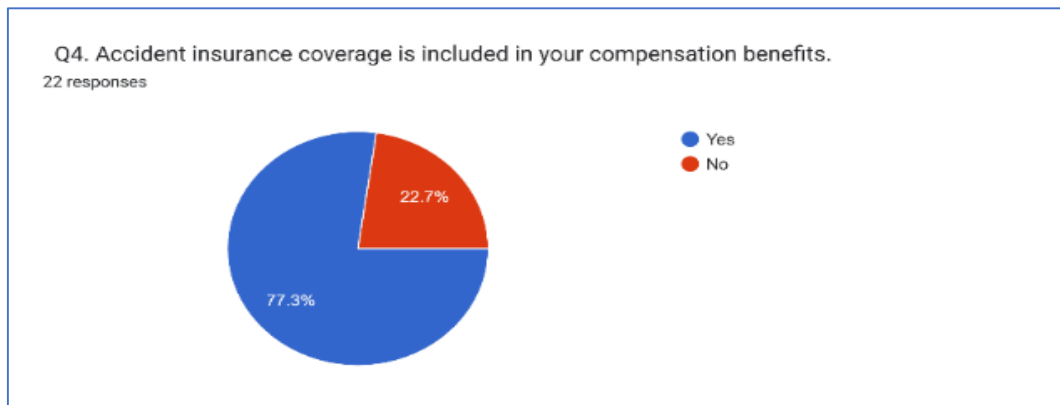


Yes: 12 (54.5%)

No: 10 (45.5%)

Analysis:

The almost equal distribution of the responses is an indication that not all life insurance is used by the private organisations. This means that the businesses may consider short-term health insurance more than long-term financial stability. Lack of uniformity in life insurance benefits indicates that other firms possess varying financial strength and compensation ideology.

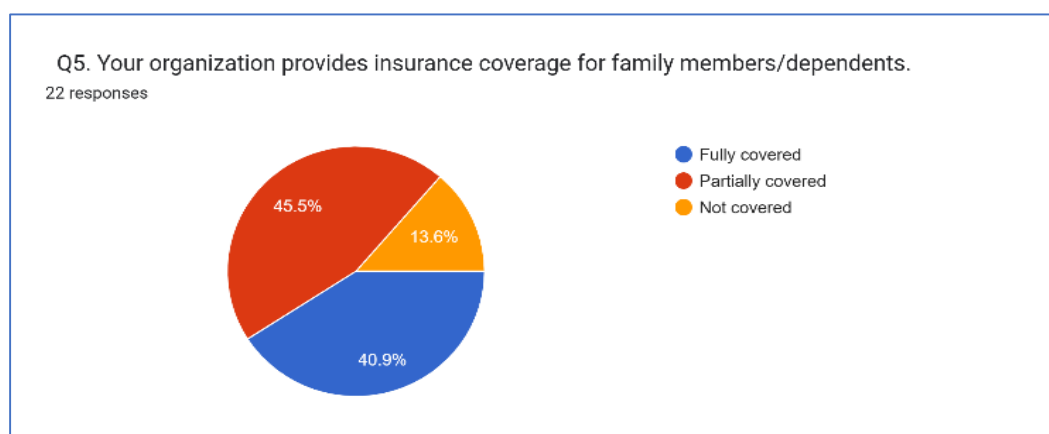


Yes: 17 (77.3%)

No: 5 (22.7%)

Analysis:

Most of the respondents possess accident insurance, which refers to its low cost and high value as a risk-reducing measure. However, the percentage of workers who are not covered (over a fifth) implies that there is no uniform protection of accident insurance between various private firms, and this means that there is no standardisation of accident insurance.



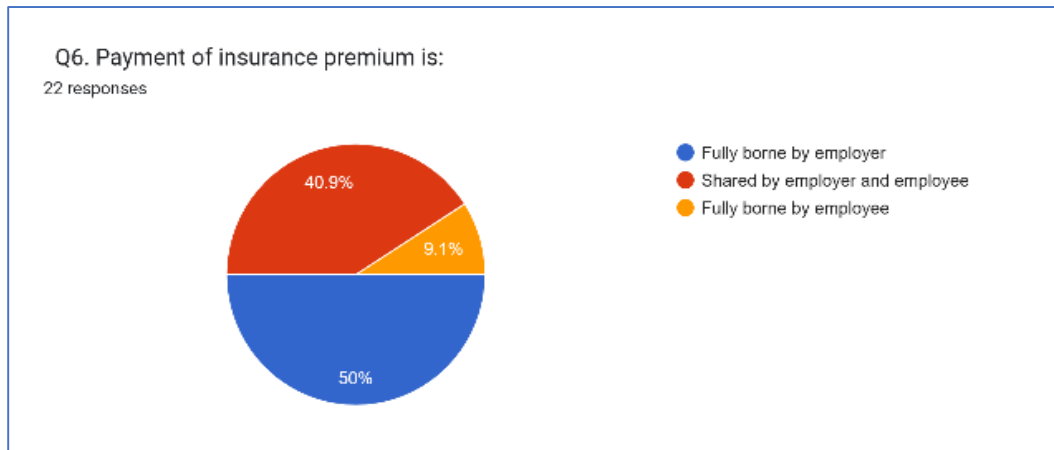
Full coverage: 9 (40.9%)

Partial coverage: 10 (45.5%)

No coverage: 3 (13.6%)

Analysis:

Although the majority of the responders have partial coverage as opposed to full coverage, most of them are covered under some type of dependent coverage. It is an indication that to balance the interests of the employees and the financial constraints, companies often resort to cost sharing or limited coverage plans. The gap in the levels of coverage underlines the lack of consistency in the benefit schemes of the private sector, but the flexibility of their adaptation.



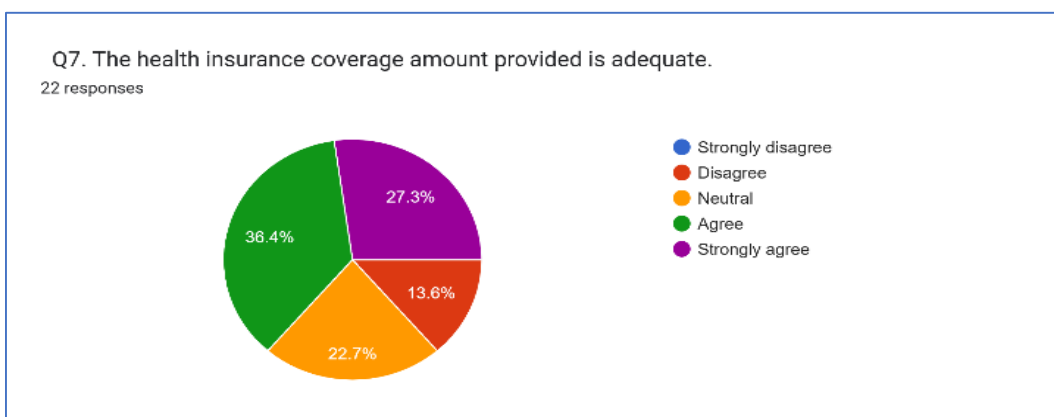
Fully borne by employer: 11 (50%)

Shared between employer and employee: 9 (40.9%)

Fully borne by employee: 2 (9.1%)

Analysis:

Premiums under employer coverage benefit half the number of the respondents, but a significant number also contribute a sizeable portion of the cost. This is one of the instances of a cost-sharing compensation plans, which is common among the privately owned companies seeking to find a balance between employee benefits and financial sustainability. The presence of employee-pay premiums in some organisations implies that the company is not committed.



Agree: 8 (36.4%)

Strongly agree: 6 (27.3%)

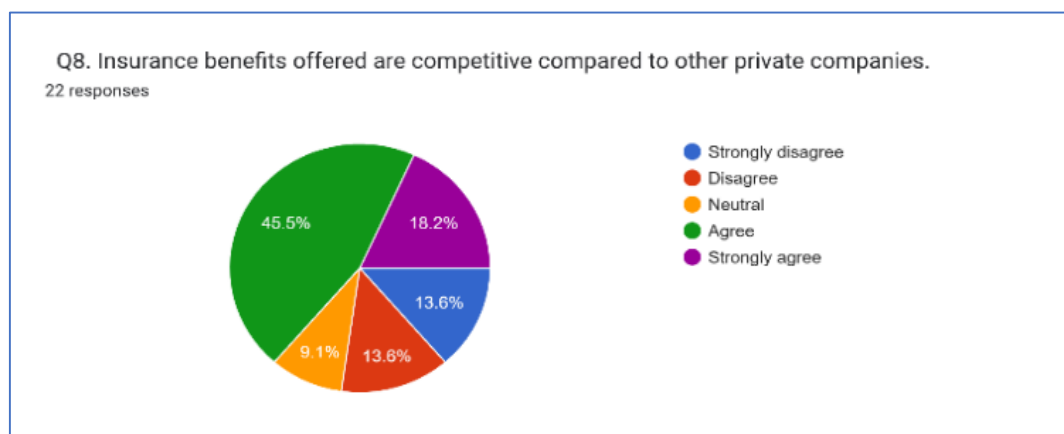
Neutral: 5 (22.7%)

Disagree: 3 (13.6%)

Strongly disagree: 0%

Analysis:

Although majority of the people believe that the coverage is adequate, more than one in three is either neutral or dissatisfied. It is possible to mean that perceived adequacy and actual healthcare spending can be out of balance, where the existing levels of coverage may not be consistent with the increasing medical costs or an assortment of employee demands.



Agree: 10 (45.5%)

Strongly agree: 4 (18.2%)

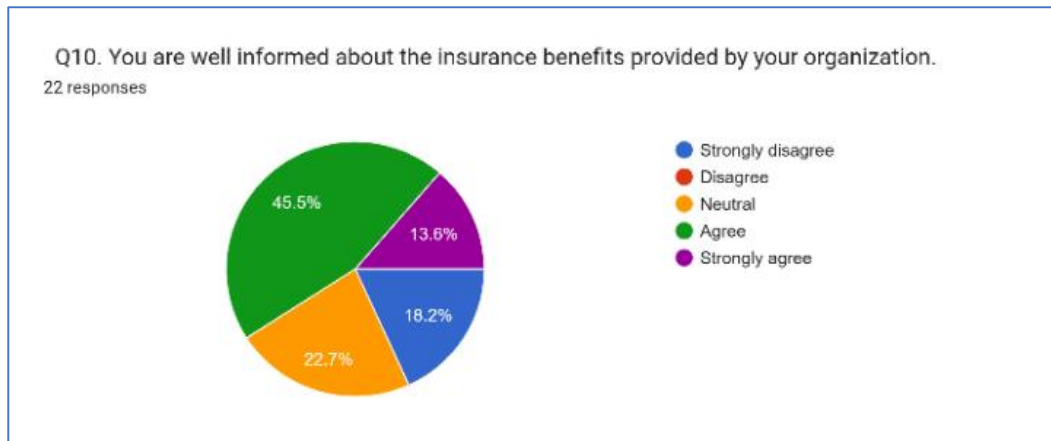
Neutral: 2 (9.1%)

Disagree: 3 (13.6%)

Strongly disagree: 3 (13.6%)

Analysis:

Most of the respondents are of the opinion that their insurance benefits are competitive which implies that the market determines how they will pay. Over a quarter of people do not agree, however, which suggests significant distinctions between businesses and unequal norms of benefits packages across the private sector.



Agree: 4 (18.2%)

Strongly agree: 1 (4.5%)

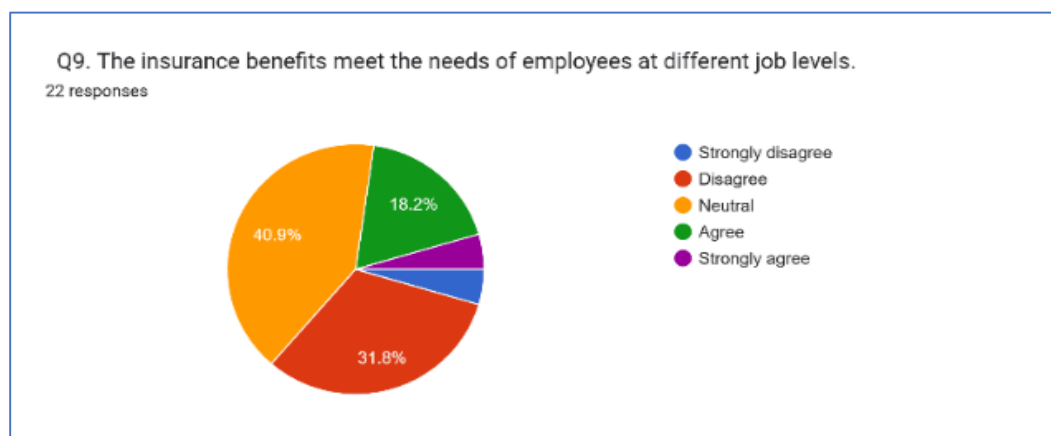
Neutral: 9 (40.9%)

Disagree: 7 (31.8%)

Strongly disagree: 1 (4.5%)

Analysis:

The high rates of negative and uninterested responses indicate that insurance benefits were not adjusted to different degrees of hierarchy adequately. This is an indication of the common use of standard benefit plans that may not consider the various risk profile and financial needs of various groups of employees.



Agree: 10 (45.5%)

Strongly agree: 3 (13.6%)

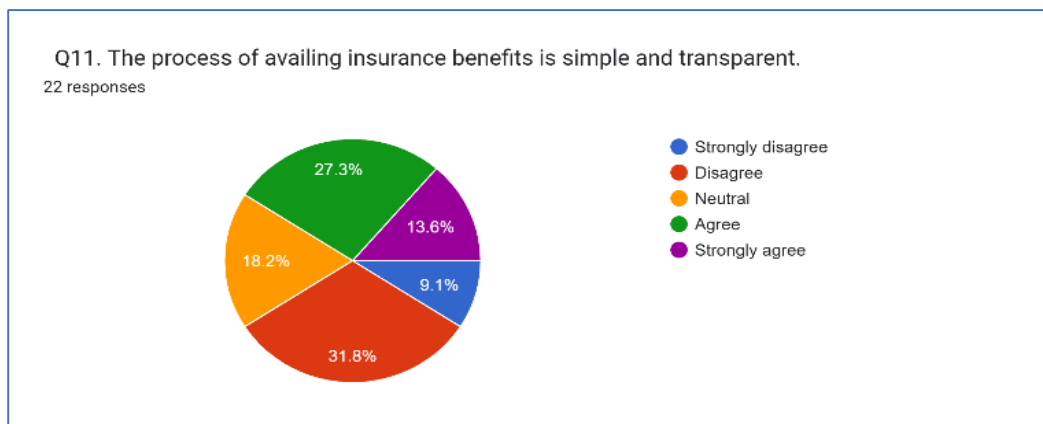
Neutral: 5 (22.7%)

Disagree: 0%

Strongly disagree: 4 (18.2%)

Analysis:

Although the majority of them claim to be adequately aware, a large proportion of them are indifferent or uninformed. This implies that businesses are possibly not well advising employees on the insurance benefits availed to them since it demonstrates a weak spot in HR practices.



Agree: 6 (27.3%)

Strongly agree: 3 (13.6%)

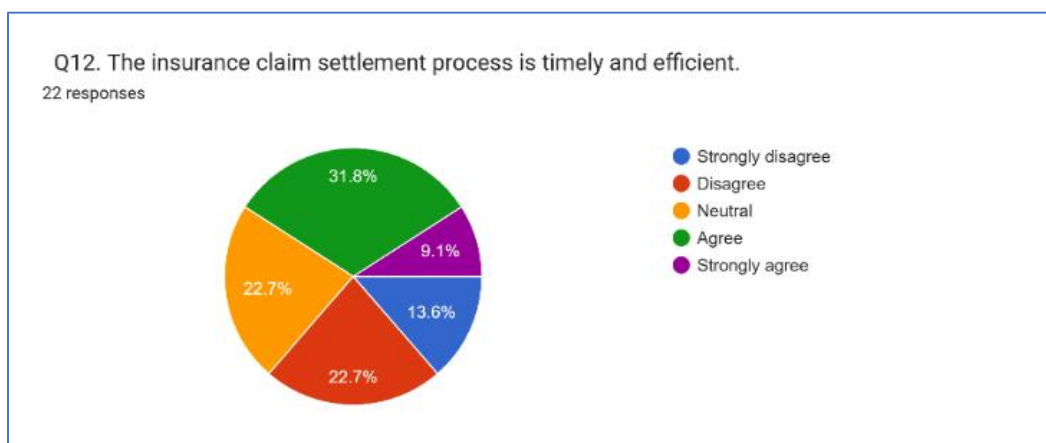
Neutral: 4 (18.2%)

Disagree: 7 (31.8%)

Strongly disagree: 2 (9.1%)

Analysis:

The prevalence of administrative efficiency inconsistencies is emphasized by the fact that the positive and negative feedback were equally as many. The complexity or ambiguity of processes in certain organisations seems to affect employee happiness whereas other organisations appear to be finding it difficult to cope with it.



Agree: 7 (31.8%)

Strongly agree: 2 (9.1%)

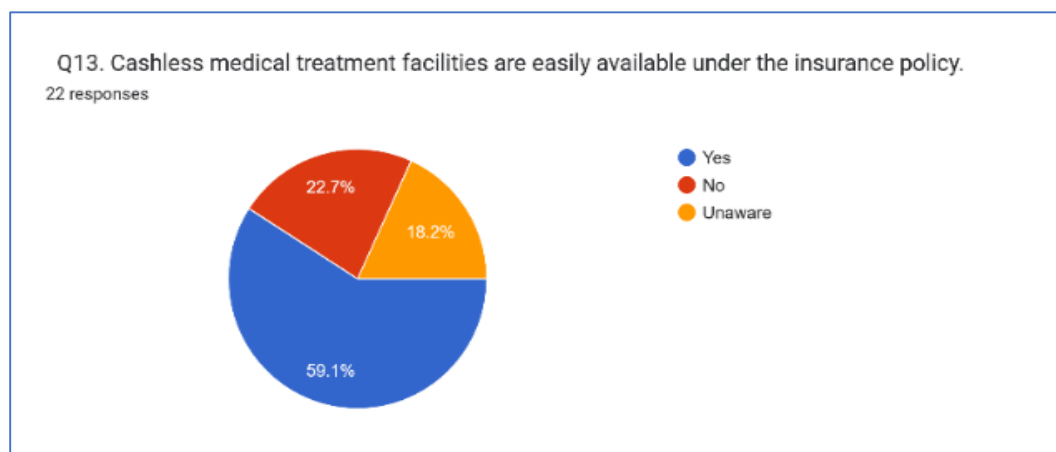
Neutral: 5 (22.7%)

Disagree: 5 (22.7%)

Strongly disagree: 3 (13.6%)

Analysis:

A large percentage of the respondents feels dissatisfied even though more than a half say that claims are resolved effectively. This implies that the performance of insurers and the support systems in the companies are not the same and this may influence the way the staff perceives the effectiveness of benefits.



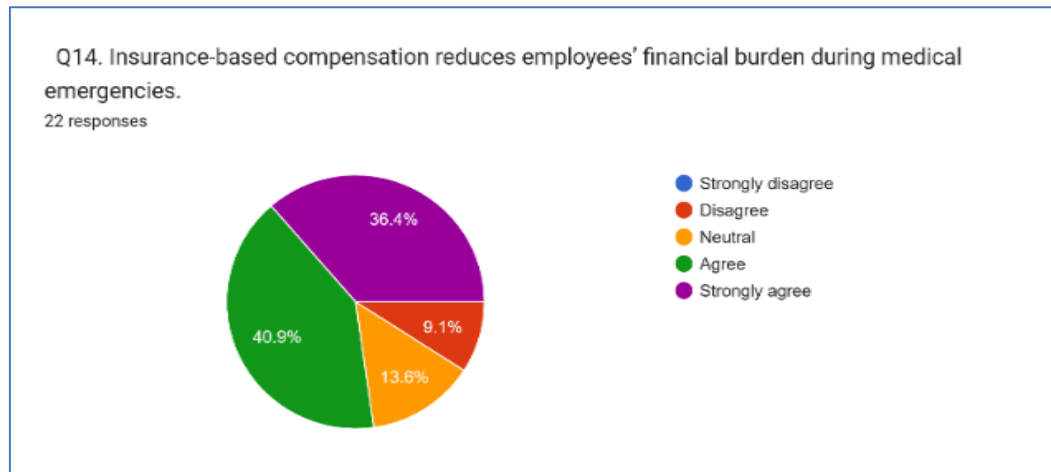
Yes: 13 (59.1%)

No: 5 (22.7%)

Unaware: 4 (18.2%)

Analysis:

The health insurance infrastructure has also been enhanced evidenced by a majority of them who reportedly have access to cashless facilities. However, over one-fifth face factors, meaning operational issues or network limitations of certain organisations or regions.



Agree: 9 (40.9%)

Strongly agree: 8 (36.4%)

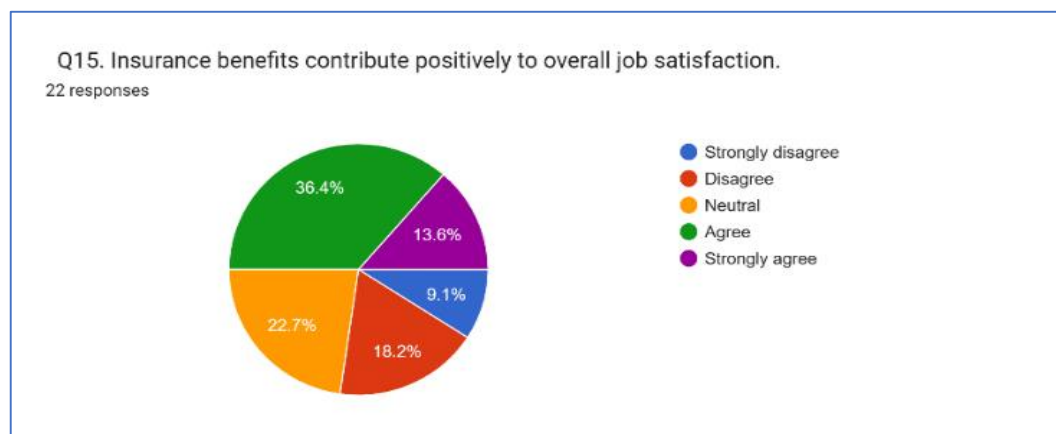
Neutral: 3 (13.6%)

Disagree: 2 (9.1%)

Strongly disagree: 0%

Analysis:

A robust majority recognizes the financial alleviation that insurance benefits give which validates their essence in playing a fundamental role as a risk-reduction tool. This strengthens the importance of insurance in improving employee wealth and welfare.



Agree: 8 (36.4%)

Strongly agree: 3 (13.6%)

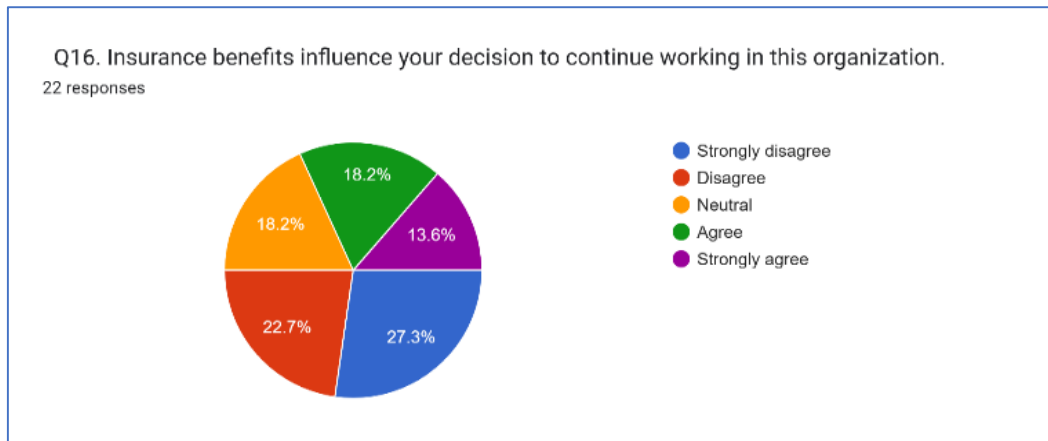
Neutral: 5 (22.7%)

Disagree: 4 (18.2%)

Strongly disagree: 2 (9.1%)

Analysis:

The majority of the respondents identify insurance benefits as increasing job satisfaction and it means that insurance benefits are non-monetary motivators. This justifies the compensation theories that put benefits in enhancing employee morale and engagement.



Agree: 4 (18.2%)

Strongly agree: 3 (13.6%)

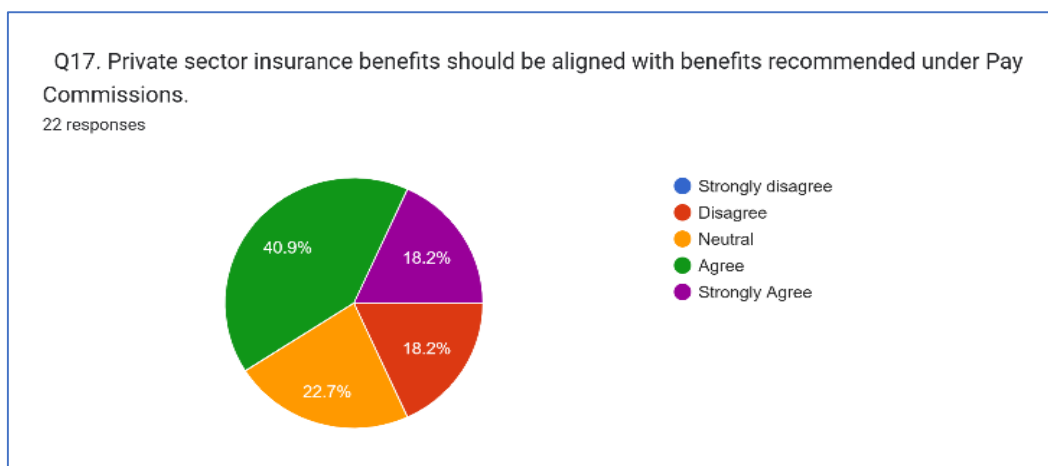
Neutral: 4 (18.2%)

Disagree: 5 (22.7%)

Strongly disagree: 6 (27.3%)

Analysis:

Over fifty percent of the respondents would review insurance perks as a retention factor, which indicates their significance in loyalty of employees and organizational dedication. Nonetheless, the note of the neutral and negative responses indicates that the benefits do not necessarily dictate the retention decisions.



Agree: 9 (40.9%)

Strongly agree: 4 (18.2%)

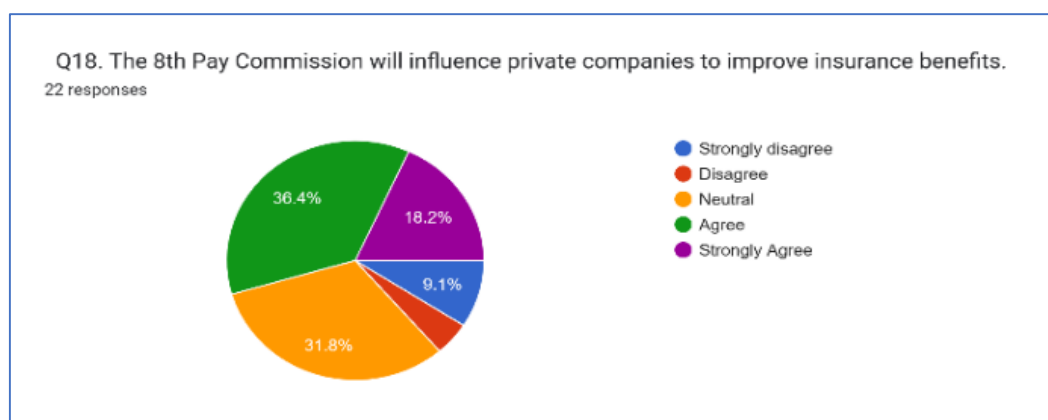
Neutral: 5 (22.7%)

Disagree: 4 (18.2%)

Strongly disagree: 0%

Analysis:

Most of them are in support of conforming to standards Pay Commission, which implies that there is an apparent difference in the security of benefits between sectors. This implies that workers consider schemes in the public sector as examples of being stable and reliable.



Agree: 8 (36.4%)

Strongly agree: 4 (18.2%)

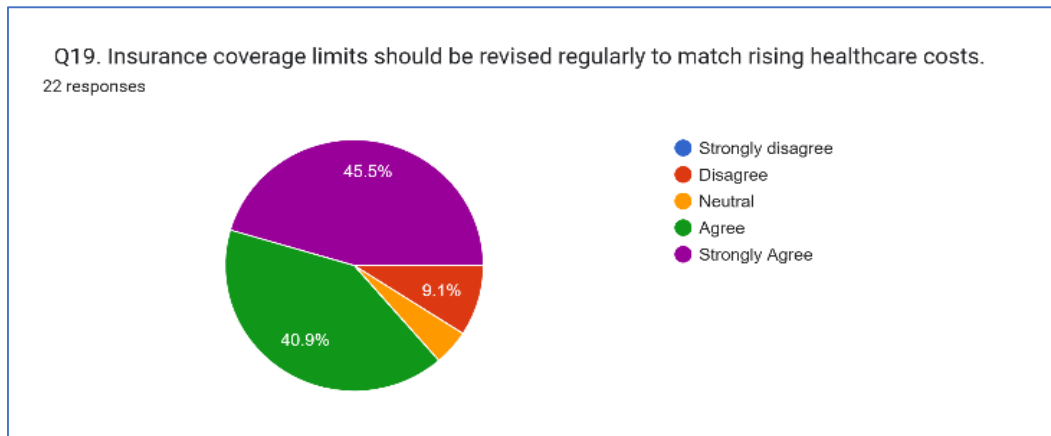
Neutral: 7 (31.8%)

Disagree: 1 (4.5%)

Strongly disagree: 2 (9.1%)

Analysis:

Most respondents believe the 8th Pay Commission will create benchmarking pressure on private organizations. This reflects the demonstration effect of public-sector policies on private compensation practices.



Agree: 9 (40.9%)

Strongly agree: 10 (45.5%)

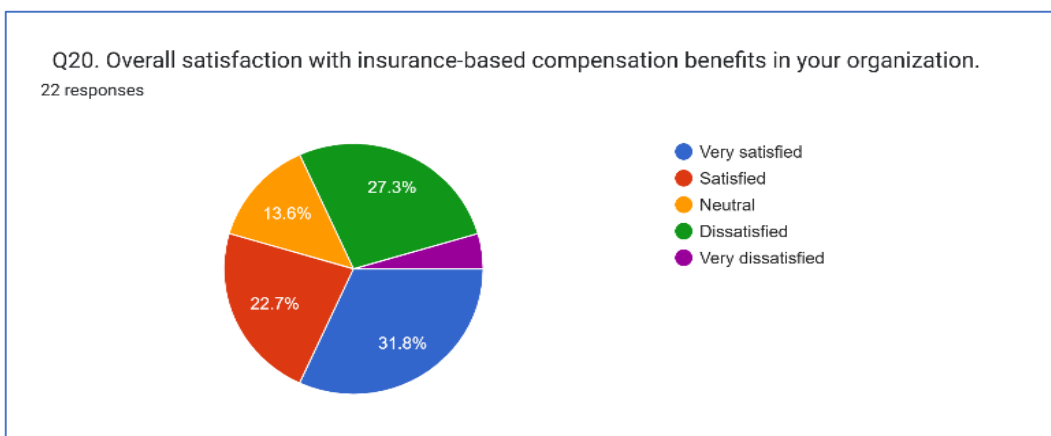
Neutral: 1 (4.5%)

Disagree: 2 (9.1%)

Strongly disagree: 0%

Analysis:

Majority vote overwhelmingly in favour of frequent revisions pointing to the issue of increased healthcare expenses and inflation. This means that there is high demand of dynamic and responsive insurance policies by the employees.



Satisfied: 5 (22.7%)

Very satisfied: 7 (31.8%)

Neutral: 3 (13.6%)

Dissatisfied: 6 (27.3%)

Very Dissatisfied: 1 (4.5%)

Analysis:

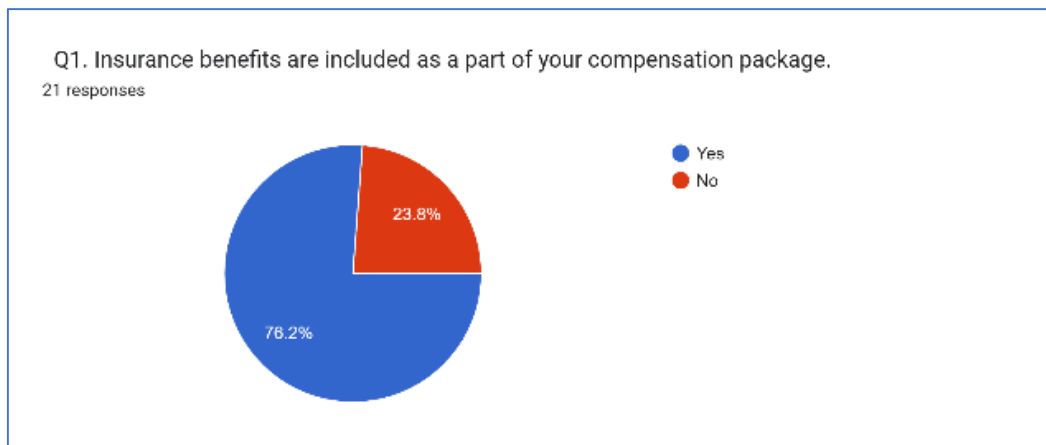
Although the majority of respondents are satisfied, there is still the large percentage of those

who are indifferent or dissatisfied. This indicates that despite the importance attached to insurance benefits, coverage, processes, and communication can be enhanced to increase the overall satisfaction of the employees.

Overall Analysis:

The answers reveal the fact that, although insurance benefits are prevalent in both sectors, there are several significant distinctions in terms of design and the perceived value of employees. Stability, dependability, and long-term financial security are mostly the benefits of insurance in the eyes of respondents in the public sector. The benefits provided to employees in the private sector, however, are more flexible and performance-driven, but they can also be easily identified in terms of coverage and sufficiency as well as administrative practices. The majority of respondents representing the business sphere express concerns about irregular benefits and the need to change the coverage limits regularly. However, the two parties recognize insurance usefulness in minimizing financial stress and increasing job satisfaction.

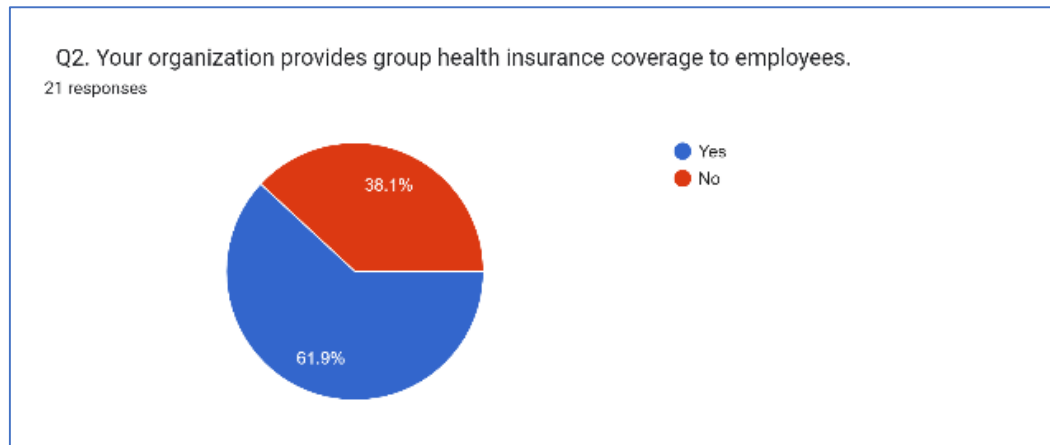
Responses for Public Companies:



Yes: 16 (76%)

No: 5 (24%)

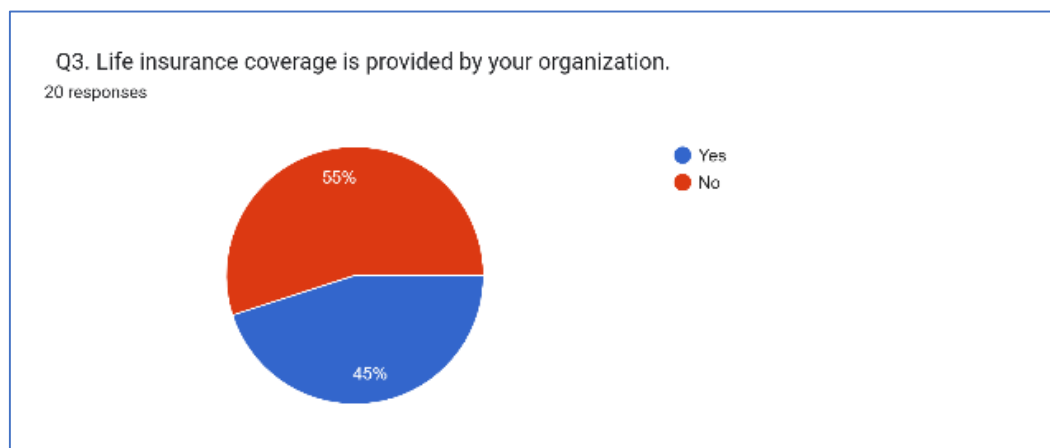
Analysis: It is evident that the respondents who are in the majority of the respondent count are actually being provided with insurance benefits as part of their compensation, which means that insurance benefits are a normal characteristic in the public sector. This is indicative of the welfare-oriented and structured nature of working in the government. Nevertheless, it is still uneven with almost a quarter of them deprived of these benefits. This disparity could be attributed to the discrepancy in the employment status or the departmental policy.



Yes: 13 (61.9%)

No: 8 (38.1%)

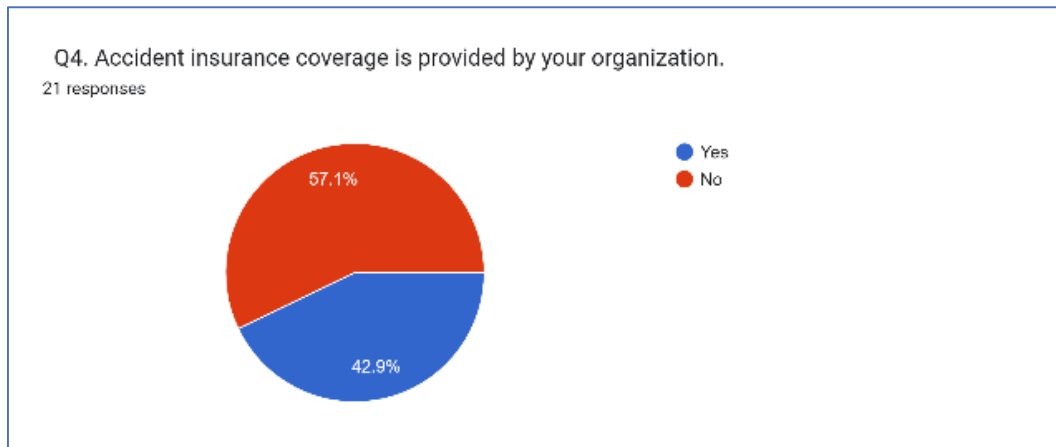
Analysis: The majority of the respondents attest to the presence of group health insurance, so the emphasis on the welfare of the employees in the public sector is high. This is an indication that health coverage is a recognized necessary benefit. But the fact that close to one-third is not covered is problematic. It indicates the necessity to be more uniform in all units and types of employees.



Yes: 9 (45%)

No: 11 (55%)

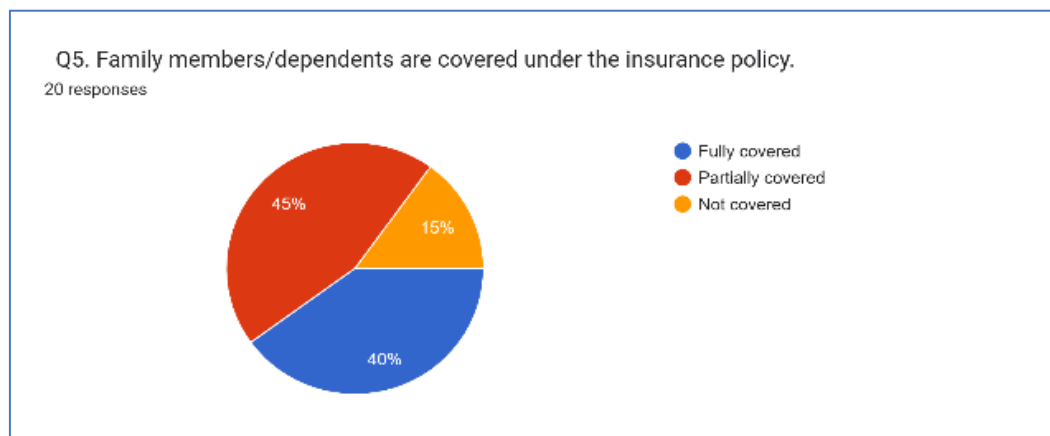
Analysis: The answers are nearly in equal measures indicating that there is no uniformity in the provision of life insurance in the public-sector organizations. This implies that there are institutions that provide a comprehensive risk cover, and those institutions whose primary aim is health benefits. The non-standardization can lead to decreased general security of the workers. It brings to the fore the importance of a wider coverage of life insurance in compensation policies.



Yes: 12 (57.1%)

No: 9 (42.9%)

Analysis: The coverage of the accident insurance seems to be inconsistent and only marginally fewer respondents pointed to its lack. This is an indication that there are high numbers of employees who are vulnerable to both occupational and personal risks without proper protection. This sort of inefficiency lowers the effectiveness of insurance-based compensation. This could enhance security and satisfaction of the employees by expanding the coverage of accidents.

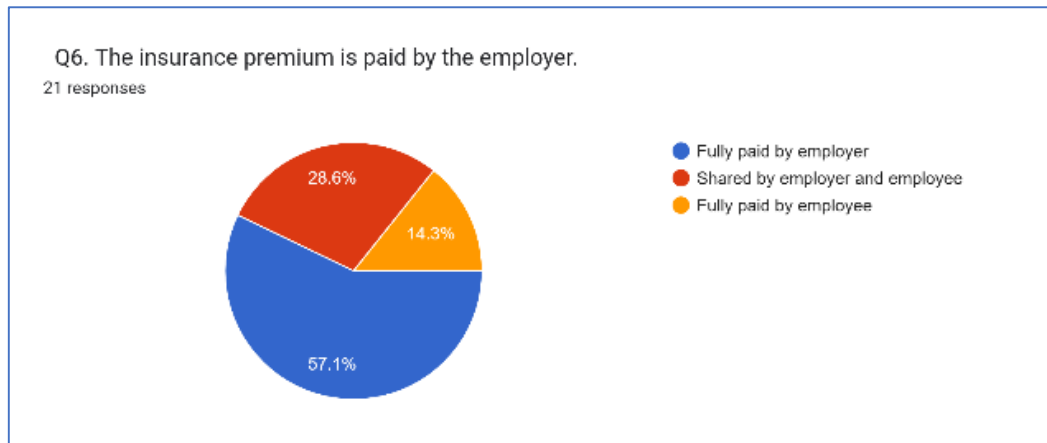


Fully covered: 8(40%)

Partially covered: 9 (45%)

Not covered: 3 (15%)

Analysis: Most of the respondents are at least partially dependent meaning that the benefits provided by the government are family oriented. Nevertheless, only a part of them are fully covered, and almost a quarter of them do not. This shows differences in policy generosity and form. Full dependent coverage expansion should help increase the value of compensation as perceived.

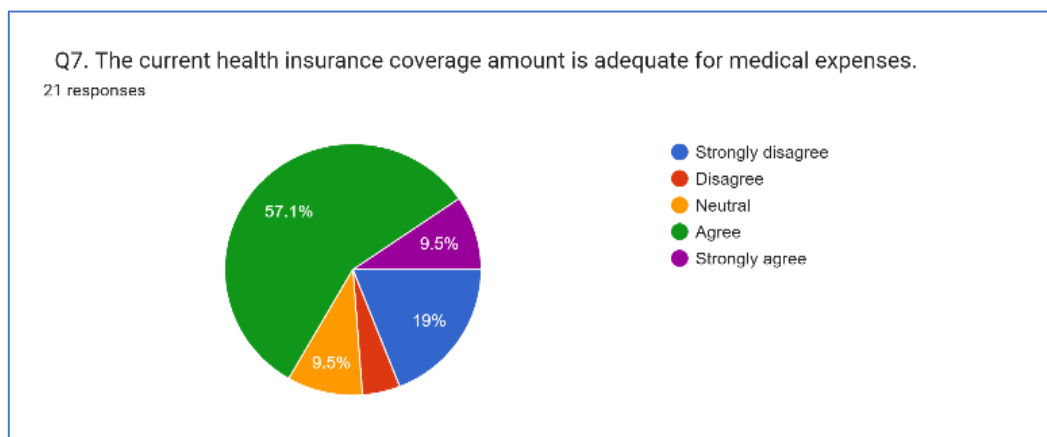


Fully paid by employer: 12(57.1%)

Shared by employer and employee: 6 (28.6%)

Fully paid by employee: 3 (14.3%)

Analysis: Most of the respondents have an employer-sponsored premium, which is a welfare-oriented strategy of the government sector. This is lessening the economic burden of the employees and makes government jobs more appealing. Nevertheless, there are employees who share or pay their premiums completely. This implies that there are differences between organizations on the structures of benefits.



Agree: 12 (57.1%)

Strongly agree: 2 (9.5%)

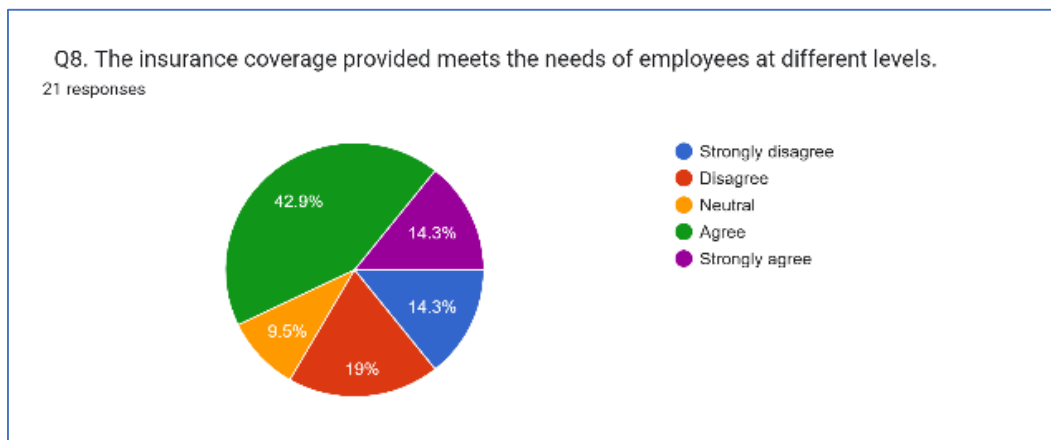
Neutral: 2 (9.5%)

Disagree: 1 (4.8%)

Strongly disagree: 4 (19%)

Analysis: The respondents are less than half that the coverage is adequate, and a large proportion of respondents do not agree. This is indicative of the increasing medical cost

concerns. The occurrence of the neutral responses indicates doubtfulness in the sufficiency of the coverage. On the whole, the results show that the coverage limits should be increased.



Agree: 9 (42.9%)

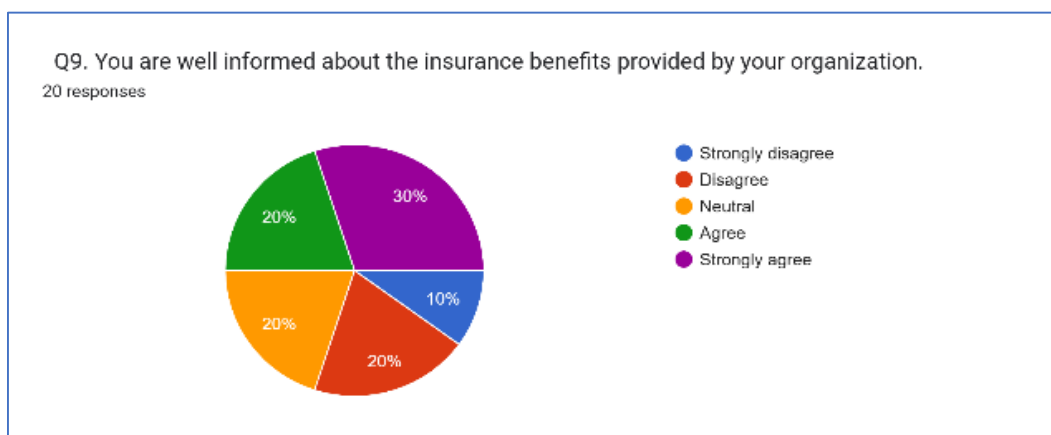
Strongly agree: 3 (14.3%)

Neutral: 2 (9.5%)

Disagree: 4 (19%)

Strongly disagree: 3 (14.3%)

Analysis: The reaction is mixed, which means that at present, insurance policies do not sufficiently meet the needs of employees of various hierarchical levels. A large neutral group is an indicator of indecision on the appropriateness of benefits. This can be an indicator of homogenous policies to various categories of employees. Satisfaction could be enhanced by having flexible and level based coverage.



Agree: 4 (20%)

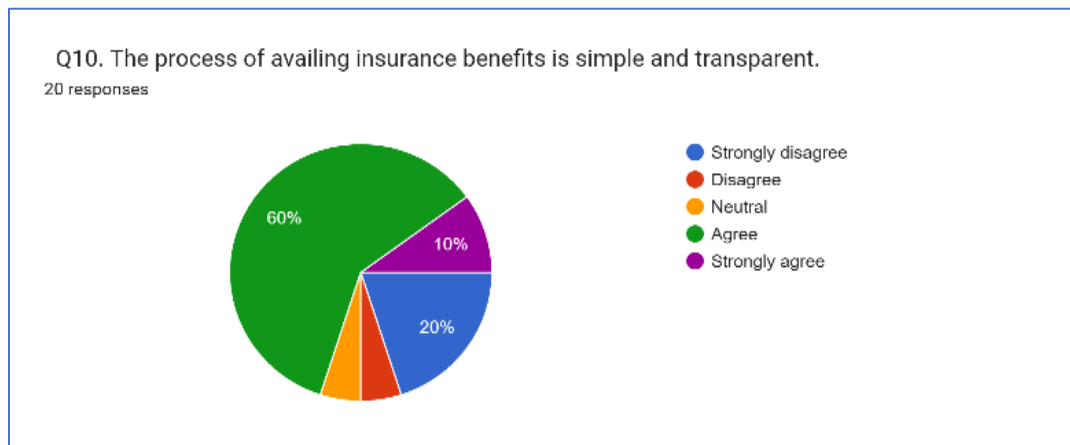
Strongly agree: 6 (30%)

Neutral: 4 (20%)

Disagree: 4 (20%)

Strongly disagree: 2 (10%)

Analysis: The number of respondents who are aware of their insurance benefits is quite low. This implies the lack of communication between organizations and employees. Perceived value of benefits can be lowered due to low awareness. Better information and orientation programs may increase the level of understanding and usage.



Agree: 12 (60%)

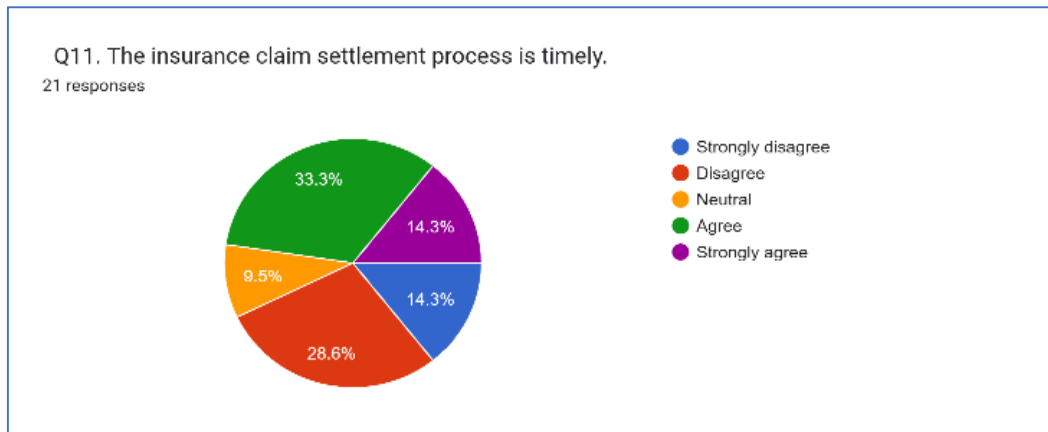
Strongly agree: 2 (10%)

Neutral: 1 (5%)

Disagree: 1 (5%)

Strongly disagree: 4 (20%)

Analysis: The process is very simple and clear to more than half of the respondents, which implies overall successful procedures. But almost a third still have problems. This implies administrative discrepancies. Employee experience could enhance through simplification of claim procedures.



Agree: 7 (33.3%)

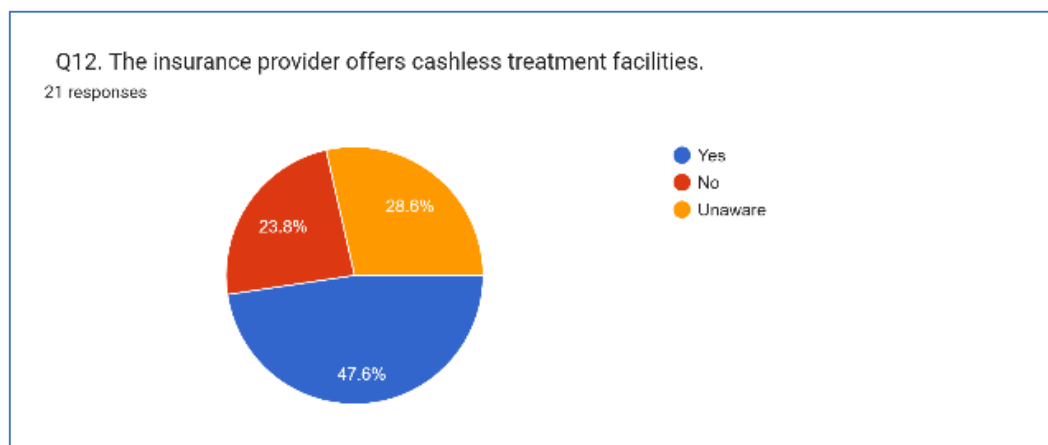
Strongly agree: 3 (14.3%)

Neutral: 2 (9.5%)

Disagree: 6 (28.6%)

Strongly disagree: 3 (14.3%)

Analysis: The reaction is balanced with both positive and negative experiences in settlement timelines of claims. Some employees report the settlements in a timely manner, whereas others are delayed. This discrepancy can decrease the confidence in the insurance system. Satisfaction could be improved by improving the efficiency of processing claims.

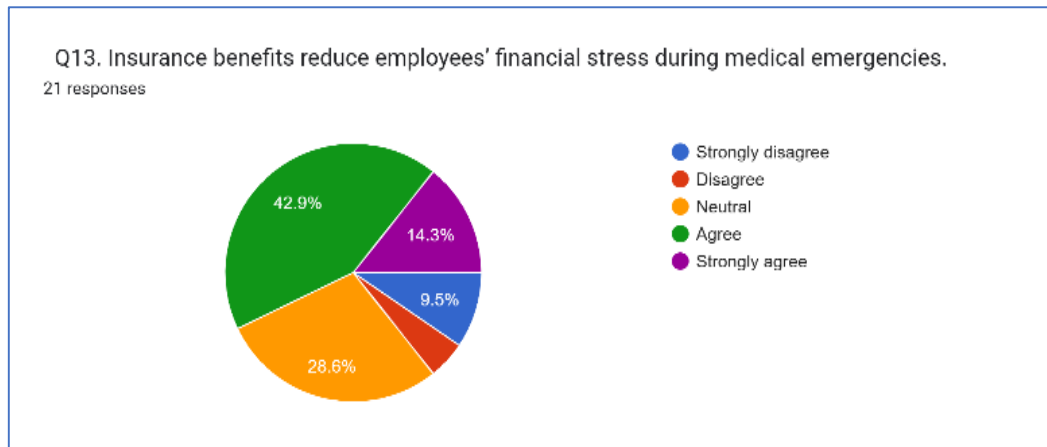


Yes: 10 (47.6%)

No: 5 (23.8%)

Unaware: 6 (28.6%)

Analysis: Much of the respondents do not have cashless facilities or are not aware of it. This implies accessibility as well as communication problems. One of the characteristics of the modern insurance policy is cashless treatment. Awareness and network hospitals may be improved to increase the use of benefits.



Agree: 9 (42.9%)

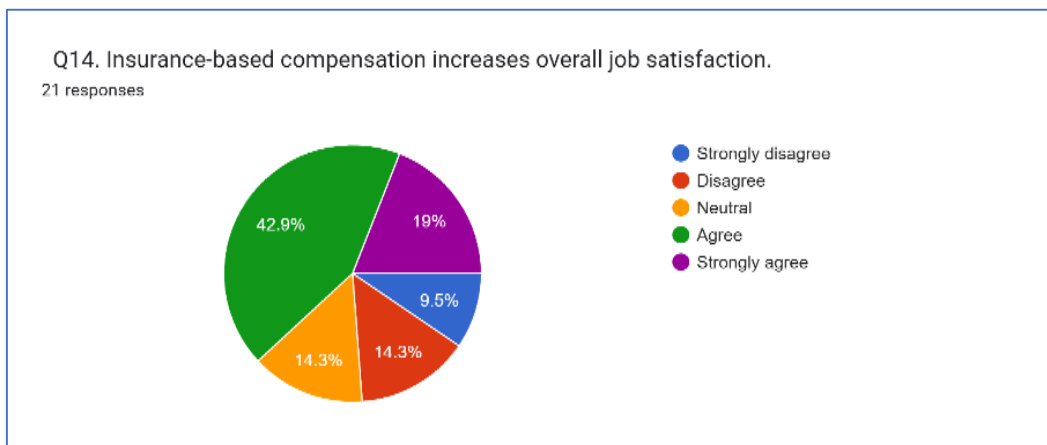
Strongly agree: 3 (14.3%)

Neutral: 6 (28.6%)

Disagree: 1 (4.8%)

Strongly disagree: 3 (14.3%)

Analysis: A clear majority recognize the stress alleviating nature of insurance benefits. This validates them to be significant as a form of social security. Nevertheless, not all employees are convinced, which may be caused by the lack of coverage or issues with claims. Improving coverage and processes would reinforce this perception.



Agree: 9 (42.9%)

Strongly agree: 4 (19%)

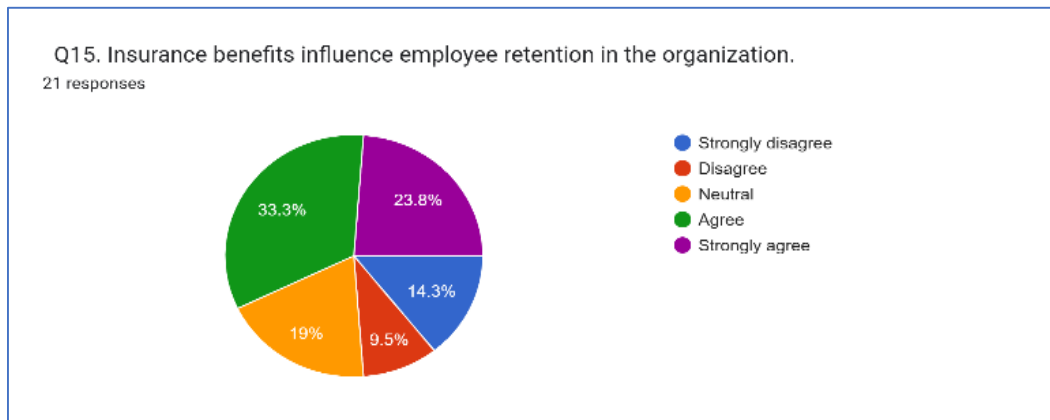
Neutral: 3 (14.3%)

Disagree: 3 (14.3%)

Strongly disagree: 2 (9.5%)

Analysis: The majority of the respondents assume that insurance benefits enhance job satisfaction. This demonstrates that this kind of benefits is a motivational factor other than a

financial security. A dissatisfied minority also proposes disproportionate experiences of benefits. Coverage and awareness would further improve satisfaction on strengthening.



Agree: 7 (33.3%)

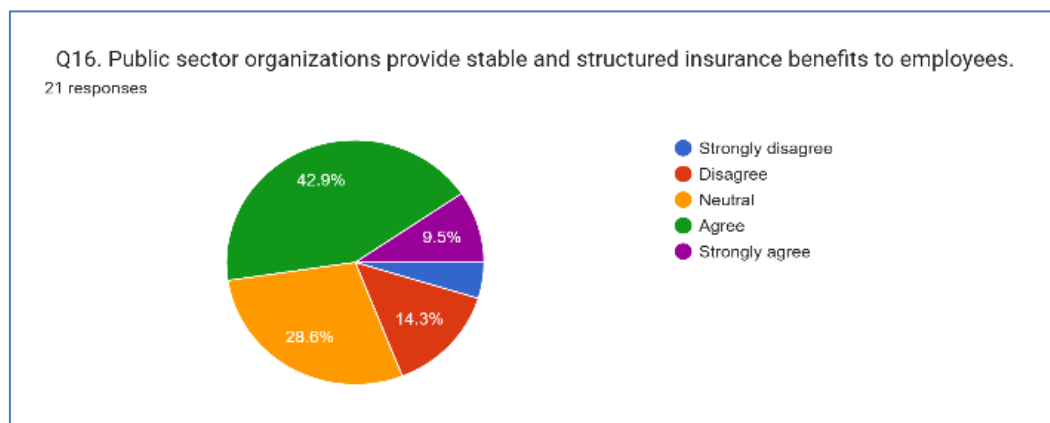
Strongly agree: 5 (23.8%)

Neutral: 4 (19%)

Disagree: 2 (9.5%)

Strongly disagree: 3 (14.3%)

Analysis: Over 50 percent of the respondents believe insurance benefits have a role in retention. This shows their strategic role in stability of workforce. But there is a significant non-partisan group that indicates that there is another influence on retention. Enhancing the quality of the benefits would make employees more loyal.



Agree: 9 (42.9%)

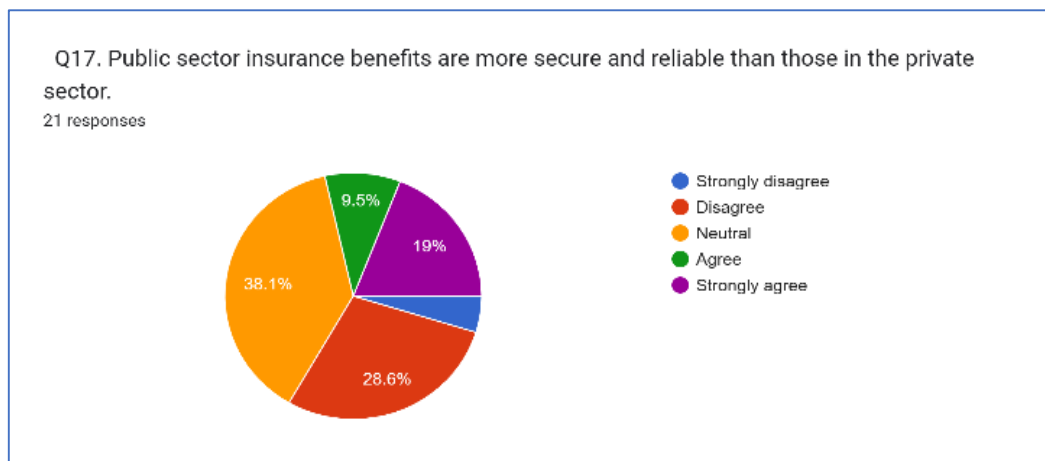
Strongly agree: 2 (9.5%)

Neutral: 6 (28.6%)

Disagree: 3 (14.3%)

Strongly disagree: 1 (4.8%)

Analysis: Almost half of the participants view public-sector insurance as stable and organized. This indicates the conventional power of the government work. Nonetheless, there is a high mixed neutral group, which shows ambivalent experiences. Further policy enhancements may support this impression.



Agree: 2 (9.5%)

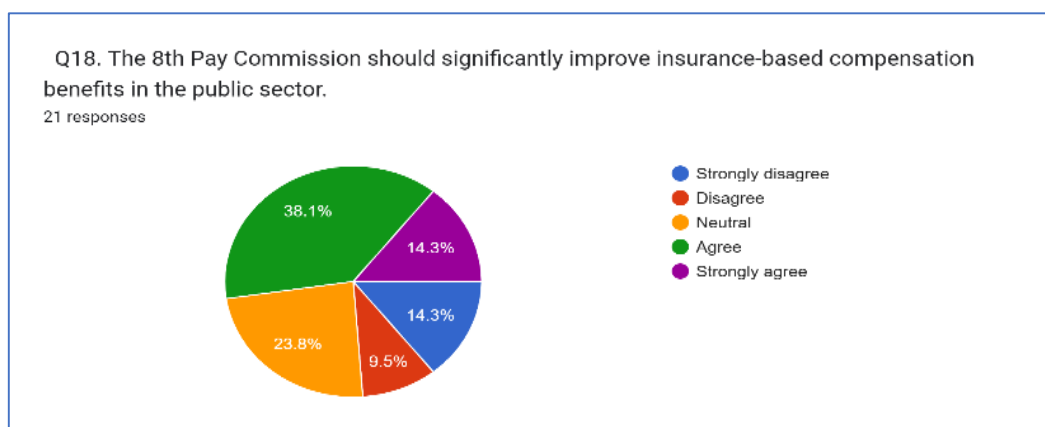
Strongly agree: 4 (19%)

Neutral: 8 (38.1%)

Disagree: 6 (28.6%)

Strongly disagree: 1 (4.8%)

Analysis: There is a mixed opinion with fluctuating views on the benefits of the public and private sectors. Whereas there are people who still consider the insurance of the public sector to be more secure, there are people who do not agree. This implies the intensification of competitiveness of packages by the private sector. It points out the necessity of modernization of benefits in the public sector.



Agree: 8 (38.1%)

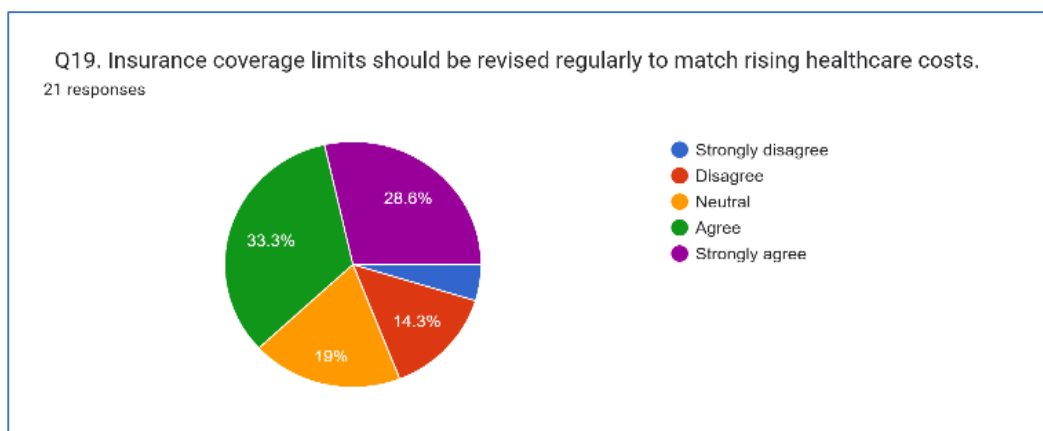
Strongly agree: 3 (14.3%)

Neutral: 5 (23.8%)

Disagree: 2 (9.5%)

Strongly disagree: 3 (14.3%)

Analysis: There is a vast majority of the 8th Pay Commission that is expected to improve insurance benefits. This is an indication of increased need of improved healthcare protection. The workers are starting to worry more on the increasing medical expenses. The findings indicate the apparent strengthening of the policy changes.



Agree: 7 (33.3%)

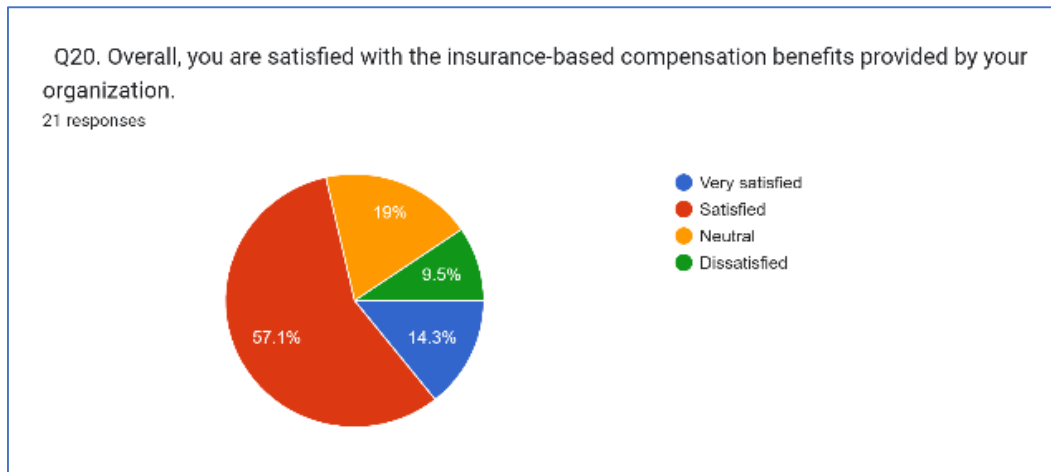
Strongly agree: 6 (28.6%)

Neutral: 4 (19%)

Disagree: 3 (14.3%)

Strongly disagree: 1 (4.8%)

Analysis: The majority of the respondents advocate frequent changes in coverage limits. This shows that there is a general anxiety on inflation and health costs. The employees require the insurance policies to be dynamic and responsive. Frequent revolutions might sustain the actual worth of benefits.



Satisfied: 12 (57.1%)

Very Satisfied: 3 (14.3%)

Neutral: 4 (19%)

Dissatisfied: 2 (9.5%)

Analysis: The satisfaction levels are fairly high, with approximately two-thirds of people saying that they are satisfied. This has been a mirror of the broadly designed character of social government assistance. Nevertheless, close to one-fifth are not satisfied. Adequacy of coverage and improvements in claim procedures would help enhance levels of satisfaction.

Overall Analysis:

The poll has shown that most of the workers are given group health care and employer-based premiums, which indicates that the inclusion of insurance benefits in the wages of the public sector is massive. But a good number of respondents are concerned with the sufficiency of cover yet life and accident insurance is usually not provided. In some cases, even the unawareness of the benefits and access to such services as cashless treatment appears. Nevertheless, most employees believe that insurance can be used in retention, job satisfaction and reducing financial strain. Despite the fact that the overall satisfaction is rather good, one can see that there are certain areas that require enhancement such as coverage limitations and communication of benefits.

Suggestions:

1. Raise the insurance cover limits regularly in line with their increased living and medical costs.

2. The private sector businesses should ensure that the insurance benefits are much more homogenised and standardised.
3. Public sector organisations should make benefit arrangements more flexible and adjustable.
4. Enhance awareness and communication to make the staff members understand the benefits of the insurance.
5. Make the process of claims faster and more transparent.

Limitations:

1. The research also criticizes the small size of the sample that only 43 respondents are not representative of all the workers in the public and the private sector.
2. The convenience sampling was used and as a result, responses were likely to be biased as regards to the selection.
3. Part of the information that is contained in the study is self-reported, and thus may be biased by personal views.
4. The paper fails to discuss every aspect of total compensation; it only discusses particular insurance benefits.

Future Scope:

1. To get more favourable results, the future study can include more participants representing different locations and industries.
2. Research can also be conducted on other facets of pay which are in forms of bonuses and allowances and other benefits.
3. A study involving longer period can be made to monitor the impacts of the 8th Pay Commission.
4. It is possible to study in future how insurance benefits are connected to worker happiness and productivity.

AI in Compensation Management: 2026 Industry Pulse

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Abstract:

Using 40 experts as a resource for validating why "clear-box" AI is necessary to comply with the law (by 2026) and for improving employee trust, this research looks at how compensation management shifted from being an administrative task to becoming one of HR's critical strategic functions supported by predictive analytics and Artificial Intelligence (AI). It can assist in solving things like: out of date benchmarks that go into how compensation is set before; ability to accurately predict future salary costs; identifying differences in pay; and need for employers to have measures in place to proactively stop employees from leaving the company.

Keywords: AI in compensation management, predictive analytics, pay equity, agentic AI, clear-box transparency, total rewards, attrition risk, human-in-the-loop, HR technology (HR-tech)

Introduction & Background Summary:

In 2026, companies are moving away from using manual spreadsheets and toward using AI systems for accountability and equal and fair pay between employers & employees. In a recent study of 40 experts in multiple disciplines, 77.5% of respondents indicated that using AI technology was developed primarily to overcome operational inefficiencies (e.g., 'spreadsheet fatigue' and errors made by humans). Current agentic (meaning that they can act on their own) AI systems used within today's compensation plan typically account for the expected salary

for each employee and compare that to the amount of salary that males and females would have received had they been doing the same job historically.

Approximately 45% of organizations are implementing a ‘Human-in-the-loop’ hybrid model whereby AI conducts the auditing and then people reach the decision.

As we move into 2026 we see that what used to be a back office function of HR have turned into the strategic role within HR in which digital shift compensation is managed as a key component of the human resource management function. Companies' continued need for human oversight will play a significant role in being able to spot employees likely to leave and provide justification for how pay differs among employees.

One of the biggest impediments to using artificial intelligence to aid Human Resource activities effective is what is commonly referred to as the "black box" nature of algorithms. Because there is no way to see the "decision making logic" behind how an algorithm arrived at its result, employees do not trust the system being used.

In today's labor market, where transparency is expected, all companies will need to develop "transparent" pay models to offer to their employees. However, while "the clear box" solution is trending in a more positive direction, there is still a significant difference between how much of the information provided is "rationale reports." According to recent survey results, three-quarters of respondents reported they had pay increase systems generating transparent rationale reports.

The major strategic effort must be focused on aligning speed with the explanatory nature of an algorithm, as these two measurements will ultimately determine whether the system is lawfully compliant and more importantly, if true pay equity between employees exists.

Research Objective & Questions:

Main Objective

The purpose of this study is to determine how much AI is being used in auditing and enhancing compensation plans today, and how effective it is.

The research will focus on four functional areas; through which the AI transition will be examined.

Implementation Context; which will investigate the drivers of AI under implementation (error reduction and/or equity), the software landscape under implementation (Enterprise HCM and/or Specialized AI) and the training of the human resources for the implementation of AI.

Baseline & Integration; will provide an analysis on the AI-Human Split in the audits of compensation, including the applications available to the AI for auditing (benchmarking compensation, identifying flight risks and/or identifying revenue leakage) and the technical sophistication of AI tools available for integration.

Accuracy & Ethics; will address the AI “Black-Box” issue through an analysis of data governance, the existence and availability of “Clear-Box” rationale reports in the use of AI, and the degree of human oversight and/or empowerment of managers in using AI.

ROI & 2026 Trends; will help to understand the future of personalized compensation plans and measure the actual impacts of AI on turnover, the fairness of pay and the efficiency of merit cycle processes.

Methodology:

Research Design: The research used a Quantitative Research Design, using a structured Google Form to collect data on 2026 AI adoption trends. The survey was organized thematically to allow for a comparative analysis of how AI is impacting compensation plans.

Sampling: The research employed a combination of Snowball and Targeted Strategies to identify high-level executives in the corporate sector using Snowball Sampling techniques. Initial outreach to the LinkedIn and NM College Alumni Networks focused on professionals in HR, Technology, and Consulting Management. Respondents were encouraged to refer their colleagues who work in Compensation and Strategy to ensure specialized data quality.

Respondent Profile Data was successfully collected from 40 authorized experts in their field. The sample was limited to 3 core classification groups: Compensation & Benefits (C&B), People Analytics professionals who manage algorithmic governance, and HR Strategy & Consulting professionals (including those with Big 4 firms).

Data Collection Tools: The primary data collection tool was a comprehensive 12-question qualitative survey that measured the 2026 AI adoption trends as well as readiness of human capital through training.

Ethical Guardrails and Privacy Enhancements: Strict academic protocols were followed and included: 100% Anonymity - No names (personal or corporate) were collected; Voluntary Participation - All 40 respondents participated with complete informed consent; and Confidentiality - Only in aggregate form (by way of the percentage or trend) were data presented, so that sensitive corporate information is protected.

Key Findings:

In this article, empirical information is demonstrated from 40 subject matter experts showing that there was a shift from manual compensation administration to data-driven auditing for compensation. Implementation and Software Ecosystem Motivation for AI adoption has primarily been operational, with 77.5% of organizations implementing AI to eliminate “spreadsheet fatigue” and manual error. Only 15% prioritized pay equity-related compliance, while just 7.5% emphasized “real-time” benchmarking. Most organizations use AI in conjunction with their existing Enterprise HCM platforms (such as WorkDay, SAP, and Oracle) rather than as stand-alone tools.

AI-Human Division of Labour (Automation Maturity) The industry currently has a preference for some human oversight over total autonomy at present:

- 45% (Hybrid Standard): AI performs the audits, while humans provide final approvals. 22.5% (AI-Driven): Systems provide suggestions for human approval.
- 15% (Legacy): Rely on 100% manual processes. 7.5% (Agentic AI): Reach 100% autonomous level.

- Functional Auditing — AI/Cross Checking AI is used to validate pay integrity against various attributes:
- 50%: Real-time external market benchmarking.25%: Identifying pay equity discrepancies within organizations (based on gender/ethnicity).
- 17.5%: Identification of "Flight Risks" via Comparisons Ratios.

Conclusion & Implications:

No More Guessing - By 2026, Artificial Intelligence was moved from being an experimental auditing tool; to being integral to the entire Compensation Management (CPM) process as an audit tool.

Organizational Integrity: 77.5% of organizations employed AI for the sole purpose to remove manual error from the process and showed that the use of only human audit practices alone can not provide enough support for modern pay structures.

The Hybrid Standard: The Hybrid Model is the industry gold standard as presently 45% of respondents used AI in the audit process while employing human judgement for final accountability

Expert Insight: Although the use of AI in the Compensation Management process resolves the market benchmarking issue, human judgement continues to serve as the critical filter for cultural and empathetic factors in making pay related decisions.

Implications Affecting the Workforce

Data-Driven Retention: With 47.5% of experts reporting that companies with data-driven pay practices had improved pay equity (Fairness) scores, transparent use of data in pay practices is an emerging area of focus for companies seeking to retain talent.

The End of Opaque Pay: The growing number of companies migrating to ‘Clear-Box’ paid practice and by 2026, the majority of the companies will have eliminated the practice of secretive pay increases.

Risk Factor: Firms not developing compensation practices using AI are at substantial risk of losing employee trust as well facing significant risks of fines due to a violation of the 2026 related mandates.

Artificial Intelligence (AI) provides the opportunity for Human Resources to transition from using a reactive approach to attrition management to one that is proactive, by assisting managers in identifying individuals that may be considering leaving the organization, thereby reducing recruitment costs.

Implications of the HR Profession

Role Transformation: HR managers are experiencing a transformation from being purely ‘Administrators’ to becoming ‘Data Interpreters’. In 2026, the value of HR managers will be in their ability to explain the logic behind the use of AI technology and their ability to manage the human aspects of AI.

Continuous Auditing: The use of Native AI-Human Capital Management (HCM) system integrations has resulted in creating a process for continuous auditing of pay equity. This will provide automatic adherence to pay transparency regulations in 2026, and ultimately provide organizations with increased protection against litigation.

Recommendations:

The research suggests an official implementation of a "Human-in-the-Loop" model whereby artificial intelligence serves as the auditing tool but people will necessarily have the final say.

A human will also need to filter the data for ethical purposes – as humans still know the unique situations that may affect the outcome of an algorithm’s assessment (i.e. someone is on medical leave/maternity leave) and the algorithm does not.

This way, by having the last word on any decision that is made on the basis of an algorithm’s findings, the human will prevent companies from being strictly reliant upon any

automated bias that might occur; thus ensuring that organisations take responsibility for the algorithms' findings.

Once the "Proficiency Gap" (average rating of 3.26 out of five) is sufficiently identified, both education and corporate training, and therefore proficiency levels can also be formally improved.

Institutions such as NM College will need to refine their curriculum, such as adding coursework in "AI Ethics and Bias in HR" and/or similar classes – this will allow graduates from NM College to become familiarised with the necessary skills needed to succeed in a data-driven work environment.

Companies can offer bi-annual workshops in which HR personnel would be educated on how to read and interpret the "Clear Box" rationale reports with their employees. Immediate attention should be given to organisations in the "Black Box" category (22.5%) regarding the timely transition to Explainable AI.

Q: Will the accuracy of a transparent rationale in respect to compensation increases affect company's Pay Fairness ratings positively and in-turn create higher company morale amongst employees?

Regulatory Requirement: Shifting to Clear-Box reporting is now legally required to adhere to the Pay Transparency laws of 2026.

Proactive Predictive Analytic Companies must go from reactive talent management to proactive talent management utilizing AI's predictive capabilities.

Retention Strategy: AI should flag 'Flight risks' by flagging who are top employees but are being paid less than current market rates.

Hyper-personalisation: Employers should transition from traditional-tiered benefits to an AI-determined 'Choice Menu' of benefits based on demographics of a given employee group.

Limitations & Future Scope:

To ensure the academic rigor of the research, the researchers acknowledge several constraints which dictate the scope and findings from their research studies:

Sample Size: The sample size of 40 industry experts whom this research is based on is both highly qualified, and yet does not represent the many and multifaceted dynamics of the global industry,

Geographic Bias: The researchers' use of the NM College Alumni Network and local LinkedIn circles more than likely creates both geographical bias towards Indian Corporates. For example, the use of a 45% recommendation to conduct longitudinal studies of employee retention after an AI-suggested Hybrid model only reflects regional veracity and may likely not represent global averages.

Sector Specificity: Because of the high rates of adoption in Technology Supplier (SaaS) and Professional Services, there may be portions of the results that will not be applicable to more traditional sectors like manufacturing, where highly manual processes are likely to still be prevalent.

Future Scope of the Fiscal Budget 2026 and Its Impact

The Union Budget for 2026-27 has recently initiated significant ‘force multipliers of the digital economy’ that will influence the next phase of research:

The Impact of the Fiscal Budget for 2026: The upcoming tax holidays for Cloud Services until 2047, as well as the ₹40,000 crore allocation for Electronics Manufacturing, is expected to drive infrastructure reductions in the cost of implementing Artificial Intelligence. The fiscal support has almost certainly provided the momentum behind the transition of the remaining 15% of manual laggards from this study to an AI-driven compensation audit process. Future research on pay transparency and "clear box" AI will need to examine how the 2026 Pay Transparency Regulations will impact the way that developers prioritize explainability.

Future research could evaluate whether there is a decreasing trend in the 22.5% 'Black Box' gap identified in this study due to the efforts of organizations to mitigate their risk of litigation.

Synergy & Retention of Workforces: A budget-mandated Committee on Education to Employment will conduct an audit of the effects that AI has had on jobs; this is consistent with our recommendation for longitudinal studies to measure the actual ROI of predictive analytics related to employee retention after receiving changes in pay due to AI prediction.

References:

Primary Source



Google Form Responses From 40 Industry Experts.

Secondary Source

PIB (2026): Budget 2026-27 lays strong foundation for AI Data Centres and Semiconductor Ecosystem.

KPMG India (2026): Union Budget 2026: A strategic push on AI, semiconductors, and data infrastructure.

A Dual-lens Analysis of Global best practices and India's Resource-Driven Self Reliance Path

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Abstract:

This Study examines India's pursuit of self-reliance in the context of natural resource utilization and prevailing global practices. Using a descriptive-analytical research design, the paper relies on secondary data sourced from national and international institutions to assess trends in Innovative capability, Employment generation, Implementation efficiency Sector- Specific Policy Initiatives, resource-based development. A comparative analytical framework is employed to evaluate India's self-reliance initiatives against selected global benchmarks in natural resource management.

The findings highlight the critical role of sustainable resource utilization and policy alignment in strengthening India's self-reliance strategy while remaining integrated with the global economic system. The study contributes to existing literature by providing a structured

assessment of self-reliance as a dynamic and globally interconnected process rather than isolationist approach.

Keywords: India Self-reliance, natural resources, global practices, economic policy.

Introduction:

Global economic uncertainty has intensified over the past years. Repeated chain disruptions, rising geopolitical tensions, growing technological dependencies, and climate-induced resource risks have collectively pushed countries to reconsider the foundations of their economic systems. In this context, national self-reliance and economic resilience have gained renewed importance with also citizens being patriotic about it. As a result, countries across the world are reassessing how effectively they utilize natural resources, strengthen domestic capabilities and reduce excessive external dependence. Although existing literature discusses self-reliance, natural resource management, and global best practices, these aspects are often examined separately, with limited integrated analysis linking technology, governance and resource efficiency.

This study seeks to address this gap by examining how leading economies combine technological capability, governance frameworks, and efficient resource utilization to achieve self-reliance and what lessons India can draw from these experiences and understand their context and probably get inspired through it. To do so, the paper undertakes a comparative analysis of Japan, South Korea, and Finland, focusing on economic indicators, innovation systems, industrial strategies and resource-efficiency mechanisms. These countries provide relevant reference points due to their emphasis on long- term planning, technological depth, and strategic management of resources, and particularly in areas where India continues to face structural and capacity-related constraints.

In response to repeated global shocks and emerging strategic vulnerabilities, countries such as Japan, South Korea, and several European Union members have gradually reduced their overdependence on extended global supply chains instead focusing on self-reliance to decrease the dependency. Instead, they have placed greater emphasis on innovation-led industrial strategies, domestic manufacturing strength, and secure access to critical resources.

Increased attention to circular resource use, energy security, and technological upgrading rather than withdrawal from global engagement. For India, these experiences offer important learning opportunities, particularly as economic resilience is increasingly tied to how efficiently the country utilises, manages and conserves its natural resources, such as minerals, energy, water and land.

India currently stands at a critical stage in its development trajectory. The pursuit of self-reliance in India has been reflected in several government-led policy initiatives. Among these, the Atmanirbhar Bharat Abhiyan has emerged as a key framework focused on strengthening domestic manufacturing, encouraging technology, and more sustainable use of resources. Programmes such as Make in India, the National Industrial Policy and the Production Linked Incentive (PLI) scheme further aim to enhance manufacturing competitiveness, support technological upgradation, and improve the efficiency of industrial processes. This has helped India a lot in these past few years but the outcomes are still in the developing stage.

At the same time, India has introduced several sector-specific initiatives across agriculture, energy and environmental management. These initiatives, supported by institutions such as NITI Aayog, the Ministry of Environment, Forest and Climate Change, and the Ministry of Mines, reflect a growing understanding that economic self-reliance cannot be achieved in isolation from responsible resource management. Measures are focused on renewable energy expansion, water conservation, mineral security and sustainable agriculture practices suggest that India's long-term growth increasingly depends on balancing resource utilization with conservation.

In this context, the study adopts a dual analytical approach by examining global best practices alongside India's policy framework in order to identify key strengths, existing gaps, and emerging opportunities related to natural resource utilization and self-reliance. By aligning international experiences with domestic priorities, the research seeks to develop a more grounded understanding of how India's economic resilience can be strengthened through strategic, sustainable and innovation-driven resource management at the same time, the study also acknowledges that challenges such as limited coordination, uneven technological diffusion and inefficiencies in resource allocation continue to constrain the overall effectiveness of these initiatives, and help us get the point of view of the structures and

patterns of these initiatives to understand this model clearly.

Literature Review:

3.1 Global Best Practices in Self Reliance

Japan: Self-Reliance and Innovation

Through innovation, digital transformation, and advanced manufacturing, Japan is often a strong example of industrial and technological self-reliance. However, this resilience has been built gradually and remains uneven across sectors

Japan's self-reliance strategy is examined in this section using:

- 1. Key Economic and Innovation Indicators**
- 2. Policy Framework**
- 3. Technology and Innovation**
- 4. Major Innovation Clusters**
- 5. Resource Utilisation**
- 6. Case Study**

1. Key Economic & Innovation Indicators

- ➔ GDP (2024): \$4.03 trillion, providing a solid economic foundation for the expansion of industry and technology.
- ➔ GDP per capita (2024): \$33,000 – supports capacity for innovation and workforce development.
- ➔ A strong industrial base is reflected in the manufacturing percentage of GDP (2023): 21%.
- ➔ R&D spending (as a percentage of GDP, 2023): 3.4% for domestic innovation.
- ➔ 2025 Global Innovation Index Rank: 12th for technological competitiveness.

2. Society 5.0 Policy Framework

It is a Human-centered technological vision that aims to unify physical systems with cyberspace while emphasizing on real-world social outcomes.

Focus Areas -

1. AI and automation in mobility: Smart transportation.
2. Robotics and advanced manufacturing: Domestic innovation and productivity.
3. IoT for plant and operational monitoring in infrastructure safety.
4. AI-driven research and commercialisation in biotech and advanced materials.
5. Digital services and smart living: Data driven answers to societal problems.

Important Takeaways

- Tech-driven self-reliance: Modern industrial and digital technologies have reduced reliance on external systems, though strategic dependencies remain.
- Human-centered & resilient: Strikes a balance between workforce empowerment, automation and disruption adaptability.
- Global lesson: The development of domestic capability can be guided by innovation and process optimisation, which can replace abundance of resources.

3. Technology & Innovation

- High patent output and robust R&D incentives have supported domestic innovation and long-term technical capacity.
- Specialised domestic ecosystems that integrate talent, production, and research, allowing innovation to shift from labs to industry.

4. Major Innovation Clusters

- Tsukuba with more than 300 labs dedicated to robotics, artificial intelligence, and nanotechnology, Science City is Japan's biggest scientific center.
- Keihanna City of Science: Focuses on ICT, smart-city technologies, AI, and green innovation. Toyota is part of the Aichi Robotics Cluster, an automotive and robotics hub that promotes industrial innovation and advanced manufacturing.

5. Resource Utilization

- The percentage of renewable energy rose from 21% in 2018 to 26% in 2022.
- Investing in a French refining project to lessen reliance on China is a rare-earth security measure.
- Energy self-sufficiency is still low, and policy improvements are happening

gradually.

6. Case Study: Toyota Production System

- Focuses on increasing efficiency, quality and reducing waste.
- Principles: **Just-in-Time manufacturing** and **Jidoka** (intelligent automation).
- Increases internal resilience, lessens reliance on outside sources, and exhibits process innovation that makes up for a lack of resources.

Important findings:

1. **Human-Centred Production:** Workers actively find inefficiencies to help boost output.
2. **Global Competitiveness:** Shows how cutting-edge industrial techniques can replace finite natural resources.
3. Increased domestic manufacturing capacity, technological leadership, and a decreased dependency on outside inputs are all benefits of economic resilience.

Finland: Resource-Based Self-Reliance and Sustainable Innovation

Despite its relatively small economic scale, Finland exhibits sustainability-led self-reliance by integrating circular economy and bioeconomy strategies supported by a robust innovation ecosystem.

1. Key Economic and Innovation Indicators

- ➔ GDP: Finland has a stable, innovation-driven economy, as evidenced by its USD 314.72 billion GDP.
- ➔ GDP per capita: At USD 56,084, it shows advanced human capital and high productivity.
- ➔ Manufacturing share: With a focus on high-value industrial output, manufacturing accounts for 13.86% of GDP.
- ➔ R&D intensity: 3.22% of GDP is allocated to R&D, promoting technological independence.
- ➔ Innovation rank: 7th in the world, demonstrating a robust domestic innovation ecosystem.

2. Policy Framework: National Circular Economy Strategy

- The Finnish Innovation Fund (Sitra) spearheaded its adoption in 2016.
- Transforms the economy from linear “take-make-dispose” to resource-efficient, sustainable systems.

Focus Areas include knowledge promotion, sustainability, multi-stakeholder collaboration, industrial innovation and Resource efficiency.

Important takeaways

- Innovation-driven self-reliance: using resources effectively has helped lower reliance on imports.
- Collaboration is crucial as it involves multiple levels of stakeholder helps ensure broader adoption and long term policy effectiveness.
- Systemic change is required as integration across sectors is essential; policy alone may not be sufficient without coordinated implementation.

3. Technology and Innovation

- Business Finland: Provides Funding for R&D, encourages internationalisation, and makes investment easier.
- Sitra (Innovation Focus): Data and artificial intelligence, health and well-being, and the circular economy.
- National Innovation System: Effective coordination between government, academic, institutions, business and industry.

4. Major Innovation Clusters

- *ICT, digital services, startups, and research-led innovation in the Helsinki-Espoo region. Oulu Innovation Cluster: Telecommunications, wireless technology, and electronics.*
- *Tampere Region: Innovation in engineering, smart manufacturing, and industrial technology.*

5. Resource Utilisation

- The circular economy maximises value addition, minimizes material extraction, and

maximises reuse.

- Material efficiency: product life-cycle management and recycling are enhanced by Policy-driven innovation.
- Bio-based resources: Sustainable materials are supported by forestry and bioeconomy
- Energy transition: Reliance on fossil fuels is decreased by a large proportion of renewable and bioenergy.

Strategic insight: Circular systems, policy, and innovation collectively make up for the scarcity of resources.

6. Case Study: Metsä Fibre Bioproduct Mill, Äänekoski

- Since 2017, it has invested €1.2 billion and produced 1.3 million tonnes of pulp per year.
- Self-sufficient energy: produces an excess of 2.4 TWh of electricity annually for the national grid.
- Closed-loop ecosystem: Nearby facilities are supplied by Surplus steam and by-products.

Key Insights:

1. *Sustainable Resource Use:* Wood is sourced from sustainably managed forests, creating a renewable resource.
2. *Energy independence:* Provide a surplus supply of renewable energy to meet energy needs as well as supporting the national grid.
3. *Reduced Carbon Emissions:* Reduced reliance on fossil fuels, supports a transition to a lower carbon economy will stimulate future industrial development.

South Korea: Export-Driven Industrialisation and Technological Self-Reliance

South Korea's economic self-sufficiency has largely been shaped by export-driven industrialization and strong government-industry partnerships supported by coordinated industrial policies at the national and regional levels.

1. Key Economic and Innovation Indicators

- ➔ GDP (2024): \$1.88 trillion, providing a substantial foundation for the developing industrial community in South Korea
- ➔ GDP per capita (2024): \$36,239, showing a high standard of living and advanced workforce development.
- ➔ Manufacturing as a % of GDP: 31.6% in 2023 demonstrates strength in manufacturing and export orientation.
- ➔ R&D expenditures as a % of GDP in 2022: 5.21%, demonstrating commitment to technological innovation.
- ➔ Innovation Index Rank (2025): 4th in the world shows global competitiveness in innovation.

2. Policy Framework: Industrial & Resource Security Strategy

- Government-driven strategies continue to shape domestic industries, while global markets influence the pace of technological advancement.
- Facing global shifts, attention turns to chips, electronic systems, electric vehicles, while modern production methods gain ground.
- A shift began in 2020 with the Korean New Deal focusing on Digital upgrades alongside environmental efforts. Data-driven sectors grew under this framework.
- The Materials, Parts and Equipment (MPE) framework was introduced to gradually reduce reliance on essential inputs sourced from overseas.

Focus Areas

- Semiconductors & Electronics: boost local chip manufacturing. Digital Economy & AI: Expand data, AI, and digital infrastructure. Green Growth through renewable energy and hydrogen.
- MPE Localisation helps cut supply-chain risks.
- Smart Manufacturing with Advanced automation and Industry 4.0.

Key Insights:

- Strong state–industry coordination accelerates self-reliant industrial development.
- High R&D intensity has enabled relatively rapid domestic innovation and technology leadership.

- Focus on key sectors limits vulnerability when supplies outside face disruptions.
- Export strength combined with localisation strategies has strengthened economic resilience while reducing external supply shocks.

3. Technology & Innovation Ecosystem

- Research and development spending remains high, supported by sustained investment from both the government and private sector.
- Chaebol-led innovation: Samsung, LG, SK boost scale and global competitiveness.

4. Major Innovation Clusters

- *Pangyo Techno Valley (Gyeonggi): Hub for AI, software, gaming, and digital platforms*
Seoul Innovation Hub: Startups, fintech, ICT, government–industry collaboration
- *Daedeok Innopolis in Daejeon functions as a national research hub, bringing together government research institutes and advanced laboratories.*

5. Resource Utilisation

- Reduce dependence on China by diversifying critical minerals (target: 80% → 50% by 2030).
- Support emerging sectors like semiconductors, EVs, and batteries.
- Build stronger domestic R&D and production capacity.
- Encourage circular economy practices to keep materials in use longer.

Key Insight: securing resources strategically plays an important role in maintaining long-term self-reliance in key industrial sectors.

6. Case Study: Secondary Battery Recycling

- Rapidly growing due to EV adoption, energy storage needs, and portable electronics.
- Government policies back sustainability and circular economy practices.
- Recycling helps lower dependence on imported lithium, cobalt, nickel while also reducing environmental hazards.
- Advanced recovery processes and standardised procedures strengthen domestic capabilities.
- This supports innovation, expands production, and fits into broader industrial and

sustainability plans.

Key Insights:

1. Recycling plays a crucial role in securing resources and promoting economic self-reliance.
2. Government-industry collaboration is vital for effective circular economy adoption.
3. Technology-driven approaches help cut material dependence and lessen environmental harm.

Comparison Analysis: Japan, Finland and South Korea

This section compares Japan, Finland, and South Korea to understand how different economic structures, innovation systems, and resource-utilisation strategies support national self-reliance. Using key indicators, policy frameworks, and selected case studies, the analysis highlights distinct development models and identifies lessons relevant for India.

Economic and Innovation Profile:

Japan, Finland, and South Korea reflect three different pathways to innovation-led self-reliance. Japan combines a large economic base with advanced manufacturing and steady R&D investment, allowing it to sustain competitiveness despite limited natural resources. Finland, although much smaller in scale, achieves high productivity and innovation outcomes through strong human capital and efficient knowledge systems. South Korea stands out for its exceptionally high R&D intensity and strong manufacturing share, driven by export-oriented industrial growth.

Overall insight:

Japan and South Korea rely on industrial scale and depth, while Finland achieves resilience through innovation efficiency.

Refer to **Chart 1** (*Comparative GDP of Japan, Finland, and South Korea*) and **Chart 2** (*Comparative Key Indicators of Self Reliance: Japan, Finland, and South Korea*)

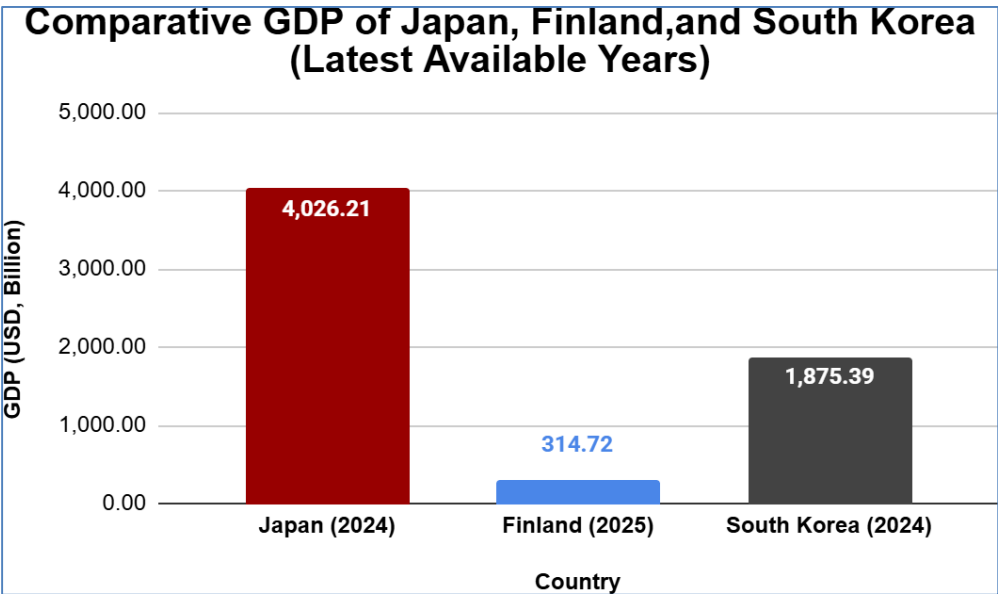


Chart 1: Comparative GDP of Japan, Finland, and South Korea

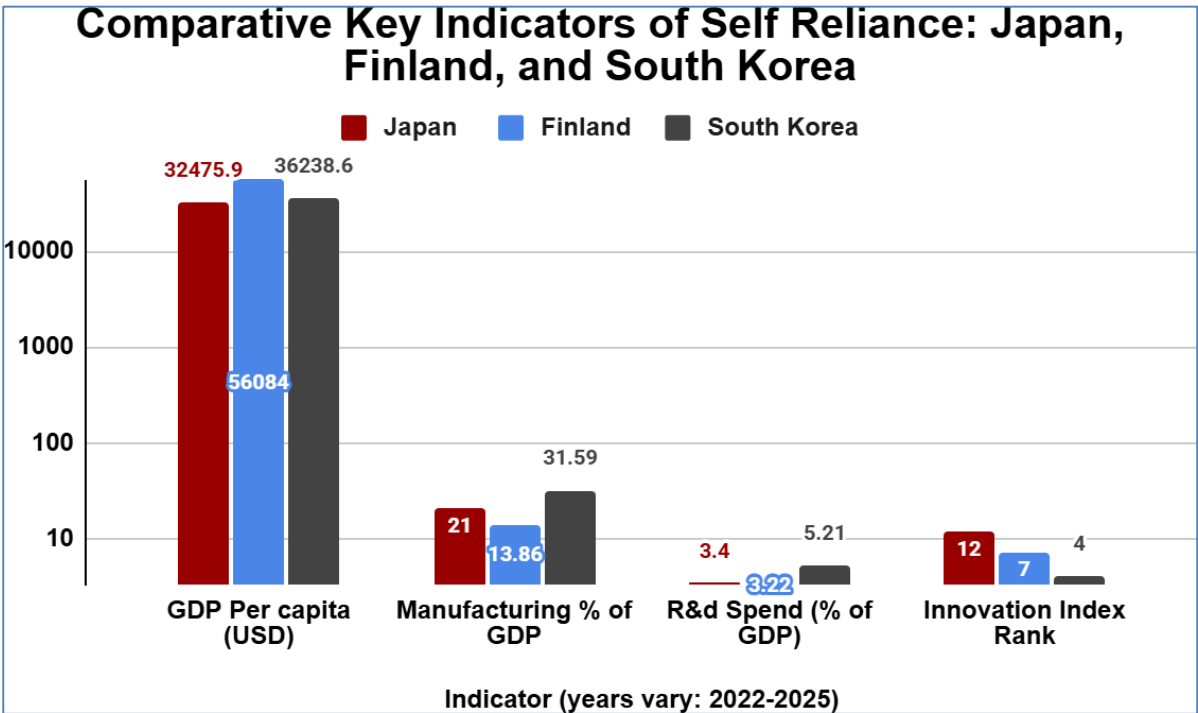


Chart 2: Comparative Key Indicators of Self Reliance: Japan, Finland, and South Korea

Policy and Strategic Orientation:

Each country follows a distinct policy approach to self-reliance. Japan’s Society 5.0 strategy focuses on integrating advanced technologies such as AI, robotics, and smart infrastructure into economic and social systems. Finland’s Circular Economy Roadmap emphasises sustainable resource use, industrial symbiosis, and innovation-driven

environmental solutions. South Korea adopts a state-led industrial strategy targeting semiconductors, EVs, batteries, and critical mineral security.

Comparative view:

Japan prioritises technological sophistication, Finland sustainability-led resilience, and South Korea strategic industrial dominance.

Refer to **Table 1 (Policy and Case Study)**

Table 1 (Policy and Case Study)				
Country	Policy/Strategy	Focus Areas	Case Study	Key Insight
Japan	Society 5.0	AI-driven mobility, advanced manufacturing & robotics, IoT safety management, biotechnology & advanced materials, smart life & digital services	Toyota Production System (TPS) – JIT + Jidoka, human-centered manufacturing, waste elimination, continuous improvement	Demonstrates how process innovation can boost self-reliance and manufacturing efficiency despite limited natural resources
Finland	Circular Economy Roadmap	Sustainable material use, renewable energy, bioeconomy, stakeholder-inclusive innovation	Metsä Bioproduct Mill (Äänekoski) – industrial symbiosis, pulp & energy production, closed-loop resource use	Shows practical application of circular economy principles; maximizes resource efficiency and renewable energy generation
South Korea	Self-reliance in Critical Industries	Semiconductors, secondary batteries, EVs, critical minerals	Secondary Battery Recycling – EV and energy storage batteries, lithium/cobalt/nickel recovery	Strengthens domestic supply chain security, reduces import dependency, supports sustainable industrial transformation

Technology and Innovation Systems

Innovation ecosystems differ in structure across the three countries. Japan’s system is anchored in long-established industrial clusters supported by close government–industry coordination.

Finland operates a highly collaborative national innovation system linking government, academia, and startups, with a strong focus on sustainability. South Korea has developed dense, policy-aligned innovation hubs concentrated in strategic technologies such as semiconductors, digital platforms, and electric mobility.

Key insight: Japan and South Korea follow industry-driven models, while Finland relies on knowledge-driven and sustainability-oriented networks.

Resource Utilisation and Sustainability

Resource strategies play a central role in reducing external dependence. Japan mitigates resource risks through overseas processing investments and gradual expansion of renewable energy.

Finland demonstrates leadership in circular resource use through bio-based industries and energy-positive production systems. South Korea focuses on recycling and diversification of critical minerals, particularly for batteries and EV supply chains.

Comparative insight: Finland leads in circular sustainability, Japan in strategic risk management, and South Korea in resource-security planning.

Refer to **Table 2 (Resource Utilisation)**

Table 2 (Resource Utilisation)		
Country	Resource Focus	Key Initiative
Japan	Rare-earth & energy	\$109M investment in French rare-earth refining; Renewable energy share grew to 26%.
Finland	Forests & Bioeconomy	Metsä Fibre bioproduct mill produces 1.3M tonnes pulp/year; 2.4 TWh renewable energy; circular economy model.
South Korea	Critical minerals & energy	Reducing dependence on China for 10 key minerals from 80% → 50% by 2030; Secondary battery recycling market growth.

Implications for India:

The comparison suggests that India can strengthen self-reliance by combining:

- Japan's process efficiency and manufacturing discipline
- South Korea's sector-focused industrial clustering
- Finland's circular-economy and innovation-collaboration model

Together, these approaches can support industrial growth while reducing long-term resource and supply-chain vulnerabilities.

Conclusion:

The comparative analysis shows that self-reliance is not about isolation, but about reducing critical dependencies while remaining globally connected. Japan, South Korea, and Finland demonstrate that effective self-reliance emerges from the alignment of technology, policy coordination, and resource strategy. Adapting these lessons can help India strengthen economic resilience in a sustainable and competitive manner.

3.2 India's Policies and Strategies Toward Self-Reliance

The concept of self-reliance has remained a recurring theme in India's economic and policy discourse, evolving in response to shifts in domestic priorities and global economic conditions. Contemporary literature increasingly frames self-reliance not as economic isolation but as the capacity to sustain critical production, institutional stability, and policy autonomy while remaining embedded in global markets (*World Bank, 2020; OECD, 2021*). In this sense, self-reliance is closely associated with economic resilience, the ability of an economy to absorb external shocks and adapt to systemic disruptions. We will understand the overview of India's self-reliance and the existing literature about it through this given information below.

3.2.2 Conceptual and Historical Foundations

India's self-reliance discourse originates in the Swadeshi Movement, widely interpreted as economic nationalism aimed at resisting colonial domination through indigenous production and reduced dependence on foreign goods and materials (*Chandra, 1989*). Beyond symbolic boycott strategies, Swadeshi linked economic practice to political sovereignty by emphasising

control over production and markets, shaping post-independence development thought. After independence, self-reliance was institutionalised through state-led planning and import substitution industrialisation, prioritising domestic capacity and public sector expansion (Kohli, 2004). While this strategy enabled industrial diversification, scholars note persistent inefficiencies, limited technological dynamism, and weak global competitiveness, even as self-reliance became a central normative goal of India's development trajectory.

3.2.3 Reconfiguration through Liberalisation

The economic reforms initiated in 1991 marked a significant redefinition of self-reliance in India. Rather than abandoning the concept, liberalisation reframed it within an outward-oriented growth model which helped to restructure the economic definition of India which was just beginning to come to track. Literature suggests that post-1991 self-reliance was increasingly associated with competitiveness, institutional quality, and technological capability rather than protectionist self-sufficiency (Panagariya, 2008). International institutions such as the World Bank and OECD argue that integration into global markets, when combined with domestic capability-building, can strengthen it more than undermine economic autonomy (World Bank, 2020; OECD, 2021). This period thus represents a transition from inward-looking autonomy to adaptive, globally embedded self-reliance.

3.2.4 Economic Resilience and Contemporary Policy Thinking

Recent scholarship situates self-reliance within the broader framework of economic resilience, particularly in light of global financial crises, geopolitical tensions, and the COVID-19 pandemic. The economic path moulded with it. Studies emphasise that resilient economies share certain structural features, including:

- Diversified industrial bases.
- Robust manufacturing and technological depth.
- Strong domestic institutions.
- Adaptive and coherent policy frameworks (IMF, 2021).

Empirical research indicates that countries possessing these characteristics are better equipped to manage disruptions across financial, health, and energy systems. In this context, self-reliance emerges less as a defensive reaction to crises and more as a strategic, long-term approach to sustaining a model for competitiveness under conditions of global uncertainty.

3.2.5 Atmanirbhar Bharat as a Contemporary Framework

Atmanirbhar Bharat represents the most recent articulation of India's self-reliance strategy. Announced in 2020 amid pandemic-induced supply-chain disruptions, the initiative emerged as a response to vulnerabilities revealed by excessive external dependence (Government of India, 2020) on imports like energy resources (crude oil, oil, coal), Capital goods (machinery, electronics, iron& steel) etc. Scholarly interpretations emphasise that the framework does not advocate economic isolation; instead, it focuses on strengthening domestic capacities while remaining integrated with global value chains.

The literature identifies the following priority areas under Atmanirbhar Bharat:

- Manufacturing expansion and domestic value-chain development.
- Innovation and technological capability.
- Infrastructure and logistics enhancement.
- Skill development and human capital formation.
- Competitiveness in strategic sectors such as defense, healthcare, and digital technologies.

Analysts interpret this framework as a shift from protectionist self-sufficiency toward resilience-based autonomy, where internal capacity is viewed as a prerequisite for effective global engagement (*NITI Aayog, 2021*). By framing self-reliance as a dynamic and adaptive process, Atmanirbhar Bharat situates economic autonomy within contemporary realities of interdependence and global competition.

3.2.6 Role of Innovation and Industrial Policy

Literature on innovation systems further strengthens this perspective. The National Innovation System (*NIS*) framework highlights the importance of coordinated interactions among government, industry, and academia in sustaining technological advancement (*Lundvall, 2010*). Evidence from the Global Innovation Index and OECD reports suggests that sustained investment in research, skills, and technology infrastructure reduces reliance on imported technologies and enhances productivity (*OECD, 2022*). In parallel, renewed emphasis on industrial policy—particularly in strategic sectors such as advanced manufacturing, electric mobility, and digital technologies—is viewed as central to strengthening domestic value

chains and economic sovereignty (UNIDO, 2021). However, several scholars caution that gaps in implementation capacity and outcomes projected with the planning made had an uneven technological diffusion and continue to constrain the effective realisation of self-reliance objectives.

3.2.7 Synthesis

Overall, the reviewed literature indicates that India's approach to self-reliance has undergone a gradual change from economic nationalism and state-led protectionism to a resilience-oriented globally embedded policy framework with time. Significant transformation is conceptualised as the capacity to participate in global markets from a position of strength, supported by domestic institutions, innovation ecosystems, and strategic policy coordination.

3.3 Natural Resources Utilization & Self Reliance

3.3.1 Economic Base, Industrial Input, Strategic Autonomy-

Studies highlight, Natural resources are fundamental to achieving self-reliance as they provide the essential raw materials and energy needed for economic development, industrial growth, and technological advancement. By effectively managing and utilizing their natural resources, countries can reduce dependence on external imports, enhance domestic production capabilities, and strengthen their economic sovereignty. Policy literature suggests sustainable exploitation of natural resources supports long-term environmental stability, which is crucial for maintaining consistent resource availability. This self-sufficiency in resources fosters resilience against global market fluctuations and geopolitical uncertainties, enabling a nation to maintain steady progress and independence in its development trajectory.

3.3.2 Contemporary Policy Shifts and Resource-Based Self-Reliance

Recent reforms in India's mining sector, particularly those targeting critical minerals, are central to advancing Viksit Bharat 2047 and strengthening Atmanirbhar Bharat. Scholarly and policy discourse situates critical minerals at the intersection of energy transition, sustainability, and strategic autonomy, as clean energy technologies are mineral-intensive and global demand for transition minerals is projected to rise sharply (International Energy Agency [IEA], 2023). In India, the Critical Minerals Mission identifies these resources as essential for reducing external dependence and supporting domestic clean-energy capacity,

aligning with broader self-reliance objectives (Press Information Bureau, 2023). Achieving India's net-zero target by 2070, however, will require resilient value chains that integrate environmental and social governance considerations alongside resource security (International Institute for Sustainable Development [IISD], 2022).

Strengths of the Existing Literature

- The literature provides a strong historical grounding of self-reliance in India, clearly linking the Swadeshi movement to contemporary policy frameworks such as Atmanirbhar Bharat.
- Scholars effectively conceptualize self-reliance as a dynamic and adaptive process, rather than a static or isolationist economic strategy.
- Existing studies offer robust policy-level analysis, particularly in relation to manufacturing, industrial capacity, and strategic autonomy.
- Critical political economy literature contributes valuable insights into resource governance, highlighting continuities between colonial extractive practices and postcolonial development models.
- Recent policy-oriented research increasingly recognizes the strategic importance of natural resources and critical minerals in achieving energy security, sustainability, and economic resilience.

Limitations of The Existing Literature

- Much of the literature examines self-reliance and natural resources in isolation, with limited integrated analysis linking resource governance directly to self-reliance outcomes.
- There is an overemphasis on policy intent and discourse, while empirical assessment of actual outcomes remains limited.
- Existing studies often adopt macro-level perspectives, neglecting sectoral or material-specific analysis of critical resources.
- Critical mineral policies are frequently discussed in the context of energy transition, but their role in India's broader self-reliance strategy remains underexplored.
- Limited comparative engagement exists between India's resource-based self-reliance approach and global best practices, especially in sustainable resource governance.

Research Gap

Existing literature extensively discusses national self-reliance, innovation systems, industrial policy, and resource management, but largely treats these dimensions in isolation. Studies on Japan, South Korea, and Finland focus on country-specific achievements—such as advanced manufacturing, export-led growth, or circular-economy leadership—without integrating technology, policy, and resource utilisation within a comparative framework.

In the Indian context, research on Atmanirbhar Bharat is predominantly policy-oriented and descriptive. Limited attention is given to how natural resource availability translates into domestic value addition, technological capability, and supply-chain resilience. Resources such as minerals, energy, water, and forests are often examined separately, leaving the link between resource endowment, import dependence, and self-reliance outcomes insufficiently explored. This results in *three key gaps*:

Comparative Gap:

Limited cross-country analysis of how advanced economies integrate technology, industrial policy, and resource utilisation to achieve self-reliance.

Operational Gap:

Inadequate focus on implementation mechanisms such as innovation ecosystems, industrial clustering, and circular production models.

Applicability Gap:

Lack of studies translating global self-reliance models into actionable insights for India.

Contribution of the Study:

This study addresses these gaps through a comparative analysis of Japan, South Korea, and Finland, focusing on practical innovation systems and resource-utilisation strategies, and linking global best practices directly to India's self-reliance objectives.

India's Self-reliance- The Gap

1. Lack of Systematic Performance Evaluation

Despite the extensive policy articulation, systematic and outcome-based evaluation of India's self-reliance initiatives remains limited in practice. Existing studies and policy

documents largely outline the objectives and institutional design of India's self-reliance initiatives; however, systematic evaluation of economic performance, measured through indicators such as **innovative capability**, **employment generation**, and **implementation efficiency**, remains fragmented and limited. As a result, the effectiveness of self-reliance initiatives in translating policy intent into measurable economic outcomes is not rigorously established. To address this gap, the study will employ outcome-based indicators to evaluate the performance of India's self-reliance initiatives over time, providing a quantitative basis for understanding policy effectiveness in the research gap angle.

2. *Absence of State-wise Comparative Analysis*

- Most studies focus on India at the national level.
- Differences between states in **innovation adoption** and **policy implementation efficiency** remain underexplored. This limits understanding of which states are translating policies into measurable outcomes and how regional capacities shape success.
- States vary in **R&D intensity**, **technological integration** and **industrial innovation**, which directly impacts long-term self-reliance.
- Implementation efficiency differs due to governance quality, budget utilization, and institutional capacity.
- Without this comparative lens, policies may be overgeneralized, missing opportunities for state-specific improvements and replicable best practices.

This research will evaluate inter-state disparities in:

- I. Innovation & Technology Adoption – e.g., R&D expenditure, patent filings, adoption of advanced manufacturing technologies.
- II. Policy-to-Outcome Implementation Index – e.g., program coverage, budget utilization, adherence to timelines.

Policy-to-Outcome Implementation Index – e.g., program coverage, budget utilization, adherence to timelines.

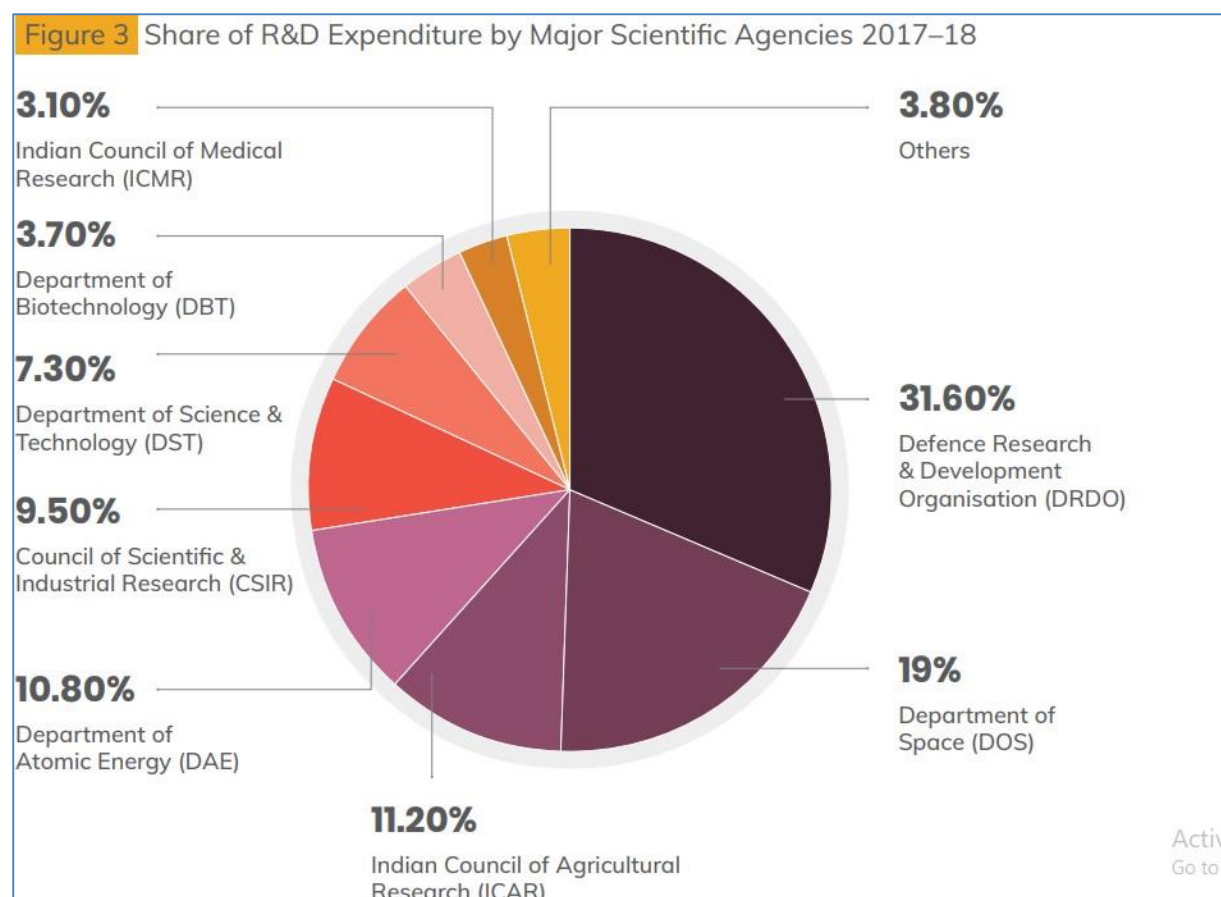
For effective comparison of performances, the States & UTs have been divided into 17 Major States, 10 North-East (NE) & Hill States & 9 UTs and City States. (Aayog, 2021)

The following tables and figures are represented to illustrate the uneven distribution of innovation capacity and policy implementation outcomes across Indian states, highlighting the absence of systematic comparative evaluation within existing self-reliance literature.

Rank	Major States	Score
1	Karnataka	42.50
2	Maharashtra	38.03
3	Tamil Nadu	37.91
4	Telangana	33.23
5	Kerala	30.58

Rank	UT and City States	Score
1	Delhi	46.60
2	Chandigarh	38.57
3	Daman & Diu	26.76
4	Puducherry	25.23
5	Goa	24.92

Rank	NE & Hill States	Score
1	Himachal Pradesh	25.06
2	Uttarakhand	23.50
3	Manipur	22.78
4	Sikkim	20.28
5	Mizoram	16.93



(Kapoor, 2021)

Source: Research & Development Statistics 2019-20, Department of Science and Technology, GoI.

Atmanirbhar Bharat and the Strategic Management of India's Natural Resources Utilization

1. Introduction

Atmanirbhar Bharat is not restricted to the idea of domestic production, but represents a larger initiative to gain power over major factors of economic development. The basis of this strategy is natural resources, especially minerals and renewable sources of energy. Lithium, cobalt, and copper are not just inputs in the industrial process in the present world, but they are the strategic resources. Despite the recent policy measures that suggest increased awareness of this fact, it still remains that the resource management approach in India is still fraught with structural and institutional problems.

2. Dependence on import and Structural Vulnerabilities

One of the weaknesses underlying the self-reliance strategy of India is that it relies heavily on imported materials which are needed in the new technologies. Most of the batteries, electric cars, and clean energy systems components are of critical importance and are mostly imported. Such

reliance makes any strategic areas vulnerable to outside threats and creates the question of the economic viability of the local assembly's goals in the long run. Unless these structural weaknesses are solved, the resource-based self-reliance is likely to be limited.

3. Fragmented Value Chains

Although the country has access to raw materials, the natural sector in India has a poor value-chain integration. Advanced processing and refining is insufficient in support of extraction activities. This makes imported high-purity materials which are used in complex production common, which restricts value additions at home. The gap between mining and manufacturing is a missing middle that still poses a big challenge to the effective use of resources.

4. The controls on governance, environment and technology.

The development of resources in India is highly influenced by environmental policies, the social factor and water supply. Although these factors are crucial to sustainability, they also affect the speed and viability of resource-based projects. Simultaneously, it can be noted that the capacity of India to govern its resources is further constrained by the constraints in exploration methods and processing technologies. The aspect of technological dependency on outside suppliers still eats the ambition of strategic independence even in renewable energy industries.

5. Research Gap

The majority of studies that have been done examine the availability of resources, the reliance on imports, the issues of governance, or the technological capacities individually. What is yet to be fully covered in the dynamics of these factors in relation to each other. It is apparent that there is a need to have an analytical framework which integrates the natural resource endowments with the value-chain dynamics, technological capability, and environmental and social constraints. Filling this gap is the key to the realization of the true constraint of Atmanibhar Bharat when it comes to management of natural resources.

6. Conclusion

To experience meaningful self-reliance using natural resources, there is a need to have a shift in an extraction oriented policy to a value-oriented management of resources. The enhancement of domestic processing capacity, technology development, and the implementation of an integrated way of governance are key measures towards achieving this objective. Unless these are taken, the potential of the natural resources in India can stay untapped and the strategic impact of the Atmanirbhar Bharat initiative cannot be fully realized.

Methodology:

Research Design:

This study follows a qualitative–comparative research design supported by selective quantitative indicators. The objective is to examine India’s self-reliance efforts in the context of natural resource utilisation by comparing them with global practices adopted by Japan, Finland, and South Korea.

The research is primarily based on secondary data and combines qualitative policy analysis with quantitative economic and innovation indicators. This mixed analytical approach allows for a balanced evaluation of policy intent, implementation patterns, and measurable outcomes related to self-reliance.

Data Sources:

Secondary data has been collected from a range of reliable and publicly available sources. These include government policy documents, reports from international organisations such as the OECD, World Bank, and Global Innovation Index, as well as peer-reviewed academic literature and institutional publications.

For the Indian context, data has been drawn from government and regulatory sources including NITI Aayog, RBI, and the Ministry of Statistics and Programme Implementation (MoSPI).

Country-specific models of self-reliance are examined through selected case studies from Japan, Finland, and South Korea to capture variations in policy approach and resource management strategies.

Analytical Approach:

The analysis uses a set of economic, innovation, and resource-utilisation indicators, along with policy frameworks and case studies, to identify similarities and differences across the selected countries. Comparative tables and charts are used to support cross-country evaluation and highlight key trends.

Insights derived from this comparative assessment are then contextually linked to India's self-reliance objectives, with a focus on understanding how global best practices can inform domestic policy and resource-based development strategies.

Core Variables of the Study:

To address the research objectives systematically, the study focuses on the following core variables:

a) Global Practices

- International benchmarks in resource management.
- Comparative policy frameworks adopted by selected economies.
- Best practices influencing national self-reliance models.

b) India's Self-Reliance

- Innovative capability.
- Employment generation.
- Policy implementation efficiency.
- Sector-specific policy initiatives.

c) Natural Resource Utilisation

- Availability and use of key natural resources.
- Resource-based industrial output.

- Sustainability and efficiency indicators.

Analytical Framework:

The study adopts a comparative and trend-based analytical framework to evaluate India's self-reliance strategy in relation to global practices, particularly in the area of natural resource utilisation.

Trend analysis is used to examine changes in innovation capacity, employment generation, implementation efficiency, and resource utilisation over time.

Comparative analysis is applied to contrast India's approach with global best practices across selected sectors.

Policy analysis is conducted to assess the effectiveness of existing initiatives aimed at strengthening economic self-reliance.

Scope of the Study:

The study focuses on India's self-reliance initiatives related to natural resources within a defined time period, based on data availability. The analysis is limited to macro-level indicators and policy frameworks and does not extend to firm-level or microeconomic assessment.

Limitations of the Study:

The research relies entirely on secondary data, which may be subject to reporting limitations or data gaps. Differences in international data definitions may affect direct comparability across countries. In addition, the absence of primary surveys or interviews may limit the depth of contextual insights.

Analysis, Discussion & Conclusion:

Analysis

The comparative analysis of global best practices demonstrates that self-reliance in advanced and emerging economies is achieved through systemic integration rather than isolated policy interventions. Decreasing the dependency from other countries than oneself. In our analysis took examples of three countries i.e. evidence from Japan, Finland, and South Korea highlights three recurring patterns:

- **Innovation-led growth** supported by strong national innovation systems linking government, industry and academia.
- **Strategic industrial Policy** focused on high-value and future- oriented sectors rather than blanket protectionism.
- **Resource strategy integration**, where access to critical inputs is aligned with industrial competitiveness and sustainability goals.

These cases indicate that self- reliance functions with resilience within globalization, not withdrawal from it and going hand in hand with it. Control over critical value-chain segments, technological capability, and policy continuity emerges as a common foundation across models.

In the Indian context, the Atmanirbhar Bharat initiative shows some alignment with global approaches to self-reliance, particularly in the way natural resources are being viewed as a strategic concern. Resource utilisation has gradually become an important part of India's self-reliance efforts, reflecting a shift towards treating resource security as a foundation for industrial and technological development rather than a secondary issue.

The transition towards cleaner energy has further increased the importance of mineral and resource- intensive sectors. Technologies related to renewable energy, green hydrogen, and advanced manufacturing depend heavily on stable access to critical inputs. India's expansion of renewable energy capacity, along with initiatives such as the National Green Hydrogen Mission, points to a policy effort aimed at reducing external dependence while making better use of domestic resource potential. At the same time, continued reliance on imported

components, machinery, and certain critical materials suggests that India's progress towards resource-based self-reliance remains incomplete.

Overall, the analysis indicates that Atmanirbhar Bharat is increasingly linking natural resource management with industrial and innovation policies. While resource governance is beginning to play a more central role within India's self-reliance framework, this integration is still evolving and faces practical limitations.

Discussion

The findings suggest that India's self-reliance strategy is best understood as an evolving framework shaped by historical experience, global economic shifts, and domestic constraints. Three interlinked dimensions emerge from the discussion:

- **Linking Global Practices and India's Policy Framework Global experiences demonstrate that:**

- Self-reliance is Institutional, not symbolic.
- Innovation systems and industrial policy must operate in co-ordination.
- Long-term policy credibility matters more than short-term interventions.

India's current approach aligns conceptually with these insights but faces challenges related to scale, regional disparities, and technological dependence.

- **Role of Natural Resources in Self-Reliance**

Natural resources, particularly critical minerals form the material base of self-reliance in the era of energy transition. The study highlights that:

- Resource security is inseparable from industrial and innovation strategies
- Extraction-focused approaches risk reproducing dependency and environmental costs.
- Sustainable, value-added resource governance is essential for durable autonomy.

India's critical minerals strategy signals progress, yet its effectiveness depends on integration with technology development, domestic processing, and environmental

governance

- **Interlinkages Across the Three Themes**

The Discussion underscores that:

- Global best practices inform how self-reliance can be achieved.
- India's policy framework defines where adaptation is required.
- Natural resource utilization determines whether self-reliance is sustainable.

Thus, these dimensions are not parallel but mutually reinforcing.

Conclusion

This study finds that self-reliance should be understood as a flexible and evolving process rather than a fixed economic outcome. Evidence from the comparative analysis suggests that countries which have been relatively successful in building self-reliance tend to combine strong innovation systems, targeted industrial policies, and careful management of natural resources, while still remaining connected to global markets. India's current approach to self-reliance broadly follows these patterns, but the analysis indicates that further progress will depend on stronger institutional coordination, continued technological improvement, and more effective integration of sustainability concerns.

By bringing together international experiences with India's own historical background and recent policy initiatives, the study offers a more connected perspective on self-reliance. It shows that India's long-term economic resilience is likely to depend on how well innovation systems, industrial strategies, and natural resource use are aligned within a consistent and practical development path.

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Comparative Analysis of Unhedged Investment Performance: A Study of the United States, Germany, and India (2010–2024)

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Abstract:

This paper looks at the unhedged returns of the United States, Germany and India, in terms of various economic factors, specifically real GDP growth, nominal GDP growth, movements in stock indices and shifts in currencies, over the years 2010 to 2024. Techniques, namely regression analysis and time series analysis, were applied to the data, to determine the relationships between growth rates of output and returns on capital.

One can see from the tables and figures, that ANOVA tests were used to check for important differences in growth rates of GDP and returns on capital for the three countries, over the years studied. The MSCI ACWI, the US Dollar Index and the Nominal Emerging Markets Index, were chosen as indices to represent market risk and value of currencies. The use of Value at Risk and Monte Carlo simulations, to calculate risk, were also applied and various ratios, such as the Sharpe Ratio, the Treynor Ratio, Jensen Alpha, Sortino and the CAPM, were calculated, for each country, to provide a measure of performance of each.

It must be noted, that these findings show possible avenues for investment. However, they are not sufficient, for making real investment world decisions, specifically because the calculation of hedging taxes and costs, were not taken into account, in this analysis so please kindly consult your investment advisor before investing into securities markets.

Keywords: Investment Performance, Currency Risk

Introduction:

Investing in equities has become a globalised activity in a financial world where Capital, borders and people move freely across the globe. Investors consider many factors from around the world when choosing where to put their money, including different economies, better returns and diversification. International investing offers access to a wider universe of investment choices but results are affected by Economic growth rates, currency swings and market turbulence. In that context the returns on international equity holdings, particularly those that are not hedged against currency risk, can be subject to greater risk from the fluctuations in currency exchange rates. In light of that it is useful to analyse the performance of shares in various countries considering the impact of currency movements. All investors weigh up numerous factors in their decisions on where to invest funds, though investors into international shares weigh up a considerable variety from all over the globe.

These different factors vary by country and their respective economies such as US, Germany, India. The United States possesses the most developed economy, and plays an influential part, and has a major influence on the world economy, financial markets having considerable effect on world economic development. The economy of Germany is dominant in Europe and the Eurozone; the economy of India represents the developing economy that is developing the fast world, its economy is highly unstable. The differences in each economy & economy sectors also reflected in its currencies behaviours so analysing in this regard will enable the research to be completed. All the studies present discuss the impacts on macro-economic or on the financial factors or both individually whereas; there isn't any existing integrated system where we analyse macro factors, risks, & performance together. As all of the researches is focused only on the return it may miss different risks & factors that can influence over return by which the results would be incomplete so this study analyses integration of factors from different dimensions like that is Macro economy, systematic risk and Downside risk, etc. for several well developed and developed economies in both time series and panel data.

In this direction the present research analyses the linkage of real and nominal GDP growth, systematic and downside risk, financial performance for developed and developing

stock markets including the United States, Germany, and India from January 01, 2010 to December 31, 2024, on the basis of an unbalanced panel data.

The analysis incorporates time series analysis (for the extraction of the trend component of real and nominal GDP growth rates), ANOVA and beta estimation for downside risk measurement and Value at Risk, Sharpe Ratio, Treynor Ratio, Jensen's Alpha and Sortino Ratio for financial performance. The final output integrates the trends of real and nominal GDP growth rates, the systematic and downside risk and the financial performance of the markets, under the unhedged scenario.

The objective of this study is to provide an integrated analysis combining the strong signals of the macroeconomic variables with the risk measures to make the performance comparison more transparent. The output of the study will be used as a tool for comparison and not as the single driver of investment decision making for the markets of major developed and emerging economies.

Literature Review:

International investment performance has been looked at for ages using macroeconomic angles and also financial ones. The classic economic view kinda says that when the economy grows faster, corporate profits usually improve, and then as a result there shall be appreciation in the stock price either directly or indirectly (capital gains or dividend payouts). But in practice, the data isn't that neat, growth in GDP does not always line up in a direct, proportional way with equity returns, especially once you compare developed economies with emerging ones. We can think about developed countries such as those in America or Europe as for example, as they have solid money market, at the same time they have various economical and financial dilemmas that affect those markets. The emergence of new economy such as that of India has potential on the possibility of growing quickly in rate. They are often unpredictable at the financial aspect of the market and cash flow that they have. Earlier research had shown that such growth has some possibility. However, since the emerging countries possess various phenomena of unseen aspects there is a possibility of economic upheaval and shocks. When analyzing the financial performance and outcome of these emerging markets we have to keep an account for the risk factor instead of its total income.

It is best to use indices that not only assess but also reflects those particular risks. In other words, developed countries such as in the U.S or Germany can lead with their problem, but the potential of growth is better while India in general has more risks although there is potential for tremendous and unprecedented growth.

GDP Growth and Stock Market Performance

There has been huge research on the relationship between economic growth and stock returns. The conventional view in finance is that higher GDP growth means better earnings and subsequently higher stock prices. But when researchers actually look at the data, the picture is pretty muddled. In more developed economies, the fact that investors "see through" and incorporate future growth expectations means the relationship between today's GDP growth and today's stock returns becomes much weaker. For emerging markets, however, it can appear more optimistic as this is affected by other factors, such as structural reforms, capital flows and external shocks.

Thus, the evidence indicates that GDP growth is not a sufficient measure to help usefully distinguish investments. One needs to take a subtler view which counters the volatility with other risk measures and currencies. Only then can you make a more careful judgment about relative performance.

Currency Risk and Unhedged Investments

Clearly, exchange rate risk is quite important in determining international portfolio returns, at least for unhedged investors. Currency depreciations can have a large negative impact on foreign equity returns, even when underlying market fundamentals are strong. International finance textbooks cite interest rate differentials, inflation expectations, capital flows, and geopolitical conditions as important determinants of exchange rate movements, that is, which currency is expected to be stronger.

Some studies that compare currencies across developed versus emerging markets suggest that emerging market currencies tend to be more volatile, and they usually come with more downside risk too. So, if someone is looking at unhedged investment results, it's not

enough to only stare at the equity side. You really should fold currency risk into the total return and the risk measurements, rather than treating the equity market like it exists on its own.

Systematic Risk and Beta

Systematic risk, which is usually summarized with beta, is basically at the core of modern portfolio theory, and also shows up a lot in the Capital Asset Pricing Model (CAPM). Beta sort of tells you how an asset's returns wiggle when the whole market moves, and it acts like a yardstick for comparative volatility, not just "random" fluctuation. What the research keeps showing is that developed market indexes tend to have less beta variability than emerging markets, where returns seem more attuned to worldwide risk drivers, and also to capital flow reversals, sometimes pretty sharply.

By using a global standard to evaluate beta for a selection of assets, people working to figure out comparable numbers across countries have another option and an approach of evaluating risk on a somewhat more equal footing. This is helpful when thinking about comparing the cross country investing experience using one, agreed-upon standard, if no more than for comparison.

Backtracking, Beta, when calculated using standard methods of regression is basically how much that individual security is influenced by ups and downs of the global stock market. \ A beta less than 1 says that this stock will have less fluctuations than the market, and a beta greater than one means this stock is likely more volatile than the stock market in general. So, for a stock that has a beta of 1.5, it means that when the market is rising by x percent, it is expected that this security rises by 1.5x percentage.

There will naturally be a number of utility stocks that return Betas in less than 1. And the vast majority of tech stocks that the Nasdaq will produce an eye appealing Beta with respect to the return aspect; but, with an ample share of risks involved.

$$\text{Beta coefficient}(\beta) = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

where:

R_e = the return on an individual stock

R_m = the return on the overall market

Covariance = how changes in a stock's returns are related to changes in the market's returns

Variance = how far the market's data points spread out from their average value

Downside Risk and Value at Risk

Conventional volatility measures, such as standard deviation, do not discriminate between upside and downside variation when, typically, people fret much more about downside losses in practice. Value at Risk, or VaR, has become a pretty common instrument for guessing what losses might show up when market conditions turn ugly. A bunch of empirical work points out that historical simulation and Monte Carlo methods are both quite useful for picking up tail risk, especially in those high-volatility emerging markets where things can swing quickly.

$$\text{VaR} = P \times z \times \sigma$$

- P — portfolio value
- z — one-tailed z-score for the desired confidence level
- σ — portfolio standard deviation over the VaR time horizon

Risk-Adjusted Performance Measures

Previous papers focused in performance appraisals literature is that the return to an investment must be judged by its risk, and that returns alone are not sufficient measure for an investment. That means, that it's not just about what happened but also how it happened. For example, the Sharpe Ratio gives excess return per unit of total risk, whereas the Treynor Ratio kinda checks return relative to systematic risk. Jensen's Alpha is used to estimate those abnormal outcomes beyond CAPM assumptions, and the Sortino Ratio then narrows the lens to downside deviation only, not the overall scatter.

A whole host of previous literature, looking at the same measures of performance in international markets, typically shows that if you just simply take out all sorts of very high raw returns you didn't actually see that you get much better performance adjusted for risk. Emerging markets, for instance, can look stronger in nominal terms, but may fall short once we account for volatility and their exposure to the market's systematic side. So in practice, a more complete performance check really means blending multiple risk adjusted measures, instead of leaning on just one single indicator.

Sharpe Ratio:

Sharpe basically pioneered how mutual fund performance gets evaluated, using the Sharpe Ratio, and in the process he sorts of introduced risk-adjusted returns as this kind of proxy for fund efficiency or how well it actually does. His early work, if you look at it, stressed this careful equilibrium between returns and risk, and that theme seemed to stick, becoming a benchmark for later studies that measured mutual fund performance, pretty much afterwards.

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

where:

R_p = return of portfolio

R_f = risk-free rate

σ_p = standard deviation of the portfolio's excess return

Treynor Ratio:

Treynor kinda leaned into market risk beta as a way to judge how well a fund did, like what you get when you adjust for that systematic wobble. He put forward the Treynor Ratio, to measure risk adjusted returns not just in general but specifically against that systematic risk. Over time it sorts of became crucial for comparing funds even when their risk profiles were not the same, and it gave investors a clearer feel for how the fund's return connects to its built in market risk.

$$\text{Treynor Ratio} = \frac{r_p - r_f}{\beta_p}$$

where:

r_p = Portfolio return

r_f = Risk-free rate

β_p = Beta of the portfolio

Jensen's Alpha:

Jensen introduced Jensen's Alpha, a metric to measure excess returns generated by fund managers beyond expected benchmarks. This study highlighted the importance of active fund management and its impact on performance, providing a way to assess whether a fund manager was adding value through skillful investment choices.

$$\alpha = R_p - \{R_f + \beta (R_m - R_f)\}$$

Where:

- R = The returns generated by the portfolio
- R_f = The risk-free rate
- B = The portfolio's beta
- R_m = The expected market return

Sortino Ratio:

The Sortino Ratio is used to measure how well an investment does compare to the things that can happen. The Sortino Ratio is different from the Sharpe Ratio because it only looks at the times when an investment does not do well as it should. When we talk about the Sortino Ratio, a higher number is better. This is because a higher Sortino Ratio means an investment does well and does not have a lot of risk. It's very useful for seeing how good a portfolio is at managing risk because it helps us understand how return we get from an investment, for every unit of downside risk that we take. So the Sortino Ratio is a way to evaluate how well a portfolio does considering the risk that is involved with the Sortino Ratio.

$$\text{Sortino Ratio} = \frac{R_p - r_f}{\sigma_d}$$

where:

R_p = Actual or expected portfolio return

r_f = Risk-free rate

σ_d = Standard deviation of the downside

Capital Asset Pricing Model:

The Capital Asset Pricing Model, also known as CAPM is one of the basics of money matters. It explains how the money you can expect to get back, from something is connected to the big risks that you cannot avoid. The Capital Asset Pricing Model was thought up by William Sharpe, John Lintner and Jan Mossin in the 1960s. The Capital Asset Pricing Model shows that the money you can expect to get from something is made up of a safe rate of return plus an extra amount of money that you get for taking a risk and this extra amount is decided by the things beta which is a measure of how much the things value goes up and down when the market does.

$$ER_i = R_f + \beta_i(ER_m - R_f)$$

where:

ER_i = expected return of investment

R_f = risk-free rate

β_i = beta of the investment

$(ER_m - R_f)$ = market risk premium

Standard Deviation:

- 1) A measure of the dispersion of a set of data from its mean. The more spread apart the data, the higher the deviation. Standard deviation is calculated as the square root of variance.
- 2) In finance, standard deviation is applied to the annual rate of return of an investment to measure the investment's volatility. Standard deviation is also known as historical volatility and is used by investors as a gauge for the amount of expected volatility.

Standard deviation is a statistical measurement that sheds light on historical volatility.

For example, a volatile stock will have a high standard deviation while the deviation of a stable blue chip stock will be lower. A large dispersion tells us how much the return on the fund is deviating from the expected normal returns.

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

where:

x_i = Value of the i^{th} point in the data set

$\bar{x}$ = The mean value of the data set

n = The number of data points in the data set

Covariance:

Covariance is a measure of the degree to which returns on two risky assets move in tandem. A positive covariance means that asset returns move together, while a negative covariance means returns move inversely. Covariance is calculated by analyzing at return surprises (standard deviations from expected return), or by multiplying the correlation between the two variables by the standard deviation of each variable. Statistical correlation is measured by what is called coefficient of correlation (r). Its numerical value ranges from +1.0 to -1.0. It gives us an indication of the strength of relationship. In general, $r > 0$ indicates positive relationship, $r < 0$ indicates negative relationship while $r = 0$ indicates no relationship (or that the variables are independent and not related). Here $r = +1.0$ describes a perfect positive correlation and $r = -1.0$ describes a perfect negative correlation. Closer the coefficients are to +1.0 and -1.0, greater is the strength of the relationship between the variables.

$$\text{Cov}(X, Y) = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{N - 1}$$

Where:

- X_i and Y_i represent the observed values of X and Y .
- $\bar{X}$ and $\bar{Y}$ denote their respective means.
- N is the number of observations.

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where:

- r_{xy} – the correlation coefficient of the linear relationship between the variables x and y
- x_i – the values of the x-variable in a sample
- $\bar{x}$ – the mean of the values of the x-variable
- y_i – the values of the y-variable in a sample
- $\bar{y}$ – the mean of the values of the y-variable

ANOVA:

ANOVA (analysis of variance) compares the means of three or more different groups to see whether or not they are all the same and by how much they differ from each other. The ANOVA tests this using the variance of all of the means among all of the groups (the between-group variance) compared to the variance of the presumed population means in the groups (the within-group variance) to see whether there is an important difference between the two. The null hypothesis of the ANOVA states that the means of all of the groups are the same, and the alternate hypothesis states that at least one or more of the group means is different. The test statistic used in ANOVA is referred to as the F-ratio, which is the ratio of the between-group variance to the within-group variance. If the p-value is greater than or equal to the specified alpha level (typically 0.05), there is a statistically significant difference between the means of the groups. When conducting ANOVA, you want to verify whether or not the assumptions of normality, independence of observation, and homogeneity of variance are satisfied prior to performing the ANOVA.

- **Sum of Squares (SS):** This measures the overall variability in the dataset.
 - **SS Total:** Total variability across all observations.
 - **SS Between (SSB):** Variability due to the differences between group means.
 - **SS Within (SSW):** Variability within each group, showing how scores differ within individual groups.
- **Mean Square (MS):** The average of squared deviations, calculated for both between-group and within-group variability.

- **MS Between (MSB):** $MSB = \frac{SS \text{ Between}}{df \text{ Between}}$

- **MS Within (MSW):** $MSW = \frac{SS \text{ Within}}{df \text{ Within}}$

- **Degrees of Freedom (df):** The number of values that are free to vary when calculating statistics.
 - **df Between:** $df \text{ Between} = k - 1$, where k is the number of groups.
 - **df Within:** $df \text{ Within} = N - k$, where N is the total number of observations.
- **F-Ratio:** The ratio of MSB to MSW, used to test the null hypothesis.

- $F = \frac{MSB}{MSW}$

- **P-Value:** This probability value helps determine if the F-ratio is significant. A small p-value (e.g., <0.05) suggests significant differences between groups.

Objectives of research paper:

1. To examine and compare the real and nominal GDP growth rates of the United States, Germany, and India, and to determine whether the differences among them are statistically significant.
2. To analyse and compare currency depreciation and stock index price movements of the selected countries in order to assess whether the variations across countries are statistically significant.
3. To calculate the beta of the selected stock indices using MSCI ACWI Adjusted Closing Price as the benchmark index in order to measure systematic risk and relative volatility.

4. To estimate the beta of the respective currencies using the U.S. Dollar Index as the primary benchmark for USD/EUR and USD/INR, and the Nominal Emerging Markets Index as a secondary benchmark for USD/INR to enhance analytical depth.
5. To measure downside risk in stock indices and currency movements by calculating Value at Risk using both the Historical approach and Monte Carlo simulation.
6. To evaluate unhedged risk adjusted returns of the selected stock indices using performance measures such as the Sharpe Ratio, Treynor Ratio, Jensen's Alpha, Sortino Ratio, CAPM based expected returns, and alpha returns.
7. To conduct time series analysis and other relevant statistical analyses to understand trends, volatility patterns, and relationships among the selected macroeconomic and financial variables.

Methodology:

This study adopts a quantitative research approach using secondary data collected from 1 January 2010 to 31 December 2024. Quarterly data on real and nominal GDP growth rates, stock index prices, and currency exchange rates for the United States, Germany, and India were analysed.

$$GDP = C + G + I + NX$$

where:

C = Consumption

G = Government spending

I = Investment

NX = Net exports

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{R}$$

where:

GDP = Gross domestic product

R = GDP deflator

Time series analysis was conducted to examine trends, growth patterns, volatility, and structural movements in the selected macroeconomic and financial variables. When it came

to comparative statistical techniques, like ANOVA, we used them to check if there were real differences in GDP growth, stock index returns, and currency depreciation among the three countries, and if those gaps were statistically significant. Systematic risk was also looked at via beta estimation, basically through regression analysis and related testing.

For the stock indices we relied on the MSCI ACWI Adjusted Closing Price as the benchmark index, while for the USD/EUR and USD/INR side, the U.S. Dollar Index was treated as the main benchmark, not something secondary. The Nominal Emerging Markets Index was used as a secondary benchmark for USD/INR to provide a broader perspective on emerging market currency exposure.

Downside risk was evaluated using Value at Risk (VaR) calculated under both the Historical approach and Monte Carlo simulation. These methods estimate potential losses in stock indices and currency movements under observed and simulated market conditions.

Unhedged risk-adjusted returns were calculated using established performance metrics, including the Sharpe Ratio, Treynor Ratio, Jensen's Alpha, Sortino Ratio, CAPM-based expected returns, and alpha returns. For the risk-free rate, SOFR (Secured Overnight Financing Rate) rates are used as a proxy. Although SOFR data are available only from 2017 onward, it provides a reliable and current benchmark following the discontinuation of LIBOR (London Interbank Offered Rate). SONIA (Sterling Overnight Index Average), while available from 2010, contains several outliers during the sample period that could distort results. Therefore, SOFR was picked for the sake of consistency and reliability, when it came to calculating risk-adjusted performance, like that.

All statistical calculations, regression estimates, and graphical visualizations was done with suitable quantitative tools, so that accuracy, consistency, and sturdiness of results could be supported.

Data Analysis - Value at Risk (VAR) Calculation

Value at Risk (VAR) Calculation

MSCI ACWI

MSCI ACWI - Historical Approach

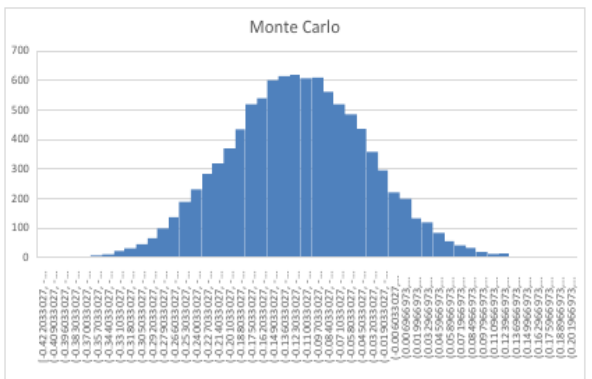
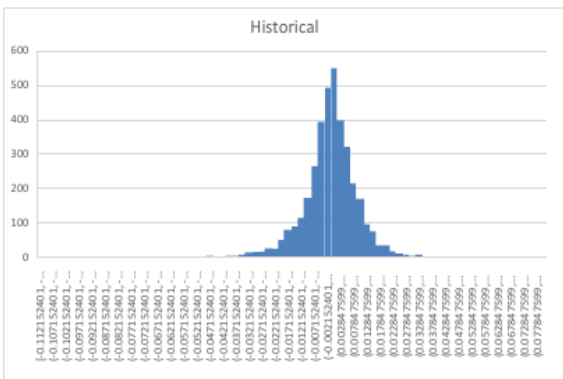
Mean	0.04%
Std Dev	1.09%
Min	-11.22%
Max	8.14%
CMP	115.58

MSCI ACWI - Monte Carlo

Mean	-11.34%
Std Dev	8.24%
Min	-42.20%
Max	20.48%
CMP	115.58

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	2.69%	118.69	3.11
98%	2%	2.18%	118.10	2.52
95%	5%	1.61%	117.45	1.86
90%	10%	1.17%	116.94	1.35

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	8.30%	125.18	9.59
98%	2%	5.68%	122.15	6.57
95%	5%	2.24%	118.18	2.59
90%	10%	-0.84%	114.61	-0.97



S&P 500

S&P 500 - Historical Approach

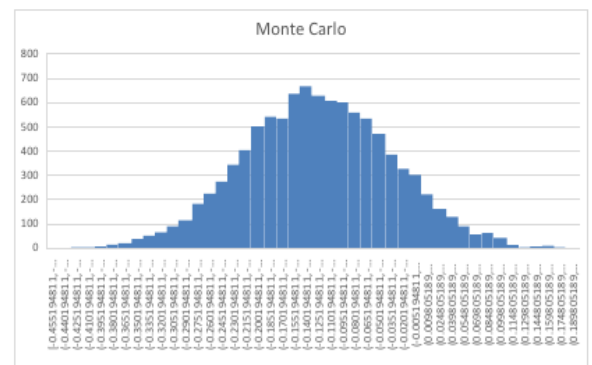
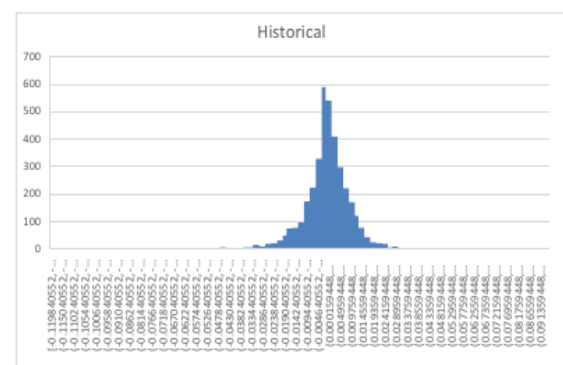
Mean	0.05%
Std Dev	1.08%
Min	-11.98%
Max	9.38%
CMP	5881.63

S&P 500 - Monte Carlo

Mean	-11.85%
Std Dev	9.26%
Min	-45.52%
Max	20.27%
CMP	5881.63

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	2.65%	6037.69	156.06
98%	2%	2.20%	6011.16	129.53
95%	5%	1.55%	5972.69	91.06
90%	10%	1.16%	5950.14	68.51

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	9.81%	6458.58	576.95
98%	2%	7.29%	6310.12	428.49
95%	5%	3.26%	6073.47	191.84
90%	10%	0.00%	5881.34	-0.29



DAX 40

DAX 40 - Historical Approach

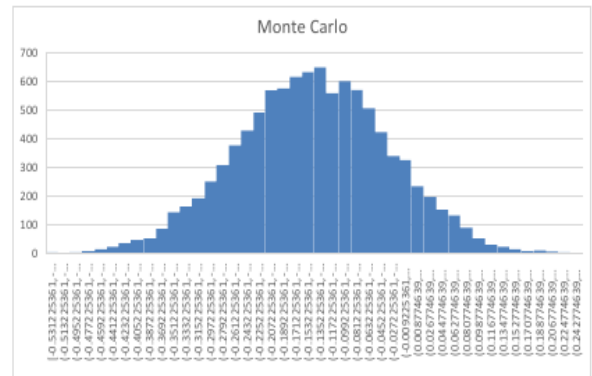
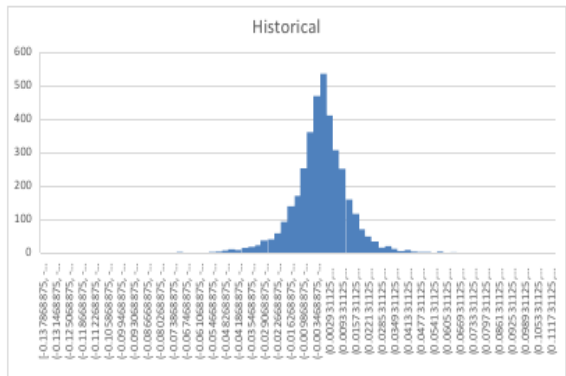
Mean	0.03%
Std Dev	1.41%
Min	-13.79%
Max	11.33%
CMP	20607.95

DAX 40 - Monte Carlo

Mean	-13.69%
Std Dev	11.22%
Min	-53.12%
Max	25.34%
CMP	20607.95

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	3.59%	21348.39	740.43
98%	2%	3.05%	21236.98	629.03
95%	5%	2.14%	21048.82	440.86
90%	10%	1.51%	20919.37	311.42

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	11.64%	23006.65	2398.70
98%	2%	8.84%	22430.34	1822.39
95%	5%	4.83%	21603.48	995.53
90%	10%	0.70%	20751.27	143.32



NIFTY 100

NIFTY 100 - Historical Approach

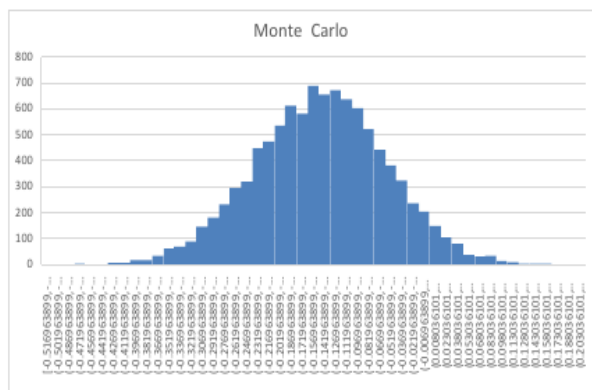
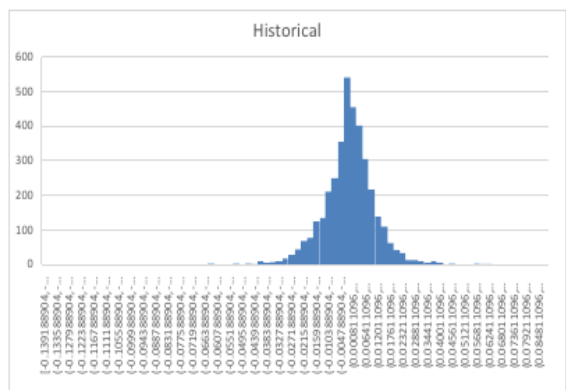
Mean	0.03%
Std Dev	1.25%
Min	-13.92%
Max	8.87%
CMP	286.33

NIFTY 100 - Monte Carlo

Mean	-13.93%
Std Dev	8.97%
Min	-51.70%
Max	21.31%
CMP	286.33

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	3.33%	295.87	9.54
98%	2%	2.53%	293.58	7.25
95%	5%	1.89%	291.74	5.41
90%	10%	1.35%	290.21	3.88

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	7.13%	306.73	20.40
98%	2%	4.27%	298.57	12.24
95%	5%	0.70%	288.34	2.01
90%	10%	-2.56%	278.99	-7.34



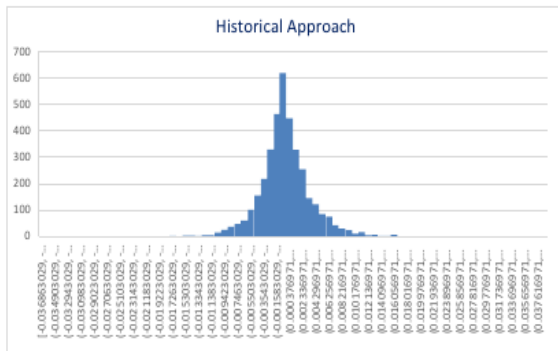
Value at Risk (VAR) Calculation

USDINR

USDINR - Historical Approach

Mean	0.02%
Std Dev	0.43%
Min	-3.69%
Max	3.86%
CMP	85.55

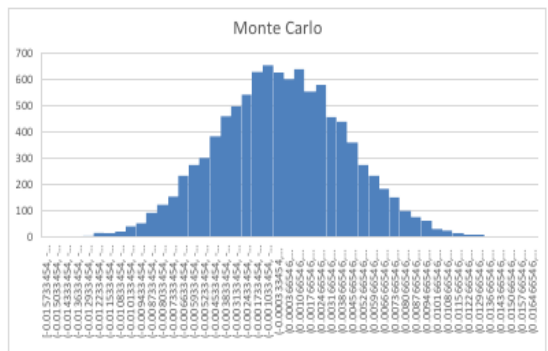
Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	1.25%	86.62	1.07
98%	2%	0.96%	86.37	0.82
95%	5%	0.69%	86.14	0.59
90%	10%	0.49%	85.97	0.42



USDINR - Monte Carlo

Mean	0.02%
Std Dev	0.43%
Min	-1.57%
Max	1.68%
CMP	85.55

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	1.02%	86.42	0.87
98%	2%	0.90%	86.32	0.77
95%	5%	0.73%	86.18	0.63
90%	10%	0.57%	86.04	0.49

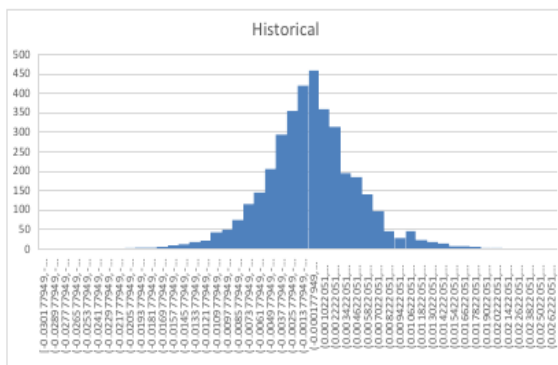


USDEUR

USDEUR - Historical Approach

Mean	0.01%
Std Dev	0.53%
Min	-3.02%
Max	2.71%
CMP	0.97

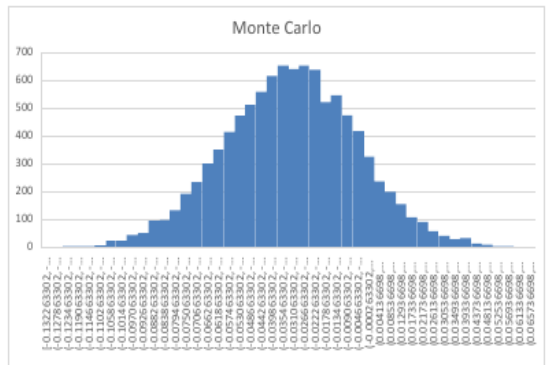
Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	1.44%	0.98	0.01
98%	2%	1.23%	0.98	0.01
95%	5%	0.86%	0.97	0.01
90%	10%	0.63%	0.97	0.01



USDEUR - Monte Carlo

Mean	-3.00%
Std Dev	2.71%
Min	-13.23%
Max	6.98%
CMP	0.97

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	3.34%	1.00	0.03
98%	2%	2.57%	0.99	0.02
95%	5%	1.40%	0.98	0.01
90%	10%	0.38%	0.97	0.00

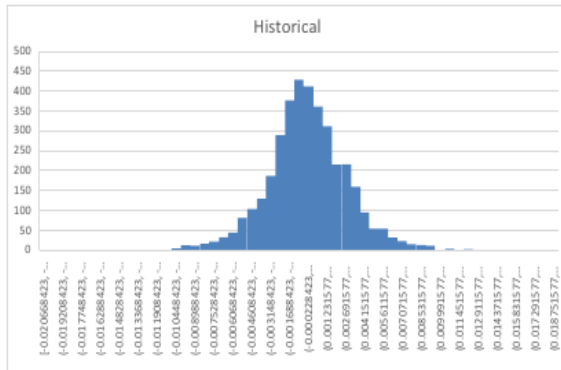


Dollar Index

Dollar Index - Historical Approach

Mean	0.01%
Std Dev	0.32%
Min	-2.07%
Max	1.91%
CMP	129.49

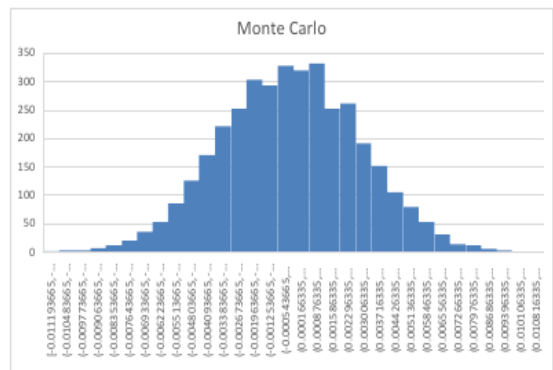
Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	0.89%	130.63	1.15
98%	2%	0.72%	130.42	0.93
95%	5%	0.54%	130.18	0.69
90%	10%	0.39%	129.99	0.50



Dollar Index - Monte Carlo

Mean	0.01%
Std Dev	0.32%
Min	-1.25%
Max	1.30%
CMP	129.49

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	0.74%	130.45	0.96
98%	2%	0.67%	130.35	0.86
95%	5%	0.54%	130.18	0.70
90%	10%	0.42%	130.03	0.54

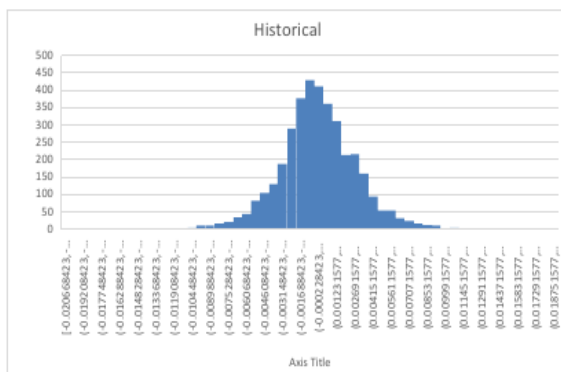


Emerging Market Index

Emerging Market Index - Historical Approach

Mean	0.01%
Std Dev	0.32%
Min	-2.07%
Max	1.91%
CMP	139.53

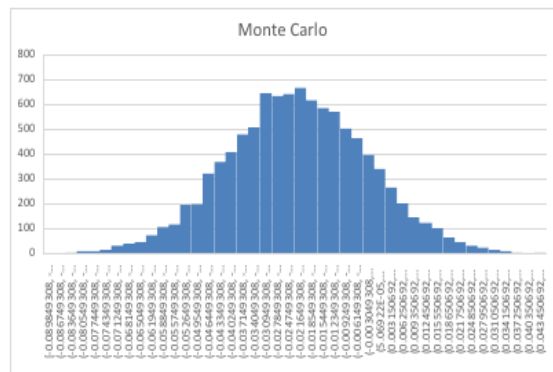
Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	0.89%	140.76	1.24
98%	2%	0.72%	140.53	1.01
95%	5%	0.54%	140.28	0.75
90%	10%	0.39%	140.07	0.54



Emerging Market Index - Monte Carlo

Mean	-2.07%
Std Dev	1.90%
Min	-8.98%
Max	4.62%
CMP	139.53

Confidence	Percentile	VAR %	Price	VAR (Price)
99%	1%	2.35%	142.81	3.28
98%	2%	1.84%	142.09	2.56
95%	5%	1.08%	141.04	1.51
90%	10%	0.34%	140.01	0.48



Currency Beta

Beta Drifting	
Index= Emerging Market Index	USDINR
Levered Beta	0.68
Raw Beta Weight	50%
Index Beta	1
Index Beta Weight	50%
Adjusted Beta	0.84

Beta Drifting	
Index= Emerging Market Index	USDINR
Levered Beta	0.68
Raw Beta Weight	0.25
Index Beta	1
Index Beta Weight	75%
Adjusted Beta	0.92

Beta Drifting	
Index= Emerging Market Index	USDINR
Levered Beta	0.68
Raw Beta Weight	75%
Index Beta	1
Index Beta Weight	25%
Adjusted Beta	0.76

Beta Drifting			
Index= Dollar Index	USDINR	USDEUR	Emerging Market Index
Levered Beta	0.59	1.29	0.85
Raw Beta Weight	50%	50%	50%
Index Beta	1	1	1
Index Beta Weight	50%	50%	50%
Adjusted Beta	0.79	1.15	0.93

Beta Drifting			
Index= Dollar Index	USDINR	USDEUR	Emerging Market Index
Levered Beta	58.84%	1.29	0.85
Raw Beta Weight	25.00%	0.25	0.25
Index Beta	1	1	1
Index Beta Weight	75%	75%	75%
Adjusted Beta	0.90	1.07	0.96

Beta Drifting			
Index= Dollar Index	USDINR	USDEUR	Emerging Market Index
Levered Beta	0.59	1.29	0.85
Raw Beta Weight	75%	75%	75%
Index Beta	1	1	1
Index Beta Weight	25%	25%	25%
Adjusted Beta	0.69	1.22	0.89

Stock Indices Beta

Beta Drifting			
Index= MSCI ACWI	S&P 500	DAX	NIFTY 100
Levered Beta	0.96	0.88	0.40
Raw Beta Weight	25%	25%	25%
Index Beta	1	1	1
Index Beta Weight	75%	75%	75%
Adjusted Beta	0.99	0.97	0.85

Beta Drifting			
Index= MSCI ACWI	S&P 500	DAX	NIFTY 100
Levered Beta	0.96	0.88	0.40
Raw Beta Weight	75%	75%	0.75
Index Beta	1	1	1
Index Beta Weight	25%	25%	0.25
Adjusted Beta	0.97	0.91	0.55

Beta Drifting			
Index= MSCI ACWI	S&P 500	DAX	NIFTY 100
Levered Beta	0.96	0.88	0.40
Raw Beta Weight	50%	50%	50%
Index Beta	1	1	1
Index Beta Weight	50%	50%	50%
Adjusted Beta	0.98	0.94	0.70

Risk Adjusted Metrics

CAPM Returns				
Base Index=MSCI ACWI	MSCI ACWI	S&P 500	DAX 40	NIFTY 100
Market Returns (Rm)	9.13%	9.13%	9.13%	9.13%
Risk Free Rate (Rf)	2.11%	2.11%	2.11%	2.11%
Marginal Returns (Rm-rf)	7.02%	7.02%	7.02%	7.02%
Beta	1.00	0.98	0.94	0.70
Risk Premium	7.02%	6.88%	6.60%	4.92%
CAPM Expected Returns	9.13%	8.99%	8.71%	7.03%

Calculation of Sharpe Ratio				
Particulars	MSCI ACWI	S&P 500	DAX 40	NIFTY 100
Market Returns (Rm)	9.13%	11.61%	5.90%	6.50%
Risk Free Rate (Rf)	2.11%	2.11%	2.11%	2.11%
Marginal Returns (Rm-rf)	7.02%	9.50%	3.79%	4.39%
Annualised Volatility	0.17	0.17	0.22	0.20
Sharpe Ratio	0.40	0.55	0.17	0.22

Calculation of Jensen's Alpha				
Base Index=MSCI ACWI	MSCI ACWI	S&P 500	DAX 40	NIFTY 100
Market Returns (Rm)	9.13%	9.13%	9.13%	9.13%
Risk Free Rate (Rf)	2.11%	2.11%	2.11%	2.11%
Marginal Returns (Rm-rf)	7.02%	7.02%	7.02%	7.02%
Beta	1.00	0.98	0.94	0.70
Risk Premium	7.02%	6.88%	6.60%	4.92%
Portfolio Returns (Rp)	9.13%	11.61%	5.90%	6.50%
Jensen's Alpha	2.11%	4.72%	-0.70%	1.57%

Calculation of Alpha				
Base Index=MSCI ACWI	S&P 500	DAX 40	NIFTY 100	
Variable Returns	11.61%	5.90%	6.50%	
Benchmark Returns	9.13%	9.13%	9.13%	
Alpha	2.48%	-3.23%	-2.63%	

Calculation of Treynor Ratio				
Particulars	MSCI ACWI	S&P 500	DAX 40	NIFTY 100
Market Returns (Rm)	9.13%	11.61%	5.90%	6.50%
Risk Free Rate (Rf)	2.11%	2.11%	2.11%	2.11%
Marginal Returns (Rm-rf)	7.02%	9.50%	3.79%	4.39%
Beta	1.00	0.98	0.94	0.70
Treynor Ratio	7.02	9.68	4.03	6.25

Calculation of Sortino Ratio				
Particulars	MSCI ACWI	S&P 500	DAX 40	NIFTY 100
Market Returns (Rm)	9.13%	11.61%	5.90%	6.50%
Risk Free Rate (Rf)	2.11%	2.11%	2.11%	2.11%
Marginal Returns (Rm-rf)	7.02%	9.50%	3.79%	4.39%
Annualised Volatility	0.14	0.14	0.17	0.16
Sortino Ratio	0.49	0.66	0.22	0.28

Data Analysis - ANOVA Test Results

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
USA Nominal GDP	57	67.98700047	1.192754394	0.600569156
USA Real GDP	57	33.51116704	0.587915211	0.277249396

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	10.42616746	1	10.42616746	23.75472116	3.63389E-06	3.925834269
Within Groups	49.15783891	112	0.438909276			
Total	59.58400637	113				

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Germany Nominal GDP	57	31.47972056	0.552275799	4.225082803
Germany Real GDP	57	31.11266368	0.545836205	4.175279025

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.001181849	1	0.001181849	0.00028138	0.98664644	3.925834269
Within Groups	470.4202623	112	4.200180914			
Total	470.4214442	113				

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
India Nominal GDP	57	91.31646311	1.602043212	4.388078048
India Real GDP	57	24.17219079	0.424073523	3.839347131

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	39.54695881	1	39.54695881	9.613447208	0.002443731	3.925834269
Within Groups	460.73581	112	4.113712589			
Total	500.2827688	113				

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
USA Real GDP	57	33.51116704	0.587915211	0.277249396
Germany Real GDP	57	31.11266368	0.545836205	4.175279025
India Real GDP	57	24.17219079	0.424073523	3.839347131

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.825376957	2	0.412688478	0.149310663	0.861415666	3.049792131
Within Groups	464.3450309	168	2.763958517			
Total	465.1704079	170				

Anova: Single Factor

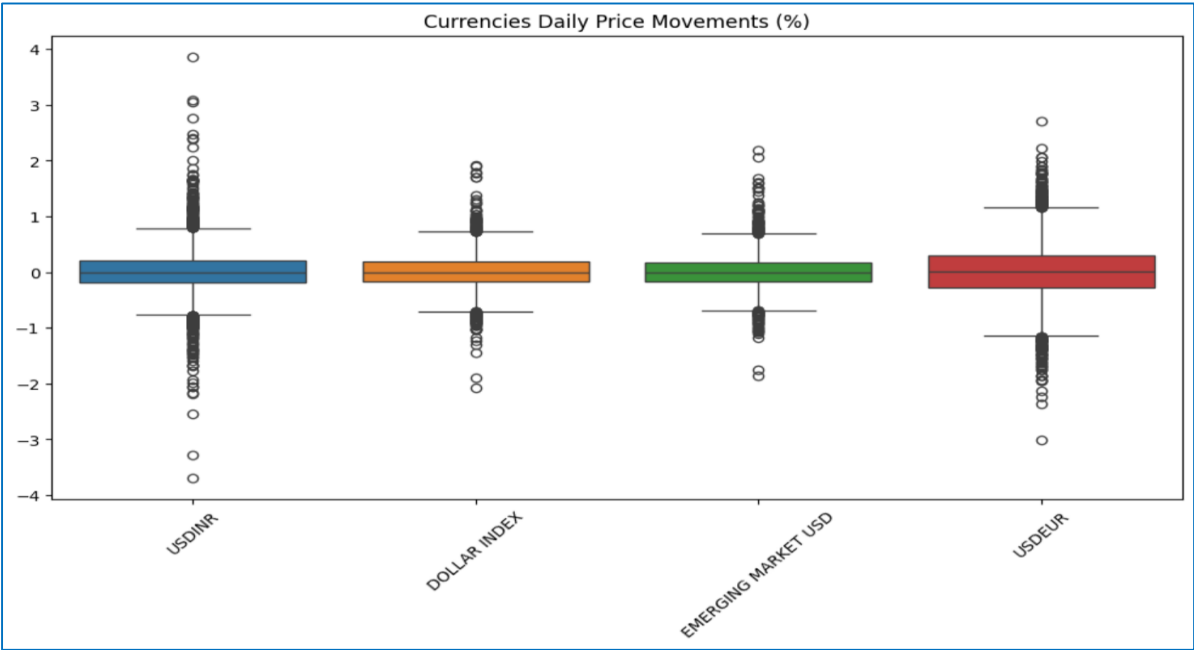
SUMMARY

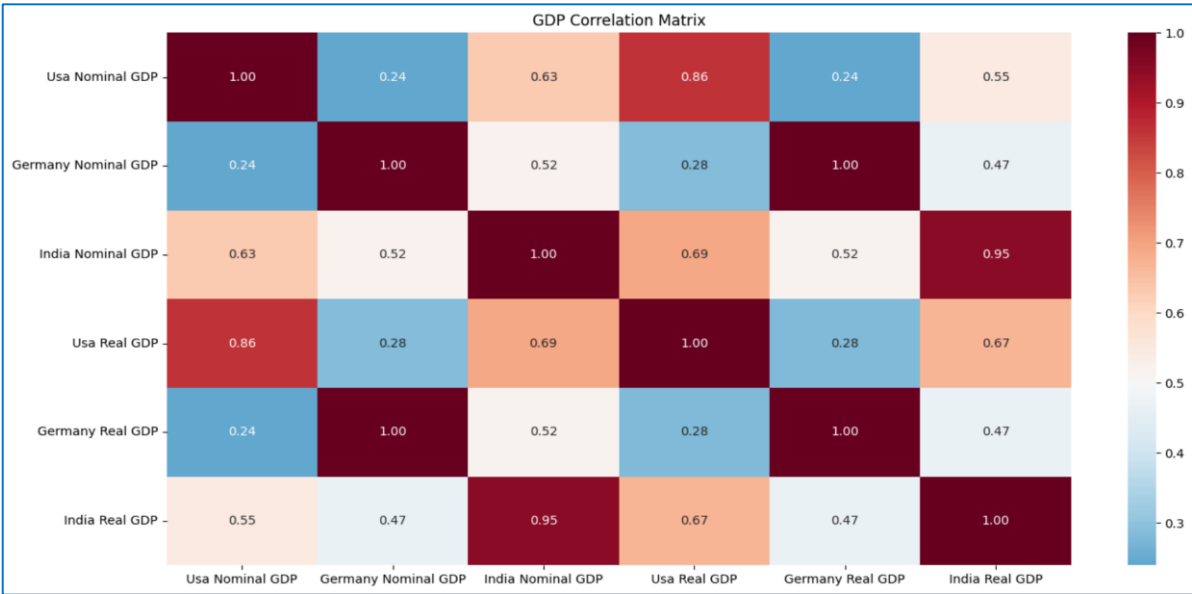
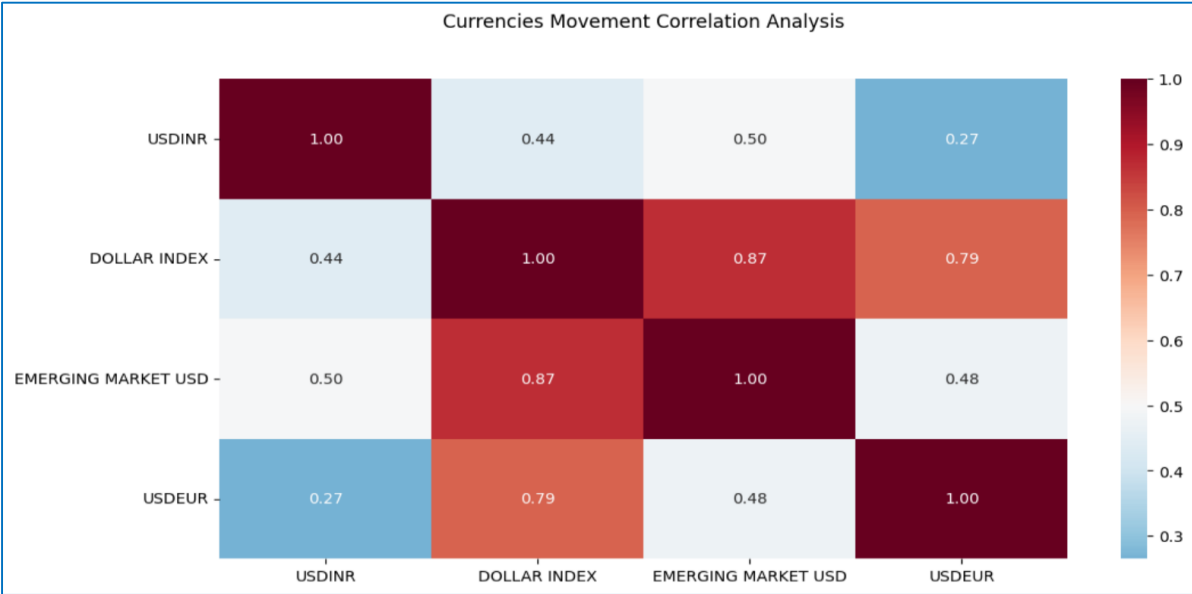
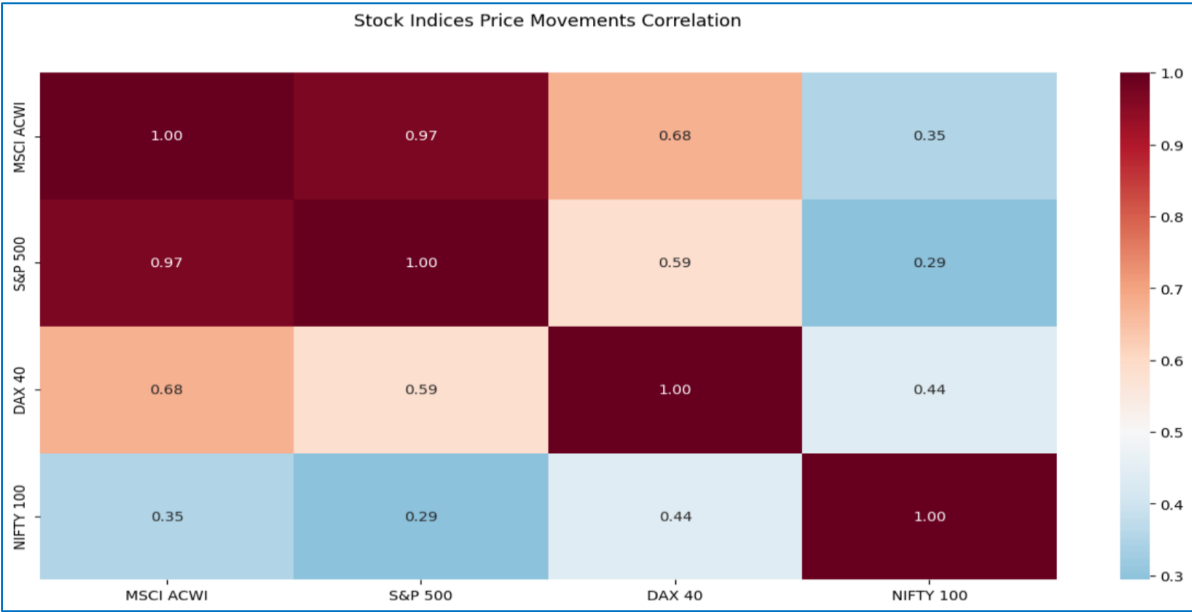
Groups	Count	Sum	Average	Variance
USA Nominal GDP	57	67.98700047	1.192754394	0.600569156
Germany Nominal GDP	57	31.47972056	0.552275799	4.225082803
India Nominal GDP	57	91.31646311	1.602043212	4.388078048

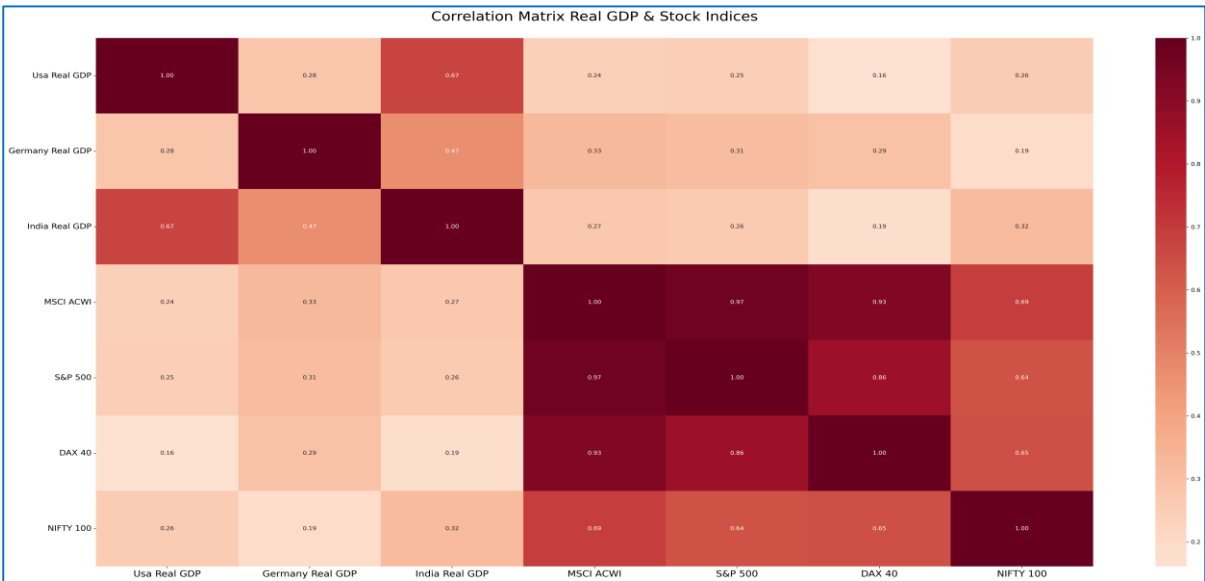
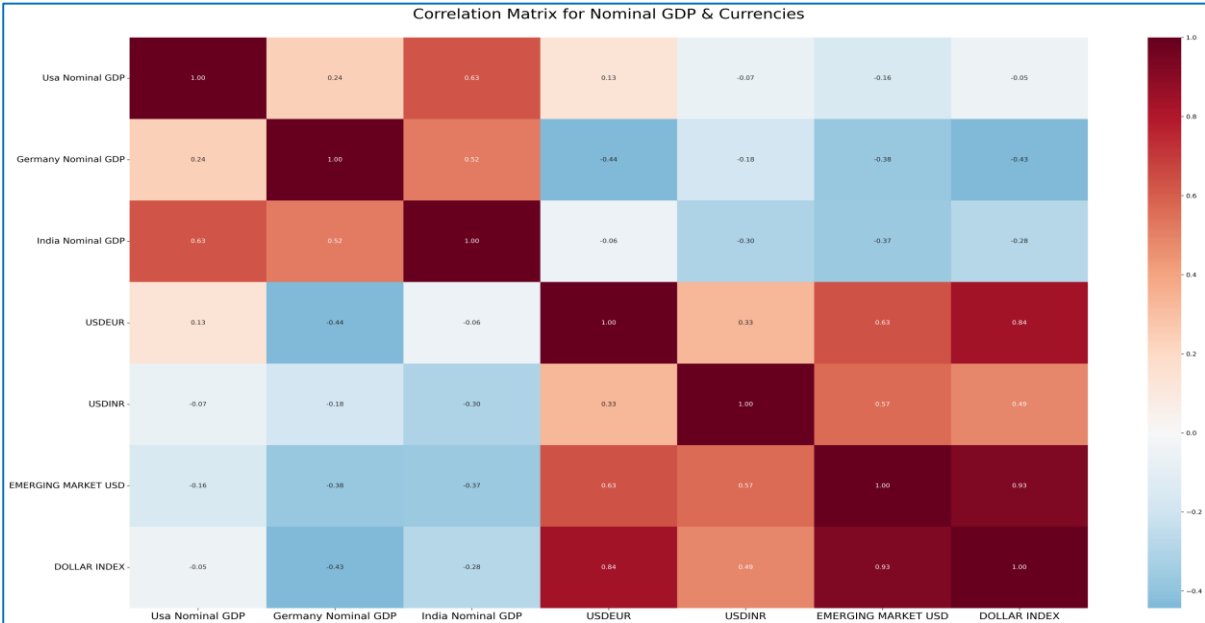
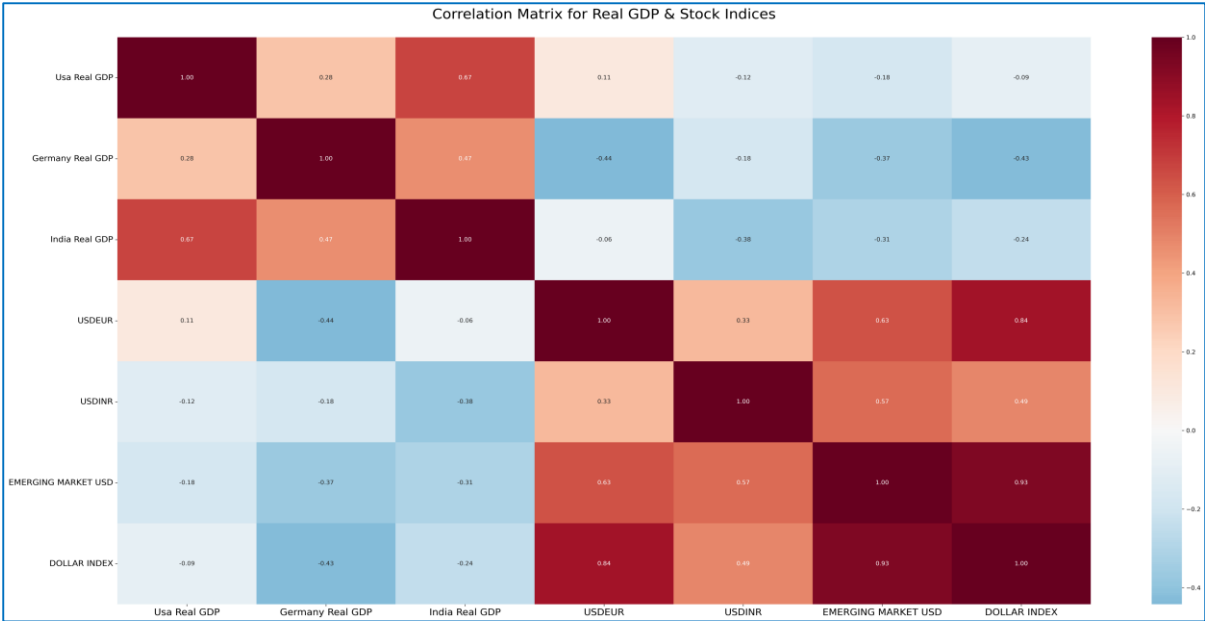
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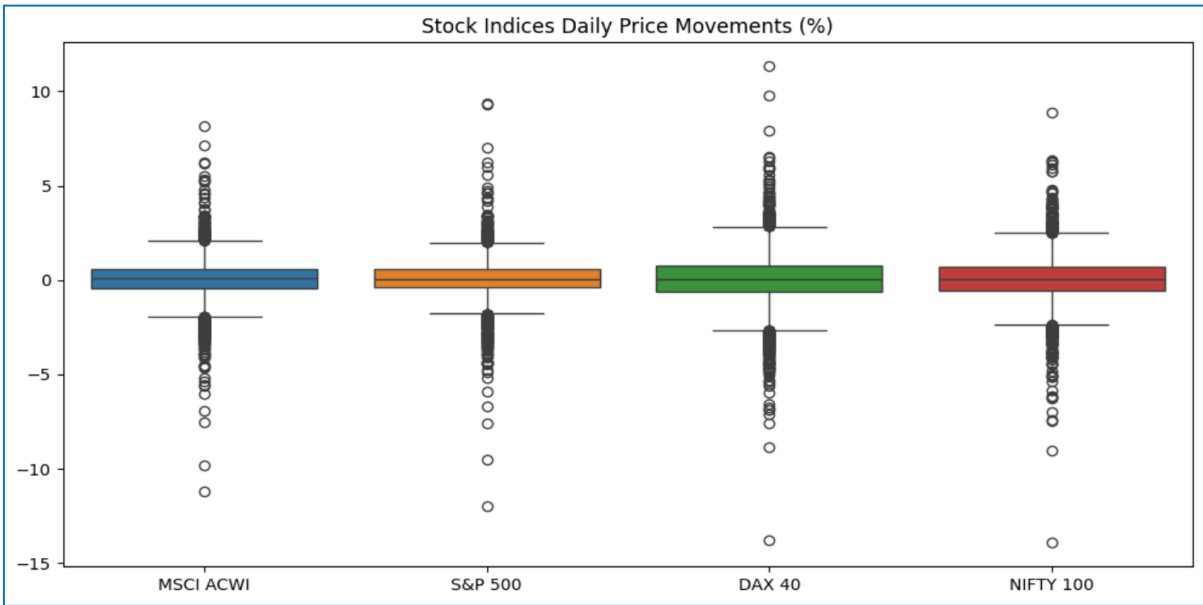
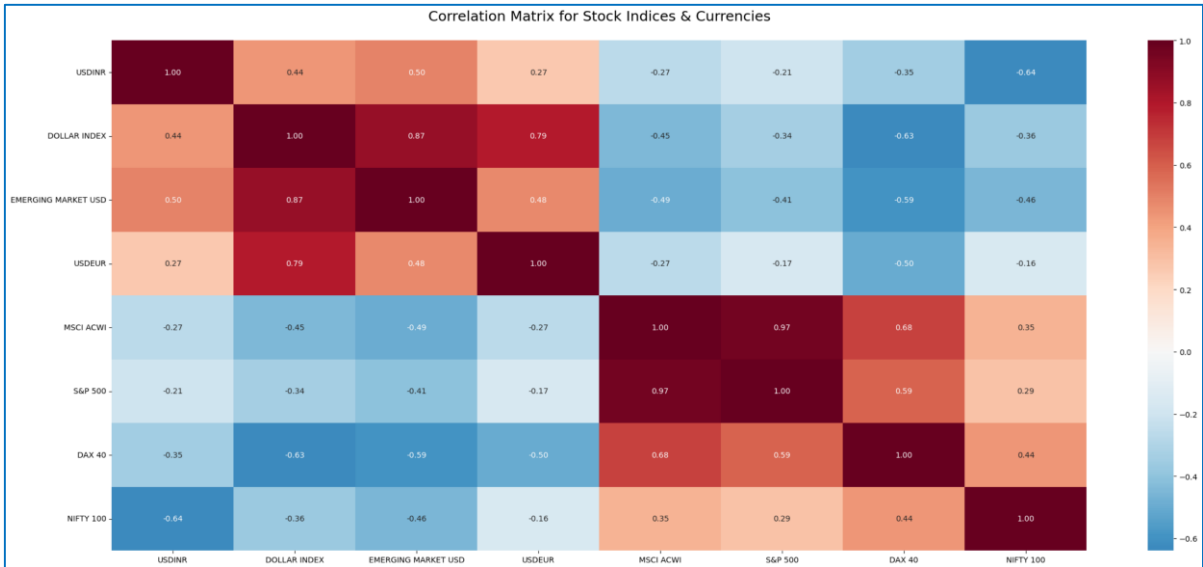
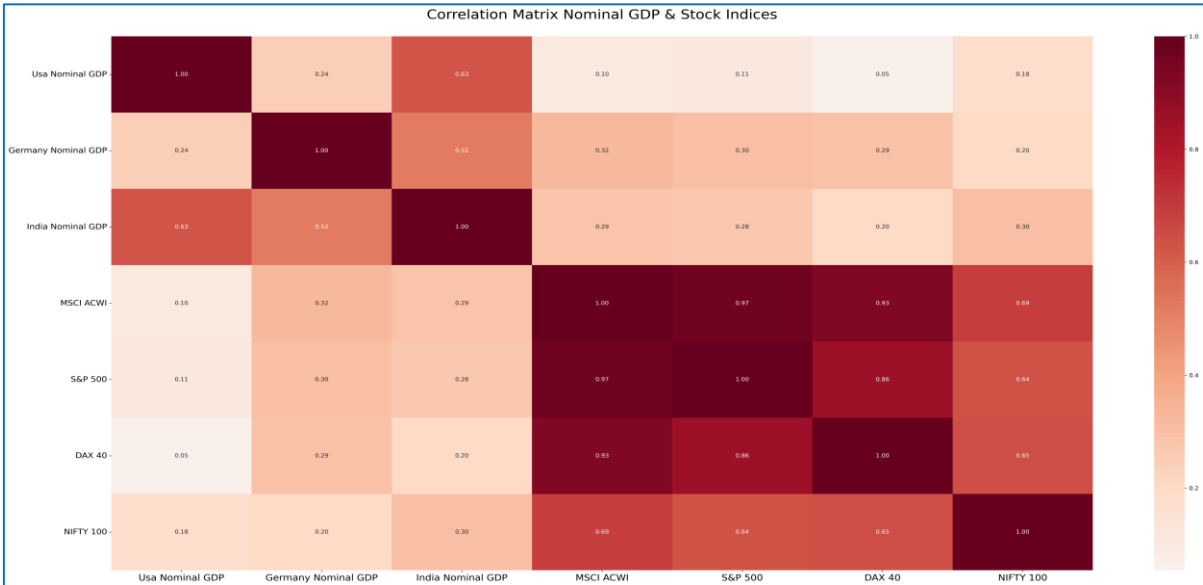
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	31.91509399	2	15.957547	5.195793772	0.006464464	3.049792131
Within Groups	515.9688804	168	3.071243335			
Total	547.8839743	170				

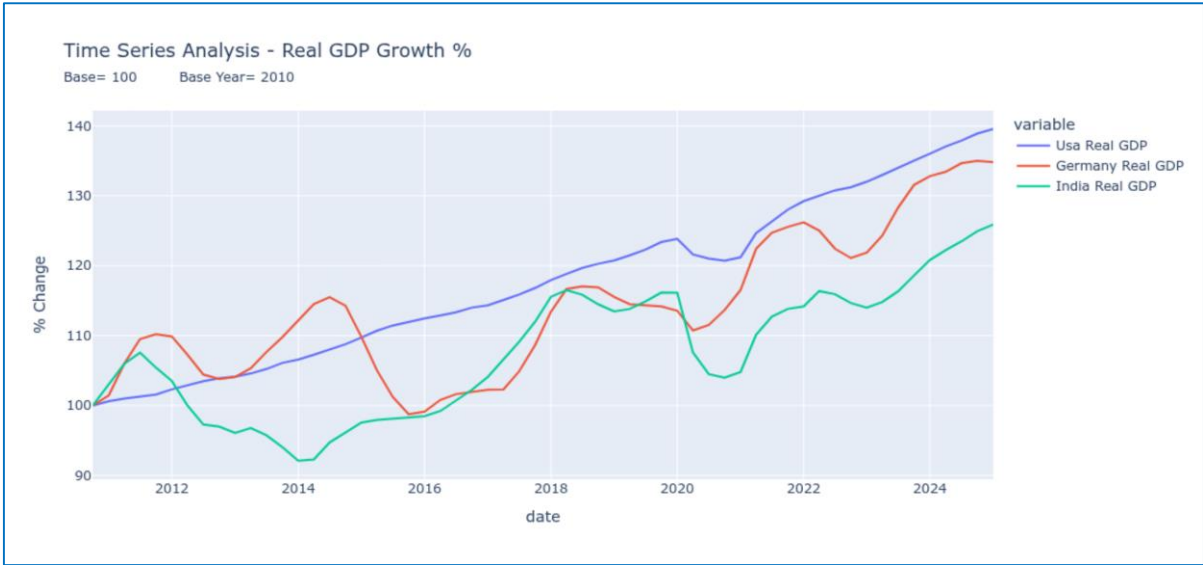
Data Analysis - Visualizations













Data Analysis and Findings:

GDP Growth Analysis:

In terms of real GDP growth in 3 countries, we see three different stories from the time series graph of real GDP and nominal GDP growth in the 3 countries over the period from 2010 to 2024. In case of US, the increase in index from approx. 100 from the baseline of 100 in the year 2010 seems to be rather steady and growing from 100 to 140 until 2024. Germany started from close to the same levels, but the index was more volatile; there was some dip after the 2014-2016 period and another after 2020. As for India, its nominal GDP growth was the most striking of the group, with the index almost hitting 245 by 2024, which points to a fast-growing economic engine, supported by domestic consumption, plus a sort of structural progress that keeps moving things forward.

The ANOVA output basically gives us that useful statistical backdrop for the differences we see. So when we look at nominal GDP across the three countries, we get an F-statistic of 5.20, and the p-value comes in at 0.006. Since that is under the 0.05 cutoff, it points to the idea that the gap in nominal GDP growth between the United States, Germany, and India is statistically significant. However, the ANOVA results for real GDP growth come the reverse way around – the F- statistic of just 0.149 and with p-value of 0.861. It looks that

the differences in the real GDP growth of the three countries do not even make it to level of statistical significance.

Overall it kind of signals that yes, the nations look notably different in nominal numbers, mostly because of inflation disparities and currency spillovers. Underneath, their true growth paths (how their economies actually are growing) are statistically indistinguishable for the period examined.

Further support comes from the results of the individual country ANOVA tests. Comparing real and nominal GDP for the USA provides an F statistic of 23.75 and a near zero p-value confirming significant disparity between its real and nominal GDP series. For Germany the equivalent statistics produce an F statistic of 0.0003 and a p-value of 0.987 confirming there are no differences, typical of the countries low level of inflation coupled with periods of stagnation. Germany is seen to be similar to India whereby the comparison of the real and nominal GDP statistics produced an F statistic of 9.61 and a p-value of 0.002 which confirm significant divergence due to India's higher inflation rates and robust nominal growth.

Stock Index Performance:

The time series study of stock index prices on 2010 - 2024, normalise with respect to 100 in year 100 of base year, shown S&P 500 provided a best total return out of all indices above and concluded by end of 2024 the price reaches around 530. Close second behind is MSCI ACWI and around 380 in 2024 year ending. The DAX 40, having bottomed at less than half of its pre- pandemic value at approx 120, finished at nearly 240, while the NIFTY 100 finished the period at approximately 265. The sharp market selloff experienced in early 2020 as a result of the global pandemic can be seen on all indices, although many were able to claw back and begin a new ascent, more so the S&P 500.

The index-level correlation matrix confirms that the MSCI ACWI is 0.97 correlated to the S&P 500, which is to be expected given the large proportion of US equities in the world index. The DAX 40 had a kinda moderate correlation with the MSCI ACWI at 0.68 and also with the S&P 500 at 0.59. Meanwhile, the NIFTY 100 kind a showed the lowest relationship to the global indices, landing at 0.35 with MSCI ACWI and 0.29 with the S&P 500, which hints at a sort diversification edge when Indian equities get folded into a worldwide portfolio.

If you look at the box plot of daily price moves it sort of backs this up too, because the DAX 40 and NIFTY 100 show wider interquartile ranges and more frequent outliers than the S&P 500. So overall, it points to more day-to-day turbulence, in these markets compared.

Beta and Systematic Risk:

So, when we perform the beta estimation, we use the MSCI ACWI as the benchmark and it shows a S&P500, say adjusted beta, of say 0.98 if we go to equal weights. So it's kind of moving almost closely the global benchmark that we used as a benchmark, so. Whereas you will get something like the DAX 40 on adjusted beta on say 0.7 in the same weighting scheme. The NIFTY 100, on the other hand, registers a comparatively smaller beta, kind of less synced up with that broader index. Overall, what these numbers suggest is that the S&P 500 tends to move almost as if it is in step with global markets, while the DAX 40 and NIFTY 100 hold less of the systematic global risk, but also they do not ride the global upswings as much.

If we look at the currency betas, the USDINR has an adjusted beta near 0.84 versus the Emerging Markets Index, which points to real exposure to the wider emerging market currency drift. Meanwhile USDEUR displays a lower level of systematic currency risk, not as much sensitivity overall.

Value at Risk Analysis:

The VaR analysis was done with the Historical method as well as Monte Carlo simulation, across all stock indices and the currency pairs. Looking at the S&P 500, with a 99% confidence interval, the historical approach gives what seems like a max single day loss of 2.65% (around 156 index points relative to the current market price, 5881.63), while the Monte Carlo simulation suggests a much larger potential hit of 9.81% (roughly 577 points). That broader Monte Carlo number is basically because the simulation can craft scenarios that don't always show up in the historically observed outcomes, and so it captures tail risk more thoroughly.

On the MSCI ACWI, at the same 99% confidence interval, Historical VaR is at 2.69 percent, where Monte Carlo has an estimate max loss of 8.30 percent. Now that we see that

the Dax 40 shows say a 99% historical value at risk of 3.59% then Monte Carlo Value at Risk of 11.64%, we are sort of indicating perhaps a greater sort of down-side worry against a broad basket of US indices. For the NIFTY 100, the 99% historical VaR sits at 3.33%, and that also seems to point to heightened downside exposure, even if the numbers aren't as extreme as DAX. Next, to the currencies: for USDINR, Monte Carlo yields a much larger VaR (3.34% at 99% conf.) and for USDEUR it's only 1.44% at 99% confidence interval with historical analysis. So this is consistent with my thesis above regarding the depreciation trend as well as much higher depreciation trend in USDINR relative to USDEUR and currency in general

Risk-Adjusted Performance:

Those risk adjusted performance metrics maybe the most obvious point for a side by side check, like the clearest basis, yes. If we use the MSCI ACWI as the base benchmark, with annualized market returns of 9.13% and a risk free rate of 2.11%, then the Sharpe Ratio for the S&P 500 comes out at 0.66, which is higher than all the other indices that were analyzed. After that you have the MSCI ACWI at 0.49, then NIFTY 100 at 0.28, and DAX 40 at 0.22. The Treynor Ratio also sort of seals it, in the sense that it still shows S&P 500 as the top performer, with a reading of 9.68, whereas MSCI ACWI is at 7.02, NIFTY 100 sits at 6.25, and DAX 40 drops to 4.03.

There's not a lot new once Jensen's alpha is computed. Above all, the S&P500 has a positive alpha of 2.48% relative to CAPM, by taking MSC I ACWI as a reference index. Meanwhile, DAX 40 and NIFTY 100 both deliver negative alphas of -3.23% and -2.63% respectively, so they underperform vs what the risk adjusted model would imply. Moreover, the Sortino Ratio is 0.66 (again the best ratio) for the S&P 500 while the DAX 40 is the worst value of 0.22 indicating higher downside deviation relative to the return generated.

Currency Performance:

When it comes to time series analysis of currency movements, set against a base of 100 in 2010, it pretty much shows, in a rather clear way, the big depreciation of the Indian Rupee vs the US Dollar for the whole study period. The USDINR index then essentially reached the 183 mark around end 2024, signifying about a cumulatively loss of about 83%

through 14 years of time, unlike the USDEUR, as well as the dollar Index which seem to move much less, closing somewhere around the 130-140 marks and exhibiting a less stable behavior for developed currencies. Meanwhile, the Emerging Market USD index also kept climbing, so it matches that wider emerging market currency weakness is/was already there.

Also, if we look at the currency correlation matrix, it has a similar tale. Dollar index and emerging market USD has close to 0.93 Corr; whereas USD inr remains moderately positively corr to the dollar index with 0.44 and to the emerging market dollar with 0.50. However, the correlation of USDINR to USDEUR is not significant (at just 0.27), this means the Rupee is driven by factors other than the Euro-related dynamics, domestic inflation, the Current Account deficit, capital flow, and that the dynamics surrounding those are particularly Indian-specific. And it doesn't stop there when the stock indices are brought in alongside the same currency correlation matrix, it also suggests a negative relationship between currency depreciation and equity index results. When we look at the NIFTY 100, it correlates about -0.64 with USDINR., which just reinforce that when the rupee becomes weaker, that's just another drag on foreign investors unhedged returns who holds the Indian equities

Conclusion:

This analysis that sort of took a swing at comparatively gauging the risk-adjusted, unhedged investment performance of the USA, Germany and India across the 2010 to 2024 timeframe using macro as well as a series of financial risk measures, putting together all those figures - based on GDP analysis, the performance metrics of stock indices, Beta assessment, VaR estimations, as well as returns adjusting for risk-adjusted metrics - all seems to lead to quite a unified, if not expected, result. The outcome: The USA, as represented by the S&P 500 Index, ultimately proved itself to be the most appealing of the three economies from an unhedged investment standpoint on a risk-adjusted basis. Real GDP Growth Data Analysis As expected and as confirmed by our ANOVA calculations, while real growth rates in output among the three nations did not have statistical meaning between 2010-2024 ($F = 0.149$, $p = 0.861$), the gross nominal difference between these three economies had great importance ($F = 5.20$, $p = 0.006$) - this was based on the fact that, the stunningly high nominal growth figures of India could largely be attributed, in the most part, to currency effects, or

rather a weaker currency, and inflation, and this growth wasn't from stronger real expansion of their real economy at hand.

And for that matter the case of Germany's nominal and real economic numbers weren't very convincing as well, having showed very little deviation and periods of near stasis (especially in between 2014-16 and after 2020).

Overall, the German economy seemed to have gotten caught in long stagnation and consolidation with minimal dynamism, which in turn led to very similar behavior in their own stock market's performance. Financial Metrics-Performance of the Equity Markets Indeed, the data we collected on the equity performance of the three economies pretty much solidified the analysis we previously covered in the macroscopic economy. With around 430% cumulative return in S&P 500 Index between 2010-2024, the nearest peers, India's Nifty100 (approx 165%) and Germany's DAX40 (less than 140%) have underperformed the US index by wide margin during this period.

Nonetheless, it was the total amount that was gained by American stocks wasn't the only relevant metric: this enormous growth wasn't achieved just because of higher and higher levels of taken risk or 'excessive caution turn-round into more volatility' as one can name it.

Sharpe Ratio(S&P) of 0.66 with Treynor ratio of 9.68 seems to put in a higher grade, in contrast, DAX40 ended the period in question with a Jensen alpha that equal to -3.23% of that of its expected earnings given its Beta as the German economic situation, and as expected its stock market had also a poor perform. In other hand India is, compared to what I stated previously, a case to take another look at. Its Nifty100 earned a good return and, if properly measured, it obtained a very positive alpha value alongside the capability to lower the foreign investment correlation to the global indexes such as MSCI All Country World Index - having correlation values at 0.35 for Nifty100 against the MSCI ACWI.

Nevertheless, the continuous depreciation in value of the Indian Rupee – over 83% against the Dollar throughout our examined study period - becomes a heavy hurdle, the fact which couldn't be evaded without going through extra financial and operational expenses related to money transactions, for any unhedged investment in the foreign markets. The NIFTY 100 attained values for its Sharpe ratio and Sortino Ratio that are in the range of merely 0.28;

as a matter of fact, those levels stand quite below the level reached by S&P 500 stocks as well as it could also be inferred from the Value at Risk (VAR) test that Indian equities carry with them significant extra volatility in most confidence intervals situations. Indeed, while India has potentially the best 'growth story' given its long-term structural view, currency risk has considerably increased its risk at least under the circumstances of the investment at hand without hedge strategies, and that's what has prevented it from further appealing to the American investor.

All this background about the currency's movement serves a dual role as background for both analyses; in one hand for what was discovered before on currency performance and on the other hand as a general clue what the hell are happening behind the scene and indeed this is explained here below on further depth.

As shown here below, the relative stability of the dollar in the forex compared to the rupee offers yet more explanations regarding the divergence of risk. As you can clearly see from the figures above with respective figures of USD / INR and dollar's overall market performance in general (and here more concretely via our dollar index), relative currency instability and in relation to their overall world performance has a meaningful negative correlation with the unhedged returns of a given financial asset. And even if you as investor had planned on these dollar- denominated investments without considering currency's movements then you have it here anyway! In summation, what separates the U.S. Economy at present time is, the solid macroeconomic stability with constant expansion, the lower-than average risks inherent in equities trading on their financial market, the absence of large risk in dollar, as well as large market depths available for transactions.

While looking at the data and the results of the statistical tests, Germany currently presents itself as a stagnant economy, with no signs of macro or market dynamism at present – making it unappealing for risk and income on a risk-adjusted basis.

For their parts, Indian stocks, though offering reasonable long-term economic prospects and solid nominal growth rates, carry a substantial amount of risk mainly based on their fluctuating currency and the volatility and transactional costs this implies for the U.S. Unhedged investors. The objective is to present an organize comparative outlook, and that

doesn't substitute the whole financial world and market view you take before taking any decision.

Limitations of this research paper:

1. The study, assumes unhedged investments for the chosen countries. Hedging strategies weren't, really built in, mostly because of data limits and resource constraints.
2. The analysis is sort of limited to GDP growth rates, currency variables, and stock index data. There are other macroeconomic plus geopolitical factors (Global Economic Slowdown during Covid-19 outbreak) that could, in a roundabout way affect investment performance, but those just weren't included for simplicity of the research, however the continuous time series data uncovers the trend and provides brief insights of the markets and economic strength of the respective countries during the crisis covered under the research.
3. A consistent period of quarterly data for which some annualised data was available spanned between 1 January 2010 and 31 December 2024, but a limited amount of annualised data began on 1 October 2010 only.
4. We did not use any 2025 data because we do not have the complete data for the year 2025, while we were sourcing data for our research.
5. Taxation, transaction costs, and other investment related charges were not considered in the performance evaluation.
6. In this research paper, the only statistical assessments and risk-adjusted return calculations are provided. Since there was no time available, machine learning or deep learning approaches were not used because this study had limitations associated with both its scope and time frame.
7. These findings, they do give comparative insights but they should not be used as the only foundation for investment decisions, unless you also look at other financial, economic, and personal risk factors, and shall be consulted with the reputed financial advisor before making any financial decisions.

Data Source for gathering data:

- 1) Official Fred API Key provided by Fred

2) yfinance python library

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