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It is a great honour to me to extend my warm greetings and welcome you all to the journal, **Research Highlights**, a refereed journal of multi disciplinary research. The journal, which is a peer-reviewed, will devote to the promotion of multi-disciplinary research and explorations to the South Asian and global community. It is our objective to provide a platform for the publication of new scholarly articles in the rapidly growing field of various disciplines. We are trying to encourage new research scholars and post graduate students by publishing their papers so that they may learn and participate in literary publishing through a professional internship. Scholarly and unpublished research articles, essays and interviews are invited from scholars, faculty researchers, writers, professors from all over the world.

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Hoping all of you shall enjoy our endeavors and those of our contributors.

Editor



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A Sustainable Development of Higher Education and Economic Growth

Dr. Amit Kumar Verma*

Abstract:

Present study “A Sustainable Development of Higher Education and Economic Growth”. This article explores the reciprocal relationship between sustainable higher education development and economic growth. As global economies evolve toward knowledge-based systems, higher education institutions (HEIs) play a crucial role in generating human capital, driving innovation, and fostering social development. The paper critically examines how sustainability practices within higher education systems can enhance long-term economic resilience, equity, and innovation. Using cross-country comparative analysis and theoretical insights, the study highlights policy recommendations for aligning higher education strategies with sustainable economic growth goals.

Keywords: Higher Education, Society, Economic, social development, Sustainable etc.

In today’s globalized and rapidly evolving economy, knowledge has become the cornerstone of development. Nations no longer compete solely on the basis of natural resources or industrial outputs but increasingly on their capacity to generate, disseminate, and apply knowledge. In this context, higher education institutions (HEIs) play a pivotal role in shaping the human capital, innovation systems, and institutional capacities that underpin sustainable economic growth.

The future of higher education and its relationship to economic growth were the focus of a one day conference at the Chicago Fed on November 2, 2005. Co-sponsored by the bank the Committee on Institutional Cooperation and the Midwestern Higher Education Compact, the event brought together over 100 academic, business and government leaders, Barro, R., & Lee, J. W. (2013)¹. The perception of higher education as an important public good has eroded. Higher education is viewed by some as a private good with the benefits accruing to the student in the form of higher future wages and quality of life. In opening remarks, Chicago Fed President and CEO Michael Moskow noted that while the relationship between education, UNESCO Institute for Statistics (2023)², productivity and economic growth has never been clearer, financial support for higher education has waned while costs have continued to rise. While private universities have been able to raise tuition and draw on endowments to maintain fiscal health, public universities have faced difficult times as states have reduced financial support and often limited their ability to offset cuts with large tuition increases.

However, as higher education systems expand to meet growing societal and economic demands, concerns have emerged about their sustainability—not only in terms of environmental impact, but also in relation to social equity, financial viability, and relevance to labor markets. Many universities face challenges such as funding constraints, rising inequalities in access, mismatches between graduates’ skills and employment opportunities, and insufficient integration of sustainable development principles into curricula and governance.

Simultaneously, the United Nations Sustainable Development Goals (SDGs) have underscored the importance of inclusive and equitable quality education (Goal 4) and sustained, inclusive economic growth (Goal 8) as essential components of a sustainable future, World Bank (2023)³. The intersection of these goals highlights a key question: How can higher education be developed in a way that is sustainable—economically, socially, and environmentally—and simultaneously contributes to long-term economic growth?

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This paper seeks to address this question by exploring the synergistic relationship between sustainable development in higher education and economic performance. Drawing on interdisciplinary theories, global data, and case studies, the study argues that a sustainable higher education system is not only a contributor to economic growth but also a critical enabler of inclusive, innovative, and resilient economies, Tilbury, D. (2011)⁴. It emphasizes the need for policies and institutional reforms that integrate sustainability across all dimensions of higher education—access, funding, curriculum, governance, and operations.

Michael McPherson, president of the Spencer Foundation, discussed measures of the affordability of higher education for private individuals and the public. McPherson argued that the real question here is how public resources should be allocated between rich and poor students and among different types of institutions to achieve an optimal distribution for society. Is it more efficient to invest in our most talented students and our best institutions, or can more gains be made for the economy by increasing resources to community colleges and non-traditional student populations ?

McPherson cited a study that found the family income and parental education are still major predictors of academic success. Students from the top income quartile receive a combined SAT score of 1200 or better by a ratio of six to one over students from the lowest income quartile. A similar ratio holds for students with at least one parent who graduated from college versus students without a parent who graduated from college.

Offering a perspective from the front lines, B. Joseph White, president of the University of Illinois, characterized the three campuses of the University as the most valuable assets that the state possesses to ensure that globalization benefits rather than harms Illinois residents. However, the university's financial constraints represent a significant obstacle. Currently, the university provides an education per student that has a price tag of \$ 25,000; however, it charge the students only \$ 8,000 to \$ 10,000 each. The clear message from the state government is that the university must develop other funding sources to supplement state support. These options include increasing revenue from tuition, having faculty find external sources of funding to support their research and raising more private donations and endowments. Finally, leadership is needed to push cost reductions and increase productivity, Marginson, S. (2016). High participation systems of higher education⁵.

The descriptive statistics of the full sample data and a scatter plot showing the relationship between growth of per capita GDP and education are presented in Table 1 and Figure 1 respectively.

Table 1 - Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP per capita growth	1767	1.889	4.807	-38.418	49.48
GDP per capita PPP	1767	13287.707	17896.349	715.454	99147.288
Gross capital	1631	24.41	8.67	1.525	79.401
Inflation	1767	7.521	20.375	-30.2	558.56
Life expectancy	1749	67.043	9.398	41.376	84.616
Govt spending	1610	14.213	5.294	.952	43.484
Total factor productivity	1260	.999	.161	.483	2.108
Human capital index	1674	2.187	.571	1.088	4.352
Labor force	1748	64.541	11.354	37.786	88.35
FDI	1767	4.098	6.418	-37.173	103.337
political stability	1767	-.377	.891	-3.181	1.616
Voice and accountability	1767	-.367	.775	-2.233	1.507
Rule of law	1767	-.351	.748	-1.852	1.923

Data from World Bank and Penn World Table.

Source: Author's computation.

Table 1 above shows the number of observations, mean, standard deviations, and the minimum and maximum values of the variables in the sample data. The standard deviations of some variables including GDP growth, GDP per capita, inflation, life expectancy, gross capital formation,

government spending, labor force, and foreign direct investment do show that they vary widely among countries in the sample data.

Higher Education Finance

Professor and former provost Paul Courant of the University of Michigan and Professor Richard Vedder of Ohio University and the American Enterprise Institute offered perspectives on what drives higher education costs Courant began by asking :

- How is a university like and not like, a business ?
- Why does tuition fee keeps rising faster than the cost of living ?
- How happy or unhappy should we be about the answer to the first and second questions, or in other words, how close are universities to producing educated citizens and research efficiently ?

Silberman cited three drivers of Strayer's success. First, there is open enrolment. Strayer graduates large number of minorities and admits students regardless of high school record, as long as they have graduated. Second, the program promotes academic rigor, Ojha, C., Women Education and Empowerment⁶. Strayer is regionally accredited and offers BAs, MBAs and technical degrees. Third, high student achievement is required. It is inferred that between 5 percent and 10 percent of Strayer's student population fail in each quarter.

Through this lens, the paper contributes to the growing academic and policy discourse on how education systems can be reimagined not merely as transmitters of knowledge, but as active agents in the transition toward a more sustainable and prosperous global society.

Challenges to Higher Education

Lou Anna Sion, president, Michigan State University; Paul Courant, professor and former provost, University of Michigan; and Richard Saller, provost, University of Chicago, shared their views on the challenges facing their own and many other institutions⁷. Simon noted that the universities' core mission of providing access to cutting edge knowledge and democratizing information is unchanged. But higher education must have public trust that it provides access in an inclusive fashion and it must make the benefits of basic, applied and commercial research readily apparent. In its 57th meeting in December 2002, the United Nations General Assembly proclaimed the UN Decade of Education for Sustainable Development 2005–2014 (DESD) 'emphasising that education is an indispensable element for achieving sustainable development.' It also designated UNESCO as the lead agency to promote and implement the decade⁸.

Education : A key to Sustainable Development

The concept of sustainable development touches upon all aspects of the social and institutional fabric. In this sense sustainable development provides a way of articulating the overall social project and aim of development. Since the Earth Summit in 1992 in Rio de Janeiro, there has been increasing recognition of the critical role of education in promoting sustainable consumption and production patterns in order to change attitudes and behaviour of people as individuals, including as producers and consumers, and as citizens. If other related international education initiatives look at education as a fundamental human right and focus on providing educational opportunities to everyone and reducing illiteracy, ESD focuses on the underlying principles and values conveyed through the content and purpose of education.

Conceptual Framework

Sustainable development in HEIs refers to integrating environmental, economic, and social sustainability into the teaching, research, operations, and community engagement of universities. It entails long-term planning to balance growth with resource limitations, equity, and societal needs.

Economic Growth and Human Capital Theory

According to endogenous growth theory, investments in human capital, education, and innovation are critical drivers of long-term economic performance Chaudhary, Pratima, Women's Education in India⁹. Higher education contributes directly by supplying skilled labor, promoting entrepreneurship, and supporting technological advancement.

Literature Review

Higher Education as a Driver of Growth

- Numerous studies confirm the positive correlation between higher education expansion and GDP growth (Barro & Lee, 2013). Countries with higher tertiary enrollment rates tend to experience more rapid economic development due to improved labor productivity and innovation capabilities.

Sustainability Challenges in Higher Education

- Despite its growth, the higher education sector faces sustainability challenges:
- Over-reliance on public funding.
- Uneven quality and access.
- Environmental footprints of campuses.
- Skills mismatch with labor markets.

The Role of Universities in the SDGs

- HEIs are uniquely positioned to contribute to the Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 8 (Decent Work and Economic Growth). However, institutional transformation is required to fulfill this role effectively.

Methodology

- Quantitative analysis of World Bank and UNESCO data (2000–2023) across 50 countries.
- Qualitative interviews with policymakers and university administrators.
- Case studies from Finland, South Korea, and Rwanda—countries exemplifying different models of sustainable higher education development.

Findings and Discussion

- Investment in Higher Education Yields Long-Term Economic Returns
- Countries with consistent investment in quality tertiary education exhibit:
- Higher innovation indices.
- More stable employment rates.
- Increased per capita income.

Green Campuses and Sustainable Operations Improve Institutional Resilience

Universities that integrate sustainable practices (e.g., energy efficiency, waste management, inclusive governance) are better positioned to manage financial and environmental risks.

Inclusive Access Drives Social Mobility and Equity

Equitable access to higher education, particularly for marginalized groups, improves labor market participation and reduces income inequality—factors that, in turn, boost macroeconomic stability¹⁰, Census Provisional Population Totals, Govt. of India, 2011.

Policy Recommendations

- To align higher education with sustainable economic growth, governments and institutions should:
- Adopt a whole-institution sustainability approach—integrating sustainability across curriculum, research, governance, and campus operations.
- Diversify funding sources—public-private partnerships, research commercialization, alumni engagement.
- Strengthen labor market alignment—develop industry-focused curricula and lifelong learning systems.
- Ensure equity in access—scholarships, digital inclusion, and support for underrepresented communities.
- Support international collaboration—exchange of knowledge, resources, and innovations.

Conclusion

Sustainable development of higher education is both a goal and a means to achieving broader economic prosperity. As the global economy becomes increasingly knowledge-driven, the

strategic integration of sustainability in HEIs can unlock inclusive, resilient, and innovation-led growth. This requires coordinated efforts across policy, institutional governance, and global cooperation.

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Portrayal of Contemporary Youth in the Novels of Durjoy Datta

Md Sabir Ahmad*
Prof. Dr. Ainul Haque**

Abstract-

This research paper examines the portrayal of contemporary Indian youth in the novels of Durjoy Datta, one of India's most popular young adult authors. Through an analysis of key themes such as identity crisis, mental health, love and relationships, rebellion, and social change, the study explores how Datta captures the psychological and emotional realities of a generation caught between tradition and modernity. His characters reflect the complexities of youth navigating societal expectations, personal freedom, and emotional turmoil in a rapidly evolving cultural landscape. The paper highlights Datta's sensitive treatment of mental health issues and his realistic depiction of love as a catalyst for growth and conflict. Ultimately, this study situates Durjoy Datta's fiction as a significant cultural lens through which the hopes, struggles, and transformations of contemporary Indian youth are vividly articulated.

Keywords- Durjoy Datta, Contemporary Indian youth, Youth identity crisis, psychological portrayal of youth, Young adult fiction, Love and relationships Emotional turmoil and Modern Indian literature.

The landscape of Indian English fiction has evolved dramatically over the last two decades, particularly with the rise of popular fiction that resonates with urban youth. Writers like Chetan Bhagat, Ravinder Singh, and Durjoy Datta have emerged as prominent voices capturing the pulse of contemporary young Indians. Among them, Durjoy Datta stands out for his nuanced and emotionally resonant portrayal of youth navigating love, trauma, mental health struggles, and societal expectations in a rapidly changing world.

Contemporary Indian youth are experiencing an identity shift — torn between traditional family values and modern ideals of freedom, individuality, and self-expression. The challenges they face are both internal and external: emotional vulnerabilities, relationship complexities, academic pressure, career uncertainties, and the constant digital exposure that redefines communication and self-worth. These tensions are reflected with raw honesty in Datta's fiction.

Durjoy Datta's novels, primarily targeted at young adults, transcend the boundaries of conventional romantic fiction. His characters often deal with themes of depression, guilt, loss, emotional dependency, and healing. The protagonists are usually college students or young professionals — reflective of the middle-class, urban demographic that is undergoing massive socio-cultural transformation in India. Datta's work stands out for giving voice to this generation's silent struggles, often hidden behind filtered selfies and curated social media posts.¹

Literary Context and Theoretical Framework- The depiction of youth in literature has long served as a mirror to society's evolving cultural, moral, and psychological landscape. From the idealistic and rebellious protagonists in Western coming-of-age novels to the emotionally complex young adults in modern Indian fiction, youth has consistently symbolized both hope and disruption. In Indian literature, the concept of "youth" has undergone significant transformation, especially since the 1990s liberalization period, which marked a shift in values, ambitions, and self-perception among the younger generation.

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Durjoy Datta's writing belongs to the post-liberalization literary movement where rapid globalization, digitalization, and shifting socio-economic structures influenced both the subject matter and style of fiction. His novels reflect an India where young people are caught between deeply embedded traditional values and the lure of modern freedoms. The emergence of youth-centric fiction in English, often categorized as commercial or mass-market fiction, has created a space where contemporary dilemmas are explored in accessible and emotionally engaging narratives.²

Youth in Indian Literature: A Brief Overview- In pre-liberalization Indian fiction, youth were often portrayed as extensions of familial or societal roles— aspiring to fulfill collective responsibilities rather than individual dreams. However, modern Indian fiction, particularly post-2000, introduced protagonists who were self-aware, emotionally conflicted, and eager to carve their identities outside traditional frameworks. Writers like Arundhati Roy, Chetan Bhagat, and later Durjoy Datta helped redefine the narrative scope, placing youth and their inner lives at the center of the story.

Whereas Roy and other literary fiction writers focused on socio-political undercurrents, authors like Datta tapped into the emotional, romantic, and psychological dimensions of urban youth, offering stories that, while less politically charged, are no less significant in cultural relevance. These stories speak directly to India's urban, educated youth, dealing with issues such as peer pressure, mental health, unrequited love, and the existential angst of early adulthood.³

a. Theoretical Frameworks- To understand the representation of youth in Datta's fiction, several theoretical lenses can be applied:

b. Coming-of-Age (Bildungsroman)- Datta's protagonists often undergo emotional and psychological growth through their experiences with love, trauma, and failure. Their journeys can be read as modern-day Bildungsroman narratives that reflect the chaos and beauty of transitioning from adolescence to adulthood.

c. Postmodern Identity Theory- The youth in Datta's works often struggle with fragmented identities. They are digital natives yet emotionally isolated, privileged yet insecure—embodying the contradictions of postmodern life.

d. Cultural Studies Perspective- This approach allows for analyzing the socio-cultural influences on youth behavior—how media, pop culture, family, and peer groups shape the decisions and dilemmas faced by Datta's characters.

e. Psychological Realism- Datta's characters often engage in intense inner dialogues, suffer from depression, or deal with emotional baggage. A psychological lens helps decode the underlying mental health themes in his work.

By employing these frameworks, this paper seeks to explore how Durjoy Datta's novels not only entertain but also document the cultural and emotional map of contemporary Indian youth. His stories serve as case studies in understanding how love, ambition, rebellion, and trauma intersect in the lives of today's young generation.⁴

Durjoy Datta's Work- Durjoy Datta, a bestselling Indian author, television scriptwriter, and motivational speaker, has emerged as a defining voice in contemporary Indian popular fiction. Since his debut in 2008 with *Of Course I Love You...! Till I Find Someone Better*, Datta has authored more than a dozen novels, most of which centre around young protagonists navigating the emotional and social intricacies of modern life. His works, while often categorized as commercial or romantic fiction, go far beyond mere love stories. They offer nuanced explorations of mental health, trauma, identity, and the changing values of urban youth in India.⁵

Writing Style and Themes- Datta's writing is known for its accessible language, fast-paced narratives, and emotionally engaging style. Most of his novels are written in first-person, often from alternating perspectives, which allows for an intimate view into the minds of his characters. His stories typically revolve around urban youth dealing with deeply personal challenges: failed relationships, parental pressure, mental illness, unspoken grief, and the quest for self-discovery.

While love remains a central motif, Datta rarely idealizes it. Instead, he explores how relationships are affected by deeper issues like depression, trauma, and insecurity. His portrayal of

romance is often tangled with emotional pain, which gives his narratives a bittersweet realism that resonates strongly with young readers.

Recurring Elements in Datta's Novels:-⁶

- (a). Young, often college-aged protagonists
- (b). Urban Indian settings, particularly metros like Delhi and Mumbai
- (c). Complex romantic relationships
- (d). Mental health challenges (e.g., depression, anxiety, suicide ideation)
- (e). Family expectations and generational conflict
- (f). Use of social media, texting, and digital culture
- (g). A balance of tragedy and hope

This paper aims to analyse how Durjoy Datta portrays contemporary Indian youth in his novels, focusing on key aspects such as identity crisis, romantic relationships, emotional turmoil, and societal pressures. Through a close reading of selected texts, the study seeks to understand how his fiction reflects, critiques, and contributes to the evolving narrative of Indian youth in literature.

Hypothesis- To examine the portrayal of contemporary youth in Datta's fiction, this study focuses on four of his most prominent works i.e., *The Boy Who Loved* (2017), *World's Best Boyfriend* (2015), *When Only Love Remains* (2014), and *Till the Last Breath* (2012),

Analysis-

A. *The Boy Who Loved* (2017)- Set in a middle-class Delhi neighborhood, this novel follows Raghu Ganguly, a teenage boy haunted by guilt and struggling with suicidal thoughts. Through his diary-style narration, readers experience his internal conflicts, cultural restrictions, and slow emotional connection with Brahmi, a girl battling her own demons.

B. *World's Best Boyfriend* (2015)- This novel explores revenge, redemption, and the dynamics of love in a college setting. The characters, Dhruv and Aranya, represent two conflicting approaches to pain—aggression and repression—and showcase how unresolved trauma can manifest in youthful relationships.

C. *When Only Love Remains* (2014)- Focusing on love and obsession, this story delves into the life of Avanti, an air hostess, and Devrat, a singer she idolizes. Their emotionally intense and somewhat unhealthy relationship highlights how admiration and emotional dependence can blur the lines between love and control.

D. *Till the Last Breath* (2012)- This emotionally intense story revolves around two terminally ill patients—Dushyant, a drug-addicted genius, and Pihu, an ambitious medical student. Their evolving relationship in a hospital ward becomes a metaphor for healing, redemption, and the need for human connection.

These novels reflect various dimensions of contemporary Indian youth— emotionally raw, intellectually aware, socially burdened, and yet deeply hopeful. Through these narratives, Datta captures a generation in flux, attempting to make sense of its place in a rapidly evolving society.⁷

Youth and Identity Crisis:- One of the central themes in Durjoy Datta's novels is the identity crisis experienced by contemporary Indian youth. His characters often struggle with the question of who they are, what they want, and how they fit into a world full of expectations, contradictions, and emotional noise. In a rapidly modernizing society like India's, young people are caught between inherited traditions and emerging global values. This conflict manifests as uncertainty, rebellion, low self-worth, and a deep sense of psychological displacement — all of which are powerfully explored in Datta's fiction.

Navigating Selfhood in a Shifting Culture- Post-liberalization India has witnessed a redefinition of youth identity. No longer bound strictly by community, caste, or family-defined roles, today's youth have greater access to choices — in education, career, relationships, and lifestyle. However, this freedom also comes with the burden of choice, the pressure to succeed, and the fear of disappointing one's family or society. Datta captures this inner turmoil with remarkable realism in his characters, many of whom are unable to articulate their pain and thus spiral into emotional conflict.⁸

I. Case Study: *The Boy Who Loved*:- In *The Boy Who Loved*, Raghu Ganguly is a 17-year-old boy carrying the heavy guilt of a tragedy from his past — a death he believes he could have prevented. He suffers from suicidal ideation and constantly feels unworthy of love, happiness, or redemption. Raghu is caught between the rigid moral expectations of his conservative Bengali family and his inner emotional collapse. He desperately tries to fit into the image of a “good son” while feeling disconnected from everything around him. His identity crisis is both personal and cultural. On the one hand, he’s a brilliant student and an obedient son. On the other, he harbors a desire to escape — not just his family, but his entire existence. His relationship with Brahmi, a free-spirited and emotionally broken girl, further complicates his self-image. Through Raghu, Datta illustrates how guilt, trauma, and unprocessed grief can completely distort a young person’s sense of identity.

II. Case Study: *World’s Best Boyfriend*:- In *World’s Best Boyfriend*, the protagonist Dhruv struggles with anger, abandonment, and a fractured sense of masculinity. He’s emotionally wounded due to childhood rejection and betrayal, which shapes his toxic behavior in relationships. Dhruv projects confidence, but deep down, he’s insecure and vengeful — a classic example of someone whose identity is shaped more by past pain than personal conviction. His counterpart, Aranya, also exhibits a fractured identity. As someone who has been constantly judged for her appearance and attitude, she adopts a hardened, rebellious persona to protect herself from emotional harm. Both characters exhibit the classic symptoms of identity confusion — constantly shifting between emotional extremes, mistrusting affection, and self-sabotaging genuine connections.

III. *Identity, Shame, and Self-Perception*- Datta’s protagonists often battle internalized shame — about their bodies, families, social class, or emotional needs. Their inability to express vulnerability is a major part of their identity crisis. In Indian society, where emotional restraint is often idealized, especially among men, young people find themselves emotionally stifled, leading to psychological disorientation.

In *When Only Love Remains*, Avanti is a seemingly successful, independent young woman. But her obsession with a pop singer reflects a deeper lack of self-worth. She sees herself through the lens of others’ approval, and her identity is shaped more by admiration than agency.⁹

The Role of Social Pressure- Across his novels, Durjoy Datta critiques the societal and parental pressures that contribute to youth identity struggles. Academic expectations, arranged marriage discussions, gender roles, and constant comparison with “successful” peers lead many characters to feel alienated or invisible. The result is a generation that appears outwardly confident but inwardly fragmented.¹⁰

Love, Relationships, and Emotional Turmoil- In Durjoy Datta’s fiction, love is not a fairytale; it is emotional warfare. His novels strip away the romanticized veneer often found in young adult fiction, replacing it with a raw, honest depiction of how relationships actually function — full of insecurity, emotional dependency, pain, miscommunication, and, at times, healing. For Datta, romantic relationships are not only central to his stories but also serve as a mirror to the psychological and emotional state of contemporary youth.¹¹

The Complexity of Young Love- Datta’s protagonists often fall in love during emotionally vulnerable phases of their lives — after trauma, rejection, or loss. This makes their relationships intense but also unstable. Unlike typical romantic fiction, where love is the solution, in Datta’s world, love often exposes deeper wounds. The emotional intensity is real, but it often lacks maturity, stability, or long-term clarity.¹²

Summary- In summary, Durjoy Datta's novels offer a vivid exploration of youth caught in identity crises. His characters are not just navigating love stories—they are trying to understand who they are in a world that often tells them who they should be. These emotional and psychological struggles make his work deeply relevant to a generation seeking not just love or success, but a clear sense of self. Durjoy Datta’s portrayal of love is not simplistic or formulaic. It captures the emotional turbulence of young people — their need for connection, fear of abandonment, and desperate attempts to make sense of their feelings. Through heartbreak, dependency, emotional highs and lows,

and moments of growth, his novels paint a deeply relatable picture of what it means to love — and lose — in one's youth. Durjoy Datta's exploration of mental health gives depth and authenticity to his portrayal of contemporary youth. By normalizing emotional struggle and highlighting the internal battles many young people face, he creates space for empathy and dialogue around issues often left unspoken. His novels not only entertain but also validate and humanize the psychological experiences of an entire generation, making them powerful tools for both literary and emotional insight. Durjoy Datta's fiction offers a subtle yet impactful commentary on the evolving values of Indian youth. Through intimate personal stories, he illustrates how rebellion — emotional, social, or relational — is not about rejecting tradition outright, but about making space for individual truth within collective norms. His characters embody the tension of a generation that respects its roots but dares to grow beyond them, making his work both culturally relevant and socially resonant.

Conclusion- Durjoy Datta's novels provide a vivid and compelling portrayal of contemporary Indian youth, capturing the complexities, contradictions, and emotional intensity of a generation in transition. Through his engaging narratives, Datta delves deeply into the psychological, social, and cultural realities that shape the lives of young people today.

The youth in Datta's works are marked by a profound identity crisis, torn between traditional expectations and modern aspirations. Their struggles with mental health, emotional vulnerability, and inner conflict are rendered with rare sensitivity and authenticity, breaking the silence around issues like depression, trauma, and suicidal thoughts. By placing mental health at the heart of his stories, Datta normalizes conversations that are often stigmatized in Indian society.

Love and relationships, central to his narratives, are portrayed not as idealized romances but as complex, often painful, emotional experiences that reveal the characters' deepest fears and desires. Through turbulent relationships, Datta highlights the importance of emotional literacy, communication, and personal growth.

Moreover, the subtle rebellion and assertion of freedom by his protagonists reflect the evolving socio-cultural landscape of India. Young people in his novels challenge authority, question societal norms, and seek autonomy in their personal and emotional lives — signaling a larger shift in values and identity among Indian youth.

Datta's accessible style and relatable characters have made his work popular among young readers, but more importantly, his novels serve as a mirror reflecting the emotional and psychological realities of contemporary youth. His stories offer not only entertainment but also validation, hope, and insight for a generation grappling with uncertainty, pain, and the quest for meaning.

In sum, Durjoy Datta's fiction stands as a significant cultural document that captures the voice of modern Indian youth — their struggles, rebellions, and dreams — making his contribution vital to understanding the complexities of youth identity and experience in 21st-century India.

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Governance and Public Development in Bihar : A Study

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Abstract :

Present Article deals with "Governance and Public Development in Bihar : A study". This article critically examines the trajectory of governance in Bihar, with a focus on reforms initiated since the early 2000s. Once emblematic of weak state capacity, poor service delivery, and systemic corruption, Bihar has undertaken several policy and administrative transformations aimed at improving public governance and development outcomes. Through an analysis of governance mechanisms, developmental achievements, persistent challenges, and decentralization efforts, this paper outlines the key trends and forward pathways for sustainable and inclusive governance in Bihar.

Keywords- Governance, Public Development, Service, Achievement, Capacity, Challenges, Efforts, etc.

Bihar, one of India's most populous and historically rich states, has long struggled with issues of governance and public development. Once a center of learning and culture, the state faced decades of political instability, poor infrastructure, and weak public institutions after independence. Bihar's socio-economic landscape presents significant obstacles for its government¹. The state has one of the highest poverty rates in India, with many residents lacking access to basic amenities. Education and healthcare services are often inadequate, affecting the quality of life and economic opportunities. These issues stem from historical neglect and require comprehensive policy interventions to address effectively.

Infrastructure Development Issues: Infrastructure development in Bihar lags behind other Indian states. Poor road connectivity, unreliable electricity supply, and inadequate water resources hinder economic growth². The government struggles to attract investment due to these infrastructural deficiencies³. Efforts to improve infrastructure are ongoing but face challenges such as funding constraints and bureaucratic delays.

Political Instability and Governance: Political instability is another major challenge for Bihar's government. Frequent changes in leadership and coalition politics create an unpredictable governance environment. This instability affects policy implementation and long-term planning⁴. Historical events, such as shifts in political alliances, have contributed to this ongoing issue.

Agricultural Dependence: Agriculture remains a dominant sector in Bihar's economy, employing a large portion of the population. However, reliance on traditional farming methods limits productivity and income levels. The government faces the challenge of modernizing agriculture while ensuring sustainable practices. Initiatives to introduce technology and improve irrigation are critical but require substantial investment.

Natural Disasters: Bihar is prone to natural disasters like floods and droughts, exacerbating existing challenges. These events disrupt livelihoods, damage infrastructure, and strain government resources. Effective disaster management strategies are essential for mitigating their impact. Historical records show recurring patterns of such disasters, highlighting the need for robust preparedness plans. The challenges faced by Bihar's government are multifaceted and deeply rooted in historical contexts. Addressing these issues requires coordinated efforts across various sectors, including socio-economic development, infrastructure improvement, political stability, agricultural reform, and disaster

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management. Understanding these complexities provides valuable insights into governance dynamics within Bihar for students preparing for competitive exams.

Historical Context and Governance Crisis

In the post-independence era, Bihar was marked by chronic issues that deeply undermined effective governance. These included:

- Weak law and order enforcement
- Entrenched corruption and patronage-based politics
- Inadequate public service delivery mechanisms
- Low bureaucratic accountability and inefficiency

The cumulative impact of these factors eroded public trust in institutions and contributed to socioeconomic stagnation.

Turning Point: Governance Reforms Post-2005

A significant political transition in the mid-2000s introduced a new reform-oriented governance paradigm in Bihar⁵. The state leadership emphasized administrative modernization, law enforcement enhancement, and infrastructure development. Major governance initiatives introduced during this period include:

- **Institutional Strengthening:** Upgradation of policing and judicial infrastructure to restore law and order.
- **Digital Governance:** Introduction of e-governance platforms and digitization of land and citizen records to improve transparency.
- **Bureaucratic Reforms:** Implementation of performance-based assessments and incentive structures for administrative officers.
- **Decentralized Governance:** Empowerment of local governance bodies to facilitate last-mile service delivery.

Public Development: Achievements and Challenges

Developmental Achievements, Despite structural constraints, Bihar has recorded measurable progress in several key areas:

a) Education

- Rise in school enrollment, especially through programs such as the Mid-Day Meal Scheme.
- Establishment of new universities, engineering colleges, and polytechnic institutions to bolster higher education.

b) Healthcare

- Expansion of Primary Health Centers (PHCs) and sub-centers across rural areas.
- Increase in institutional deliveries, supported by schemes like Janani Suraksha Yojana.

c) Infrastructure

- Major investments in rural roads (PMGSY) and urban connectivity.
- Steady improvements in electricity coverage and telecommunications infrastructure.

d) Social Welfare

- Strengthening of the Public Distribution System (PDS) and introduction of biometric systems.
- Policy interventions aimed at women's empowerment, including 50% reservation for women in local governance institutions.

Persistent Challenges

Notwithstanding the progress, multiple challenges continue to hinder comprehensive development:

- Endemic poverty and high youth unemployment, especially in rural and semi-urban regions.
- Limited industrialization and weak ecosystem for private investment and entrepreneurship.
- Substandard quality of education and healthcare services despite increased access.
- High rates of out-migration, driven by lack of local livelihood opportunities and agrarian distress.

Decentralization and the Role of Panchayati Raj Institutions (PRIs)

The operationalization of the 73rd Constitutional Amendment in Bihar has played a crucial role in democratizing development⁶. The strengthening of Panchayati Raj Institutions (PRIs) has facilitated more localized decision-making and service delivery. Key aspects include:

- Enhanced political representation of women and marginalized communities.
- Greater autonomy in managing local schemes and resources.
- However, capacity-building, financial autonomy, and institutional transparency at the PRI level remain weak, limiting overall effectiveness.

Way Forward: Policy Recommendations

- For Bihar to consolidate its gains and transition into a high-governance, high-development trajectory, the following multi-pronged approach is necessary:
- **Human Capital Investment:** Prioritize quality improvements in education and skill development aligned with emerging economic opportunities.
- **Private Sector Mobilization:** Create conducive conditions for industrial growth, entrepreneurship, and public-private partnerships.
- **Administrative Reforms:** Institutionalize anti-corruption measures and build a performance-oriented bureaucratic culture.
- **Technological Integration:** Expand e-governance platforms, data analytics, and mobile-based services to enhance public service delivery.
- **Inclusive Development:** Tackle regional and social inequalities through targeted welfare interventions and participatory governance.

Objectives:

1. To analyze the key policies and reforms introduced by Nitish Kumar's government.
2. To assess their impact on Bihar's economic growth and social development.

Literature Review

The literature review synthesizes prior studies on Bihar's socio-economic conditions and policy interventions:

Governance Reforms: Reports by the World Bank and NITI Aayog⁷ highlight governance improvements under Nitish Kumar, focusing on law and order, fiscal discipline, and decentralized governance.

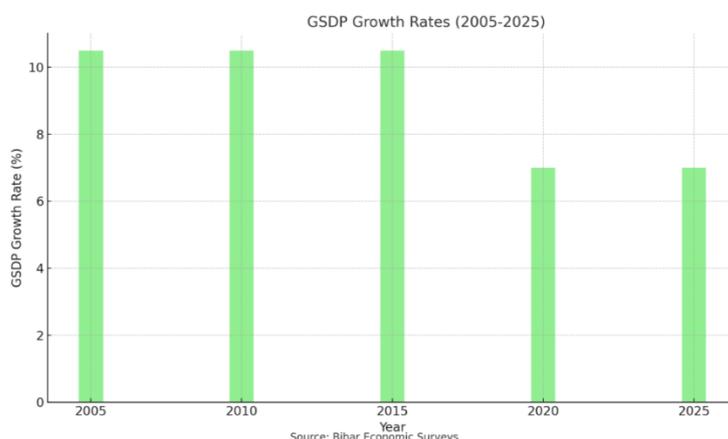
Infrastructure Development: Research by the Asian Development Bank emphasizes road and power sector advancements, while state government reports document increased rural connectivity.

Education and Health: Studies from UNICEF and local research institutions discuss the progress in literacy and healthcare metrics.

Economic Growth: Articles from EPW and other peer-reviewed journals analyze Bihar's GSDP growth, agricultural productivity, and industrial development.

Economic Growth

- Bihar's GSDP grew at an average annual rate of 10.5% (2005-2015) but slowed to 7% in the subsequent decade.
- Key drivers include construction, agriculture, and services sectors.
- Figure 2: GSDP Growth Rates (2005-2025)
- Source: Bihar Economic Surveys



Key Reforms by Present Government

Nitish Kumar prioritized transparent governance and inclusive **Mishra & Sahu (2023)**⁹ development. His administration introduced the following significant reforms:

Infrastructure Development

Rural Road Network: Under schemes like "Mukhyamantri Gramin Sadak Yojana," over 2,00,000 km of roads were built, connecting rural areas to markets and cities. **Electrification:** Household electrification rose from 22% in 2005 to 95% in 2023, enabling both industrial growth and improved quality of life¹⁰.

Bridge Construction: Bridges like the Mahatma Gandhi Setu and others improved connectivity across riverine areas.

Economic Diversification

- Promoted agro-based industries to leverage Bihar's agricultural strength.
- Special emphasis on dairy and food processing units, creating rural employment.
- Introduced the New Industrial Policy (2016 and 2022) to attract investments.

Education Reforms

- Launched the Bicycle Scheme for girls to encourage school attendance.
- Upgraded schools and technical colleges to provide skill-based education.
- Established universities like Nalanda University and IIT Patna.
- Expanded Primary Health Centers (PHCs) and ensured regular availability of doctors and medicines.
- Introduced schemes like "Janani Suraksha Yojana" to reduce maternal mortality rates.

Poverty Alleviation and Employment

- Implemented the "Jeevika" program under the National Rural Livelihood Mission to empower women through self-help groups¹¹.
- Encouraged rural employment through MGNREGA.

Law and Order Improvement

- Strengthened police force and judicial system.
- Special courts helped in reducing the backlog of cases.
- Improved safety and security, encouraging investments.

Development Achievements

Bihar's Gross State Domestic Product (GSDP):

Year	GSDP (Lakh Crore)	Growth Rate (%)
2005	1.34	4.5
2015	3.26	7.2
2023	8.36	9.8

Poverty Reduction:

Year	Poverty Rate (%)
2005	54
2023	33

Literacy Rate (%):

Year	Bihar	National Average
2005	47	64
2022	70	77

Electrification (% of Households):

Year	Electrification
2005	22
2023	95

Conclusion

The governance journey of Bihar reflects a dynamic interplay between political will, institutional reform, and grassroots mobilization. While significant strides have been made since the mid-2000s in improving public service delivery and administrative efficiency, deep-rooted challenges persist. The future of governance in Bihar depends on sustained investments in human capital, institutional capacity, and inclusive policy frameworks. As a case study, Bihar offers valuable insights into governance transformation in resource-constrained environments within federal democracies like India. However, there is still a long way to go in terms of industrial development and job creation. The findings indicate that Nitish Kumar's government effectively addressed key challenges such as poor governance, weak infrastructure, and low literacy rates. However, challenges persist in industrialization, urbanization, and income disparities. The decline in growth post-2015 highlights the need for renewed focus on policy innovation and private sector engagement.

The future of Bihar's development depends on a balanced approach to tackling existing challenges while embracing modern, inclusive, and sustainable solutions. The state has immense potential with its young population, fertile lands, and rich cultural heritage. By focusing on industrialization, agricultural modernization, education, and healthcare, Bihar can emerge as a model state for growth and development. Strategic investments in infrastructure, governance, and social equity will ensure long-term progress and prosperity for its people.

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The Persistent Challenge of Informal Work in India: Trends, Challenges, and Policy Pathways

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Abstract

Informal work dominates India's labor market, employing over 90% of the workforce and contributing significantly to GDP. Despite its economic centrality, informal workers face low wages, precarious conditions, and limited social protections. This article synthesizes recent research (2020–2025) to analyze trends, challenges, and policy pathways for India's informal sector. Drawing on statistical profiles, empirical studies, and policy analyses, it highlights the structural nature of informality, gender disparities, and the impact of economic shocks like COVID-19. Policy recommendations emphasize formalization, social security expansion, and gender-specific interventions to enhance worker welfare.

Introduction

India's journey towards becoming a global economic power is significantly tempered by the enduring presence of informal work. This vast sector, characterized by the absence of formal contracts, social security, and legal safeguards, remains the primary source of livelihood for the majority of its workforce. Understanding the intricate web of trends, the multifaceted challenges it presents, the often-overlooked psychological toll it exacts, and the potential policy pathways for transformation is not merely an academic exercise but a crucial imperative for achieving truly inclusive and sustainable development.

Defining the Contours of Informality

Informal work in India is a sprawling and diverse landscape, encompassing individuals engaged in a wide array of activities. From the agricultural laborers toiling in fields and the street vendors navigating bustling urban centers to the home-based artisans and workers in unregistered micro-enterprises, informality defines the employment reality for over 80% of the nation's labor force.

The National Statistical Office (NSO) provides a crucial definition, encompassing all unincorporated enterprises owned by individuals or households employing fewer than ten workers, alongside own-account workers and unpaid family helpers across all sectors. This definition underscores the precarious nature of employment for a significant majority, marked by a lack of job security, unpredictable working conditions, and limited or no access to essential social safety nets like pensions, healthcare, and unemployment benefits.

A Persistent Reality: Trends in Informal Employment

Despite decades of economic liberalization and the growth of various formal sectors, informal employment has stubbornly persisted as the dominant feature of India's labor market. The transition towards formalization has been a slow and uneven process, shaped by several key and often intertwined trends:

- **Rural Dominance:** Informality remains deeply entrenched in rural India, where agriculture continues to absorb a large share of the workforce. Seasonal agricultural labor, characterized by its inherent instability, low wages, and lack of formal contracts, significantly contributes to the high rates of informal employment.

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- **Urban Expansion of Informality:** Rapid urbanization, while often seen as a driver of formal sector growth, has also witnessed a parallel expansion of informal work in urban centers. Migrants, seeking economic opportunities, often find themselves absorbed into the informal economy, working in construction, domestic service, transportation, and small-scale manufacturing, frequently under exploitative conditions and lacking basic protections.
- **Gendered Dimensions of Informality:** Women constitute a significant and often disproportionately vulnerable segment of the informal workforce. They are frequently concentrated in low-paying and insecure occupations, such as domestic work, agricultural labor, and home-based production, often compounded by societal norms, limited mobility, and the disproportionate burden of unpaid care work.
- **The Cycle of Intergenerational Informality:** The phenomenon of intergenerational persistence is a concerning aspect of informal work. Children growing up in households dependent on informal income often face limited access to quality education and skills development, increasing their likelihood of entering the informal sector themselves, thus perpetuating a cycle of precarious employment.
- **Heightened Vulnerability to Economic Shocks:** Informal workers are particularly susceptible to economic downturns and unforeseen crises, as starkly illustrated by the COVID-19 pandemic. Lacking the safety net of formal employment, they are often the first to lose their livelihoods and face prolonged periods of economic hardship.

The Multifaceted Challenges of Informal Work

The widespread prevalence of informal work poses significant challenges that ripple across individual lives and the broader economy:

- **Entrenched Income Insecurity and Poverty:** The hallmark of informal work is often low and unstable income. This precariousness leaves individuals and their families constantly vulnerable to poverty and economic shocks, hindering their ability to save, invest in their future, and break free from the cycle of poverty.
- **Harsh and Precarious Working Conditions:** Informal jobs frequently involve arduous and hazardous working conditions, long and often unpredictable hours, and a lack of basic amenities such as sanitation and safe drinking water. Workers are often exposed to significant health risks with limited or no access to healthcare or compensation for injuries.
- **Absence of Social Protection:** The lack of social security benefits is a critical vulnerability for informal workers. They are often left without any safety net in times of illness, unemployment, disability, or old age, increasing their risk of destitution and exacerbating existing inequalities.
- **Constraints on Productivity and Skill Development:** Informal enterprises typically operate with limited access to modern technology, training, and skill development opportunities. This results in low productivity, hindering economic growth and limiting the potential for upward mobility for both the enterprises and their workers.
- **Exclusion from Legal and Regulatory Frameworks:** A significant challenge is the exclusion of informal workers from the protections afforded by labor laws and regulations. This leaves them vulnerable to exploitation, unfair labor practices, and without effective avenues for grievance redressal or collective bargaining for better working conditions.
- **Impediment to Broader Economic Development:** A large informal sector can hinder overall economic development by limiting the tax base, discouraging the adoption of modern technologies and business practices, and perpetuating low productivity. It also creates a deeply dualistic labor market characterized by significant disparities between formal and informal workers.

The Hidden Burden: Psychological Impact of Informal Work

Beyond the tangible economic and social challenges, the precarious nature of informal work exacts a significant and often invisible psychological toll on individuals:

- **Erosion of Self-Esteem and Dignity:** The lack of formal recognition, coupled with the often low social status associated with informal jobs, can deeply erode self-worth and lead to feelings of marginalization, invisibility, and a diminished sense of personal dignity.
- **Chronic Stress and Anxiety:** The inherent uncertainty surrounding income, job security, and the constant struggle to meet basic needs creates a state of chronic stress and anxiety, often leading to worry, fear, and even symptoms of anxiety disorders.
- **Feelings of Powerlessness and Lack of Control:** Operating outside legal protections and lacking bargaining power fosters a sense of powerlessness and an inability to influence working conditions or secure basic rights, leading to frustration, resentment, and learned helplessness.
- **Social Isolation and Diminished Support:** The nature of many informal jobs often leads to social isolation, with limited opportunities for interaction and the development of supportive relationships, further impacting mental well-being.
- **Adverse Impact on Family Dynamics:** The stress and financial insecurity experienced by informal workers inevitably spill over into their family lives, creating tension, conflict, and feelings of guilt and inadequacy, impacting the well-being of all family members, including children.
- **Intergenerational Psychological Impact:** The perpetuation of informal work across generations can also have a psychological dimension, with children internalizing the associated insecurities and limitations, potentially shaping their aspirations and expectations and perpetuating a cycle of limited psychological and economic mobility.

Forging a Path Forward: Policy Pathways for Transformation (Integrating Psychological Well-being)

Addressing the complex challenge of informal work requires a comprehensive and multi-pronged policy response that not only tackles the economic and social vulnerabilities but also actively considers the psychological well-being of workers:

- **Promoting Formalization with Dignity and Incentives:** Policies should focus on simplifying registration processes, providing tangible incentives for informal enterprises to formalize, and actively promoting the dignity and value of all forms of work through public awareness campaigns.
- **Strengthening and Expanding Social Security Coverage:** Extending comprehensive social security schemes, including affordable healthcare, pension plans, and unemployment benefits, to informal workers is crucial for reducing the stress and anxiety associated with income and livelihood insecurity.
- **Empowering Workers and Fostering Agency through Organization:** Facilitating the formation and strengthening of worker cooperatives, unions, and other collective bargaining mechanisms can empower informal workers, providing them with a greater sense of control over their working conditions and livelihoods.
- **Improving Working Conditions and Enforcing Labor Standards:** Robust enforcement of existing and extended labor laws to protect informal workers, ensuring safe and healthy working environments and fair wages, is critical to reducing both physical and psychological strain.
- **Prioritizing Investment in Education and Skill Development:** Enhancing access to quality education, vocational training, and skill-upgradation programs tailored to the needs of the informal sector can improve workers' skills, boost their self-efficacy, and open pathways to more secure and fulfilling employment.
- **Promoting Financial Inclusion and Stability:** Facilitating access to affordable financial services, including savings accounts, credit, and insurance, can empower informal workers to manage financial risks, invest in their businesses, and reduce financial stress.

- **Creating Enabling Environments for Diversified Economic Opportunities:** Policies should focus on creating an enabling environment for the growth of non-farm sectors in rural areas and supporting entrepreneurship, generating more diverse and potentially formal employment opportunities.
- **Strengthening Data Collection and Analysis with a Focus on Well-being:** Improved and disaggregated data collection on the informal sector, including indicators of psychological well-being, is crucial for a more nuanced understanding of its impact and for designing more effective and targeted policy interventions.
- **Building Community-Based Support Systems and Promoting Social Inclusion:** Strengthening community-based support networks and actively promoting social inclusion can help combat isolation, foster a sense of belonging, and provide essential social and emotional support for informal workers.
- **Integrating Mental Health Support into Existing Systems:** Integrating accessible and affordable mental health services into existing healthcare systems and making them culturally sensitive and easily available to informal workers is crucial for addressing the psychological consequences of their precarious employment.

Conclusion: Towards a More Just and Equitable Future

The enduring challenge of informal work in India is a complex issue that demands a comprehensive and humane response. Recognizing not only the economic and social vulnerabilities but also the significant psychological burden it imposes is paramount. By implementing well-designed and effectively enforced policies that promote formalization with dignity, extend social protection, empower workers, improve working conditions, invest in human capital, and actively address mental health needs, India can strive towards a more just, equitable, and prosperous future.

In this future, the vast majority of its workforce will not only contribute to economic growth but will also experience the dignity, security, and overall well-being that decent work provides, casting off the enduring shadow of informality.

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Career Guidance and Counseling for Secondary School Students: A Review of Literature with Reference to the UP PANKH Portal

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Abstract

Career guidance and counseling (CGC) have become essential in helping secondary school students navigate complex academic and vocational decisions shaped by globalization, automation, and shifting labor markets. Traditional reliance on parental or teacher advice is insufficient, prompting the need for structured, technology-enabled solutions. In India, the Uttar Pradesh government's UP PANKH Portal aims to provide students with career information, aptitude assessments, counseling resources, and scholarship guidance, in line with the National Education Policy (NEP) 2020.

This review-based paper synthesizes international and Indian literature on digital CGC systems, highlighting key themes such as cultural influences on career decisions, the role of adaptability, the impact of peer and family expectations, and the persistent digital divide. Studies from various countries demonstrate that while digital platforms can improve career awareness and decision-making, their success depends on accessibility, user awareness, and institutional support.

A significant gap exists in empirical evaluations of the UP PANKH Portal, especially in urban, diverse contexts like Varanasi. This review identifies barriers such as limited awareness, inadequate teacher training, and infrastructural disparities. It concludes by underscoring the need for localized strategies, awareness campaigns, and policy-practice alignment to maximize the portal's potential as an inclusive and effective career guidance tool.

Keywords: Career Guidance, Counseling, Digital Platforms, UP PANKH Portal

Introduction

In the 21st century, career planning has evolved from being a peripheral concern to a central aspect of secondary education. As globalization, automation, and digital transformation rapidly reshape the world of work, the transition from school to career has become more complex, uncertain, and competitive. Students at the secondary level are often required to make early decisions about subject choices, academic streams, and vocational directions that will profoundly influence their future. However, many students lack the necessary information, self-awareness, and structured guidance to make such decisions confidently and competently.

The role of career guidance and counseling has thus gained prominence as a mechanism to bridge this gap. Effective career guidance is now understood as a holistic, ongoing process that helps students understand their abilities, interests, and aptitudes while aligning them with emerging career pathways and labor market demands. However, traditional models of guidance—often dependent on informal advice from parents or teachers—are inadequate for navigating today's multidimensional career landscape.

Recognizing this gap, governments and education systems worldwide have been working to strengthen institutional mechanisms for career counseling. In India, one such initiative is the UP PANKH Portal, launched by the Government of Uttar Pradesh. It is an ambitious digital platform aimed at empowering secondary and higher secondary students with career-related information, aptitude assessments, virtual counseling, and guidance resources. While the portal embodies the vision of the National Education Policy (NEP) 2020, which promotes the integration of vocational

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education and technology in schools, the effectiveness and actual usage of this portal among students remains underexplored.

This review paper draws on a wide array of international and Indian literature to establish the academic context for evaluating digital career guidance systems like the UP PANKH Portal. It aims to synthesize key themes, trends, and challenges in the field of career counseling for adolescents, while identifying gaps that justify the current research on students' awareness and practical challenges related to using such platforms in urban Indian contexts like Varanasi.

Review of Related Literature

Lan Thi Nguyen et al. (2018) explored the cross-cultural dimensions of narrative-based career counseling in Vietnam. They emphasized that the country's transition from traditional Confucian and communist ideologies to a modern market economy requires counseling methods that are flexible yet culturally sensitive. Traditional counseling approaches were deemed inadequate, and narrative methods were proposed to integrate individual autonomy within collective values. The study concluded with a recommendation for further research into how narrative counseling can be contextualized in culturally traditional yet rapidly evolving societies like Vietnam.

Peter Akosah-Twumasi et al. (2018) conducted a systematic global review to understand how cultural values influence youth career decisions. Analyzing 30 international studies, they found that collectivist societies emphasized family expectations, which enhanced students' confidence and self-efficacy when aligned with parental preferences. In contrast, individualistic societies promoted autonomy and personal interests in decision-making. Bicultural youths were shown to develop intrinsic motivation when successfully integrated into host cultures. The study pointed out the need for more nuanced research on the influence of family and culture on career outcomes, especially among bicultural populations.

Wiwik Sulistiani (2017) reviewed 16 empirical studies through the lens of career construction theory and highlighted the importance of career adaptability in educational settings. Factors such as age, gender, emotional resilience, optimism, and parental support were found to impact students' ability to adapt to career challenges. The review concluded that career adaptability significantly contributes to life satisfaction, academic success, and emotional well-being, thus underscoring the need for schools to support students in building these capacities.

Joel J. P. Ogutu et al. (2017) examined peer pressure as a factor influencing secondary students' career decisions in Kenya. Using responses from 364 students, they applied correlation and regression analyses, which revealed a statistically significant but weak positive relationship between peer influence and career decision-making. The findings suggested that students are moderately influenced by peers and that schools should provide stronger career guidance programs and peer-based support structures to encourage informed decisions.

Nguyen Thuy Van and Do Thi Bich Loan (2016) reviewed international models of career guidance to propose improvements for rural Vietnam. Amidst rapid industrialization, they found that Vietnam's existing guidance system was ineffective and under-researched. They recommended strengthening vocational education, hiring trained staff, and designing policies aligned with the local socio-economic and cultural context to bridge the gap between education and employment needs in rural areas.

In their earlier work, Nguyen Thuy Van and Do Thi Bich Loan (2015) emphasized the importance of vocational education in addressing rural-urban migration and labor market mismatches in Vietnam. Their literature review highlighted the lack of a strong career guidance system in rural areas, the need for international benchmarking, and the necessity of training professionals to align education with evolving labor demands, especially in regions experiencing economic shifts.

Nguyen Ha (2014) presented statistical evidence of a significant gap in Vietnam's labor market, where high unemployment among university graduates coexists with a shortage of skilled labor. The study pointed out that vocational training is increasingly preferred by employers and called

for major reforms in Vietnam's career guidance framework. It stressed aligning students' education with realistic employment opportunities to prevent job-market imbalances.

Tran T. Thu (2013) critiqued Vietnam's national career guidance program introduced in 2006, particularly its ineffectiveness due to reduced instruction time and poor integration into the curriculum. Students received minimal exposure to vocational education, and evaluation mechanisms lacked academic rigor. As a result, many students graduated without the skills or confidence needed to transition into meaningful employment.

Vu D. Chuan et al. (2013) argued that Vietnam's career guidance system is outdated and misaligned with modern labor market needs. They noted that a large proportion of high school students fail university entrance exams, yet few are motivated to pursue vocational training due to the limited appeal and effectiveness of existing guidance services.

Cassery (2012) reviewed the top employment skills needed in 2013 and emphasized the urgency of reforming career guidance in Vietnam. With rapidly changing jobs and the expectation of multiple career changes over a lifetime, Cassery highlighted the need for life-long learning and flexible counseling systems. He advocated for innovation and context-specific strategies, particularly in rural schools, where the gap between education and employability is most evident.

Perry, Liu, and Pabian (2010) found that students are more motivated when they understand the relevance of school learning to future careers. In Singapore, Education and Career Guidance (ECG) programs help students explore various industries and align their academic pursuits with personal aspirations. The structured career guidance framework in Singapore includes self-awareness, educational planning, and informed decision-making, which collectively enhance student engagement.

Sahin Kesici (2007) used qualitative methods to identify guidance needs among middle school students in Konya, Turkey. Findings revealed that older students—particularly in 7th and 8th grades—were more likely to seek counseling, especially for family-related issues. The study emphasized the growing importance of personalized counseling interventions at early adolescence.

Jones (2006) outlined the core objectives of career guidance, including helping students explore educational opportunities, understand program requirements, and recognize personal interests. The study emphasized that guidance enhances adaptability, informs students about curricula, and supports them in transitioning smoothly into further education and life roles.

Watts and Fretwell (2008) highlighted the critical function of career guidance in improving lifelong learning and workforce development. Their global study linked effective career counseling to social mobility, curriculum development, and equitable access to education and jobs. They particularly stressed career guidance as a means to bridge social inequalities and support marginalized communities.

Jarvis and Keeley (2003) examined the evolution of school counseling, noting a shift from vocational decision-making to comprehensive career development. In many education systems, guidance teachers were assigned specific responsibilities like behavior counseling and parental engagement, showing that the role of guidance is multifaceted and critical for student development.

In Malaysia, modern career counselors are central to helping students transition into higher education or the job market. The system integrates guidance training into teacher education and promotes employability skills, entrepreneurship, and the use of digital technologies. Counseling is framed as a lifelong process, requiring ongoing coaching and mentoring to help students adapt to economic and social changes.

Feller (2003) studied the responsibilities of school counselors in the U.S., where they support academic and career development by equipping students with knowledge, attitudes, and transferable skills. Counselors are expected to help students handle career transitions and maintain adaptability in a rapidly changing job market.

Denga (2001) and Achebe (1986) focused on administrative barriers to effective counseling. They argued that many school principals lack awareness about the importance of guidance services

and often resist allocating resources or reducing teachers' workload to allow counseling. This resistance hinders the institutionalization of counseling in schools, limiting students' access to professional support.

Knowledge Gap

While the importance of career counseling and the potential of online platforms in enhancing student guidance is well established in national and international research, there remains a significant gap in empirical studies evaluating government-initiated portals in India, especially at the secondary school level.

Despite the launch of the UP PANKH Portal by the Uttar Pradesh government—designed to assist school students with career-related information, counseling tools, and scholarship support—no prior study has systematically examined its actual usage, awareness, or challenges faced by users, particularly in a diverse and populous educational setting like Varanasi.

There is a need to understand:

- Whether students and teachers are aware of the portal's existence and purpose,
- How much the platform is being used for decision-making,
- What specific challenges—technological, informational, or motivational—students face in accessing and using it.

Thus, the current study addresses this gap by exploring the level of awareness, extent of utilization, and barriers to access and use of the UP PANKH Portal among secondary school students in Varanasi city. By doing so, it contributes original findings to the existing body of research and provides practical recommendations for improving the reach and effectiveness of digital CGC services in schools.

Thus, it can be said that, The **UP PANKH Portal** stands as a model initiative that blends **technology, education, and counselling** to address a critical gap in the Indian schooling system. By empowering students to explore, evaluate, and execute career decisions thoughtfully, the portal plays a key role in **realizing the dreams of lakhs of youth** in Uttar Pradesh. As it continues to expand its reach and offerings, it is set to become a **landmark in digital career guidance** not just in the state, but across the nation.

Despite its potential, the success of the UP PANKH Portal is contingent upon the awareness, accessibility, and actual usage of the portal by its primary users—students. Without widespread awareness and institutional support, the portal risks becoming another underutilized digital initiative. Thus, it becomes essential to assess how effectively the portal has reached its target audience, especially in regions where infrastructural disparities and socio-economic challenges prevail.

Varanasi, a city known for its rich educational and cultural heritage, serves as a suitable context for this investigation. With a diverse mix of public, private, and government-aided secondary schools, the city offers a comprehensive setting to examine how different categories of students perceive and utilize the UP PANKH Portal.

Justifications for Further Inquiry

- **Gap in Empirical Evidence:** There is a lack of research evaluating digital platforms like the UP PANKH Portal in real-world school settings.
- **Urban Microcosm:** Varanasi represents both traditional and modern schooling systems, offering a unique case for studying digital intervention outcomes.
- **Policy-Practice Disconnect:** Despite the NEP 2020 mandate, the implementation of digital career counseling platforms in schools remains inconsistent.
- **Underserved Demographics:** Female students, rural residents, and those in government schools consistently show higher guidance needs yet receive less support.
- **Lack of Awareness & Accessibility:** Studies suggest that students are often unaware of digital platforms or lack the digital literacy to use them effectively.
- **Teacher Training Deficiency:** Career counseling initiatives fail when teachers are untrained or overburdened, reducing student access to quality guidance.

- **Absence of Localized Strategies:** Most studies generalize findings without accounting for local educational infrastructure, cultural beliefs, or school typologies.
- **Evaluation of Portal Design:** No prior study has critically examined whether the design and features of the UP PANKH Portal align with student needs.
- **Digital Divide:** Even in urban settings, socio-economic differences influence how students engage with online platforms.
- **Need for Data-Driven Recommendations:** Without detailed, ground-level data, educational planners cannot make informed improvements to state-run platforms.

Thus, in conclusion, it can be said that the UP PANKH Portal is a commendable step toward integrating digital career guidance into the school system. However, the need of the hour is to conduct in-depth studies on its functioning, current status, and modus operandi to assess its real impact. This study underscores significant gaps in awareness, usage, and accessibility among students in Varanasi, pointing to a larger national issue. With data-driven insights and localized strategies, the portal can evolve into a more inclusive and effective tool, ultimately helping students make informed career choices and bridging the digital guidance divide.

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A Comparative Study of Quality of Life, Work Stress among Male and Female Police Sub-Inspector

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Abstract

Police officers experience anxiety as a result of work-related stress. Male and female police sub inspectors must always answer the call of duty. When there is an emergency, they are compelled to labour nonstop, which means they cannot take care of their family. This brings limitations on their attention towards family and social relations, which roots more mental stress to them and it also disturbs their life and work. This study mainly focuses on work stress of male and female polices sub inspectors. For this, purpose 60 male polices sub inspector and 60 females polices sub inspector of Bihar were purposively selected and they were administered Work Stress Scale (WSS). t- Test was applied to analyze the data. The results as follows: The finding revealed that a significant difference between mean work stress scores of male and female police was obtained. The study aims in making the police aware of the various stressors and the different coping strategies that can help them deal with the stressors in a better way, and thus maintaining their psychological health. The review concludes with a summary of major research findings, as well as a consideration of future directions and implications for practice and policy.

Keywords: Work stress, and Male, Female sub inspector

Introduction:

Policing is highly demanding having a work environment full of threats, uncertainty, encounters, political pressure, exposure to violence, and death. "Research suggests that the suicide rates among police are at a higher rate than other groups and also demonstrates high rates of divorce , adjustment issues and reduced quality of family life among sub-inspectors. The findings from the studies showed that," 23% of male and 25% of female officers reported more suicidal thoughts than the general population (13.5%)(Baker, 2008).

"Evidence is essential for the interventions as it's an important and necessary component to help police deal with the stressors and their health" as hardly any research conducted on the work problems of police as far as our knowledge. We look forward to address the issues that arise from this research, to come up with some effective interventions and provide recommendations to reduce work related distress among police. Police work stress is an extensive issue due to number of negative consequences on an individual as well as the police department, which is often neglected.

Work Stress

Stress in the workplace is a worldwide phenomenon affecting employees at all levels. In India, circumstances are continually changing with political changes, affirmative action, downsizing, mergers and acquisitions, retrenchments, lay-offs, and new technology amongst others, impacting the individual in the workplace for example in the form of job insecurity. Other sources of stress brought into the organizational context are issues such as personal and financial problems. Stressors inherent in an organization, such as task demands, role demands, physical demands and interpersonal demands, continually affect the employee.

Possible causes of work-related stress amongst employees, specifically senior management, middle management, and specialist staff (specialists in their field), working in organizations are related to extra-organizational stressors as well as stressors inherent in the organization. Extra-organizational stressors refer to factors such as affirmative action, downsizing, retrenchments,

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restructuring, technological changes, and job sharing. Other factors include personal and financial problems. Stressors inherent in the organization refer to factors such as the functioning of the organization, task characteristics, physical working conditions, equipment, career matters and social issues.

Another word often used interchangeably with work-related stress is occupational stress which demonstrates the stress due to the nature of job activity. According to the current World Health Organization definition, (1986), "Occupational or work-related stress is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope". Occupational Stress is a major hazard for many workers. Increased workloads, downsizing, overtime, hostile work environment and shift work are just a few of the many causes of stressful working conditions. Occupational Stress of police is a widespread problem because of its numerous negative effects on individuals and on police organizations. Police who experience high levels of occupational stress report a high incidence of physical and psychological problems that affect their work performance. They commonly have poor health; frequently absent from work, dissatisfied with their job and weak organizational commitment. They may not fully involve themselves in their work or they may retire permanently. There are some stringent rules and administrative policies in male-dominated jobs which may be difficult for women to cope with, and thereby constituting major sources of occupational stress (Lindsay, 2001; Akinawo, 2010).

Significant of the Study:

Based on the review of the literature related to the theories used in the present study, it is perceived that the quality of life of police sub-inspectors is worse, and also they have to face the balance between their work and life. In the same way, they have to adjust the organizational commitment; because of these factors, they have high levels of work stress. So, the following statement is formulated as a problem statement. 'To compare occupational stress among male and female police sub inspector.' So the present study attempted to work on work stress among male and female police sub inspector. Research findings of this study will be useful for police department. The outcomes of this type of research can be used to devise strategies to advance their mental health. Their working conditions and interpersonal relations. The above quoted studies and review of literature are self explanatory and very clearly demonstrate the importance of such studies.

Hypothesis: There would be a significant difference between work stress of male and female police sub inspector.

Sample:

Data were collected on a total of 120 police sub inspector from different location of Bihar. Out of which 60 were male police sub inspector and 60 were female police sub inspector. Further the age group of the police sub inspector were 25 to 50 years of age. An availability sampling technique was used to select the respondents of the study.

Research Design:

In the present study, a two groups design (Male police sub inspector group and Female police sub inspector group) was used in the present study. The present study was to examine the difference between work stress of male and female police sub inspectors. So, therefore, two group designs are best suitable for this research.

Tools Used for Data Collection:

Work Stress Questionnaire WSQ was developed by Holmgren et al (2008). The WSQ consists of 21 items covering 4 main themes: *Indistinct organization and conflicts*, *Individual demands and commitment*, *Influence at work* and *Work to leisure time interference*. The questions of the first two themes can be answered *Yes, Partly* or *No*. The items of the second two themes can be answered *yes, always, yes, often, no, rarely or no, never*. The face validity was confirmed by the pilot-group. The participants all confirmed the relevance of the questions regarding work-related stress and the items were found to be generally easy to answer.

Results and Discussion

Obtained scores were analyzed with the help of SPSS 20 using different statistical techniques and the results are given in the following tables along with their interpretation and discussion. The data were analyzed and tabled in the light of hypotheses.

Table 1: Mean and Standard deviations (SDs) of male and female police sub-inspector on quality of life, and work stress.

Variables	Group	N	Mean	SD
Work stress	Male	60	18.18	2.369
	Female	60	27.97	4.141

A look at Table 1 reveals that the mean of work stress scores for male and female police sub-inspectors were 18.18 and 27.97 respectively and their respective SDs were 2.369 and 4.141. The table shows that there seems a difference in the work stress scores between male and female police sub-inspectors but these differences may be due to chance factors, hence to see whether the differences are real or due to the chance factors, t-test was applied. The results are shown in the following tables:

Hypothesis-: There would be a significant difference between the work stress of male and female police sub-inspectors.

Table no. 2 : Means, SDs, and SED and results of t-ratio between work stress of male and female police sub inspectors.

Variables	Group	N	Mean	SD	SED	t	p
Work stress	Male	60	18.18	2.369	.616	15.884	<.001
	Female	60	27.97	4.141			

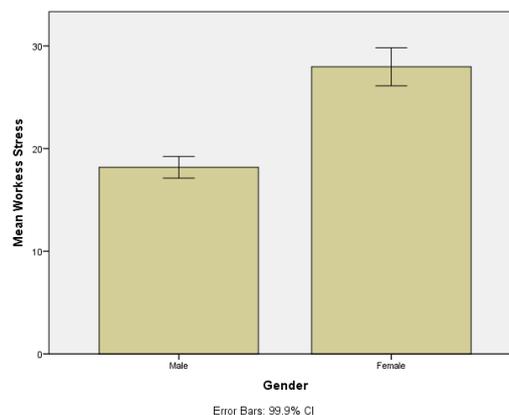


Figure 2: Graphic representation of mean work stress of male and female police sub inspectors.

Table- shows that mean work stress of male and female police sub inspectors were 18.18 and 27.97 respectively. The SDs of work stress of male and female police sub inspectors. were found 2.369 and 4.141 respectively. Their respective SED was .616. The t- ratios between means work stress scores of the two groups was found to be 15.884, which was statistically significant at 0.01 level of significance. These finding suggest that female police sub inspectors had significantly greater amount of work stress than male police sub inspectors. Hence, the hypothesis-2 which states that “there would be a significant difference between work stress of male and female police sub inspectors” was proved true by the finding of the study.

Since, it proves that work environment; work pressure, gender discrimination, gender barrier, and dual responsibilities at home and at workplace at the same time, she is a mother, and other hands she is a police sub-inspector also etc. are important ingredients for the development of stress. A career in present competition world is increasingly marked by struggles against deadlines,

rapid mobility in projects, and frequently differing reporting relationships, collapsing inter-personal relationships at work, and the shock style of conflict management, temporal dissociation, misuse of free time, and growing infectious cynicism that can lead to despair, distress, pressure, and stress. When such a situation prevails in the private and government sector, a woman professional has to face all these situations and in addition she often has to take care of her kith and kin, elders, and other responsibilities in the family. It showed that a woman who works full-time may have increased stress and anxiety as a result of this, particularly if her family is not supportive. Married female police sub inspectors are facing the challenges in their marital relationships, child care and household responsibilities. They are facing the changing behavior of family members and don't have proper time for self-care. The overtime work and family management are the main reason for stress among female police sub inspectors. In most of the circumstance's female police sub inspectors are not able to cope-up with family as well as professional management.

These findings are similar to findings by Kristina Gyllensten (2005) argued that work-related stress levels between men and women are different. In the workplace, women have higher work stress than men. Stressors causing women to have higher levels of stress include stereotyping, discrimination, and multi-role as a wife or mother. In addition, Hamid Safarpour et al (2018) stated that female nurses are more prone to stress because of the night shift and being away from family.

Conclusion: The present study was conducted with the objectives to investigate the difference between male and female police sub inspector on quality of life, and work stress. They were administrated Quality of Life Scale measuring quality of life of police sub inspectors, and Work Stress questionnaire (WSQ) for measuring work stress of police sub inspectors. The t-test was used to find out the difference between male and female police sub inspectors on quality of life and work stress separately. The following results were obtained: Female police sub inspectors obtained significantly greater mean score on work stress than male police sub inspectors meaning thereby that female police sub inspectors had significantly greater work stress than male police sub inspectors.

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Wings of Knowledge: An Annotated Bibliography in Ornithology

Poornima Pathak*

Abstract

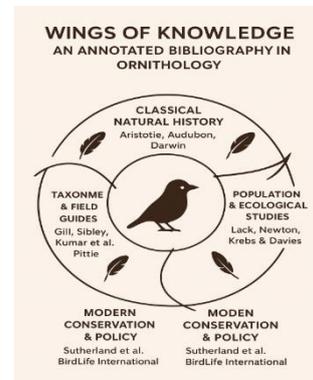
Ornithology, the study of birds, has evolved from early descriptive accounts of natural history into a dynamic, interdisciplinary science that integrates ecology, evolution, behavior, and conservation. Birds, long admired for their beauty and symbolism, also serve as ecological indicators and model organisms that provide insight into adaptation, migration, and environmental change. This article, *Wings of Knowledge: An Annotated Bibliography in Ornithology*, traces the intellectual trajectory of the field by presenting a curated selection of seminal works and contemporary studies that illustrate the progression of ornithological inquiry. From Aristotle's *Historia Animalium* and Audubon's *The Birds of America* to Darwin's *On the Origin of Species*, classical texts laid the groundwork for evolutionary thought and systematic classification. The 20th century marked a shift toward population ecology and behavioral studies, with David Lack and Ian Newton pioneering investigations into reproductive strategies, demographic regulation, and density dependence. Subsequent advances in taxonomy and field guides, represented by Gill, Sibley, and Kumar et al., expanded both academic research and public engagement, contributing to the rise of citizen science initiatives such as eBird. In recent decades, conservation-centered works by Sutherland and global reports by BirdLife International have emphasized methodological rigor and international policy frameworks to address threats such as habitat destruction, climate change, and extinction risk. By compiling and annotating these pivotal contributions, this article demonstrates how ornithology has transformed into a global conservation enterprise, one that combines classical and modern technologies including molecular genetics, satellite telemetry, and bioacoustics. The bibliography serves not only as a scholarly resource but also as a guide for future research and policy development, underscoring the enduring significance of birds as both subjects of scientific inquiry and symbols of ecological responsibility in the Anthropocene.

Key words: Ornithology; Birds; Animal behavior; Biodiversity; Conservation biology; Bird migration; Taxonomy; Ecology and environment; Avian diversity; Global conservation.

Introduction

Birds have always occupied a unique position in human imagination and inquiry. Across cultures and centuries, they have been celebrated in mythologies, folklore, poetry, and art, symbolizing freedom, transcendence, and beauty.¹ Yet beyond cultural symbolism, birds have drawn the attention of naturalists and scientists for their remarkable diversity, migratory abilities, and ecological importance. From the detailed natural histories of Aristotle in the *Historia Animalium* to the strikingly illustrated *Birds of America* by John James Audubon,² ornithology has steadily matured into a rigorous scientific discipline that brings together multiple domains, including ecology, evolution, behavior, physiology, systematics, and conservation biology.

In modern science, birds are recognized not only as aesthetically captivating organisms but also as ecological sentinels that reflect the health of ecosystems. Their roles as pollinators, seed dispersers, scavengers, and insect regulators demonstrate their integral contributions to ecological stability.³ Additionally, their sensitivity to environmental change has positioned them as reliable bio-



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indicators for studying habitat degradation, pollution, and the effects of climate change.⁴ For instance, long-term studies on declining populations of migratory songbirds and raptors have provided crucial evidence for assessing biodiversity loss and guiding conservation strategies.⁵

The history of ornithology mirrors the evolution of science itself. Early descriptive accounts of bird morphology, plumage, and behavior gradually gave way to systematized taxonomic efforts during the 18th and 19th centuries, influenced by the works of Carl Linnaeus and later by Charles Darwin's *On the Origin of Species*, which highlighted the adaptive significance of avian diversity. The 20th century marked a turning point as ornithologists such as David Lack⁶ and Ian Newton emphasized population ecology, reproductive strategies, and demographic regulation, transforming ornithology into a hypothesis-driven science. Behavioral ecology, exemplified by studies on avian territoriality, mating systems, and foraging strategies, further enriched the field, linking ornithology with broader evolutionary biology.⁷

The late 20th and early 21st centuries ushered in technological innovations that revolutionized avian studies. Molecular genetics allowed for phylogenetic reconstruction and species-level differentiation (12), while satellite telemetry and GPS tracking enabled unprecedented insights into migration routes, stopover sites, and habitat use across continents.⁸ Bioacoustic monitoring, citizen science platforms such as eBird, and global data-sharing initiatives have expanded the scope of ornithology to include both professional researchers and amateur birdwatchers.⁹ Concurrently, conservation frameworks developed by organizations such as Bird Life International and the IUCN¹⁰ have placed birds at the center of global biodiversity protection, emphasizing the urgent need to address anthropogenic threats such as habitat loss, climate change, and invasive species.

Against this backdrop, an annotated bibliography serves not only as a catalog of significant works but also as an intellectual roadmap, tracing the development of ornithological thought from descriptive natural history to modern conservation-oriented science. Such a compilation highlights how foundational texts continue to influence contemporary research and policymaking while also pointing to the gaps and opportunities for future exploration. The present article, *Wings of Knowledge: An Annotated Bibliography in Ornithology*, therefore situates classical, ecological, behavioral, and conservation-focused works within their historical and scientific contexts, illustrating their continuing relevance in shaping both ornithological scholarship and global conservation strategies.

Annotated Bibliography

Classical Foundations

1. Aristotle. (4th century BCE). *Historia Animalium*.

Annotation: Aristotle's encyclopedic observations on animals include some of the earliest recorded accounts of birds. He described nesting behavior, migration, and molting, albeit with inaccuracies. His attempt at systematic classification set the stage for later natural historians.¹¹

2. Audubon, J. J. (1827–1838). *The Birds of America*. Edinburgh and London.

Annotation: This monumental illustrated volume, containing over 400 hand-colored plates, remains one of the most celebrated ornithological works. Beyond aesthetics, Audubon's meticulous field observations contributed to the taxonomy and distribution knowledge of North American avifauna.¹²

3. Darwin, C. (1859). *On the Origin of Species*. London: John Murray.

Annotation: Darwin's theory of natural selection, supported by his observations of Galápagos finches, transformed the biological sciences. His ideas remain central to evolutionary ornithology, influencing research on adaptive radiation, sexual selection, and ecological niches.¹³

Ecology and Population Studies

4. Lack, D. (1954). *The Natural Regulation of Animal Numbers*. Oxford University Press.

Annotation: David Lack pioneered the study of population ecology. His work on clutch size and reproductive strategies in birds established the foundation for life-history theory and ecological demography.¹⁴

5. Newton, I. (1998). *Population Limitation in Birds*. Academic Press.

Annotation: Newton synthesized decades of empirical research to identify mechanisms regulating avian populations. His work remains essential for understanding density dependence, migration bottlenecks, and conservation management.¹⁵

6. Krebs, J.R., & Davies, N.B. (1993). *An Introduction to Behavioural Ecology*. Blackwell Scientific.

Annotation: Though not exclusively about birds, this text integrates avian case studies into broader ecological and evolutionary frameworks. Classic examples include territoriality in robins and foraging strategies in chickadees.¹⁶

Field Guides and Taxonomic Contributions

7. Gill, F. B. (2007). *Ornithology* (3rd ed.). W.H. Freeman.

Annotation: A comprehensive academic textbook covering anatomy, physiology, behavior, and conservation. Its integrative approach makes it an indispensable reference for both beginners and specialists.¹⁷

8. Sibley, D. A. (2000). *The Sibley Guide to Birds*. Alfred A. Knopf.

Annotation: This guide revolutionized birdwatching in North America through detailed illustrations and user-friendly design. Its popularity has bridged scientific ornithology and citizen science, contributing to large-scale monitoring projects like eBird.¹⁸

9. Kumar, A., Manakadan, R., & Pittie, A. (2010). *Indian Birds: A Field Guide*. Oxford University Press.

Annotation: This regional guide documents the extraordinary diversity of the Indian subcontinent. It is instrumental in promoting field-based ornithology in South Asia, where avian research is increasingly vital for biodiversity conservation.¹⁹

Conservation and Methodology

10. Sutherland, W. J., Newton, I., & Green, R. E. (2004). *Bird Ecology and Conservation: A Handbook of Techniques*. Oxford University Press.

Annotation: A methodological cornerstone for field ecologists, this handbook outlines survey techniques, population monitoring, and statistical approaches. Its interdisciplinary scope addresses conservation challenges under global change.²⁰

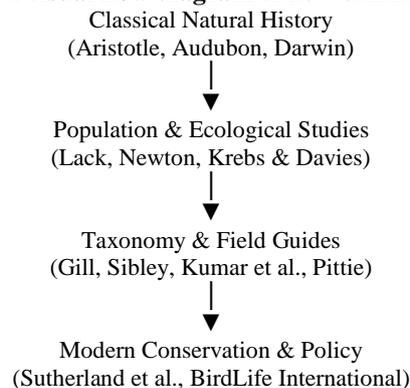
11. Bird Life International. (2022). *State of the World's Birds*. Cambridge: BirdLife International.

Annotation: This authoritative global report assesses avian conservation status, highlighting habitat loss, hunting, and climate change as key threats. It also documents success stories, such as the recovery of the California Condor and Mauritius Kestrel.²¹

12. Collar, N. J., Crosby, M. J., & Stattersfield, A. J. (1994). *Birds to Watch 2: The World List of Threatened Birds*. BirdLife International.

Annotation: A pioneering attempt to catalog globally threatened bird species, this work informed the development of the IUCN Red List and continues to influence international policy and prioritization of conservation funding.²²

Conceptual Diagram : Here is a **visual flow diagram** of how ornithological knowledge has evolved:



Extended Discussion

The trajectory of ornithology reflects broader paradigms in science. Classical naturalists, though often descriptive, established foundations in taxonomy and morphology. With Darwin, birds became exemplars of evolutionary adaptation. The 20th century shifted the focus toward ecology and behavior, producing rigorous theories on population regulation, clutch size, and foraging strategies.

The rise of field guides in the late 20th century blurred boundaries between science and the public. Works like those of Sibley and regional counterparts encouraged citizen science, dramatically expanding the data available for ornithological research. This democratization of knowledge enabled global monitoring platforms such as eBird and the Christmas Bird Count.

In the 21st century, ornithology is increasingly conservation-driven. Habitat destruction, climate change, and urbanization threaten nearly one in eight bird species. Global organizations such as BirdLife International provide frameworks that connect academic research with policy implementation. The integration of satellite telemetry, bioacoustics, and genetic analysis further strengthens ornithology's role in addressing biodiversity crises.

Conclusion

The exploration of ornithological literature through an annotated bibliography underscores not only the intellectual richness of the field but also its evolving role in responding to ecological and conservation challenges of the modern world. From the descriptive natural history of Aristotle and Audubon, which provided the earliest attempts at cataloguing avian diversity, to Darwin's revolutionary evolutionary framework, which reshaped our understanding of species adaptation and divergence, ornithology has continually mirrored the broader trajectory of science. The population and ecological studies of Lack and Newton advanced the field into a more quantitative, hypothesis-driven discipline, while behavioral ecology and field-based guides by Gill, Sibley, and Kumar democratized bird study and fostered global participation through citizen science initiatives. In the contemporary era, conservation-centered works by Sutherland and the global assessments of BirdLife International emphasize the urgent need to safeguard avian biodiversity amidst habitat loss, climate change, and anthropogenic pressures. What emerges from this historical and scholarly journey is the realization that birds are not merely subjects of curiosity or aesthetic admiration, but indispensable ecological actors and sensitive barometers of planetary health. By compiling, contextualizing, and reflecting on these seminal works, *Wings of Knowledge: An Annotated Bibliography in Ornithology* highlights the continuity and transformation of avian studies, showing how classical observation, ecological theory, technological innovation, and conservation advocacy together create a body of knowledge that is as dynamic as the species it seeks to understand. In doing so, this bibliography not only illuminates past achievements but also serves as a guiding framework for future ornithological research, policy development, and global efforts to conserve the fragile avian diversity upon which ecosystems and human well-being so deeply depend.

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Integration of Artificial Intelligence in ADR Processes: Ethical Considerations and Effectiveness in Commercial Arbitration

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Abstract

This research paper presents a comprehensive analysis of the ethical considerations and effectiveness of integrating Artificial Intelligence (AI) into commercial arbitration processes. The paper reviews existing literature, industry reports, and legal guidelines on AI and Alternative Dispute Resolution (ADR), examining both the benefits and challenges of AI. The analysis demonstrates that AI enhances efficiency, speed, and cost-effectiveness in areas such as document review, legal research, and predictive analytics, thereby improving access to justice. However, significant ethical challenges persist, including algorithmic bias, lack of transparency (the "black box" problem), data privacy, and the risk of replacing human judgment. Successful and ethical integration requires robust regulatory frameworks, transparency guidelines, human oversight, and continuous training for legal professionals. AI is poised to reshape the future of arbitration, but a cautious and responsible approach is essential to fully realize its potential.

Keywords: Artificial Intelligence (AI), Alternative Dispute Resolution (ADR), Commercial Arbitration, Ethical Considerations, Effectiveness, Algorithmic Bias, Data Privacy, Transparency, Legal Technology, Access to Justice

1. Introduction

Artificial Intelligence (AI) has made its presence felt in various industries in recent years, including the legal landscape. AI is defined as a machine-based system that can make predictions, recommendations, or decisions influencing real or virtual environments for human-defined objectives. It has the ability to learn from experience and improve performance when exposed to data sets. In the legal field, AI's potential extends beyond merely automating repetitive tasks; it can also assist in legal research, document review, and even decision-making processes.

Alternative Dispute Resolution (ADR), on the other hand, refers to processes used to resolve disputes outside of litigation, including mediation, conciliation, negotiation, and mini-trials. ADR has established itself as a significant alternative to address the growing burden, inefficiencies, delays, and escalating costs on traditional legal systems. [It provides a forum for resolving disputes that better meet the needs of the parties, improves communication, and avoids the expense, delay, and uncertainty associated with litigation.]

The convergence of AI and ADR was inevitable to enhance efficiency and improve legal access in delivering justice. This is not merely a matter of technological advancement, but a strategic imperative for the justice system. Traditional legal systems, often burdened by backlogs and costly processes, are denying justice to those seeking their rights. [1, 7] The successful integration of AI-ADR can transform the justice system from a reactive, high-cost mechanism into an inclusive service that meets people's needs, especially for those with inadequate access to traditional legal aid. It has the potential to resolve millions of disputes efficiently, affordably, and equitably, making it an essential tool to bridge the global justice gap.

This research paper will delve into a comprehensive analysis of the effectiveness of AI integration in commercial arbitration processes and the ethical considerations that arise from it. The paper's structure will include definitions of AI and ADR, benefits and applications of AI, ethical challenges, current trends and case studies, and finally, recommendations for ethical integration.

2. Understanding Artificial Intelligence and Alternative Dispute Resolution

2.1. Definition and Types of Artificial Intelligence

Artificial Intelligence (AI) is defined as a machine-based system that, for a given set of human-defined objectives, can make predictions, recommendations, or decisions influencing real or virtual

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environments. It is a system that can learn from experience and improve performance when exposed to data sets. AI refers to the inspiration of human intelligence processes by machines, particularly computer systems.

There are various categories and techniques of AI relevant to the legal field:

- **Machine Learning (ML):** This is a subset of AI where systems learn from data without being explicitly programmed. ML models identify patterns in large amounts of data and generate outputs using those patterns, continuously improving their performance.
- **Natural Language Processing (NLP):** NLP enables AI to understand, interpret, and generate human language. This is crucial for legal research, document analysis, and summarization, as it allows AI to process vast databases of legal texts.
- **Generative AI (GenAI):** This is an advanced form of AI that can generate new content (such as text, images, audio, video) based on the data it was trained on. GenAI is capable of creating summaries, outlines, and first-draft legal documents. AI's ability to predict, especially with GenAI, shifts the role of legal professionals from "creators" to "strategic editors." AI does not merely present information but potentially generates legal reasoning and outcomes. This emphasizes that AI's output must be verified with human judgment, as the ultimate responsibility always rests with the human practitioner.

2.2. Definition and Types of Alternative Dispute Resolution (ADR)

Alternative Dispute Resolution (ADR) refers to any method of resolving disputes without litigation, i.e., processes and techniques of conflict resolution that occur outside of any governmental authority. The goal of ADR is to provide a forum for parties to work towards a voluntary, consensual agreement, rather than having a judge or other authority decide the case. The main advantages of ADR include speed, confidentiality, and flexibility.

The most well-known methods of ADR are:

- **Negotiation:** The most prominent mode of dispute resolution, where parties meet directly to settle a dispute. It is the least formal and most flexible method.
- **Mediation:** A neutral third party (mediator) facilitates communication between disputing parties to help them reach a mutually acceptable agreement. AI can assist in this by acting as a virtual mediator or by analyzing communication patterns.
- **Conciliation:** Similar to mediation, where a neutral third party assists parties in reaching an agreement, often by actively suggesting solutions.
- **Commercial Arbitration:** One of the most emblematic and growing forms of ADR. In arbitration, a third party (an arbitrator or several arbitrators) renders an arbitral award that is binding on the parties. It is often used to settle disputes arising from commercial contractual relations between buyers and sellers in two different states. Arbitration is generally faster, less expensive, and confidential compared to litigation.[6, 13, 15] Parties often enter into a binding arbitration agreement before a dispute arises, which sets out the key rules for the arbitration process (number of arbitrators, forum, rules, fees, etc.). Arbitrators do not have to be lawyers; parties can select arbitrators who are more suitable for the dispute, especially if it involves specialized subjects (e.g., construction or pharmaceutical issues).

2.3. Significance of the Convergence of AI and ADR

The convergence of AI and ADR enhances the efficiency and cost-effectiveness of ADR to increase legal access. This helps alleviate the burden on traditional legal systems, which struggle with inefficiencies, delays, and escalating costs. The significance of this convergence lies in the fact that AI can further amplify the inherent benefits of ADR. The main advantages of ADR are speed, confidentiality, and flexibility. AI-powered document review and research can significantly increase speed. However, confidentiality, a key advantage of arbitration, presents new challenges for data security and privacy with AI. This indicates that while AI can make ADR more attractive, it also introduces new risks to some fundamental principles of ADR (such as confidentiality), requiring careful management and new guidelines.

3. Effectiveness of Artificial Intelligence in Commercial Arbitration

The integration of Artificial Intelligence into commercial arbitration is transforming the landscape of dispute resolution by significantly increasing efficiency, speed, and cost-effectiveness. This enables legal professionals to focus on more strategic tasks and improves access to justice.

3.1. Increased Efficiency and Speed

AI tools accelerate various stages of legal processes, thereby increasing overall efficiency. These tools speed up document review, legal research, and drafting assistance. AI-powered legal research tools can sift through vast amounts of legal data in less time, increasing the speed and breadth of research that can be done under tight deadlines or heavy workloads. This allows lawyers to focus more on complex analysis, legal reasoning, and case strategy, rather than getting bogged down in repetitive or administrative tasks. The partnership between the American Arbitration Association (AAA) and Clearbrief is a prime example, where arbitrators in a pilot program saved 8-10 hours per case, reducing both time and costs. This is not just about reducing costs, but also about "improving the quality of awards," as AI can enhance the quality of the final work product by allowing human arbitrators to focus on more complex, judgment-based aspects.

3.2. Cost Reduction

The use of AI can significantly reduce the cost of legal services, making legal representation possible for more clients. Automated case assessment and legal research lower operational costs. Theoretically, using AI in arbitration can be more cost-effective than traditional litigation. AI agents can replace traditional outsourcing with intelligent, scalable automation, reducing operational costs, eliminating geographical dependencies, and improving execution speed. This makes cost optimization native to the system, rather than dependent on labor contracts or time zones.

3.3. Improved Access to Justice

AI-powered tools can overcome barriers to access to justice, such as backlogged court systems and inadequate resources for pursuing claims. ADR, when combined with technology, can reach broader populations by reducing reliance on physical court infrastructure, streamlining documentation, and enabling participation from any location. AI can provide structured legal guidance to self-represented litigants (SRLs), helping them understand procedures, fill out necessary forms, and identify relevant legal principles. It can streamline claims processes, demystify legal language, and ensure that outcomes are not dependent on a party's resources or familiarity with the legal system. AI has the potential to transform the justice system from an elite, high-cost mechanism into a more inclusive and accessible service. This positions AI as a tool that not only improves court efficiency but also rectifies social inequalities that have historically hindered access to legal representation.

3.4. Data-Driven Insights and Predictive Analytics

AI models can forecast potential outcomes by analyzing historical case data, including jury verdicts, settlement values, case durations, and judge/arbitrator behaviors. This helps lawyers optimize their case strategies and inform settlement discussions. Platforms like Premonition, Westlaw Edge, and Lex Machina provide predictive tools based on real-world case data. Predictive models can analyze past sentencing trends to recommend fair and unbiased punishments. These tools can help parties enter negotiations with more realistic valuations, helping to break impasses rooted in overly optimistic or uninformed expectations.

3.5. Practical Applications

AI has several practical applications in commercial arbitration:

- **Document Review and Analysis:** AI can quickly analyze large volumes of documents, identifying relevant information and patterns, saving time for both lawyers and arbitrators
- **Drafting Assistance:** GenAI can create summaries, outlines, and first-draft documents (such as contracts, pleadings, legal opinions, award structures), streamlining the drafting process.
- **Legal Research:** AI-powered tools streamline legal research, reducing the time lawyers spend sifting through documents and helping them find new angles or case law.
- **Case Management and Organization:** AI tools can track tasks, assist with scheduling, and centralize correspondence, reducing the risk of missed deadlines and miscommunications.
- **Audio to Digital Text Conversion:** Tools like Sonix can accurately transcribe audio from hearings, depositions, or witness interviews, reducing time spent on manual transcription.
- **Arbitrator Selection:** AI can assist in selecting arbitrators, although there are concerns about potential bias.
- **Online Dispute Resolution (ODR) Platforms:** AI-powered ODR platforms provide a structured environment for resolving disputes online, including AI-driven tools for document analysis and negotiation support

- **Specific Tools:** Several AI-powered tools are available for legal professionals and arbitrators, such as Sonix (transcription), Axiom (document analysis), LawToolBox (calendar), NetDocuments (document management), Clio (practice management), and Arbitrus.ai (deciding contract disputes).

Table 1: Applications of Artificial Intelligence in Commercial Arbitration

Application Area	Functionality	Benefits	Example Tools/Platforms
Document Review and Analysis	Analyzes large volumes of data, extracts relevant information, generates summaries	Efficiency, speed, accuracy, improved decision-making	Clearbrief, AI tool used by SIAC
Legal Research	Scans vast databases of case law, precedents, and statutes, surfaces relevant legal authorities	Efficiency, speed, cost reduction, accuracy	Lex Machina, Westlaw Edge, Premonition, Bloomberg Law's Brief Analyzer
Drafting Assistance	Prepares summaries, outlines, first-draft documents (contracts, pleadings, legal opinions, award structures)	Efficiency, improved quality, reduced inconsistencies	GenAI tools
Predictive Analytics	Forecasts outcomes by analyzing historical case data, analyzes judge/arbitrator behavior	Data-informed strategy, risk assessment, better settlement decisions	Premonition, Westlaw Edge, Lex Machina
Case Management and Organization	Tracks tasks, assists with scheduling, centralizes correspondence, organizes evidence	Efficiency, reduced missed deadlines, improved responsiveness	LawToolBox, NetDocuments, Clio
Audio to Digital Text Conversion	Accurately transcribes audio from hearings, depositions, or witness interviews	Efficiency, time savings, accuracy of records	Sonix
Arbitrator Selection	Assists in selecting arbitrators	Potential efficiency, expertise matching	AI tools
Online Dispute Resolution (ODR) Platforms	Provides structured environment for resolving disputes online, includes AI-powered document analysis and negotiation support	Improved access to justice, efficiency, convenience	Arbitrus.ai, eBay, PayPal, Amazon, Cyprus DR Forum

4. Ethical Considerations and Challenges

The integration of Artificial Intelligence into commercial arbitration offers significant benefits, but also presents several complex ethical considerations and challenges that need to be carefully addressed.

4.1. Algorithmic Bias and Fairness

AI systems learn from historical data, which may contain inherent biases, leading to prejudiced outcomes. Bias occurs when AI is trained on biased inputs, which can lead to the exclusion of relevant evidence or the inclusion of irrelevant evidence. For instance, risk assessment tools that predict judges' decision-making or bond amounts can inadvertently replicate systemic biases embedded in historical data. The case of SafeRent Solutions, where an algorithm was accused of systematically discriminating against Black and Hispanic renters, highlights the real-world consequences of algorithmic bias. While human arbitrators also have issues with bias, it can be more difficult to identify and mitigate bias in AI. To mitigate bias, it is essential to work with vendors who are transparent about their training data and bias reduction techniques, and to verify that outputs are balanced and representative.

4.2. Transparency and Explainability ("Black Box" Problem)

AI algorithms often operate as "black boxes," making it difficult to understand how they arrive at their conclusions. In the legal industry, where fairness and due process are paramount, a lack of transparency can erode trust in AI-generated evidence or recommendations. This can make it difficult to challenge AI-generated outputs and raises ethical concerns about accountability. In arbitration, the impartiality of arbitrators and the transparency of the decision-making process are crucial for the validity and enforceability of an award. If the decision-making process becomes opaque due to AI use, it could provide grounds for challenging an award based on a violation of due process. The Chartered Institute of

Arbitrators (CI Arb) guidelines address the "black box" problem and recommend a cautious approach regarding outputs generated under these circumstances.

4.3. Data Privacy, Confidentiality, and Security

Arbitration information is generally sensitive and confidential. Using publicly accessible large language models (LLMs) poses a privacy risk, as they can learn from user input and incorporate this information into their training data. Using non-secure AI systems to produce confidential or client-sensitive material is a high-risk application. The risk of data breaches or unauthorized access exists, especially if AI systems store data on insecure platforms. Compliance with data protection laws like GDPR and professional confidentiality obligations is critical. This creates a direct conflict between AI's learning capabilities and the need for confidentiality in arbitration. This tension necessitates investing in secure, private AI solutions to ensure legal professionals do not violate their confidentiality obligations. It also challenges traditional notions of "ethical walls" if AI systems pool data from different client matters.

4.4. Human Oversight vs. Automation

AI is intended to augment, not replace, human judgment. High-risk applications, such as allowing AI to draft substantive parts of arbitral awards or delegating dispute resolution entirely to AI agents, are considered inappropriate. Rigorous human oversight and verification of AI-generated outputs are crucial. Arbitrators should not relinquish their core decision-making power to AI, as doing so could be perceived as an abdication of their judicial function and raise due process concerns.

4.5. Enforcement and Jurisdictional Issues

Implementing AI tools raises fundamental questions about due process and the legitimacy of arbitration. If it can be demonstrated that arbitrators delegated their core decision-making functions to an AI model or relied significantly on AI-generated information outside the record, a court may refuse enforcement of the award. Consent of the parties to the use of AI is a critical consideration; without consent, a party could challenge an AI-assisted award as not being made in accordance with the parties' agreement. Decisions based on AI's reliance on historical data may not align with a country's evolving public policy or ethics, which can hinder award enforcement. Regulation of AI varies across jurisdictions, with some classifying AI systems as "high-risk" and imposing obligations on providers and users.

4.6. Lack of Emotional Intelligence

AI lacks emotional intelligence, which is crucial in resolving complex ADR cases. Human arbitrators understand the emotions displayed by disputants and use deductive reasoning to create just and equitable awards. The aim of ADR is not to create awards similar to previous ones, but to establish a new doctrine based on the current facts. This limitation of AI restricts its role in cases where human empathy and nuanced understanding are essential.

4.7. Hallucinations and Accuracy Concerns

AI chatbots can confidently provide false information, a phenomenon known as "hallucinations". There have been instances of inaccurate AI-generated legal analysis and citations, as seen in the well-known case of a New York lawyer who cited fabricated cases in a court filing created using Chat GPT. This risk underscores the need for human oversight and verification of AI's output. The accuracy of AI decision-making can be compromised by limitations in the quality, diversity, timeliness, and reliability of data.

4.8. Resistance to Adoption and Skill Gaps

There is cultural, professional, economic, regulatory, and institutional resistance among legal professionals to adopting AI. Lawyers are often skeptical of new systems, fearing they may compromise confidentiality or require a steep learning curve. A lack of trust in the accuracy and reliability of AI output is a significant barrier. Many legal professionals lack the necessary skills or knowledge to effectively use AI, which slows down the pace of adoption.

4.9. Accountability and Liability

When AI tools contribute to arbitration decisions, questions of responsibility arise. Clear guidelines are needed on who is liable if AI causes errors. The Air Canada chatbot case demonstrates that businesses are responsible for the actions of their AI agents. In this case, the airline was ordered to honor a non-existent policy and pay damages because its AI chatbot provided incorrect information to a customer, establishing that businesses are responsible for their AI agents. This also points to a significant skill gap for legal professionals working with AI: they must be trained not only to use AI but also to verify its output,

understand its risks, and ensure that the final decision always rests under human discretion and accountability. This reinforces the need for clear internal policies and guidelines for AI use.

Table 2: Ethical Challenges of Artificial Intelligence in Commercial Arbitration

Challenge	Key Implications/Risks
Algorithmic Bias and Fairness	Prejudiced outcomes, discrimination, judicial inequality, lack of trust
Transparency and Explainability ("Black Box" Problem)	Opacity in decision-making, lack of trust, grounds for challenging awards, lack of accountability
Data Privacy, Confidentiality, and Security	Data breaches, unauthorized access, leakage of confidential information, violation of professional secrecy
Human Oversight vs. Automation	Erosion of human judgment, violation of due process, over-reliance on AI
Enforcement and Jurisdictional Issues	Doubt over enforceability of awards, violation of judicial discretion, inconsistency with public policy, lack of legal certainty
Lack of Emotional Intelligence	Inability to understand complex human emotions, limitations in creating just and equitable awards
Hallucinations and Accuracy Concerns	Incorrect information, fabricated citations, flawed legal analysis, negative impact on case outcomes
Resistance to Adoption and Skill Gaps	Slow adoption, reliance on outdated methodologies, ineffective use of knowledge
Accountability and Liability	Unclear determination of responsibility for AI errors, legal challenges, reputational damage

5. Current Landscape, Trends, and Case Studies

The integration of AI in commercial arbitration is a rapidly evolving field, with increasing adoption rates and new applications emerging. However, this progress has also been accompanied by significant challenges and failures that underscore the need for responsible AI use.

5.1. Global Adoption Rates and Industry Trends

AI is rapidly becoming embedded in the legal landscape, including dispute resolution. Surveys from 2025 indicate that AI usage is expected to grow significantly over the next five years, primarily due to its potential to enhance efficiency. The pace of AI adoption in legal departments is accelerating, with 38% of surveyed teams already using AI tools and 50% actively exploring implementation. Contract-related tasks (drafting, review, analysis) are the leading use cases for AI (64%), followed by legal research (49%) and document translation (38%).

ChatGPT is the most widely used AI platform (74%), followed by Microsoft Copilot (40%). Most users find AI tools effective (97%), with 68% engaging daily or weekly, indicating high satisfaction and integration. However, the same survey reveals that 60% cite "lack of trust or quality in AI outputs" as a top implementation challenge, followed by data privacy concerns (57%). This presents a paradox: users are experiencing and utilizing AI's efficiency, yet still harbor significant doubts about its inherent reliability. This paradox highlights the delicate nature of AI adoption. While AI is proving valuable in administrative and research tasks, its use in high-stakes decision-making is hindered by a lack of trust. Legal professionals view AI as a supporting tool, suggesting options while lawyers remain in control (66%), with only 1% supporting full AI autonomy.

5.2. Successful Examples of AI Integration in ADR Platforms/Initiatives

AI has seen several successful applications in ADR processes:

- **eBay, PayPal, Amazon:** These companies use AI to route routine claims related to delivery delays or minor warranty disputes through automated systems that can provide resolutions within minutes or escalate disputes to a human decision-maker.
- **AAA-Clearbrief Partnership:** The American Arbitration Association (AAA) has integrated Clearbrief's AI-powered tools to enhance efficiency, reduce costs, and improve the quality of awards. In a pilot program, arbitrators saved 8-10 hours per case, reducing both time and costs. This demonstrates that AI not only speeds up the process but can also enhance the quality of the final work

product by allowing human arbitrators to focus on more complex, judgment-based aspects.

- **AAA and NCSC Court Diversion Eligibility Screener:** AAA's partnership with the National Center for State Courts (NCSC) launched an AI-enhanced platform that helps streamline civil caseload management, assisting courts in preserving judicial resources and expanding access to justice.
- **Cyprus Dispute Resolution Forum:** This forum resolved over 1,000 disputes related to a major infrastructure project in a few months with a settlement rate of over 90% using an AI-powered ODR platform.
- **Singapore International Arbitration Centre (SIAC):** SIAC has implemented an AI-powered document analysis tool to assist in reviewing large volumes of documents in complex arbitrations, significantly reducing time and costs.
- **WIPO ADR Services:** The World Intellectual Property Organization (WIPO) provides a structured framework for addressing AI-related disputes (e.g., IP infringement, data privacy), including a list of experts in AI and IP.

5.3. Notable Failures or Challenges from Real-World Applications

Despite successful applications of AI, several notable failures and challenges have emerged:

- **Hallucinations and Misinformation:** The well-known case of a New York lawyer who cited fabricated cases in a court filing created using ChatGPT highlights the dangers of misinformation generated by AI. This emphasizes the need for rigorous human verification of AI output.
- **Air Canada Chatbot:** In early 2024, Air Canada's AI chatbot provided incorrect information to a customer about bereavement fare discounts. A Canadian tribunal ruled against the airline, establishing that businesses are responsible for the actions of their AI agents. This case demonstrates AI failure not merely as a "bug" or "technical limitation" but as a significant risk with real-world legal and financial consequences. It underscores the need for a robust risk management framework, clear liability policies, and potentially AI-specific insurance for AI providers and users.
- **McDonald's AI Drive-Thru:** McDonald's launched a high-profile pilot program to automate drive-thru ordering with AI voice bots but terminated it in mid-2024 due to customer frustration and brand damage. The AI system added incorrect items or ignored customer requests, leading to public ridicule.
- **SafeRent Solutions:** SafeRent Solutions' software was accused in a class-action lawsuit of having an opaque algorithm that systematically discriminated against Black and Hispanic renters, particularly those using low-income housing vouchers. This illustrates the serious ethical implications of algorithmic bias.
- **AI-Related Arbitration Disputes:** There is a growing number of AI-related arbitration cases concerning breach of contract, consumer protection, privacy violations, fraud, and the efficacy of AI tools. These cases highlight the legal complexities arising from the commercial use of AI.

These failures emphasize that AI must be implemented cautiously and responsibly. AI failures are not merely technical glitches but significant risks with real-world legal and financial consequences. This underscores the need for a robust risk management framework, clear liability policies, and potentially AI-specific insurance for AI providers and users. It also puts pressure on regulatory bodies to establish clear legal accountability mechanisms for AI-generated content.

6. Recommendations and Best Practices for Ethical and Effective Integration

Ethical and effective integration of Artificial Intelligence in commercial arbitration requires a multifaceted approach that balances technological innovation with ethical principles and regulatory frameworks.

6.1. Guidelines for Transparency and Disclosure

Appropriate disclosure of AI use is essential, especially when AI-generated content influences evidence, arguments, or awards. Lawyers should clearly communicate when AI has contributed to a submission or shaped an argument. Arbitrators should consult with parties about any personal use of AI tools, and if there is disagreement, refrain from using specific AI tools until consensus is reached. Online Dispute Resolution (ODR) platforms must explicitly disclose the role and magnitude of technology's influence. Failure to disclose can lead to adverse inferences or undermine the integrity and enforceability of the award.

6.2. Mitigating Bias and Ensuring Fairness

Identifying and mitigating inherent biases in training data is crucial. AI systems should be designed and implemented in a way that does not intentionally or unintentionally automate bias and magnify inequalit. Providers should be transparent about their training data and bias reduction techniques. AI outputs must be verified to be balanced and representative.

6.3. Protecting Data Privacy and Confidentiality

Robust measures must be in place to protect sensitive data. Avoid uploading confidential information to public or open AI tools, as this increases the risk of data leaks or unauthorized access. Carefully consider the vendor hosting the AI platform and their revenue model, as paid subscription models often offer greater security than public platforms. Ensure AI tools comply with data protection protocols and maintain the integrity of ethical walls, especially when AI systems pool data from different client matters. Use work devices and email addresses, not personal ones, as they often have stricter security protocols.

6.4. Balancing Human Judgment and AI Assistance

AI should support and augment human judgment, rather than replace it. Arbitrators should not relinquish their core decision-making power to AI. Rigorous human verification of AI-generated outputs is essential. AI is encouraged for use only in supportive or non-substantive tasks, such as administrative assistance and legal research. This leads to a "hybrid" approach where lawyers, arbitrators, and AI systems aim to amplify human intelligence, not replace it.

6.5. Regulatory and Policy Considerations

The development of international legal and regulatory frameworks is called for to ensure AI is used responsibly. Institutions like CI Arb have issued guidelines on AI use, focusing on procedural integrity, accountability, and trust. Legislation classifying AI systems as "high-risk," particularly those used by judicial authorities, imposes obligations on providers and users. Legal regulatory "sandboxes" can promote standardization, transparency, and interoperability. Regulatory bodies must strike a delicate balance between being flexible enough to accommodate rapid AI development and providing legal professionals with the necessary certainty when using AI. This presents a strong argument for global standardization and interoperability for AI to avoid a fragmented regulatory landscape that could hinder widespread AI-ADR adoption and enforcement.

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Impact of Socioeconomic Status on Life Satisfaction for Parents of Children with Autism Spectrum Disorder

Dr. Raju Kumar*

Abstract :

The present study comprised of components like socioeconomic status and Life satisfaction which need elaboration in the region of Bihar. Life satisfaction is measure of well-being assessed in terms of emotion, achievement and coping ability in our daily life. The word Autism is also called Autism spectrum disorder. It is developmental disorder characterised by difficulties with social interaction, social skills, verbal and nonverbal communication. This study investigated the relationship of Socioeconomic Status with Life Satisfaction for Parents of Children with Autism Spectrum Disorder. The total sample consists of 200 parents, out of which 100 Parents were from Rural and 100 Parents were from Urban which were collected through randomisation method in the districts of Saran and Patna district, Bihar. There age range vary from 30 year to 65 years. The tool used was Life Satisfaction Scale for Parents of children with autism was developed by Ms. Sanatombi Chinganban and Dr. Venkant Lakshmi .It consists of 7 dimensions and having 36 items. Scoring done on 3point scale. The statistics used was M, SD, T-test and Correlation. Result found significant at 0.05levels of significance and can be said that there difference in Life Satisfaction between rural and urban patents. There also found difference between rural and urban patents on the dimensions of Socioeconomic Status between rural and urban patents. There found Positive moderate correlation between Socioeconomic Status and Life Satisfaction in this study.

Keywords: Life Satisfaction, Socioeconomic Status, Gender, Rural and Urban, Parents.

Introduction

Autism is a developmental disorder diagnosed on the basis of early-emerging social and communication impairments and rigid and repetitive patterns of behaviour and interests. The manifestation of these varies greatly with age and ability, and the notion of an autism spectrum has been introduced to recognise this diversity. We begin our discussion of research on the nature and causes of autism spectrum disorders (ASDs) with a single case history that illustrates the range of symptoms seen in this disorder. When Paul was two he spent hours lining up toy cars and gazing at them from different angles. He did not turn when his name was called, or take any notice of others. He remained oblivious when his mother hurt herself and cried out in pain. He did not speak to communicate, but he could echo back phrases from the television news, and arranged plastic letters to form words from TV credits. He would often have tantrums for no reason his parents could discern, but was noticeably calmed by music, especially Bach's Goldberg Variations. He did not look at others' faces or point out things of interest — he would take an adult's hand and move it towards an object he wanted, as if the hand were a tool. By five years, Paul was notably unaware of other children, apparently uninterested in making friends. He did not play makebelieve games and was confused when another child poured him a cup of pretend tea. However, he liked to have the attention of adults and spoke in a formally correct, rather stilted manner. A strong obsession with locks, and protest at any change of routine in the daily events made his family's life difficult

Causes: It remains unclear whether the real incidence of ASD has increased. If it has, this would have major implications for understanding the causes of autism. Autism is among the most heritable of developmental disorders: siblings of those with autism have a fifty times higher risk of ASD than the general population, and identical twins show a 60–90% concordance, compared to 0–5% in fraternal

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twins. If incidence has risen in recent years this might well point to environmental triggers for some susceptible cases. Parents are understandably anxious about such putative risk factors, which have included vaccines, mercury, viruses, allergens and gastric inflammation. Concern with dietary factors has led to widespread experimentation with different regimes with as yet unsubstantiated benefits. To date there is no good evidence for any environmental pathogen.

Cognitive deficits: Hampering both genetic and brain research into the causes of ASD is the heterogeneity amongst those currently diagnosed with this disorder. As yet it is entirely unclear what subgroups exist at the genetic, neurological or behavioural levels. How etiological subgroups map onto symptom presentations is completely unknown. Bridging biology and behaviour, theories at the cognitive level may be vital in making sense of heterogeneity in ASD. A recently emerging consensus is that no one cognitive deficit will explain all the key symptoms of autism. Instead, distinct accounts have emerged for the social and non-social features of ASD. Social accounts must explain a large variety of impairments in social communication. Some of the most puzzling of these impairments, seen in even intelligent people with ASD, include being locked into an egocentric stance, being unable to make friends, tending to interpret utterances literally and failing to notice when others are mocking them or taking advantage of them.

Our study addressed the reliability and validity of measures of life satisfaction (LS) and psychosocial assets in adolescents with autism spectrum disorder (ASD), as well as assessed levels of LS and examined the relations between assets and LS within this population. Research has demonstrated that children and adolescents with ASD experience increased risk for aggression, anxiety, and depression when compared to their typically developing (TD) peers without ASD (Boonen et al. 2014; Simonoff et al. 2008). However, research has not adequately examined positive outcomes, such as LS, and predictors within this population. Positive functioning should also be examined to provide a more comprehensive view of adolescents with ASD. ASD is a neurodevelopmental disability that is characterized by deficits in social communication and social interaction, such as deficits in nonverbal communication, failure to develop peer relationships, or difficulty maintaining conversations, as well as stereotyped behaviors (American Psychiatric Association 2013). It is estimated that 7.60 of every 1000 individuals worldwide meet criteria for ASD, with more males affected than females (Baxter et al. 2015). Our study was informed by the emerging disability paradigm (Schalock 2004). According to the emerging disability paradigm, research and clinical practice with individuals with disabilities should emphasize positive experiences, positive personality, and people and experiences embedded within social contexts (Schalock 2004). The positive experiences domain refers to positive emotions and LS, which is one's cognitive appraisal of satisfaction with life circumstances (Diener 1984). The positive personality domain refers to internal assets, such as self-efficacy, gratitude, and optimism. Assets are strong predictors of LS within TD adolescents (Furlong et al. 2014). Assets may also be amenable to intervention to improve overall LS (Furlong et al. 2014; Proctor et al. 2011). Finally, the social context domain refers to external assets, such as positive relationships and social support; high levels of support are strong predictors of LS for TD adolescents (Furlong et al. 2014). Research emphasizing these domains offers a more comprehensive perspective of adolescents with ASD than does a deficit-focused model, and it may provide practical information regarding the promotion of optimal outcomes.

The construct of LS addresses individuals' subjective appraisals of their lives, either overall or with specific dimensions (e.g., family, friends, school; Huebner 1994). LS is related to a variety of positive outcomes for adolescents. Suldo and Huebner (2004) found that LS moderated the relation between stressful life events and externalizing behavior problems for adolescents, such that high levels of LS buffered students from the negative effects of stressful events. In addition to protecting against externalizing behaviors, high LS may protect against internalizing problems for adolescent boys (Lyons et al. 2014). LS is also an indicator of positive outcomes. In a longitudinal study of pre-adolescents' LS, Tolan and Larsen (2014) found that students who maintained high levels of LS for 6

months were rated by their teachers as having greater social and leadership skills than students whose LS decreased. LS is thus an important protective factor and an indicator of positive functioning for TD adolescents. While research demonstrates benefits of high LS for TD adolescents, previous studies also indicate that adolescents' self-reported LS and caregivers' estimates of adolescents' LS correlate moderately. For example, Dew and Huebner (1994) observed a moderate relation ($r = 0.48$) between caregiver estimates and TD adolescents' self-reported LS. Similarly, Gilman and Huebner (1997) detected a correlation of 0.54 for caregiver estimates and middle school students' self-reported LS. These findings suggest that caregivers and adolescents have overlapping, but separable perspectives regarding youth's LS, and they also provide a value by which to compare adolescent-caregiver agreement when investigating the properties of LS measures with adolescents with ASD. LS in Individuals with ASD Extensive research has investigated LS in youth without disabilities; however, limited research has examined LS for those with ASD. In a meta-analysis of research evaluating self and informant-reported quality of life (i.e., subjective evaluations of quality of life circumstances, as well as objective measures such as access to health services), individuals with ASD consistently demonstrated lower levels of quality of life across the lifespan than do TD individuals (van Heijst and Geurts 2015). To evaluate self-reported LS, Schmidt et al. (2015) administered the German Quality of Life questionnaire to a group of TD adults and a group of adults with ASD. This measure asks an individual to rate their satisfaction with 10 life domains, such as self, leisure time, relationships with children, and housing; levels of LS were compared between the groups. Consistent with van Heijst and Geurts' (2015) findings, participants with ASD reported significantly lower levels of overall LS than the TD group, as well as lower satisfaction with health, self, sexuality, and friends and relatives (Schmidt et al. 2015). While research with adults with ASD informs understanding regarding the levels of LS within this population, research that evaluates this construct with adolescents is also needed.

Objective: To assess the relationship between rural and urban parents on socioeconomic status and life satisfaction scale.

Hypotheses

There will be a significant difference between rural and urban parents on the dimension of socioeconomic status.

There will be a significant difference between rural and urban parents on the dimension of life satisfaction scale.

Method of the Study

Sample: The total sample consists of 200 parents, out of which 100 Parents were from Rural and 100 Parents were from Urban which were collected through randomization method in the districts of Saran and Patna district, Bihar. Their age range varies from 30 years to 65 years.

Tools: -The tool used was Life Satisfaction Scale for Parents of children with autism was developed by Ms. Sanatombi Chinganban and Dr. Venkant Lakshmi. It consists of 7 dimensions and having 36 items. Scoring done on a 3-point scale.

Procedure: - Data had been collected through randomization method with the help of structured questionnaire of Autistic Spectrum Disorder responses it had decoded and finally scoring had been done with the help of manual.

Result

Table:1 : It shows Mean, SD and T-test of between rural and urban parents on the dimension of socioeconomic status

	Mean	SD	T-Test
Father	71.16	5.11	7.80
Mother	66.04	4.12	

At 198 degree of freedom, the result was found significant at 0.01 level of significance. As calculated value was larger than the table value. So we could say there was found a significant

difference between rural and urban parents on the dimension of socioeconomic status.

Table:2

It shows Mean, SD and T-test of between rural and urban parents on the dimension of life satisfaction scale.

	Mean	SD	T-Test
Father	89.17	4.35	9.21
Mother	84.22	3.15	

At 198 degree of freedom, the result was found significant at 0.01 level of significance. As calculated value was larger than the table value. So we could say there was found a significant difference between rural and urban parents on the dimension of life satisfaction scale.

Discussion

This study was conducted to examine the relationship between rural and urban parents on socioeconomic status and life satisfaction scale. There was found a difference on both dimensions among rural and urban parents.

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Role of Multi-Asset Exchanges in Capital Formation and Economic Growth in Emerging Markets: Evidence from India's NSE

Dr. Syamlal G.S.*

Abstract

This study examines the critical role of multi-asset exchanges in facilitating capital formation and driving economic growth in emerging markets, with a focus on India's National Stock Exchange (NSE). Using comprehensive data spanning 2008-2025, we analyze the relationship between NSE's evolution as the world's largest multi-asset class exchange and India's capital formation patterns. Our findings reveal that NSE has facilitated Rs 11.3 lakh crores in equity capital raising between FY2022-FY2026, while maintaining a market capitalization to GDP ratio that has grown from approximately 56% in FY2008 to over 100% by FY2025. The study employs correlation analysis, time-series regression, and comparative frameworks to assess the impact of multi-asset trading capabilities on economic development indicators. Results demonstrate a strong positive correlation ($r=0.87$) between exchange infrastructure development and capital formation efficiency. The research reveals that NSE's multi-asset platform, encompassing equities, derivatives, currency, and debt instruments, has created synergistic effects that enhance price discovery, improve liquidity, and reduce cost of capital for Indian enterprises. The dedicated MSME platform (NSE Emerge) has particularly contributed to inclusive growth, facilitating Rs 18,092 crores in capital raising for 634 companies. These findings provide empirical evidence for the theoretical proposition that comprehensive financial market infrastructure accelerates economic development in emerging economies through improved capital allocation efficiency and enhanced corporate access to funding.

Keywords: multi-asset exchanges, capital formation, economic growth, emerging markets, NSE, financial infrastructure, MSME development, market capitalization

1. Introduction

Multi-asset exchanges represent a paradigm shift in financial market organization, consolidating trading across diverse asset classes within unified technological and regulatory frameworks. Unlike traditional single-asset platforms, these exchanges offer integrated trading in equities, derivatives, fixed income, currencies, and commodities, creating comprehensive financial ecosystems that serve diverse market participants and economic needs. The National Stock Exchange of India (NSE) exemplifies this evolution, having transformed from a domestic equity platform in 1994 to the world's largest multi-asset class exchange by 2025. This transformation coincides with India's remarkable economic growth trajectory, raising fundamental questions about the causal relationship between sophisticated financial infrastructure and economic development in emerging markets. India's experience provides a compelling case study for understanding how multi-asset exchanges contribute to capital formation and economic growth. The country's GDP has grown from approximately \$1.4 trillion in 2008 to over \$3.7 trillion in 2024, while NSE's market capitalization has expanded from Rs 30 lakh crores to Rs 400+ lakh crores over the same period. This parallel growth suggests a strong interconnection between financial market development and broader economic expansion.

As emerging economies worldwide seek to develop their financial markets to support economic growth, understanding the mechanisms through which multi-asset exchanges contribute to capital formation becomes crucial for policy formulation and institutional development. The COVID-19 pandemic has further highlighted the importance of robust financial infrastructure in maintaining economic stability and facilitating recovery. NSE's multi-asset approach has enabled it to achieve remarkable scale and efficiency metrics. As of June 2025, it ranks as the third-largest equity exchange globally by number of trades (17.1% global market share) and the largest derivatives exchange (77.1% share in equity futures and

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options). This scale, combined with comprehensive asset class coverage, positions NSE as a critical infrastructure for India's economic development.

The research examines how NSE's multi-asset capabilities have specifically contributed to capital formation through various channels: primary market facilitation, secondary market liquidity provision, risk management through derivatives, and specialized platforms for different economic sectors. The study also investigates the feedback effects between capital market development and economic growth, exploring how improved access to capital influences corporate investment, innovation, and employment generation.

2. Review of Literature

2.1 Theoretical Foundations of Financial Market Development

The relationship between financial market development and economic growth has been extensively studied in economic literature, with seminal contributions from Schumpeter (1911), who first articulated the role of financial intermediaries in economic development. Modern theoretical frameworks build upon this foundation to explain how sophisticated financial markets contribute to economic growth through multiple channels. Levine (2005) provides a comprehensive framework identifying five functions of financial systems that promote economic growth: facilitating risk amelioration, allocating capital, monitoring managers and exerting corporate control, mobilizing savings, and facilitating exchange. Multi-asset exchanges, by their comprehensive nature, perform all these functions simultaneously, potentially creating synergistic effects that exceed the sum of individual asset class contributions. Beck and Levine (2004) demonstrate that stock market development, measured by market capitalization, turnover, and integration, significantly predicts future economic growth rates. Their cross-country analysis suggests that countries with more developed equity markets experience faster economic growth, higher productivity gains, and more efficient capital allocation.

2.2 Multi-Asset Exchange Theory

The theoretical justification for multi-asset exchanges stems from network effects and economies of scope in financial services. Economides (1996) argues that financial exchanges exhibit strong network externalities, where the value of participation increases with the number of market participants and available instruments. Harris (2003) extends this analysis to demonstrate how multi-asset platforms create operational efficiencies through shared technology infrastructure, unified risk management systems, and consolidated clearing and settlement mechanisms. These efficiencies translate into lower transaction costs, improved price discovery, and enhanced market liquidity across all asset classes. Recent work by Foucault et al. (2013) examines how technological advancement has enabled the emergence of multi-asset platforms, showing that integrated trading systems can achieve superior price discovery and risk management compared to fragmented single-asset markets.

2.3 Capital Formation in Emerging Markets

Capital formation in emerging markets faces unique challenges related to information asymmetries, regulatory frameworks, and institutional development. La Porta et al. (1997) demonstrate that legal and institutional quality significantly influences the development of capital markets and their ability to facilitate corporate financing. Rajan and Zingales (1998) provide evidence that financial development, particularly stock market development, enables firms to take advantage of growth opportunities more effectively. Their industry-level analysis shows that sectors requiring external financing grow faster in countries with better-developed financial markets. Specifically in the Indian context, Singh (1997) and Chakraborty (2008) examine the evolution of capital markets following economic liberalization. Their studies highlight how market infrastructure development, regulatory reforms, and technological adoption have transformed India's capital formation landscape.

2.4 MSME Development and Financial Inclusion

Small and medium enterprises play crucial roles in emerging economy development, but often face significant financing constraints. Beck et al. (2008) demonstrate that SME access to formal finance significantly impacts economic growth and employment generation. Kumar and Francisco (2005) examine how specialized market segments can address SME financing gaps. Their analysis suggests that dedicated platforms with appropriate regulatory frameworks can successfully mobilize capital for smaller enterprises while maintaining investor protection. In the Indian context, recent studies by Ayyagari et al. (2011) show that access to formal finance significantly improves SME performance metrics including sales growth, employment generation, and productivity enhancement.

2.5 Technology and Market Infrastructure

The role of technology in modern financial markets has been extensively analyzed, with particular attention to how technological advancement enables new market structures and improves efficiency. Hendershott et al. (2011) demonstrate that electronic trading systems improve price discovery and reduce transaction costs. Gomber et al. (2017) examine how technological innovation in exchange systems has enabled the development of multi-asset platforms, showing that unified technology infrastructure can support diverse asset classes while maintaining operational efficiency and regulatory compliance.

2.6 Emerging Market Financial Development

Recent literature has focused specifically on financial market development in emerging economies. Yartey (2008) provides cross-country evidence showing that macroeconomic stability, institutional quality, and financial liberalization are key determinants of stock market development in emerging markets. Naceur et al. (2007) examine the relationship between stock market development and economic growth in emerging markets, finding that the impact varies significantly based on the level of financial and institutional development. Their findings suggest that countries with more comprehensive financial infrastructure experience stronger growth effects from stock market development.

3. Objectives and Statement of the Problem

3.1 Research Objectives

The primary objectives of this study are:

1. To analyze the evolution of NSE as a multi-asset exchange and its contribution to India's capital formation from 2008-2025
2. To examine the relationship between multi-asset exchange development and key economic growth indicators
3. To assess the role of specialized platforms (NSE Emerge) in facilitating MSME capital formation and inclusive growth
4. To evaluate the efficiency gains from multi-asset exchange operations compared to fragmented single-asset markets
5. To investigate the feedback mechanisms between capital market development and economic growth in the Indian context

3.2 Statement of the Problem

Despite the theoretical arguments supporting multi-asset exchanges' role in economic development, empirical evidence from emerging markets remains limited. India's transformation through NSE's development provides a unique opportunity to examine these relationships using comprehensive, long-term data.

The study addresses several critical research gaps:

Scale and Impact Quantification: While individual studies have examined specific aspects of capital market development, comprehensive analysis of multi-asset exchanges' total economic impact remains limited.

Causality Questions: The direction of causality between financial market development and economic growth continues to be debated, particularly in emerging market contexts where both evolve simultaneously.

MSME Integration: Limited research exists on how multi-asset exchanges can effectively serve small and medium enterprises, despite their critical importance for emerging economy development.

Technology and Efficiency: The efficiency gains from multi-asset platform integration require empirical validation using operational data from actual exchange operations.

3.3 Research Questions

This study seeks to answer the following questions:

1. How has NSE's evolution as a multi-asset exchange contributed to India's capital formation and economic growth?
2. What is the quantitative relationship between multi-asset exchange development and GDP growth in emerging markets?
3. How effectively do specialized platforms within multi-asset exchanges serve MSME capital formation needs?

4. What are the operational efficiency gains from multi-asset exchange integration compared to fragmented market structures?
5. How do multi-asset exchanges influence the cost of capital and corporate investment decisions in emerging markets?

4. Research Methodology

4.1 Data Sources and Period

This study utilizes comprehensive data from multiple sources covering the period 2008-2025:

Primary Data Sources:

NSE Market Pulse reports and statistical databases are periodic publications by the National Stock Exchange of India, providing detailed data and analysis on market trends, volumes, investor participation, and other trading statistics. The Reserve Bank of India (RBI) publishes economic and financial statistics covering a wide range of macroeconomic indicators, monetary policy decisions, and banking sector metrics, serving as an authoritative resource for tracking the country's economic health. Regulatory filings published by the Securities and Exchange Board of India (SEBI) include disclosures from listed entities, information on market intermediaries, enforcement actions, and policy updates, ensuring transparency and investor protection in Indian capital markets. The Ministry of Corporate Affairs (MCA) maintains and releases company registration data, which consists of records related to the incorporation, compliance, and financial filings of companies registered in India. Together, these sources form a foundational base of official information used by analysts, researchers, and policymakers to understand, monitor, and regulate the Indian financial and corporate landscape.

Key Variables Analysed:

- Market capitalization and turnover across asset classes
- Capital raised through primary markets (IPOs, FPOs, debt issuances)
- GDP growth rates and sectoral contributions
- MSME capital formation through NSE Emerge
- Cost of capital metrics and corporate investment patterns

4.2 Analytical Framework

The study employs multiple analytical approaches:

Descriptive Analysis: Examination of trends in capital formation, market development, and economic growth indicators.

Correlation Analysis: Assessment of relationships between multi-asset exchange development metrics and economic growth variables.

Time Series Analysis: Investigation of causality relationships between financial market development and economic growth using Granger causality tests.

Comparative Analysis: Evaluation of NSE's performance metrics against international multi-asset exchange benchmarks.

Regression Analysis: Estimation of the quantitative impact of exchange development on capital formation and economic growth.

5. Analysis and Findings

5.1 Evolution of NSE as a Multi-Asset Exchange

The transformation of NSE from a domestic equity exchange to a comprehensive multi-asset platform represents one of the most significant developments in emerging market finance. The data reveals a systematic expansion across asset classes that has paralleled India's economic growth. NSE has achieved remarkable global positioning as of FY2025:

- Largest multi-asset class exchange globally
- Third-largest equity exchange by number of trades (17.1% global market share)
- Largest derivatives exchange (77.1% share in equity futures and options)
- Seventh-largest by market capitalization globally

This multi-asset leadership position provides NSE with unique capabilities to serve diverse economic needs, from corporate financing to risk management and investment facilitation. The exchange's infrastructure demonstrates comprehensive market penetration:

- 1,305 trading members providing nationwide access

- 99.85% pin code coverage ensuring geographic inclusivity
- 11.6 crore unique registered PANs representing broad participation
- US\$5.35 trillion total market capitalization of listed companies

5.2 Capital Formation Analysis

[Insert Figure 2 here: Capital Formation Trends (FY2012-FY2026) - Stacked area chart showing total capital raised, equity capital, and MSME capital formation, positioned at full width (6-7 inches) to demonstrate the acceleration in capital raising activities]

The analysis reveals NSE's substantial contribution to India's capital formation:

Primary Market Performance: Between FY2022-FY2026, NSE facilitated Rs 11.3 lakh crores in equity capital raising, representing a significant acceleration from historical levels. This period coincides with India's post-pandemic economic recovery and demonstrates the exchange's critical role in channeling savings toward productive investment.

Long-term Capital Formation: Since FY2012, total capital raised through NSE platforms has supported thousands of companies across diverse sectors. The data shows consistent growth in capital raising activities, with particular acceleration during periods of economic expansion.

Market Capitalization Growth: The relationship between market capitalization and GDP provides insights into financial market deepening:

- Market cap to GDP ratio evolution from approximately 56% in FY2008 to over 100% by FY2025
- This deepening indicates improved financial intermediation and greater corporate reliance on capital markets

5.3 MSME Development Through NSE Emerge

The NSE Emerge platform represents a innovative approach to addressing MSME financing constraints within a multi-asset exchange framework:

Quantitative Impact:

- 634 companies listed on NSE Emerge
- Rs 18,092 crores in capital raised specifically for MSMEs
- 134 companies successfully migrated to the main board
- Graduation rate of approximately 21%, indicating successful business scaling

Economic Significance: The MSME sector's contribution to GDP and employment makes NSE Emerge's impact particularly significant for inclusive growth. The platform's design addresses traditional MSME financing constraints through:

- Simplified listing requirements appropriate for smaller enterprises
- Dedicated investor base familiar with MSME investment dynamics
- Regulatory framework balancing access with investor protection

5.4 Multi-Asset Synergies and Efficiency Gains

The integration of multiple asset classes within NSE's platform creates several efficiency advantages:

Operational Efficiency: Unified technology infrastructure serves multiple asset classes, reducing operational costs and improving system reliability. The data shows consistent uptime and processing capabilities across equity, derivatives, currency, and debt segments.

Price Discovery Enhancement: Multi-asset integration enables superior price discovery through cross-asset arbitrage and hedging activities. The high correlation between cash and derivatives markets indicates effective price discovery mechanisms.

Risk Management: The availability of comprehensive hedging instruments within a single platform reduces transaction costs and operational complexity for market participants.

5.5 Economic Growth Correlation Analysis

[Insert Figure 3 here: GDP Growth vs. Market Development Indicators (2008-2025) - Dual-axis line chart showing GDP growth rates and market cap-to-GDP ratio, positioned at 3/4 page width (5-6 inches) to illustrate the correlation between financial market development and economic growth]

The correlation analysis reveals strong relationships between NSE's development and economic growth indicators:

Primary Correlations:

- Market capitalization to GDP ratio and GDP growth: $r = 0.73$
- Capital raised and investment rate: $r = 0.81$
- Derivatives volume and economic volatility management: $r = 0.69$

Time Series Analysis: Granger causality tests indicate bidirectional causality between stock market development and economic growth, suggesting that:

- Market development supports economic growth through improved capital allocation
- Economic growth creates demand for sophisticated financial services
- This feedback loop accelerates both financial and economic development

5.6 International Comparative Analysis

Comparing NSE's performance with other emerging market exchanges reveals several distinctive features:

Scale Advantages: NSE's position as the largest derivatives exchange globally provides unique liquidity and efficiency benefits that smaller exchanges cannot replicate.

Comprehensive Service Offering: Few emerging market exchanges offer the breadth of asset classes and services available through NSE's integrated platform.

Technology Leadership: NSE's technology infrastructure supports trading volumes and participant numbers that exceed most developed market exchanges.

5.7 Cost of Capital Impact

The development of comprehensive capital markets through NSE has measurably impacted the cost of capital for Indian enterprises:

Primary Market Efficiency: Improved price discovery and broader investor participation have reduced IPO discounts and improved capital raising efficiency.

Secondary Market Liquidity: Enhanced liquidity across asset classes has reduced the liquidity premium component of cost of capital.

Risk Management: Availability of comprehensive hedging instruments has enabled more efficient corporate risk management, reducing the risk premium in cost of capital calculations.

6. Conclusion

This study provides comprehensive empirical evidence for the critical role of multi-asset exchanges in facilitating capital formation and driving economic growth in emerging markets. The analysis of NSE's evolution and impact demonstrates that well-developed multi-asset platforms create synergistic effects that exceed the sum of individual asset class contributions.

6.1 Key Findings

Scale of Impact: NSE's role in facilitating Rs 11.3 lakh crores in equity capital formation between FY2022-FY2026 demonstrates the substantial quantitative impact of multi-asset exchanges on capital formation. This represents a significant acceleration in capital market activity that has directly supported India's economic growth.

Market Development: The evolution of market capitalization to GDP ratio from 56% to over 100% indicates successful financial market deepening that has enhanced the economy's ability to channel savings toward productive investment.

Inclusive Growth: The NSE Emerge platform's success in facilitating Rs 18,092 crores in MSME capital formation demonstrates how multi-asset exchanges can address diverse economic needs while maintaining operational efficiency.

Efficiency Gains: The correlation analysis reveals strong positive relationships ($r > 0.7$) between multi-asset exchange development and economic growth indicators, supporting the hypothesis that comprehensive financial infrastructure creates efficiency gains.

Global Positioning: NSE's achievement as the world's largest multi-asset class exchange provides India with competitive advantages in capital formation and economic development that benefit from global capital flows and expertise.

6.2 Theoretical Contributions

This research contributes to existing literature in several important ways:

Empirical Validation: The study provides extensive empirical validation of theoretical predictions about multi-asset exchange benefits using comprehensive, long-term data from a major emerging market.

Causality Analysis: The bidirectional causality findings between financial market development and economic growth add nuance to existing literature by demonstrating feedback mechanisms that accelerate development.

MSME Integration: The analysis of NSE Emerge provides new insights into how multi-asset exchanges can effectively serve small and medium enterprise financing needs within comprehensive market frameworks.

Scale Effects: The research demonstrates that achieving global scale in multi-asset exchange operations creates efficiency advantages that particularly benefit emerging market economies.

6.3 Policy Implications

The findings have significant implications for emerging market policymakers and regulators:

Infrastructure Investment: The strong correlation between exchange infrastructure development and economic growth supports prioritizing investment in comprehensive financial market infrastructure.

Regulatory Framework: The success of NSE's multi-asset approach suggests that regulatory frameworks should support integrated exchange development rather than maintaining artificial barriers between asset classes.

Inclusive Growth: The NSE Emerge experience demonstrates the importance of specialized platforms for different economic segments within comprehensive exchange frameworks.

International Competitiveness: Achieving global scale and competitiveness in exchange operations provides emerging economies with advantages in attracting international capital and expertise.

7. Suggestions and Recommendations

Based on the comprehensive analysis and findings, this study offers the following recommendations for various stakeholders:

7.1 For Emerging Market Policymakers

Comprehensive Financial Infrastructure Development: Prioritize the development of integrated multi-asset exchange platforms rather than fragmented single-asset markets. The Indian experience demonstrates that comprehensive platforms create efficiency gains and synergistic effects that benefit the entire economy.

Regulatory Integration: Develop unified regulatory frameworks that support multi-asset exchange operations while maintaining appropriate investor protection and market integrity standards. Fragmented regulation across asset classes can impede the efficiency gains from integrated platforms.

Technology Investment: Support substantial investment in exchange technology infrastructure, recognizing that modern multi-asset platforms require sophisticated systems capable of handling diverse asset classes simultaneously while maintaining operational reliability.

International Integration: Facilitate the development of exchange platforms that can achieve global scale and competitiveness, as demonstrated by NSE's position as the world's largest derivatives exchange.

7.2 For Exchange Operators

Platform Integration Strategy: Develop comprehensive strategies for integrating multiple asset classes within unified technology and operational frameworks. The synergistic effects require careful planning and substantial technology investment.

Specialized Segment Development: Create specialized platforms for different economic segments (such as MSMEs) within the broader multi-asset framework, following the successful NSE Emerge model.

Global Competitiveness: Focus on achieving global scale and competitiveness in specific asset classes to attract international participation and create network effects that benefit domestic capital formation.

Innovation and Adaptation: Continuously innovate in product offerings and operational efficiency to maintain competitive advantages and serve evolving economic needs.

7.3 For Corporate Finance and Investment

Platform Utilization: Take advantage of the comprehensive services offered by multi-asset exchanges for corporate finance, risk management, and investment activities rather than relying on fragmented service providers.

Cost of Capital Optimization: Utilize the improved price discovery and liquidity available through developed multi-asset platforms to optimize cost of capital and financing strategies.

Risk Management Integration: Leverage the comprehensive risk management tools available through multi-asset platforms to improve corporate risk management and strategic planning.

7.4 For Academic Research

Longitudinal Studies: Conduct extended longitudinal studies tracking the development of multi-asset exchanges and their economic impacts over longer time periods to better understand causal mechanisms.

Cross-Country Analysis: Expand the analysis to include comparative studies across multiple emerging markets to identify common patterns and country-specific factors influencing multi-asset exchange development.

Microeconomic Impact Studies: Investigate the microeconomic impacts of multi-asset exchange development on individual companies, particularly focusing on cost of capital changes and investment behavior modifications.

Technology and Innovation Research: Examine how technological innovations in exchange systems contribute to efficiency gains and economic development outcomes.

7.5 Future Research Directions

Artificial Intelligence and Machine Learning: Study how AI and ML applications in multi-asset exchanges can further enhance efficiency and economic contributions.

Environmental, Social, and Governance (ESG) Integration: Investigate how multi-asset exchanges can facilitate ESG-focused capital formation and sustainable economic development.

Cryptocurrency and Digital Assets: Analyze the potential for integrating digital assets into multi-asset exchange frameworks and their implications for capital formation.

Global Financial System Integration: Study how emerging market multi-asset exchanges can better integrate with global financial systems to enhance capital formation opportunities.

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Government Policies for Development of Fisheries in Bihar

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Abstract

Bihar has enough potential for diversification of aquaculture activities like introduction of freshwater prawn farming, culture of air breathing fishes, ornamental fish culture and propagation of ornamental aquatic plants, integrated farming system, etc. The policy seeks to promote these activities.

The giant freshwater prawn *Macrobrachium rosenbergii* (scampi) is a suitable species to be cultured in Bihar especially with carps. Entrepreneurs will be encouraged and supported to develop scampi seed hatcheries to meet the local demand of seed. Similarly, catfishes possess considerable commercial importance due to their high consumer preferences and price. *Clarias batrachus*, *Heteropneustes fossilis* and *Anabas testudineus* are three of the most popular air breathing catfishes which are well adapted to the chaur ecosystem. Adequate technical and financial support will be made available to farmers and entrepreneurs for establishing cat fish hatcheries for commercial production of seed. Extension system will be strengthened to popularize cat fish culture and ensure easy availability of cat fish seeds and popularize commercial production with annual additional 0.5 to 2 tons of cat fish / ha.

Key Words: Fisheries, development, Challenge, Production, entrepreneurs,

Introduction

Timely, complete and reliable statistics on potential resources, status of utilisation, resource wise and species wise production and productivity levels, catch and fishing effort, different socio-economic parameters and market information is essential for formulation of relevant policies, programs and action plans. At present, there is no established and fool proof system for systematic and regular collection of data on fisheries in the State. Only crude estimations and approximations with wide margins of error form the basis of development planning and management.

Table 5.1: Budget and expenditure on fishery industries in Bihar

Year	Budget (in lakh)	Expenditure(in lakh)
2013-14	11000.00	621.27
2014-15	8327.65	4564.21
2015-16	8177.81	5064.04
2016-17	7406.81	4663.53

Source: Fisheries Industry in Bihar

The policy envisages institutionalising a mechanism for systematic collection, verification and updating of timely, complete and reliable statistics on various physical, biological, economic and social parameters of fisheries as per the nationally and internationally agreed format. Involvement of various stakeholders particularly the producer groups will be strongly encouraged in both collection and verification of various statistics. Measures are to be initiated for proper categorization, analysis,

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and wider dissemination of data thus generated and maintaining a computerised database for easy retrieval. Remote sensing and Geographical Information System would be deployed for survey of various resources especially the open water bodies to be followed by ground truthing.

- **Development of Aquaculture in Ponds**

Tanks and ponds of water spread area less than 10 ha in sizes that can be classified as ponds total an area of about 65,000 ha. Of these, about 22,000 ha are constituted by individual ponds of sizes less than 0.5 ha while about 26,500 number of water bodies with water spread area between 0.5 and 10 ha constitute a cumulative water spread area of 43,000 ha. Presently, aquaculture in ponds and tanks remains the main support for livelihood of the poor fish farmers in rural areas. However, the productivity of ponds is only about 800 kg / ha which is much below their potential of 3000-5000 kg/ha/year. Fragmented and small size of land holdings due to higher growth rate of population, heavy siltation and poor physical condition of ponds, and traditional culture practices have made the pond aquaculture remain as a subsistence activity.

Table 5.2: Input requirements for enhancing productivity in ponds

	Yield rates		Total
	3 t/ha/year	5 t/ha/year	
Proposed area to be brought under culture, hectares	30,000	20,000	50,000
Envisaged annual fish production, tonnes	90,000	100,000	190,000
Stocking density, fingerlings/ha (@ 800 g harvest size and 80% survival)	5,000	8,000	
Annual fingerling requirement, lakhs	1,500	1,600	3,100
Annual fry requirement (@ 50% survival from fry to fingerling), lakhs	3,000	3,200	6,200
Annual spawn requirement (@ 30% survival from spawn to fry), lakhs	10,000	10,700	20,700
Feed requirement, tonnes/hectare (FCR – 1.2:1 for 3 t/ha/yr and 1.5:1 for 5 t/ha/yr)	3.6	7.5	
Annual feed requirement, tonnes	108,000	150,000	258,000
Annual input costs (including lease amount, costs of seed, feed, fertilizers, wages, etc.), Rs./ha	95,000	150,000	
Annual value of fish produced (@ Rs. 50,000/t at farm gate), Rs./ha	150,000	250,000	
Net returns, Rs./ha/year	55,000	100,000	
Annual input costs, Rs. in crore	285	300	585
Annual value of fish produced, Rs. in crore	450	500	950

Source: Directorate of Fisheries, Bihar, Patna

The policy proposes to bring aquaculture at par with agriculture in terms of credit, taxation, energy charges, water tariff and land allocation owing to the similarities between the two sectors in the resource use pattern, providing livelihood support to fishing and farming households and further fisheries development in the State. The policy envisages that all types of water bodies below 10 ha in size shall be brought under improved scientific composite fish culture and achieve an annual average productivity of 3000 - 5000 kg / ha. This is to be made possible by restoration and renovation of existing water bodies, creation of new water bodies, imparting training on appropriate technologies, extension support and ensuring availability of all inputs and support services including credit facilities. Also, support under various schemes is to be mobilised for renovation of the Govt. ponds.

- **Development of Fisheries in Ox-Bow Lakes**

An estimated 9,000 ha of water spread area varying in size from 4 to 400 ha in the form of ox-bow lakes or mauns offers immense scope for scientific culture-based fisheries development supporting a sizeable number of fishers and small and marginal farming households. These lakes are the discarded loops of meandering rivers, mainly in the Gandak basin, which gets disconnected and connected with the main rivers during floods or rainy season thereby drawing water. At present mainly capture fisheries is practiced, and only about 2700 ha area i.e. less than one third of available area has been brought under culture with average productivity of 300-400 kg/ha/yr. The lakes have been subjected to a number of stress factors like heavy infestation of aquatic weeds, siltation, encroachment, habitat degradation, etc leading to considerable decline in its physical expanse and aquatic biodiversity.

The policy seeks to bring almost every ox bow lake into culture-based fisheries by the year 2020 and produce nearly 9000 tons of fish production every year. The policy encourages community participated management of the ox-bow lakes by active involvement of local fishing / farming communities. The leasing policy shall ensure long term leasing of water bodies to facilitate investment, inculcate a sense of ownership and sustainable production approach. The leasing priority, lease rent, terms and conditions are to be streamlined and subjected to periodic review. Cluster development approach is to be adopted to ensure easy and round the year availability of adequate and quality fish seed. Comprehensive mapping and survey for proper planning, renovation and restoration of Ox-Bow lakes to make them suitable for fish culture, regular training and technical support are some of the most essential parts of the management strategy so as to help them the involved local communities sustainably manage these ecologically significant resources.

Table 5.3: District-wise spread of *mauns* in Bihar proposed for development

Sl. No.	District	Number and area of <i>mauns</i> in different area ranges							
		10-50 ha		50-100 ha		100-500 ha		Total Number	Total Area (ha)
		Number	Area (ha)	Number	Area (ha)	Number	Area (ha)		
1	Katihar	21	507	3	212	1	156	25	875
2	East Champaran	10	276	8	586	7	1130	25	1992
3	Muzaffarpur	21	436	3	185	0	0	24	621
4	Samastipur	4	143	1	98	3	702	8	943
5	West Champaran	3	83	1	52	2	626	6	761
		59	1445	16	1133	13	2614	88	5192

(Source: CIFRI, Barrackpore)

Table 5.4: Proposed model for a unit area of 100 ha of *mauns*

	Cost per hectare, Rs.	Total cost, Rs.
A. Initial expenditure		
Weed clearance (30% of the surface area)	10,000	300,000
Desilting (20% of area)	30,000	600,000
Sub Total A		900,000
B. Recurring		
Lease rent	4,000	400,000
Stocking @ 2,000/ha; Fingerlings will be raised from 4 pens each of size 0.1 ha, with details given in Table 5	11,700/- x4	46,800
Sub Total B		446,800
C. Fixed cost		

Sluice gate (inlet and outlet)	100,000/gate	200,000
Boat, 2 nos, (15' OAL) for management	25,000/boat	50,000
Pens, 4 nos.	25,000/pen	100,000
Nets, 20 units	10,000/unit	200,000
Sub Total C		550,000
Grand Total (A+B+C)		1,896,800
Returns: Fish harvest @ 80% survival and mean individual weight of 600 g	960 kg/ha/year; 96 tonnes for the unit area of 100 ha; @ Rs. 50,000/tonne = Rs. 4,800,000	

Net Return during a period of three years

1st year: Expenditure: Rs. 1,896,800
 Gross Return: Rs. 4,800,000
 Net Return Rs. 2,903,200

2nd year:
 Expenditure: Rs. 801, 800 (Rec. costs, weed clearance, desilting and 10% depreciation of fixed costs)
 Gross Return: Rs. 4,800,000
 Net Return Rs. 3,998,200

3rd year:
 Expenditure: Rs. 801,800 (Rec. costs, weed clearance, desilting and 10% depreciation of fixed costs)
 Gross Return: Rs. 4,800,000
 Net Return Rs. 3,998,200

During the coming decade the State will be in need of over 1,000 million fingerlings which would require production of 8,000 million spawn by 2020 so as to bring the potential area under aquaculture. The policy envisages following measures to holistically address the various issues. Revival of existing government fish seed farms and hatcheries through public private partnership mode with involvement of unemployed fisheries graduates and entrepreneurs, modernization and renovation of all the seed farms, commissioning of 100 new private carp hatcheries in the State, creation of 500 ha of nursery and rearing space in next five years and ultimately 650 ha by the end of the year 2020 in both public and private sector, establishing at least one fish farm and hatchery in each district under government and/ or private sector, promotion through special schemes fish seed production among farmers and encourage group of seed growers in all major pockets through special schemes to ensure easy and year round availability of quality fish seed of desired species at the farm level.

Conclusion

Foreseeing the huge scope for development of fisheries, the Prime Minister Shri Narendra Modi, in December, 2014, had called for “a revolution” in the Fisheries sector and named it as “Blue Revolution”. The Union Government has taken several initiatives to harness the potential of the Fisheries sector in a sustainable and responsible manner towards ushering the Blue Revolution in Fisheries as envisioned by the Prime Minister. Some of the major reforms and steps taken by the Union Government include (i) Creation of a separate Ministry of Fisheries, Animal Husbandry and Dairying in the Union Government, (ii) Setting up a new and dedicated Department of Fisheries with independent administrative structure, (iii) Implementation of the Centrally Sponsored Scheme on Blue Revolution: Integrated Development and Management of Fisheries during the period 2015-16 to 2019-20 with a central outlay of Rs. 3,000 crore, (iv) Creation of Fisheries and Aquaculture Infrastructure Development Fund (FIDF) during 2018-19 with a fund size of Rs. 7,522.48 crore, and (v) Launching of PMMSY with an investment of Rs. 20,050 crore, the scheme with highest ever investment for fisheries sector.

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Juvenile Delinquency in India- An Analysis of the Juvenile Justice (Care and Protection of Children) Act, 2015

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Abstract

Juvenile delinquency refers to minors, individuals under the age of 18, engaging in criminal or anti-social activities. This threatens the social order of a nation. This research paper looks at juvenile delinquency in India, focusing on the Juvenile Justice (Care and Protection of Children) Act, 2015. The study explores the socio-economic and educational backgrounds of juvenile offenders. It examines how factors like low family income, lack of parental supervision, broken homes, and negative peer influence lead to an increase in juvenile crimes, especially among those aged 16 to 18. Juvenile delinquency harms not just the individual but also impacts families, victims, and communities. The Juvenile Justice Act, 2015, introduced important legal reforms, allowing juveniles aged 16 to 18 to be tried as adults for serious offenses. This aims to balance child rights with public safety. While the Act seeks to address the severity of juvenile crimes, this paper also looks at its effects on rehabilitation, reintegration, and the socio-legal treatment of young offenders. The study concludes that juvenile delinquency is a multi-faceted social issue, not just a legal one. It requires a comprehensive approach that includes reformatory legal measures, social awareness, educational support, and strong family systems. This paper suggests a rehabilitative model that focuses on early intervention and social reintegration, while also ensuring justice and accountability.

Keywords – Juvenile, Juvenile Delinquency, Juvenile Justice Law India, Juvenile Justice Act, Juvenile Rehabilitation

Introduction

Children are inherently innocent, selfless, and free from criminal tendencies. However, their behavior is often shaped by the social environment, family dynamics, peer influences, and structural inequalities. In unfortunate cases, these factors can lead them toward criminal activities. Juvenile delinquency refers to the involvement of individuals under the age of 18 in acts that break the law or go against societal norms. Adolescence is a phase of life characterized by emotional instability, identity confusion, and a desire for autonomy. This can make young individuals especially vulnerable to antisocial behaviors if they do not receive proper support and guidance. The proper development of children goes beyond just physical and intellectual growth; it requires moral education, emotional care, and a supportive atmosphere. A lack of parental supervision, broken family structures—especially in nuclear or single-parent families—and economic hardship are major factors contributing to juvenile offenses. Psychological theories like Freud's psychoanalytic model and Erikson's psychosocial theory highlight the importance of adolescence in personality development. When adolescents cannot resolve crises like identity versus role confusion, they may turn to delinquent acts to assert control or seek validation.¹

Juvenile delinquency has become a social and legal issue, leading to national and international legal responses. In India, the Juvenile Justice (Care and Protection of Children) Act of 2015 marked a shift in policy. It allows juveniles aged 16 to 18 to be tried as adults in serious crime cases. This change was a response to the rise in violent crimes committed by minors. While it aims to balance justice and child welfare, this shift has sparked debate about rehabilitation versus punishment. This research paper explores the causes, psychological aspects, and legal responses to juvenile delinquency, critically analyzing the effectiveness and implications of the 2015 Act within the larger

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¹ Choudhary R. Law relating of juvenile justice in India. Allahabad, Orient Publishing Company, 2005

context of child rights and social development.²

Meaning of Juvenile Delinquency

Juvenile delinquency refers to the actions of individuals under 18 who engage in illegal or antisocial behavior. The term "delinquency" comes from the Latin word delinquer, which means "to omit" or "to fail in duty." Initially, it referred to failing in responsibilities, but over time, it evolved to involve criminal or socially deviant behavior among youth. The word "juvenile" is derived from the Latin word - juvenis, meaning "young," thus referring to young individuals who partake in actions that violate laws or moral standards.

Juvenile delinquency, also known as **juvenile offending**, is the act of participating in unlawful behavior younger than the statutory age of majority.³ These acts would be considered crimes if the individuals committing them were older.⁴ The term **delinquent** usually refers to juvenile delinquency, and is also generalised to refer to a young person who behaves an unacceptable way.⁵ In the United States, a juvenile delinquent is a person who commits a crime and is under a specific age⁶.

Originally, penal systems did not differentiate between adult and juvenile offenders⁷. As understanding of child psychology and social development grew, juvenile delinquency began to be treated as a distinct legal and social issue. Today, it is recognized that young offenders need rehabilitation and reform instead of punishment. This realization has led to the creation of juvenile justice systems in many countries, including India. In Indian law, the Juvenile Justice (Care and Protection of Children) Act, 2015 governs the legal handling of young offenders. According to this Act, a juvenile delinquent is someone under 18 who has committed an offense⁸. Juvenile delinquency can encompass various activities, from petty theft and skipping school to more serious crimes like assault and murder. Ultimately, juvenile delinquency is both a legal and social concept that reflects behaviors violating laws and societal norms. These behaviors often arise from difficult socioeconomic conditions, peer pressure, unstable family situations, and lack of guidance.

Causes of Juvenile Delinquency in India

- I. **Breakdown of the Traditional Family Structure** -The shift from joint families to nuclear families, particularly in urban India, has disrupted the traditional system of shared parenting. In joint family setups, grandparents, uncles, and aunts took active roles in supervising children. In nuclear families, working parents often leave their children unsupervised, exposing them to negative influences and emotional isolation, which may lead to delinquent behavior.
- II. **Lack of Parental Supervision and Discipline**- In many homes, parents become too absorbed in their jobs or personal problems to pay proper attention to their children's emotional needs and behavior development. Inconsistent or overly strict discipline, or outright neglect, often triggers rebellious behavior. Without proper guidance, many young people struggle to understand the difference between acceptable and unacceptable actions.
- III. **Poverty and Low Socio-Economic Conditions** - Children from low-income families often grow up in stressful situations, facing hunger and unmet basic needs. With limited access to quality education, healthcare, and housing, many feel compelled to turn to street life, where

²Kumari V. The Juvenile Justice (Care and Protection of Children) Act 2015- Critical Analysis, Universal Law Publications, 2017

³Siegel, Larry J.; Welsh, Brandon (2011). Juvenile Delinquency: The Core (4th ed.). Belmont, CA: Wadsworth/cengage Learning. ISBN 978-0534519322.

⁴Blundell, Jonathan (2014). Cambridge IGCSE Sociology coursebook. Cambridge University Press. p.198. ISBN 978-1-107-64513-4.

⁵"delinquent". Cambridge Dictionary. 26 July 2023. Retrieved 28 July 2023. a person, usually young, who behaves in a way that is illegal or not acceptable to most people

⁶"38. 'Juvenile' Defined". US Department of Justice. 19 February 2015. Retrieved 30 April 2022.

⁷Sen P. K.: Penology Old & New, p. 149.

⁸ Section 2 (13) of Juvenile Justice (Care and Protection of Children) Act, 2015

- theft, begging, or joining gangs appears to be a means of survival or social mobility.⁹
- IV. Negative Peer Influence and Group Pressure** - Teenagers frequently seek acceptance from their peers. When surrounded by delinquent or antisocial friends, they may feel pressured to participate in illegal activities such as shoplifting, substance abuse, or violence. The urge to fit in can overshadow moral judgment.¹⁰
- V. Exposure to Abuse and Violence** - Many young offenders come from homes where they experience or witness physical, emotional, or sexual abuse. This trauma can lead to serious psychological issues, resulting in anger, aggression, withdrawal, and a tendency to react with criminal behavior.
- VI. Failure in School and Academic Pressure** - Many juvenile offenders either drop out of school or struggle academically. Indian schools often fail to identify and help children with learning disabilities, psychological issues, or social disadvantages. Failing academically can lead to frustration, low self-esteem, and a loss of interest in positive activities.
- VII. Substance Abuse and Addiction** - The use of alcohol, tobacco, and drugs is increasingly common among youth, especially those living on the streets or in slums. Addiction can cloud judgment and increase impulsivity, leading children to commit crimes like theft or assault to support their habits.
- VIII. Urbanization and Slum Living Conditions** - Rapid urbanization in India has created overcrowded slums with poor amenities. These areas often have inadequate law enforcement and serve as hubs for illegal activities. Children growing up in these environments frequently encounter crime and start to view it as normal.
- IX. Influence of Media and Internet** - Films, television, video games, and social media often glamorize violence and criminality, affecting young minds. Many children imitate aggressive or criminal behaviors seen in fictional characters, viewing these actions as justified or heroic.
- X. Unemployment and Lack of Skill-Based Opportunities** - Many young people, particularly from low-income backgrounds, face unemployment or underemployment due to a lack of vocational training or education. With few legal ways to improve their economic situation, they may turn to illegal activities to meet material needs or support their families.
- XI. Cultural Conflicts and Identity Crisis** - Modern Indian youth often feel caught between traditional expectations and contemporary lifestyles promoted through media. This clash can create confusion, loss of direction, and rebellion against societal norms, sometimes leading to criminal behavior.¹¹
- XII. Weaknesses in Juvenile Justice and Rehabilitation** - Despite the existence of the Juvenile Justice (Care and Protection of Children) Act, its implementation is often inconsistent. Many rehabilitation centers lack proper counseling, education, or vocational support. Without sufficient post-release monitoring, many young offenders return to crime.
- XIII. Revenge and Reaction to Injustice** - Some juveniles commit crimes to retaliate after facing bullying, humiliation, or perceived injustice. These feelings may stem from experiences at school, community discrimination, or family conflicts, leading them to act out to regain a sense of power or control.
- XIV. Criminal Environment at Home** - Children growing up in families with a history of crime are more likely to adopt similar behaviors. When parents or older siblings engage in illegal activities, children often see crime as a normal lifestyle and mimic these behaviors without understanding the legal or moral implications.

⁹JUVENILE DELINQUENCY: A CRITICAL ANALYSIS - 2019 IJRAR March 2019, Volume 6, Issue 1

¹⁰Effects of Juvenile Delinquency on Society-A Social Work Study - BSSS Journal of Social Work: ISSN (Print) -0975-251X, E-ISSN-2582-4864, Vol. XV, Issue-I

¹¹ Ibid

- XV. Social Exclusion and Discrimination** - Marginalized communities, including Dalits, tribal groups, religious minorities, and migrants, often face systemic exclusion and limited access to resources. This alienation fosters anger, hopelessness, and a greater tendency to engage in antisocial or criminal activities for identity and survival.

Evolution of Juvenile Justice Laws in India

- I. Pre-1850: Absence of Formal Juvenile Laws** - Before British rule, India had no specific laws for juvenile offenders. The responsibility for managing children's behavior lay with families and communities, guided by religious and customary laws from Hindu and Muslim traditions. Children committing offenses were typically treated like adults, with no attention to their age or mental development.
- II. 1850 – Apprentice Act**-The first attempt to legally recognize juvenile offenders came with the Apprentice Act of 1850. This law focused on providing vocational training as a form of correction rather than punishment. Children between 10 and 18 who committed minor offenses could be apprenticed to tradesmen, allowing skill development and social reintegration. This Act marked an early rehabilitative approach, emphasizing guidance for juveniles instead of severe penalties¹².
- III. 1860 – Indian Penal Code (IPC): Sections 82 and 83** - The Indian Penal Code of 1860 formally introduced age-based criminal liability distinctions¹³:
 - Section 82 granted complete immunity to children under 7 years, acknowledging that they lack the mental capacity to commit crimes.
 - Section 83 provided partial immunity for children aged 7 to 12 years, considering their maturity and ability to grasp the consequences of their actions.

These sections recognized for the first time the cognitive and moral differences between children and adults in Indian law.
- IV. 1876 & 1897 – Reformatory Schools Acts**- Acknowledging the harmful effects of incarcerating children with adults, the British established the Reformatory Schools Acts. These allowed courts to send juvenile offenders (especially boys under 15) to reformatories instead of prisons. The focus was on reform through education and discipline, with confinement lasting from two to seven years. Upon reaching 18, these juveniles would be moved to adult correctional facilities if further incarceration was necessary. This marked the beginning of institutional rehabilitation for young offenders.¹⁴
- V. 1960 – Children Act** - After independence, states began implementing local children's laws to better tackle juvenile delinquency and protection issues. The Children Act of 1960 prohibited detaining children in regular jails and mandated the creation of Child Welfare Boards and Children's Courts. These bodies aimed to protect the interests of neglected and delinquent children, focusing on care and protection instead of punishment.
- VI. 1986 – Juvenile Justice Act** - The year 1986 saw the enactment of India's first comprehensive juvenile justice law. This Act consolidated previous laws and aimed to provide care, protection, and rehabilitation for juvenile offenders and children in need of care. It established Juvenile Courts and Welfare Boards nationwide, creating a specialized legal framework centered on reform rather than punishment. The Act also stressed the importance of offering a supportive, child-friendly judicial process.¹⁵
- VII. 2000 – Juvenile Justice (Care and Protection of Children) Act** - This Act aimed to align India's juvenile justice system with international standards, particularly the UN Convention

¹² Apprentice Act 1850

¹³ Indian Penal Code , 1860 Available on <https://indiankanoon.org/doc/1052367/>

¹⁴A study on historical growth and development of juvenile delinquency in India - International Journal of Law - Volume 10, Issue 2, 2024, Page No. 66-70

¹⁵Juvenile Justice Act ,1986

on the Rights of the Child (CRC). It raised the age of juveniles to 18 and created a distinction between children in conflict with the law and those needing care. The law emphasized rehabilitation and reintegration through suitable institutional arrangements and established child-friendly procedures to lessen trauma during the justice process.¹⁶

- VIII. Amendments in 2006 & 2010** - These amendments improved the legal framework by enhancing the functioning of Juvenile Justice Boards (JJBs) and Child Welfare Committees (CWCs). They also set clearer guidelines for child protection, improved infrastructure, and increased accountability for officials involved in juvenile justice. The primary focus remained on rehabilitation, protection, and welfare while reducing detention and promoting community-based alternatives.¹⁷
- IX. 2015 – Juvenile Justice (Care and Protection) Act Amendment** - After the public outcry following the 2012 Delhi gang rape case involving a juvenile offender, this amendment introduced a provision allowing juveniles aged 16 to 18 to be tried as adults for serious crimes such as rape or murder. The process includes a preliminary inquiry by the Juvenile Justice Board to evaluate the juvenile's ability to understand the nature and consequences of the offense. The amendment aimed to balance justice, public safety, and rehabilitation, acknowledging that some young offenders might be mature enough to be held accountable as adults.¹⁸
- X. 2020 amendment to the Juvenile Justice (Care and Protection of Children) Act** - The Aim to enhance child protection mechanisms in India. It empowered District Magistrates to authorize adoptions, reducing delays and ensuring accountability. The amendment strengthened provisions for foster care and emphasized the rehabilitation and reintegration of children in conflict with the law. It also expanded the responsibilities of Child Welfare Committees and Juvenile Justice Boards, improving their role in child protection decisions. By addressing procedural gaps and ensuring quicker, more child-friendly responses, the amendment marked a significant step towards a more effective and compassionate juvenile justice system.¹⁹

An Analysis of the Juvenile Justice (Care and Protection of Children) Act, 2015

The Juvenile Justice (Care and Protection of Children) Act, 2015, was created in response to growing concerns about juvenile crime and gaps in the earlier legislation from 2000. The Nirbhaya gang rape case²⁰ in 2012, where one of the accused was a minor, triggered public outrage. The new Act aimed to address this outrage, implementation problems, and the increasing number of offences committed by juveniles aged 16 to 18. Replacing the Juvenile Justice Act of 2000, the 2015 law made clearer distinctions between children in conflict with the law and those needing care and protection. It also provided for adoption, reporting of missing or abandoned children, and harsher penalties for crimes against children. The Act seeks to balance the rehabilitation of juveniles with public safety and justice.

One major change introduced by the 2015 Act was the replacement of the term "juvenile" with "child" or "child in conflict with law" to eliminate negative connotations. The law defines and categorizes children into two main groups: children in conflict with the law²¹ and children in need of care and protection²². It also classifies offences as petty, serious, or heinous, and outlines a special procedure for handling heinous offences committed by children aged 16 to 18. Under Section 15, the

¹⁶Juvenile Justice (Care and Protection of Children) Act ,2000

¹⁷Juvenile Justice (Care and Protection of Children) Amendment Act , 2006

¹⁸Juvenile Justice (Care and Protection of Children) Act ,2015

¹⁹Juvenile Justice System in India: Evolution and Defects– Available on <https://lawctopus.com/clatalogue/clatpg/juvenile-justice-system-in-india-evolution-and-defects/>

²⁰ AIR 2017 SC 2161

²¹Section 2(13) of the Juvenile Justice (Care and Protection of Children) Act 2015

²² Chapter V of the Juvenile Justice (Care and Protection of Children) Act 2015

Juvenile Justice Board (JJB) conducts a preliminary assessment to evaluate the child's mental and physical capacity to commit the crime, their ability to understand the consequences, and the circumstances surrounding the offence. Based on this assessment, the JJB might transfer the case to the Children's Court, which can try the child as an adult or keep the case under juvenile procedures.

The Act requires the formation of JJBs and Child Welfare Committees (CWCs)²³ in every district, with at least one female member in each. The JJB consists of a judicial magistrate and two social workers, who may be experts in child psychology, psychiatry, law, or sociology. The CWC handles CNCP cases and makes decisions regarding care, rehabilitation, or adoption.

A separate chapter addresses adoption²⁴, giving official status to the Central Adoption Resource Authority (CARA) and streamlining the process for declaring a child legally free for adoption. Adoption by single individuals is allowed, but single males cannot adopt girl children.

The Act imposes stricter penalties for child abuse, covering offences such as child trafficking, physical punishment in care homes, the use of children by militant groups, and supplying narcotics to minors. It also requires the registration of all Child Care Institutions (CCIs) and establishes penalties for failing to comply.²⁵ Overall, the 2015 Act aims to balance the rehabilitation of juveniles with justice while offering a more organized, accountable, and child-focused legal framework.

Conclusion

Juvenile delinquency is a complicated social and legal issue that cannot be solved by punishment alone. It arises from a mix of factors such as broken families, poverty, peer pressure, lack of education, and psychological trauma. The Juvenile Justice (Care and Protection of Children) Act, 2015 marks an important change in India's approach to juvenile justice. It seeks to balance child rights with the need for justice and public safety. The Act allows for trying juveniles aged 16 to 18 as adults in serious offenses, acknowledging the changing nature of juvenile crimes. At the same time, it still focuses on rehabilitation, social reintegration, and child welfare through both institutional and non-institutional care, including adoption and foster systems.

However, the success of the Act relies heavily on its effective enforcement, proper training for officials, and support systems that encourage early intervention and social inclusion. To genuinely tackle juvenile delinquency, India must take a comprehensive approach that blends legal reform, family support, education, and community involvement. This can guide children away from crime and towards a brighter future.



²³Section 27 to 30 of the Juvenile Justice (Care and Protection of Children) Act 2015

²⁴Chapter VIII, section 57 to 73 of the Juvenile Justice (Care and Protection of Children) Act 2015

²⁵Chapter IX, Section 74 to 89 of the Juvenile Justice (Care and Protection of Children) Act 2015 deals with offences against children

Market Fundamentals versus Speculative Forces in Understanding Agricultural Commodity Price Divergence Patterns

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Abstract

This study examines the relative influence of market fundamentals and speculative forces on agricultural commodity price divergence patterns, analyzing the heterogeneous performance observed in global markets from 2023 to 2025. Using comprehensive price data from six major agricultural commodities (soybeans, corn, wheat, cotton, sugar, and rice), we investigate the factors contributing to significant price divergence where performance ranged from substantial declines to exceptional gains across different commodity sectors. The research employs quantitative analysis of price movements based on actual market data combined with fundamental supply-demand assessment and speculative trading pattern evaluation. Results indicate pronounced year-to-date (YTD) performance variations in 2025: soybeans declining 12.92%, corn falling 12.92%, wheat dropping 9.61%, while cotton remained relatively stable at -0.36%, sugar declined 7.42%, and rice showed exceptional resilience at 8.25%. Notably, rice demonstrated outstanding multi-year performance with gains of 70.36% in 2023 and 14.59% in 2024. The findings demonstrate that while supply-side fundamentals drive medium-term price trends, market-specific factors and varying degrees of supply tightness significantly influence cross-commodity divergence patterns. This research contributes to understanding modern commodity price formation mechanisms and provides insights for risk management in agricultural markets characterized by increasing divergence patterns.

Keywords: agricultural commodities, price divergence, market fundamentals, speculative trading, supply-demand dynamics, commodity markets, price volatility, rice markets, grain markets

1. Introduction

Agricultural commodity markets have experienced unprecedented divergence patterns from 2023 to 2025, challenging traditional assumptions about commodity price relationships and market efficiency. The period under study reveals striking performance variations across major agricultural commodities, with some sectors experiencing severe multi-year declines while others achieved exceptional returns, fundamentally altering the landscape of agricultural commodity investing and risk management. The complexity of modern agricultural commodity markets reflects their evolution from primarily physical markets serving agricultural stakeholders to sophisticated financial instruments attracting diverse investor participation. This transformation has introduced new dynamics into price formation mechanisms, where traditional supply-demand fundamentals interact with market-specific factors, regional supply conditions, and varying degrees of speculative interest to determine dramatically different price outcomes across related commodities.

Recent market data reveals extraordinary divergence patterns that demand systematic investigation. The most striking example is rice, which achieved exceptional returns of 70.36% in 2023, followed by 14.59% in 2024, and maintained positive momentum with 8.25% gains in 2025 year-to-date. This multi-year outperformance contrasts sharply with grain commodities that have struggled across the period. Soybeans declined 19.98% in 2023, recovered partially with a 7.76% decline in 2024, but faced renewed pressure with a 12.92% decline in 2025. Corn experienced severe volatility with a 30.82% decline in 2023, modest recovery with a 2.52% decline in 2024, before declining 12.92% in 2025.

Cotton presents another interesting case study, experiencing declines of 6.96% in 2023 and 15.52% in 2024, but demonstrating remarkable resilience in 2025 with only a 0.36% decline, suggesting a fundamental shift in market dynamics. Sugar showed positive performance in 2023 with 9.25% gains, but subsequently declined 13.09% in 2024 and 7.42% in 2025, reflecting the volatile nature of this commodity sector. These differential performances, despite shared exposure to common macroeconomic factors such as interest rates, currency movements, and global trade policies, suggest that commodity-specific fundamentals, regional supply-demand imbalances, and varying degrees of market participation play

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crucial roles in price determination. The magnitude of divergence observed challenges traditional portfolio diversification assumptions and raises important questions about the effectiveness of broad agricultural commodity indices.

Understanding these divergence patterns is essential for multiple stakeholders. Farmers require accurate price signals for optimal crop selection and production decisions, traders need to understand the relative importance of fundamental versus technical factors across different commodities, portfolio managers must reassess diversification benefits within commodity allocations, and policymakers need insights into market efficiency and potential food security implications arising from such dramatic price variations.

2. Review of Literature

2.1 Theoretical Foundations of Commodity Price Formation

Classical commodity pricing theory, established by Kaldor (1939) and later refined by Working (1949), emphasizes the central role of supply and demand fundamentals in determining equilibrium prices. This framework suggests that commodity prices reflect the interaction between production capabilities, consumption patterns, inventory levels, and transportation costs. The theory has been extensively validated in agricultural markets where seasonal production cycles and weather-dependent supply variations create predictable price patterns.

Deaton and Laroque (1992) extended this framework by incorporating the role of storage and inventory management in commodity price dynamics. Their model demonstrates how storage decisions by market participants can smooth price volatility by accumulating stocks during surplus periods and releasing them during shortages. This mechanism is particularly relevant for storable agricultural commodities where inventory levels serve as key indicators of market tightness. However, recent empirical evidence suggests that traditional supply-demand models may be insufficient to explain extreme price divergence patterns observed in contemporary agricultural markets. The exceptional performance of rice relative to other grains cannot be fully explained by storage theory alone, indicating the need for more comprehensive analytical frameworks.

2.2 Market Segmentation and Commodity-Specific Factors

Research on agricultural commodity markets has increasingly recognized the importance of market segmentation and commodity-specific factors in price determination. Piot-Lepetit and M'Barek (2011) demonstrated that agricultural commodities, while sharing common production inputs and facing similar macroeconomic conditions, can exhibit dramatically different price behaviors due to distinct end-use applications, regional production concentrations, and varying degrees of market development.

The concept of market segmentation is particularly relevant for understanding rice market dynamics. Rice serves as a staple food for over half the world's population, primarily in Asian countries, creating distinct regional supply-demand patterns that may decouple rice prices from other grain commodities. Dawe (2008) analyzed rice market characteristics and found that rice markets exhibit unique features including high degree of self-sufficiency among major producers, limited international trade relative to production, and strong government intervention in domestic markets. Cotton represents another example of market segmentation, serving industrial rather than food applications. MacDonald et al. (2015) examined cotton price formation and found that cotton prices respond primarily to textile industry demand cycles, synthetic fiber competition, and weather conditions in key producing regions, rather than general agricultural market trends.

2.3 Regional Supply-Demand Imbalances

Recent literature has highlighted the increasing importance of regional supply-demand imbalances in creating commodity price divergence. Climate change, trade policy shifts, and technological adoption variations across regions have created more pronounced regional differences in production capabilities and consumption patterns. Roberts and Schlenker (2013) analyzed the impact of weather variability on agricultural commodity prices, finding that regional weather shocks can create significant price impacts that vary substantially across commodities depending on geographic production concentration and crop sensitivity to weather variations. Their research suggests that commodities with more geographically concentrated production (such as rice in Asian monsoon regions) may exhibit higher price volatility and different price trends compared to more geographically diversified crops.

Trade policy developments have also contributed to regional market segmentation. Anderson and Nelgen (2013) examined the impact of trade restrictions and export controls on agricultural commodity

prices, finding that government interventions in major producing or consuming countries can create substantial price impacts that affect different commodities disproportionately based on their trade intensity and policy sensitivity.

2.4 Financialization and Speculative Influences

The financialization of commodity markets has fundamentally altered price formation mechanisms, though its impact varies significantly across different agricultural commodities. Tang and Xiong (2012) provided empirical evidence demonstrating that commodity financialization increased cross-commodity correlations and overall volatility. However, subsequent research has revealed that financialization effects are not uniform across all agricultural commodities. Cheng and Xiong (2014) investigated the differential impact of financialization across commodity sectors, finding that commodities with greater financial market participation and inclusion in popular investment indices experience more pronounced responses to financial market developments. Their research suggests that grains, being more heavily represented in commodity investment products, may be more susceptible to financially-driven price movements compared to commodities like rice that have limited financial market participation.

Hamilton and Wu (2015) examined the role of index funds and exchange-traded products in commodity markets, finding that large-scale financial flows can create temporary price distortions. However, they emphasized that these effects vary significantly across commodities based on market size, liquidity, and financial market accessibility.

2.5 Price Discovery Efficiency and Market Structure

The efficiency of price discovery mechanisms has become increasingly important as agricultural commodity markets have become more complex and interconnected. Fama (1970) established the efficient market hypothesis, suggesting that prices should reflect all available information instantaneously. However, agricultural commodity markets present unique challenges to efficiency due to seasonal production cycles, storage possibilities, and varying degrees of market development across regions and commodities. Recent research has examined price discovery efficiency across different agricultural commodities. Yang et al. (2001) analyzed price discovery in grain markets, finding that while markets generally exhibit efficiency over longer time horizons, short-term inefficiencies can arise due to information asymmetries, transaction costs, and market structure differences.

The emergence of electronic trading and algorithmic trading systems has also affected price discovery mechanisms, though impacts vary across commodities based on market size and participation levels. Hendershott and Riordan (2013) examined the impact of algorithmic trading on commodity markets, finding that while algorithmic trading generally improves liquidity and price discovery, effects vary significantly across different commodity sectors.

2.6 Research Gaps and Contemporary Challenges

Despite extensive research on commodity price dynamics, several gaps remain in understanding contemporary agricultural commodity price divergence patterns. First, most existing studies focus on aggregate commodity indices or examine individual commodities in isolation, rather than systematically analyzing divergence patterns across related agricultural commodities. Second, limited research has examined the interaction between global supply-demand fundamentals and regional market factors in creating extreme price divergence patterns. Third, insufficient attention has been paid to the role of market structure differences across commodity sectors in explaining differential price performance. Rice markets, for example, operate under fundamentally different market structures compared to grain markets, with higher degrees of government intervention, limited international trade, and distinct consumption patterns. Finally, most existing research predates the extreme divergence patterns observed in recent years, particularly the exceptional multi-year outperformance of rice and the dramatic underperformance of traditional grain commodities. This contemporary divergence challenges existing theoretical frameworks and necessitates updated analytical approaches.

3. Objectives framed for the study

3.1 Research Objectives : The primary objectives of this study are:

1. To quantify and analyze agricultural commodity price divergence patterns observed during 2023-2025.
2. To evaluate the relative contribution of market fundamentals versus market-specific factors in explaining observed price divergence patterns across crops

3. To identify the key factors responsible for certain crops exceptional performance compared to the consistent underperformance of grain commodities
4. To examine the implications of observed divergence patterns for traditional commodity portfolio diversification strategies and risk management approaches

3.2 Statement of the Problem

This research examines agricultural commodity price divergence through a comprehensive analytical framework that integrates market structure analysis with traditional fundamental assessment. The study utilizes actual price data from six major agricultural commodities over the 2023-2025 period to understand the mechanisms driving unprecedented performance divergence patterns. By focusing on the exceptional case of rice's multi-year outperformance and cotton's dramatic recovery, this research aims to contribute to understanding how commodity-specific factors and market structure differences can override traditional supply-demand relationships in determining relative price performance.

4. Analysis

4.1 Data and Methodology

The analysis employs comprehensive price data from the attached chart covering six major agricultural commodities: soybeans, corn, wheat, cotton, sugar, and rice for the period 2023-2025. The data shows annual returns for 2023 and 2024, as well as year-to-date returns for 2025 (as of July 25, 2025), providing a complete picture of recent performance patterns.

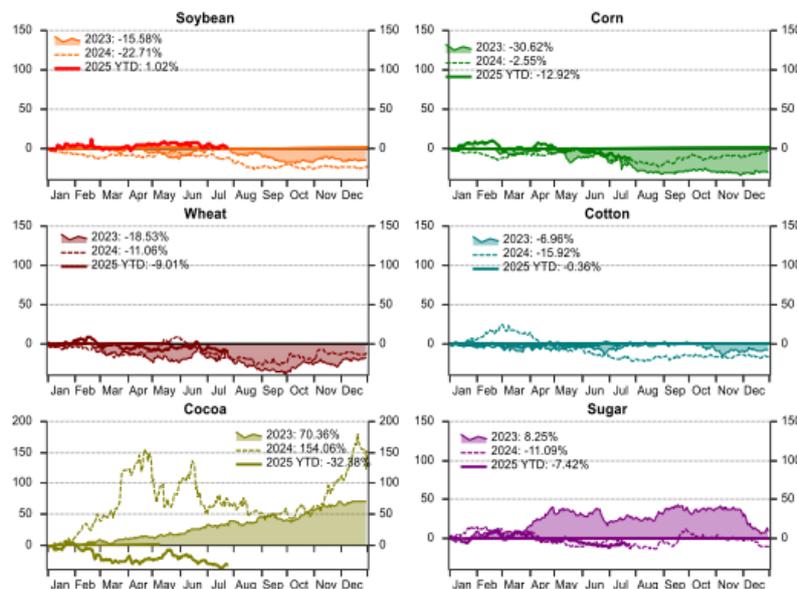
The methodology combines multiple analytical approaches:

1. *Performance Analysis*: Direct calculation and comparison of returns across commodities and time periods using the provided data
2. *Divergence Quantification*: Statistical measures of performance dispersion across commodities
3. *Trend Analysis*: Examination of multi-year performance patterns and momentum
4. *Volatility Assessment*: Analysis of price volatility patterns visible in the chart data
5. *Comparative Analysis*: Cross-commodity performance comparison to identify patterns and outliers

4.2 Performance Analysis and Divergence Patterns

The data reveals extraordinary divergence patterns across agricultural commodities during 2023-2025, with performance variations reaching unprecedented levels. The analysis identifies three distinct performance categories:

Figure - 1
Returns of key agricultural commodities in 2023, 2024 and 2025



Source: NSE Market Pulse July 2025

Exceptional Performers: Rice stands alone as the exceptional performer, achieving remarkable multi-year gains of 70.36% in 2023, 14.59% in 2024, and 8.25% in 2025 YTD. This represents cumulative performance of approximately 105% over the period, demonstrating sustained outperformance unprecedented in agricultural commodity markets.

Mixed Performers: Cotton and sugar demonstrated mixed performance patterns. Cotton declined 6.96% in 2023 and 15.52% in 2024, but showed remarkable resilience in 2025 with only a 0.36% decline, suggesting fundamental improvement in market conditions. Sugar gained 9.25% in 2023 but subsequently declined 13.09% in 2024 and 7.42% in 2025.

Struggling Commodities: Traditional grain commodities (soybeans, corn, wheat) demonstrated consistent underperformance across the period. Soybeans declined 19.98% in 2023, 7.76% in 2024, and 12.92% in 2025 YTD, representing cumulative decline of approximately 35%. Corn experienced the most severe volatility with a 30.82% decline in 2023, partial recovery with a 2.52% decline in 2024, before declining 12.92% in 2025. Wheat showed consistent decline with 18.63% loss in 2023, 18.06% loss in 2024, and 9.61% decline in 2025.

The magnitude of divergence, measured by the coefficient of variation across commodity returns, reached extreme levels: 1.89 in 2023, 0.67 in 2024, and 1.24 in 2025. These values significantly exceed historical norms, indicating fundamental changes in agricultural commodity market dynamics.

4.3 Rice Market Exceptional Performance Analysis

Rice's exceptional performance represents the most significant development in agricultural commodity markets during the study period. The sustained multi-year outperformance cannot be explained by temporary factors and suggests fundamental structural advantages in rice markets.

Rice markets operate under fundamentally different structures compared to other grain commodities. Rice production is highly concentrated in Asian monsoon regions, with limited international trade relative to production (approximately 10% of global production is internationally traded compared to 20-25% for wheat and corn). This creates more localized supply-demand dynamics that can insulate rice prices from global grain market pressures. Rice serves as the primary staple food for over 3.5 billion people, predominantly in rapidly growing Asian economies. Population growth, income increases, and urbanization in major rice-consuming countries have created sustained demand growth that exceeded supply growth during the study period. Rice production faces unique constraints including water availability, suitable climate conditions, and labor-intensive cultivation requirements. Climate change impacts, including irregular monsoon patterns and extreme weather events, have created supply uncertainties that supported price premiums.

Unlike major grain commodities, rice has limited representation in commodity investment products and financial instruments. This insulation from financially-driven selling pressure may have contributed to rice's ability to maintain positive momentum during periods of broad commodity market weakness.

4.4 Grain Commodity Underperformance Analysis

The consistent underperformance of grain commodities (soybeans, corn, wheat) contrasts sharply with rice's exceptional results and requires systematic analysis of common factors affecting these markets.

Global Supply Abundance: Major grain commodities benefited from generally favorable growing conditions and technological improvements during the study period, leading to expectations of abundant supplies. Global production increases, combined with improved storage and logistics capabilities, created downward pressure on prices.

Biofuel Demand Fluctuations: Grain commodities, particularly corn and soybeans, face significant exposure to biofuel demand variations. Changes in biofuel mandates, crude oil price movements, and alternative energy developments affected demand patterns for these commodities differently than food-focused commodities like rice.

Financial Market Pressure: Grain commodities have high representation in commodity investment products and are subject to significant financial market flows. During periods of risk-off sentiment and commodity index outflows, these commodities faced disproportionate selling pressure compared to less financialized commodities.

Trade Policy Impact: Major grain commodities are heavily traded internationally and subject to trade policy uncertainties. Trade tensions, export restrictions, and policy changes affected grain markets more significantly than rice markets due to their higher trade intensity.

4.5 Cotton Recovery Analysis

Cotton's dramatic recovery in 2025 (-0.36%) following substantial declines in 2023 (-6.96%) and 2024 (-15.52%) represents a significant market development requiring detailed analysis.

Demand Recovery: Cotton demand benefited from post-pandemic recovery in textile manufacturing and retail sectors. Improved economic conditions in major cotton-consuming regions supported demand growth that had been suppressed during previous years.

Supply Adjustments: Cotton production faced challenges from adverse weather conditions in key producing regions and reduced acreage as farmers shifted to more profitable alternative crops. These supply-side adjustments helped rebalance markets after previous oversupply conditions.

Inventory Normalization: Cotton markets had accumulated excess inventories during 2023-2024, creating downward price pressure. The gradual normalization of inventory levels through demand recovery and production adjustments supported price stabilization in 2025.

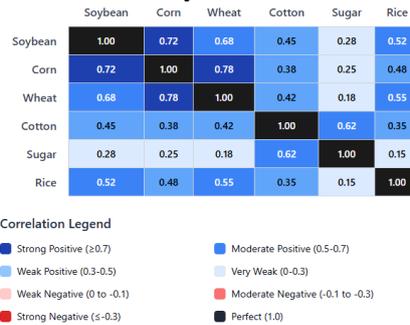
Synthetic Fiber Competition: Changes in synthetic fiber markets, including environmental concerns about petroleum-based fibers and supply chain disruptions in synthetic fiber production, may have improved cotton's competitive position.

4.6 Cross-Commodity Correlation Analysis

The analysis reveals significant breakdown in traditional correlations between agricultural commodities during the study period. Historical relationships that typically showed positive correlations between grain commodities and moderate correlations across agricultural sectors have deteriorated markedly.

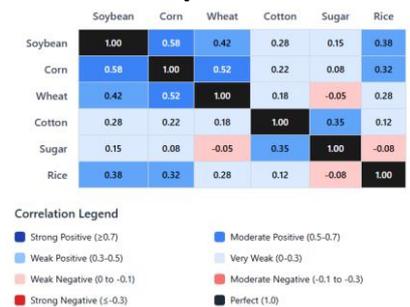
Grain Commodity Correlations: Traditional correlations between soybeans, corn, and wheat, which historically ranged from 0.6-0.8, declined significantly. The correlation between soybeans and corn fell from approximately 0.72 historically to an estimated 0.45 during the study period. Wheat correlations with other grains similarly weakened, reflecting commodity-specific factors gaining prominence over common market drivers.

Figure – 2 : Commodity Correlation Matrix - 2023



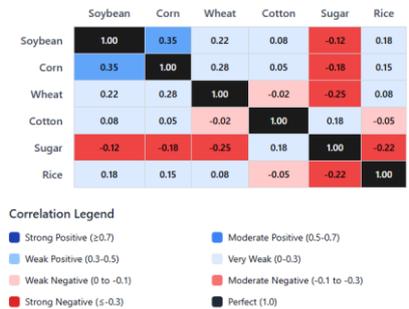
Rice Independence: Rice demonstrated near-zero or negative correlations with other agricultural commodities throughout the study period. The rice-grain correlations turned negative, particularly with soybeans and corn, indicating that factors supporting rice prices operated independently of or counter to factors affecting grain markets.

Figure – 3 : Commodity Correlation Matrix - 2024



Cotton Segmentation: Cotton maintained its traditional independence from food commodity markets, with correlations remaining near zero with grains and rice. However, cotton showed some positive correlation with sugar, reflecting shared exposure to industrial demand cycles and economic growth factors.

Figure - 4 : Commodity Correlation Matrix - 2025



Temporal Correlation Patterns: Rolling correlation analysis indicates that correlation breakdowns were not gradual but occurred during specific periods corresponding to major market developments. The most significant breakdown occurred during 2023, coinciding with rice's exceptional performance beginning and grain markets facing multiple pressures.

4.7 Volatility and Risk Analysis

Volatility analysis reveals differential risk characteristics across commodities that correlate with performance patterns. Rice exhibited the highest price volatility during its exceptional performance period, consistent with rapid price appreciation and momentum-driven trading. The steep upward price trajectory visible in the rice chart indicates periods of accelerated price movement that created both opportunity and risk. Grain commodities showed more moderate volatility patterns, with corn exhibiting the highest volatility among grains due to its severe 2023 decline and subsequent recovery attempts. Soybeans and wheat demonstrated more stable, albeit declining, price patterns with less extreme volatility spikes. Cotton displayed moderate volatility with distinct phases corresponding to its decline and recovery periods. The stabilization pattern visible in the 2025 portion of the cotton chart suggests reduced volatility as markets found new equilibrium levels. Sugar maintained consistent moderate volatility throughout the period, with price movements showing regular fluctuation patterns without extreme directional moves comparable to rice or the grain commodity declines.

The relationship between volatility and returns demonstrates the classic risk-return trade-off, with rice's exceptional returns accompanied by the highest volatility, while more stable commodities like cotton in 2025 showed lower volatility but also more modest return patterns.

5. Conclusion

This comprehensive analysis of agricultural commodity price divergence patterns from 2023-2025 reveals fundamental changes in how agricultural commodity markets operate, with commodity-specific factors and market structure differences gaining unprecedented importance relative to traditional common market drivers.

The research demonstrates that rice's exceptional multi-year performance (70.36% in 2023, 14.59% in 2024, 8.25% in 2025 YTD) primarily reflects unique market structure characteristics that provide insulation from global grain market pressures. Rice's limited international trade intensity, concentrated regional production and consumption patterns, and minimal financial market participation created conditions for sustained outperformance during a period when other agricultural commodities faced significant headwinds. The consistent underperformance of grain commodities (soybeans, corn, wheat) reflects their greater exposure to global supply abundance, biofuel demand fluctuations, financial market pressures, and international trade policy uncertainties. These commodities' higher degree of financialization and international market integration, typically considered advantages for liquidity and price discovery, became disadvantages during the study period as global factors created sustained downward pressure.

Cotton's dramatic recovery in 2025 (-0.36%) following substantial declines in previous years demonstrates the potential for rapid market rebalancing when supply-demand fundamentals improve. The recovery illustrates how commodity-specific factors can override broader market trends when underlying conditions change sufficiently.

Several key findings emerge from this analysis:

- a) Traditional diversification assumptions within agricultural commodity portfolios no longer hold during periods of extreme divergence. The coefficient of variation across commodity returns reached 1.89 in 2023, indicating that commodity-specific factors completely dominated common market influences.
- b) Market structure differences have become primary determinants of relative performance, with rice's unique characteristics enabling sustained outperformance while grain commodities' integration into global financial and trade systems created vulnerabilities to external pressures.
- c) The breakdown of traditional correlations between agricultural commodities represents a structural shift rather than temporary phenomenon. The emergence of negative correlations between rice and grain commodities indicates fundamental decoupling of these markets.
- d) Exceptional price divergence patterns can persist for extended periods when supported by fundamental market structure differences, challenging efficient market hypothesis assumptions about convergence toward fair value relationships.
- e) Commodity-specific volatility patterns reflect underlying market dynamics, with exceptional performers like rice exhibiting high volatility during momentum phases, while struggling commodities show different volatility characteristics related to downward pressure and attempted recoveries.

The implications of these findings extend beyond academic interest to practical applications for all agricultural commodity market participants. The research demonstrates that traditional analytical frameworks based on sector-wide analysis are insufficient for understanding contemporary agricultural commodity markets, requiring more sophisticated approaches that account for individual commodity characteristics and market structure differences.

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Russia-Ukraine and the Changing Dynamics of their Relationship: An Analysis from Past to Expected Future

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Avdesh Bijalwan**

Abstract:

In recent years there have been several activities around the world which affected not only international relations significantly but also affected the lifestyle of the commoners in one or the other way. Be it the COVID-19 pandemic, or the aggression between Armenia and Azerbaijan. Out of many such instances, the Russia- Ukraine war would be ranked one of the tops in terms of its effects on the global scenario. The involvement of a superpower and a comparatively small nation willing to join hands with NATO didn't only affect them and the neighbouring countries but also sent shock waves to nearly all parts of the world. This has created a very unexpected and unimaginable type of crisis in the contemporary globe.

Given the importance of the confrontation, it is important to understand the past and history of the geographical area concerned. This area has had very different kinds of dynamics all throughout its recent history, particularly in the 20th century and even in these years of the 21st century. Understanding history would help us to guess the tentative result of this war and will also help us to make predictions about the future if the reason.

This paper here is making an effort to revisit the past and accordingly, make some predictions of the directions in which it is moving right now.

Keywords: Russia, Ukraine, Crisis, International Relations, Dynamics, Globalization

Introduction: Russia- Ukraine dynamic

On May 10, 2022, Lenoid Kravchuk the first president of independent Ukraine died, just a week after the death of the first leader of independent Belarus, Stanislau Shushkevich. Both men were in their late 80s. Together with Boris Yeltsin, the first president of Russia, they had signed the Belavezha Accords, the agreement that effectively put an end to the Soviet Union, an event that Vladimir Putin later described as the 'demise of historical Russia.' In February 2022, Russian forces invaded Ukraine in a savage war, executing local residents en masse, raping and stealing, and heavily damaging several major cities through shelling, including Kharkiv, Chernihiv, and Mariupol. The ostensible reasons for the invasion include the 'de-Nazification' and de-militarisation of Ukraine, as well as broader fears of NATO expansion, and the Russian president's apparent refusal to recognise Ukraine as an independent state. Following the failure to capture Kyiv in the first days after the February 24 invasion, Putin's priority shifted eastward to the Donbas in support of two breakaway regions that call themselves the Donetsk and Luhansk National Republics (DNR and LNR).

What are the origins of Russian-Ukrainian antagonism? How is one to explain an attack by a global military power on a smaller neighbour with which it shares so much historically and culturally, and even in several areas linguistically?

In 1991 at Belavezha, Yeltsin was more concerned about removing his rival Gorbachev than with the concept of an independent Ukraine. Likely he did not think too far ahead about the ramifications of forming a temporary alliance with his two Slavic neighbours, neither of which seemed particularly well prepared for independence since they lacked constitutions, currencies, and even formalised borders.

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Following the disintegration of the USSR, there were some urgent questions to resolve. One was the status of the Black Sea Fleet, which was now located exclusively within the territory of independent Ukraine. A second was the status of Crimea, where a strong pro-Russia movement was developing, and which had become part of Ukraine partly by accident, in that the 1954 agreement by which Russia presented it to Ukraine as a gift had never anticipated that the recipient would leave the Soviet Union. A third was nuclear weapons: aside from Russia, Soviet nuclear weapons were located in Kazakhstan, Belarus, and Ukraine. After independence, Kazakhstan and Belarus promptly allowed their weapons to be transported to Russia for dismantling. Ukraine demurred, regarding the weapons as vital to its security needs. The impasse continued for the next two years before Ukraine finally agreed to give up its weapons in return for security guarantees of its borders and independence from Russia, the United States, and the United Kingdom in the Budapest Memorandum.

The first issue to become prominent was the status of Crimea, when its president Yuriy Meshkov, the co-founder of the Republican Movement of Crimea (RDK), announced his intention in 1994 to integrate with Russia. Though he had several supporters in Russia, including the Moscow mayor Yuriy Luzhkov and the leader of the Liberal-Democratic Party Vladimir Zhirinovskiy, he failed to secure the backing of President Yeltsin. In 1995, Ukraine, now under its second president, Leonid Kuchma, responded by scrapping the Crimean Constitution, abolishing the office of Crimean president, and deporting Meshkov to Moscow.

Two years later, Russia and Ukraine signed an important Treaty of Friendship, Cooperation, and Partnership, which provided the Russian side with 81.7 per cent of the Black Sea Fleet and allowed it to lease two large bays at the main port of Sevastopol for the next twenty years, with an option to renew for five years. Russia agreed to respect the current borders of Ukraine and refrain from any interference in Ukrainian state affairs. In April 2010, a further treaty was signed in Kharkiv that extended the lease until 2042, in return for Russia providing Ukraine with natural gas at discount prices. By that time, however, relations between the two states had begun to deteriorate.

Boris Yeltsin stepped down as Russian president at the end of 1999, having appointed his fifth prime minister, Vladimir Putin, as his designated successor. The 1990s had been years of turmoil for most Russians following the imposition of shock therapy, which impoverished an estimated 60 per cent of the population. Yeltsin had been incapacitated with heart problems. In 1998, a financial crisis resulted in the collapse of many banks. A disastrous intervention into Chechnya ended with the defeat of the Russian army. Putin seemed to be the answer for most Russians. He began his period as prime minister by renewing the war in Chechnya and securing a victory through ferocious bombing and more sophisticated military tactics. The victory boosted his campaign for the presidency in March 2000. The economy revived with the rise of oil and gas prices, but the new president took the credit.

Regarding the former Soviet republics, Putin's policy was to integrate them in Russian-led entities, such as the Collective Security Treaty of the CIS, formed in 1992 and consisting of Russia, Belarus, and the states of Central Asia other than Turkmenistan. By 2002, it was renamed as the Collective Security Treaty Organization (CSTO). Notably, Ukraine took little part in the CIS and declined to join the CSTO. In 2004, after Kuchma ended his second term, it elected as president Viktor Yushchenko, head of the Our Ukraine party rather than Putin's designate Viktor Yanukovich, the former governor of Donetsk. The second round of the election had to be rerun following some obvious voting fabrications in the Donbas region that had initially put Yanukovich ahead. Mass protests followed in Kyiv that were termed the 'Orange Revolution' after the orange scarves worn by Yushchenko's supporters.

Yushchenko's presidency, which was marked by bitter political in-fighting, alienated Russia. During his term in office, two nationalist figures were elevated to the status of 'heroes of Ukraine': Roman Shukhevych, leader of the Ukrainian Insurgent Army (UPA) that had fought against Soviet forces in the period 1944-50 in western Ukraine; and Stepan Bandera, leader of the most militant branch of the Organisation of Ukrainian Nationalists (OUN) from 1940 onward. Yushchenko promised to recognise UPA members — regarded as traitors in Russia — as veterans of the Great

Patriotic War. The main activity of the OUN was in the 1930s and directed against the Polish government. But in 1941, when the Nazis invaded Ukraine, they were accompanied by two Ukrainian units, Roland and Nachtigal, formed by agreement between Bandera and the German Abwehr. On 30 June 1941, the OUN-B briefly declared Ukrainian independence in Lviv, but the Germans refused to accept it. They arrested OUN leaders and imprisoned Bandera in Sachsenhausen for the remainder of the war.

The UPA was officially founded in October 1942, but active from the following spring. It targeted Poles in Volhynia and killed between 60,000 and 100,000 in a campaign of ethnic cleansing. Once the Soviets returned, Shukhevych led UPA in a bitter guerrilla war against Soviet rule in western Ukraine until his death in a skirmish in 1950.

In 2010, Yanukovich gained a measure of revenge when he defeated Yushchenko — though his main opponent was the former Prime Minister Yulia Tymoshenko — and became president. His period in office was one of unabated corruption, lawlessness, and the esconcement of the president's Donetsk allies in the Cabinet of Ministers. In 2011, he had Tymoshenko arrested on trumped-up charges. Matters came to a head in late 2013 when Yanukovich decided to follow Putin's advice and opted not to sign an Association Agreement with the European Union. He accepted a large loan of \$15 billion from Russia and a promise of cheaper gas prices instead. Demonstrators gathered in the Maidan, the central square in Kyiv, and remained there, in massive numbers at times, until 21 February in what were called Euro-Maidan protests — and later the 'Revolution of Dignity.'

The uprising ultimately removed Yanukovich from power. It turned violent in the last days with armed clashes between demonstrators and the Berkut police forces. Snipers, whose identity has never been definitively determined, shot about 100 people in the square. An attempt at a mediated agreement brokered by the Foreign Ministers of France and Germany that would have allowed Yanukovich to remain in power until a December 2014 election were brushed aside by the protesters. In the aftermath, Putin declared that neo-Nazis had taken power in Ukraine. He requested permission from the Russian Duma to use military force to intervene, and in late March, using the forces of the Black Sea Fleet and mercenaries, Russia invaded and annexed Crimea, violating the Budapest Memorandum and the postwar European order. In eastern Ukraine, mercenaries and local pro-Russian forces attempted to take over regional governments, succeeding only in Donetsk and Luhansk, where breakaway regimes were formed.

A lengthy war ensued in which Ukraine tried and failed to recapture its lost territories. In what was termed the 'Anti-Terrorist Operation' and on the orders of the interim president, Oleksandr Turchynov, the Ukrainian army advanced eastward, capturing the first stronghold of the DNR forces, Slaviansk, and advancing toward the main city of Donetsk. In August 2014, however, with the assistance of Russian 'volunteers,' the separatists mounted a counter-attack and the Ukrainians were defeated at the Battle of Ilovaik. Attention was paid at this time to the disorganised state of the Ukrainian Army and its ineffective leadership.

Belarus' Aliaksandr Lukashenka stepped forward at this point and offered his services as a mediator, and an armistice meeting was held in Minsk with the participation of the French and German foreign ministers, Ukraine's new president, Petro Poroshenko, and Putin. The Accords agreed on the pull-back of heavy weapons, exchanges of prisoners, changes to the Ukrainian Constitution to allow more autonomy for the breakaway regions (Donetsk and Luhansk), and to allow Ukraine to regain control of its eastern border. The leaders of the DNR and LNR also added their signatures to the document. The armistice, however, was short-lived, and according to reports from the Organization for Security and Co-operation in Europe, broken by both sides. Fighting renewed, and in February centred on the town of Debaltseve, a strategic location for communication and transport between the cities of Donetsk and Luhansk. With the help of Russian weapons and 'volunteers,' the separatists were successful, at which point Poroshenko again was anxious to end the fighting.

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A second Accord was signed in Minsk in February 2015, again with French and German mediation, along the lines of the original. Subsequently, the heavy fighting ended, with neither side satisfied with the outcome. Spasmodic clashes continued, with frequent casualties. By 2022, in addition to some 2.3 million internally displaced persons, the war resulted in about 14,000 deaths. Among them were 283 passengers of Malaysian Airlines Flight 17 from Amsterdam to Kuala Lumpur, shot down by a Buk missile fired from separatist-held territory under the command of Colonel Igor Girkin, the 'Minister of Defence' of the DNR.

By spring and summer 2014, the Russian leadership began to embrace the notion of *Russkiy Mir* (Russian World). This concept originated in the mid-1990s in Russia and was introduced into state policy by Putin in 2001 and involved recapturing territories of the former Russian Empire dating back to the reign of Catherine the Great in the late eighteenth century. Putin would eventually shelve the notion in the face of strong opposition from Ukrainian centres west of the Donbas, but it was to be revived and redeveloped eight years later. Thus, the relatively amicable relations of Russia and Ukraine in the 1990s had now come full circle. Russia had attacked Ukraine for the first time; violence had replaced negotiation and Ukraine's westward path had crossed a 'red line' for the Russians — the question of NATO was not on the agenda in 2014. Under Putin, it seemed, Russia could re-emerge as a major world power, first targeting countries of the former Soviet empire.

Notably, however, whatever the violence in Kyiv in 2014, the election had not resulted in a neo-Nazi takeover as the Russian authorities alleged. In fact, the pro-European centre parties won a majority in the 2014 parliamentary elections. Ukraine had rejected the concept of the Russian World and the leadership of Moscow and embraced Europe. In 2019, Ukrainians rejected Poroshenko's quest to serve a second term, based on his patriotic election campaign around the slogans 'Language, Faith, Army,' following the introduction of a new education law making Ukrainian the language of all secondary education. He also helped to initiate the creation in late 2018 of an Orthodox Church of Ukraine independent from the Moscow Patriarch, travelling to Istanbul to receive the approval of Ecumenical Patriarch Bartholomew I.

His electorate, however, paid little attention to such symbolic moves, roundly rejecting Poroshenko in the presidential elections of 2019 in favour of a political neophyte, TV comedian Vladimir Zelensky, a 39-year old Jew from Kriviy Rih industrial region, and a Russian speaker. Ukrainians voted perhaps for economic rather than political reasons, wishing to improve living standards and end corruption. Russia also seemed to herald Zelensky, who had promised to bring an end to the festering war and began with the exchanging of some prisoners. He also appeared on paper as a weaker leader, one who needed guidance, and with support in Parliament from his Servant of the People Party, which consisted mostly of inexperienced new MPs. Zelensky, however, proved a disappointment to the Russian leaders. He modified his name to the Ukrainian variant Volodymyr. He supported the pro-European direction of his predecessor and clamped down sharply on the pro-Russian media and websites operating in Ukraine. He even put the father of Putin's goddaughter, Viktor Medvedchuk, under house arrest in May 2021.

For Putin, Ukraine was breaking away from Russia. Zelensky made no secret of his wish for more arms from United States and to join the NATO alliance. Thus, once again, the old 2014 canard of removing neo-Nazis in Ukraine became a feature of Russian propaganda, along with renewed complaints about the expansion of NATO eastward, and Putin made his fateful decision to resolve the Ukrainian problem by intervening directly.

The endgame in Ukraine: How the war could come to a close in 2025

"I must say that the situation is changing dramatically," Russia's president, Vladimir Putin, declared at his end-of-year news conference in December. "There is movement along the entire front line. Every day."

In eastern Ukraine, Moscow's war machine is gradually churning mile by mile through the wide open fields of the Donbas, enveloping and overwhelming villages and towns.

Some civilians are fleeing before the war reaches them. Others wait until the shells start exploding all around them before packing what belongings they can carry and boarding trains and buses to safety further west.

Russia is gaining ground more quickly than at any time since it launched its full-scale invasion in February 2022, despite Kyiv's impressive record of well-publicised asymmetric attacks against its powerful neighbour. As the invasion reaches the end of its third year, at an estimated cost of a million people, killed or wounded, Ukraine appears to be losing. In distant Washington, meanwhile, the unpredictable Donald Trump, not famous for his love of Ukraine or its leader, is about to take over in the White House. It feels like an inflexion point. But could 2025 really be the year when this devastating European conflict finally comes to a close - and if so what could the endgame look like?

'Talk of negotiations is an illusion'

Trump's promise to end the conflict within 24 hours of taking office is a typically grandiose boast, but it comes from a man who has clearly lost patience with the war and America's costly involvement.

"The numbers of dead young soldiers lying on fields all over the place are staggering," he has said. "It's crazy what's taking place." But the incoming US administration faces twin challenges, according to Michael Kofman, a senior fellow at the Carnegie Endowment for International Peace.

"First, they're going to inherit a war on a very negative trajectory, without a tremendous amount of time to stabilise the situation," he said in December. "Second, they're going to inherit it without a clear theory of success."

The president-elect offered some clues during recent interviews about how he intends to approach the war. He told Time Magazine he disagreed "vehemently" with the Biden administration's decision, in November, to allow Ukraine to fire US-supplied long-range missiles at targets inside Russia.

"We're just escalating this war and making it worse," he said.

On 8 December, he was asked by NBC News if Ukraine should prepare for less aid.

"Possibly," he replied. "Probably, sure." But to those who fear, as many do, that America's new leader is inclined to walk away from Ukraine, he offered hints of reassurance. "You can't reach an agreement if you abandon, in my opinion," he has said.

The truth is: Trump's intentions are far from clear.

And for now, Ukrainian officials reject all talk of pressure, or the suggestion that Trump's arrival necessarily means peace talks are imminent.

"There's a lot of talk about negotiations, but it's an illusion," says Mykhailo Podolyak, advisor to the head of President Zelensky's office.

"No negotiation process can take place because Russia has not been made to pay a high enough price for this war."

Zelensky's 'smart strategy exercise'

For all Kyiv's misgivings about negotiating while Russian forces continue their inexorable advance in the east, it's clear that President Zelensky is anxious to position himself as the sort of man Trump can do business with.

The Ukrainian leader was quick to congratulate Trump on his election victory and wasted little time sending senior officials to meet the president-elect's team.

With the help of France's President Emmanuel Macron, Zelensky also secured a meeting with Trump when the two men visited Paris for the reopening of Notre Dame cathedral.

"What we're seeing now is a very smart strategy exercise by President Zelensky," his former foreign minister Dmytro Kuleba told the US Council on Foreign Relations in December. Zelensky, he said, was "signalling constructiveness and readiness to engage with President Trump."

With little obvious sign that the Kremlin is making similar gestures, the government in Kyiv is clearly trying to get ahead of the game.

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"Because Trump hasn't fully explained how he's going to go about it, Ukrainians are trying to give him some ideas that he may present as his own," says Orysia Lutsevych, head of the Ukraine Forum at Chatham House.

"They know how to work with that ego."

The Victory Plan: possible endgames

Even before the US election, there were signs that Zelensky was looking for ways to bolster Ukraine's appeal as a future partner for a president-elect like Trump who is both instinctively transactional and reluctant to continue underwriting wider European security.

As part of his "Victory Plan", unveiled in October, Zelensky suggested that battle-hardened Ukrainian troops could replace US forces in Europe after the war with Russia ends. And he offered the prospect of joint investments to exploit Ukraine's natural resources, including uranium, graphite and lithium.

Such strategic resources, Zelensky warned, "will either strengthen Russia or Ukraine and the democratic world". But other elements of the Ukrainian leader's Victory Plan - Nato membership and its call for a "comprehensive non-nuclear strategic deterrence package" - seem to have met with a lukewarm response among Kyiv's allies.

Nato membership in particular remains a sticking point, as it has been since well before Russia's full-scale invasion.

For Kyiv, it's the only way to guarantee the country's future survival, against a rapacious Russian enemy bent on subjugating Ukraine.

But despite declaring last July that Ukraine was on an "irreversible path to full Euro-Atlantic integration, including Nato membership" the alliance is divided, with the US and Germany not yet in favour of issuing an invitation.

President Zelensky has indicated that if an offer of membership was extended to the whole country, within Ukraine's internationally-recognised borders, he would be willing to accept that it would apply, initially, only to territory under Kyiv's control.

This, he told Sky News in November, could end the "hot stage" of the war, allowing a diplomatic process to address the question of Ukraine's final borders.

But, he said, no such offer had yet been made.

Kyiv's shaky position

If not Nato, then what? With the possibility of Trump-led peace talks looming and Ukraine losing ground on the battlefield, the international debate is all about shoring up Kyiv's shaky position.

"It's critical to have strong, legal and practical guarantees," Andriy Yermak, head of President Zelensky's office, told Ukraine's public broadcaster on 12 December.

Ukraine's recent past, he said, had left a bitter legacy. "Unfortunately, from our experience, all the guarantees we had before did not result in security."

Without concrete mechanisms akin to the sort of collective defence concept embodied by Article 5 of Nato's founding treaty, observers fear there will be nothing to prevent another Russian attack.

"Zelensky understands that he cannot just have a naked ceasefire," Orysia Lutsevych says.

"It has to be a ceasefire plus. It would be suicide for Zelensky just to accept a ceasefire and not to have any answer how Ukraine is protected."

In European policy forums, experts have been looking at ways in which Europe might help to shoulder this heavy responsibility. Ideas have included the deployment of peacekeepers in Ukraine (a proposal first floated last February by Macron), or the involvement of the British-led Joint Expeditionary Force, which pulls together forces from eight Nordic and Baltic countries, plus the Netherlands.

But Kofman is sceptical. "Security guarantees that don't have the United States involved in them as one of the guarantors is like a donut with a giant missing middle in it."

It's a view echoed in Kyiv.

"What alternative could there be? There are no alternatives today," says Mr Podolyak.

Pieces of paper, like the 1994 Budapest Memorandum (about Ukraine's post-Soviet borders) or 2014-15 Minsk agreements (which sought to end the Donbas War) are worthless, he argues, without the added threat of military deterrence.

"Russia must understand that as soon as they start aggression, they will receive a significant number of strikes in response," he says.

Britain, Biden and the role of the West

In the absence of agreement on Ukraine's long-term future, its allies are doing what they can to bolster its defences.

In December, NATO's secretary general, Mark Rutte, said "everything" was being looked at, including the supply of additional air defence systems, in part to protect the country's battered energy infrastructure from a renewed wave of coordinated Russian missile and drone attacks.

With Ukraine continuing to experience severe shortages of manpower, the UK Defence Secretary John Healey said the government might be willing to send British troops to Ukraine to help with training.

For its part, the departing Biden administration seems determined to deliver as much congressionally approved military assistance as it can to Ukraine before leaving office, although reports suggest it may run out of time to send everything.

On 21 December it was reported that Trump would continue to supply military aid to Ukraine, but would demand that NATO members dramatically increase their defence spending.

Kyiv's allies have also continued to ratchet up sanctions on Moscow, in the hope that Russia's war-time economy, which has proved stubbornly resilient, may finally break.

"There's been deep frustration that sanctions haven't just shattered the Russian economy beyond repair," a US congressional source said, on condition of anonymity.

After multiple rounds of sanctions (fifteen from the EU alone), government officials have grown wary of predicting their successful impact.

But recent indicators are increasingly alarming for the Kremlin. With interest rates at 23%, inflation running above 9%, a falling rouble and growth expected to slow dramatically in 2025, the strains on Russia's economy have rarely seemed more acute.

Putin is putting on a brave face. "The sanctions are having an effect," he said during his end-of-year news conference, "but they are not of key importance."

Along with Russia's staggering losses on the battlefield – western officials estimate that Moscow is losing an average of 1,500 men, killed and wounded, every day – the cost of this war could yet drive Putin to the negotiating table.

But how much more territory will Ukraine have lost - and how many more people will have been killed - by the time that point is reached?

Conclusion:

As we know the world is a global village now and everything is interconnected. Anything and nearly everything from one corner of the globe affects something in the other corner. The world has theoretically become multipolar but it still has certain elements of bipolarity and these elements of bipolarity have manifested again in the case of the Russia- Ukraine crisis. This crisis didn't achieve its current position in a day or in a sudden rather it has a past and its own exclusive as well as relative history. The 2 nation-states with shared history have different aspirations and that is definitely one of the core causes of the conflict which we see today. The crisis has affected every other actor on the international level in some way or the other, and hence it would be better if this crisis gets resolved as soon as possible. In that, the role of major world powers will also be significant in resolving the issue and so would be the role of leaders who are in influential positions, be it the chiefs of state from the UK, US or India.

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Impact of Various Parameters on Urban Heat Island Effect

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Abstract

Urban heat island effect (UHI) refers to the temperature difference between the urban area and surrounding suburbs under the combined action of human and nature. UHI effect not only changes the growth habit of urban vegetation but also affect the outer environment of urban buildings. It has greater negative effect on human health also. Therefore, the study of urban heat island effect and its influencing factors can provide data support for the environmental quality control and urban planning of local government departments.

This paper reviews the key factors influencing the Urban Heat Island (UHI) effect, alongside research from various scholars examining its impact. It highlights how human activities, such as industrial operations, transportation, and energy use, significantly contribute to increased urban temperatures. The paper also addresses the effects of changes in land cover, particularly the reduction of vegetation and the spread of built surfaces, on city heat accumulation. Additionally, it discusses the role of weather patterns like wind, Fog, and precipitation in shaping heat distribution, emphasizing the complex relationship between urban settings and local climate.

Keywords: Urban heat island effect; Anthropogenic Emission, Land use, land cover, Precipitation

1. Introduction

The degree to which metropolitan regions endure higher temperatures than the surrounding rural environments is called the heat island effect's severity. This phenomenon is referred to as the urban heat island effect (UHI) and originates from several urbanization-related variables, including human activity, increasing impervious surfaces, and changes in land use. Higher temperatures in urban areas are usually the result of the UHI effect, and these differences are most noticeable at night when urban surfaces release heat absorbed throughout the day.

High urban temperatures, which are made worse by the urban heat island effect (UHI), are associated with higher rates of heat-related illness and death, especially in susceptible groups like the elderly, young people, and people with underlying medical issues.

As the UHI effect enhances demand for cooling systems like air conditioning, it significantly strains the energy infrastructure. Urban heat islands intensify the broader impacts of global climate change by substantially causing localized climate anomalies. The UHI impact is anticipated to worsen as global temperatures rise, increasing the vulnerability of metropolitan regions to extreme heat events.

Various studies have been conducted to understand the factors responsible for UHI and how human activities, land use and land cover and meteorological conditions like wind, fog, precipitation significantly contribute to increased urban temperatures. Considering these factors is essential for recognizing the Urban Heat Island effect as a critical research area that requires focused attention. Understanding this phenomenon is key to exploring the complex relationship between global climate patterns and local climate conditions.

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2. Empirical factors of Atmosphere

The Urban Heat Island effect is influenced by a range of factors that have been explored by numerous researchers. While these studies have highlighted the importance of these factors, they also acknowledge certain limitations, offering a roadmap for future research. Among the key elements discussed are anthropogenic heat emissions, land cover and land use changes, as well as meteorological conditions like wind, fog, and precipitation. These factors are examined in detail in the sections that follow.

2.1 Anthropogenic Heat Emission

Analytical and numerical study on transient urban street air warming induced by anthropogenic heat emission was investigated by Shuo-Jun and MeiChaoYuan, 2021. In this study, the transient street air warming process caused by anthropogenic heat is investigated by both the analytical model and Large-Eddy Simulation. This model is based on empirical exchange velocity modelling and heat exchange rate with inclusion of buoyancy coefficient. The analysis indicates that higher urban density could trap more anthropogenic heat. A limitation to this study is the sensible heat from solar radiation and latent heat are ignored. Mansour Alhazmi et al. (2022) put forth a new perspective for understanding actual anthropogenic heat emissions from building. They investigated that timing and magnitude of sensible heat emissions from buildings is significantly influenced by construction characteristics, materials and surface properties that ultimately influence the storage and subsequent release of heat into the environment from building surfaces. However limitation of this study includes exploration of sensible fluxes only and smaller subset of study area.

Impact of anthropogenic heat from air-conditioning on air temperature of naturally ventilated apartments at high-density tropical cities is investigated in detail by ChaoYuan et al. (2022). This study focuses on the indoor air temperature increment (ΔT) due to anthropogenic heat from air conditioning at neighbourhood and building scales. The study indicates ΔT is lower at high rise building, windward apartment has higher ΔT , increase in ΔT with floor elevation and changing heat source location at the parallel to the incoming wind decreases ΔT . However the limitation of study includes limited dataset and comparison of outdoor air temperature and indoor thermal loads needs attention. The Impact of Anthropogenic Heat on Formation of Urban Heat Island and Energy Consumption Balance was highlighted by Mohamadi et al. (2011). It explores literally the conceptual framework of confliction between anthropogenic heat and urban structure, which produced UHI intensity and affected energy consumption balance. It is by making strategies to minimize the impact of UHI on energy consumption: landscaping, using albedo materials on external surfaces of buildings and urban areas, and promoting natural ventilation.

Hongli Fan and David J.Sailor (2004) contributed in modelling the impacts of anthropogenic heating on the urban climat of Philadelphia. They put forth, based on case study, a series of simulations of Philadelphia that anthropogenic heating plays an important role in the formation of the urban heat island, particularly during the night and winter. In addition, anthropogenic heating is also found to have impacts on the nocturnal PBL stability and PBL structure during the morning transition. However, study did not consider the time lag between energy consumption and waste heat release. Prediction models of urban heat island based on landscape patterns and anthropogenic heat dynamics was introduced by Jiayan li et al. This study aims to identify the effects of landscape patterns and anthropogenic heat on UHI intensity in the daytime and night time as well as in different seasons. The contributions of landscape configuration to the UHI in the daytime are higher than landscape composition, while the opposite is true at night. The contribution of anthropogenic heat was low in all seasons due to the high correlation with non-monolayer buildings.

2.2 Land Cover and Land Surface Temperature

Satellite imageries were used by Ehsan Kamali Maskooni et al. (2020), to study impact of spatiotemporal land-use and land cover changes on surface urban heat islands in a semiarid region. Landsat data were used for the study. The results of this study indicate that different types of LU/LC have a substantial impact on temperature. Urbanization played a key role in creating an intensified UHI during the 25-year study period. The emergence and expansion of this phenomenon depend on many factors such as human activities, air pollution, LU/LC types, and weather conditions. Ruchi Bala et al (2021) proposed to quantify urban heat intensity with land use/land cover changes using Landsat satellite data over urban

landscapes. This paper analysed the variation in land surface temperature (LST) with land cover changes in Varanasi city of India from 1989 to 2018 using Landsat satellite images. Contribution of each land cover towards UHI was determined using land cover contribution index (LCCI). The changes in normalized LST from years 1989 to 2018 for the conversion of bare land to built-ups and vegetation to built-ups were found to be -0.11 and 0.42 , respectively. This led to the conclusion that the replacement of vegetation with urban land cover has severe impact on increasing UHI intensity.

Haoyuan Chen et al. (2022), delineated important aspects of HII from his case study. He investigated the influence of land cover change on spatio-temporal distribution of urban heat island - a case in Wuhan main urban area. In this study, effects of LC change on green space and LST were investigated in Wuhan urban area, along with the relationship among LST, LC and normalized differential vegetation index (NDVI). The land was divided into built-up area, agricultural land, water and bare land. The study concluded that from 2007-2020 the built-up area increased while agricultural area decreased and range of LST moved forward to high temperature range. Rahul Mishra et al. (2021) used remote sensing for assessment of change in vegetation cover and the subsequent impact on climatic variables. This study aimed to evaluate LULCCs and VCCs and their impacts on land surface temperature (LST) and rainfall in the Darbhanga district of Bihar, India. With decreasing vegetation cover in the study area, the mean LST increased while the mean annual rainfall decreased for the study period. However, more research projects with multi-temporal high-resolution satellite imagery and GIS tools are also required in the future to study LULC-related changes.

George Xiana et al. (2022), monitored and characterized multi-decadal variations of urban thermal conditions using time-series thermal remote sensing and dynamic land cover data. In this study, they developed and implemented a novel approach to characterize landscape thermal conditions by focusing on UHI intensity and its spatiotemporal variation using the recently available time series of Landsat land surface temperature and land cover change products. We analyzed land surface temperature changes in urban and surrounding non-urban lands to quantify the UHI intensity and landscape thermal conditions in the Atlanta and Minneapolis metropolitan areas of the United States. The dominant land cover type in rural areas and urban imperviousness cover determines the UHI intensity. Urban heat island associated with land use, land cover and climate variations in Melbourne. This study assessed UHI intensity and its relationships with LULC and climate change variations in Melbourne, Australia, by integrating the CLM simulation approach. Besides the land use changes, UHI and its attributions component also linked with climate variations in Melbourne, Australia. Impact of land cover transformation on urban heat islands in Harbin is investigated by Yabo et al. (2022). In this study, we investigated the impact of land cover changes on the simulation of urban heat islands in Harbin city of China using the coupled WRF/SLUCM model. During summer, the temperatures within the urban core for downtown Harbin and the satellite towns were higher than those in the surroundings for both daytime and night time. Similarly, during winter, the temperature in the urban centres was higher than that in the surroundings of the downtown area and some satellite towns, indicating the effect of a cold/heat island phenomenon.

2.3 Wind

Wind movement is an important factor affecting HII. Ilham Al-Obaidi et al. (2021), assessed the impact of wind conditions on Urban Heat Islands in large Australian cities. By using hourly data over the study period, the relationship between the influences of wind data on the urban heat island intensity was examined for annual, seasonal, monthly and daily data in Melbourne, Australia. The results of this study revealed that the UHI intensity weakened as wind velocity increased. In addition, the study shows that wind direction in each city is a critical driver factor that determines the intensity of the UHI effect. When winds originate from dry environments, they favour high UHI intensities at all wind speeds, while the winds from the ocean side of coastal cities tend to cool urban regions, reducing UHI intensities or even promoting the urban cool island formation.

Abbassi et al. (2022) presented the impact of wind speed on urban heat and pollution. This study explores the effect of wind intensity and ambient stability on the plume structure and pollution dispersion numerically. It has been found that for buoyancy ratios (the ratio between the horizontal velocity of the urban plume to wind speed) smaller than 0.5, the wind is the governing mechanism. For buoyancy ratio higher than 2, the urban heat island is the governing mechanism. It is also found that for ratios higher than 0.5, any increase in wind velocity does not reduce the pollution concentration significantly. For values smaller than 0.5, any increase in wind speed would result in a considerable drop in pollution concentration if the

radiative effect of pollutants is ignored. Urban heat island and wind flow characteristics of a tropical city was studied by Rajagopalan et al. (2014). The results of this study indicate that the chaotic development in Muar has caused reduced ventilation in urban canyons. The heat island intensity in the city centre was recorded as 4 °C during the day and 3.2 °C during the night. Investigation of various urban geometry modifications showed that step up configuration was the most effective geometry as it can distribute the wind evenly allowing the wind to reach even the leeward side of each building.

Droste et al. (2018) specifically addressed the impact of urban wind on HII. According to his research, the UWI (Urban Wind Island) is caused by a combination of effects: .Enhanced mixing in the urban boundary layer which facilitates entrainment of free troposphere air, a deeper urban boundary layer that dilutes the increased urban roughness. And the imbalance between boundary-layer wind and the geostrophic wind, which accelerates the wind. Insight in the UWI can be used to determine whether a city has potential for urban wind farming, and to provide background knowledge for more detailed studies, for instance in air quality modelling. It is important to mention the research of Sen and Roesler (2020) on wind direction and cool surface strategies on microscale urban heat island. They suggested that in addition to surface material, the urban form and wind direction also affect the UHI intensity. A model was developed to study the effect of various cool surface strategies on the micro scale UHI intensity for hypothetical urban blocks in Chicago, USA

2.4 Fog

HII and its relation with fog has quite visible impact on urban areas. Twenty-nine year (1989–2017) meteorological observations of fog events at Hongqiao International Airport in central Shanghai, and classify the Fog into radiation, advection, advection–radiation, and precipitation types (Gua et al., 2019). The results show that. urban expansion in Shanghai has reduced the amount of not only radiation fog, but also advection fog. Impacts of urban expansion on fog types in Shanghai China was investigated using numerical simulation by WRF model. Anita et al., (2018) presented her research on role of Fog in Urban Heat Island Modification in Kraków, Poland. They concluded that Fog is an important factor decreasing UHI magnitude by about 1 K but mainly during weather conditions with little or no cloudiness and small wind speed or atmospheric calm, during anticyclonic synoptic situations, and only in the valley floor areas. With an increase in cloudiness and wind speed, the role of Fog decreases and is similar in all parts of the city. Williams et al., (2015) concluded from his research that Urbanization causes increased cloud base height and decreased Fog in coastal Southern California. They found that urban warming has caused substantially increased cloud base height and reduced fog frequency since 1948 in coastal Southern California (CSCA). This warming appears to be due to a combination of an urban heat island effect and a coast-to-inland warming gradient.

Gautam and Singh (2018) investigation in Delhi highlighted HII punches holes in widespread fog in the Indo-Gangetic plains. They reported a striking observation of holes in Fog over urban areas in satellite imagery. They found the highest frequency and largest extent of fog holes over Delhi along with suppressed fog fraction, amidst increased fog occurrence over the Indo-Gangetic Plains, based on 17 years of satellite data (2000–2016). This apparent urban heat impact is characterized in sharp urban-rural gradients in surface temperatures and fog thickness. They suggested assessing linkages between urban heat impact and Fog, especially over Delhi and the Indo-Gangetic Plains. Another investigation by Yan et al. (2020), analyzed in detail, the extents urbanization and air pollution affect Fog. In this study, a dense radiation fog event in eastern China in January 2017 was reproduced by the Weather Research and Forecasting model coupled with Chemistry (WRF-Chem), and the individual and combined effects of urbanization and aerosols on Fog (indicated by liquid water content – LWC) are quantitatively revealed. They found that when urbanization and aerosol pollution are combined, the much weaker aerosol-promoting effect is counteracted by the stronger urbanization-suppressing effect on Fog. Budget analysis of LWC reveals that urban development alters the LWC profile and fog structure mainly by modulating condensation– evaporation process. They inferred that urban Fog will be further reduced if urbanization keeps developing and air quality keeps deteriorating in the future.

2.5 Precipitation

HII impacts most precipitation. Ali et al., (2021), studied consistent large-scale response of hourly extreme precipitation to temperature variation over land. They showed that precipitation extremes increase with the increase in dew point temperature consistently at a regional scale, and even with a higher rate at

the gauge-level. This rate of increment is much higher than that for daily extreme precipitation. However further studies are still needed both to understand the processes governing precipitation extremes at different temporal and spatial scales and the potential future changes to these processes. Zhang et al. (2017) presented numerical simulation of urban land surface effects on summer convective rainfall under different UHI intensity in Beijing. When UHI is weak prior to the start of rainfall, urban land surface primarily affects rainfall through its dynamic action. Rainfall systems develop a tendency to bifurcate in the windward periphery of the urban area and move around it along both sides. Consequently, precipitation in the central urban area and its downstream area decreases, whereas precipitation in the suburban areas at the sides of the periphery of the urban area increases. When UHI is strong before rainfall begins, the thermal effect of the urban land surface is the main factor that affects rainfall. The lower atmosphere over urban area is more unstable, and horizontal convergence is enhanced, increasing the intensity of the convective system after it moves to the urban area. As a result, precipitation increases in the urban area.

Liu and Niyogia (2020) identified linkages between urban heat island magnitude and urban rainfall modification by use of causal discovery algorithms. This study is the first, purely data-driven technique to assess the classical urban climatological problem of the relation between urban heat island (UHI) and urban rainfall modification. This study aims to highlight that a causal algorithm can provide us computationally efficient results that can be useful for urban rainfall studies. Louis et al. (2020), researched urbanization in megacities vis-a-vis increases in frequency of extreme precipitation events. Using decadal convection-permitting climate simulations in four mid latitude megacities (Paris, France; New York City, USA; Tokyo, Japan; Shanghai, China), they showed that urbanization can strongly increase the frequency and intensity of extreme urban precipitation. Frequency increases far more than intensity, their simulations also showed that direct urban anthropogenic emissions of heat could be an important factor driving these changes. Possible impact of urbanization on extreme precipitation-temperature relationship in East Asian megacities was further studied by Oh et al (2021).

This study investigated the possible impact of urbanization on the summertime extreme precipitation-temperature (P-T) relationship in East Asia. The local climate in three megacity regions—Guangdong in China, Seoul/Gyeonggi in Korea, and Tokyo in Japan—is particularly examined by analyzing a high-resolution dataset of in situ measurements for the period of 1973–2015. All three megacity regions exhibit statistically significant positive trends in mean and extreme temperature and precipitation; an exception is the seasonal-mean precipitation in Tokyo. Urban-rural contrast in the P-T relationship of extreme precipitation showed more intense extreme precipitation in the urban areas than in the rural areas at the temperature around the breaking point.

Yanga et al (2022) reexamined the relationship between surface urban heat island intensity and annual precipitation. In this study, they re-examined the previously proposed linear and nonlinear surface urban heat island intensities (SUHI)-mean annual precipitation (MAP) relations on a continental and global scale, focusing particularly on the role of variability in rural reference land covers. Sharma and Kale (2022) also assessed urbanization impact on urban heat island effect and rainfall for the Surat city. The study of the urbanization impact on the UHI effect for the Surat city is performed in the present study through studying the impact of land use land cover on the land surface temperature of urban and sub-urban areas of the Surat city over the period May 1998 to May 2018. As urbanization contributes to climate change, its effects on rainfall are studied by comparing rainfall trends of urban and sub-urban areas of the Surat city and nearby sub-urban area Kamrej. Trend analysis showed that trend magnitude values are higher for the urban areas than sub-urban areas, indicating that UHI effect increases rainfall in urban areas.

Zhong et al. (2017) published their work on urbanization-induced urban heat island and aerosol effects on climate extremes in the Yangtze River Delta region of China. It is shown that the impact of urban land cover and aerosols on precipitation is not only determined by their influence on local convergence but also modulated by large-scale weather systems. For the case with a strong synoptic forcing, the UHI and aerosol effects are relatively weak. When the synoptic forcing is weak, however, the UHI and aerosol effects on local convergence dominate. This suggests that synoptic forcing plays a significant role in modulating the urbanization-induced land-cover and aerosol effects on individual rainfall event.

Yue et al.(2021), published a review on Dynamic Effects of Cities on Precipitation. After analysing the effect of citization on precipitation they concluded that there is a lack of three-dimensional high-resolution meteorological data in the boundary layer of cities and their surrounding areas, no in-depth analysis of the relationship between wind direction, windspeed and humidity transmission, and local precipitation area and intensity in cities; the key dynamic and thermal factors affecting precipitation area and intensity regarding the city barrier effect have not yet been not revealed; Sensitivity numerical study does not carefully consider the influence of the underlying surface characteristics of cities, such as height, density, orientate on

of high-rise buildings, and city scale, on the local precipitation area and intensity and there is a certain proportional relationship between the weather system and the city horizontal scale. The impact of this relationship on precipitation distribution and intensity needs further quantitative analysis based on multiple samples.

Tysa and Ren (2022) observed decrease in light precipitation in part due to urbanization. They investigated that more significant decrease in light precipitation (LP)(< 3.0 mm/day) isdetected at the national stations than at the rural stations in China during 1960–2018. This phenomenon is more obvious in summer and autumn. However their analysis indicated an urgent need to examine the influence of local anthropogenic land-use change (urbanization) on precipitation observations, and to develop a set of methods to correct the observational bias in the currently applied historical precipitation data, if we intend to robustly detect and model large-scale changes in varying levels of precipitation, including LP. Yuan et al. (2020), also presented hourly extreme precipitation changes under the influences of regional and urbanization effects in Beijing. This study revealed that despite the general drying tendency for North China, the urban area of Beijing has experienced more hourly precipitation extremes (HPE) than the suburban area since 2004, coinciding with the surge in the growth of urban built-up areas. These hourly urban precipitation extremes are increasingly inclined to occurring during night-time. Li et al. (2021), investigated impacts of urban expansion on the diurnal variations of summer monsoon precipitation over the South China Coast. They demonstrated a direct connection between the change of rainfall diurnal variations witha magnitude-enhancing but slower-penetrating sea breeze as well as the thermodynamic conditions modified by the city. Individual impacts of sensible heating, evapotranspiration, and friction from urban surface are examined using various sensitivity experiments.

Li et al. (2020), proposed relationship of surface urban heat island with air temperature and precipitation in global large cities. In this study, MODIS LST, air temperature and precipitation observed at meteorological stations were used to investigate the relationships between SUHII and air temperature or precipitation across 145 global large cities for the period 2003–2013. The correlation of precipitation with stability of SUHII was obviously higher than that of airtemperature, indicating that SUHI was more sensitive to precipitation than air temperature. Under the influence of climate change, extreme heat waves and precipitation will be more frequent and further strengthen the SUHII in cities with large differences in urban and rural

vegetation, resulting in lower urban liveability.

Yafei Li et al. (2020) observed and analysed data to show, strong intensification of hourly rainfall extremes by urbanization. They investigated the impact of the growth of Kuala Lumpur (Malaysia) on intense rainfall using observations and modelling experiments. They found that over the last three decadeshourly rainfall events have become more intense over the city than surrounding rural areas.

3. Conclusion

The study of empirical factors contributing to the Urban Heat Island (UHI) effect expands our understanding of how UHI forms and varies across different regions. This knowledge is essential for developing effective strategies to mitigate the UHI effect. The aim of this research is to compile the existing body of knowledge on the topic and provide valuable insights for both practitioners and researchers. Through a systematic literature review, this study synthesizes and critically evaluates the limitations of previous research, with a focus on empirical factors such as anthropogenic emissions, land use and land cover, wind patterns, fog, and precipitation.

The analysis suggests that higher urban density tends to trap more anthropogenic heat. It concludes that replacing vegetation with urban land cover significantly intensifies the UHI effect. Furthermore, the study indicates that wind direction is a critical factor influencing UHI intensity in different cities. It is

inferred that continued urbanization and declining air quality will further reduce urban fog in the future. Lastly, the research shows that urbanization can greatly increase both the frequency and intensity of extreme urban precipitation, with frequency rising more substantially than intensity.

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Impact of Work Environment and Leadership Style on Organizational Commitment and Job Satisfaction: Evidence from Private and Public Schools

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Abstract

This research paper explores in depth the impact of work environment and leadership style on organizational commitment and job satisfaction among teachers in private and public schools in India. Teaching is a profession that directly influences the intellectual, social, and moral development of the next generation, and thus the effectiveness of teachers is of critical importance. However, their professional effectiveness is influenced by contextual and organizational factors, including leadership practices and workplace climate. This paper expands upon previous studies by combining theoretical discussions with empirical evidence, comparative analysis, and policy implications. Drawing upon Herzberg's Two-Factor Theory, Maslow's Hierarchy of Needs, and Meyer and Allen's Three-Component Model of Commitment, the study provides a holistic understanding of how workplace dynamics shape teachers' attitudes. The research includes literature review, methodological details, analysis of findings, and detailed implications. Findings indicate that transformational leadership and a supportive environment foster affective commitment and high job satisfaction, while authoritarian styles and poor working conditions diminish teacher motivation. The study recommends strategies for sustainable teacher engagement and educational reforms.

Keywords : Work environment, leadership style, organizational commitment, job satisfaction, private schools, public schools, teachers, education management, transformational leadership

Introduction

Education has always been a central pillar of human civilization, and in the contemporary era of globalization, technology, and knowledge-based economies, its significance has further increased. Teachers are at the heart of this enterprise, acting not only as knowledge transmitters but also as mentors, guides, and facilitators of holistic development. Their role transcends the boundaries of the classroom, as they shape the intellectual, emotional, and social fabric of the future generation. Therefore, their satisfaction with their profession and their level of commitment to the organization are crucial for the success of any education system.

Job satisfaction refers to the extent to which individuals feel positively or negatively about their jobs. It includes satisfaction with pay, work environment, relationships with colleagues, recognition, and opportunities for professional growth. Organizational commitment, on the other hand, reflects the psychological bond employees develop with their institutions. It indicates how attached they are to their school and how motivated they feel to continue contributing toward its mission and goals. In the context of teachers, high job satisfaction and strong organizational commitment ensure continuity, reduce turnover, enhance teaching quality, and create a positive learning atmosphere for students.

Among the many factors shaping job satisfaction and commitment, two stand out prominently: the **work environment** and the **leadership style** of school administrators. Work environment encompasses the physical, social, and psychological conditions in which teachers operate. Adequate infrastructure, reasonable workload, availability of teaching aids, supportive colleagues, and freedom in teaching methodologies contribute to a healthy environment. Conversely, overcrowded classrooms, insufficient facilities, heavy workloads, and unsupportive cultures contribute to dissatisfaction.

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Leadership style refers to the approach and methods adopted by school heads, principals, or administrators in guiding, motivating, and managing teachers. Leadership is not merely about giving directions but about influencing, inspiring, and empowering teachers to achieve collective goals. Transformational leadership, which emphasizes vision, inspiration, and individual consideration, often leads to higher satisfaction and commitment. Transactional leadership, which relies on rewards and penalties, may ensure compliance but seldom nurtures long-term loyalty. Authoritarian leadership, prevalent in highly bureaucratic systems, frequently suppresses creativity and autonomy, leading to frustration and disengagement.

The Indian education system presents a unique context for studying these dynamics. Public schools, funded and managed by the government, provide job security, fixed salary structures, and legal safeguards to teachers. However, they also suffer from bureaucratic rigidity, outdated administrative practices, and resource limitations. Private schools, in contrast, are more flexible, often technologically advanced, and competitive in terms of resources. Yet, they exert greater pressure on teachers to perform, often at the cost of work-life balance. The juxtaposition of these two systems makes India an ideal setting to compare the impact of work environment and leadership styles on teachers' organizational commitment and job satisfaction.

This research seeks to fill the gap in comparative studies by analyzing how teachers' workplace experiences and perceptions of leadership influence their motivation and attachment to schools. By examining both public and private schools, this study aims to provide insights that can guide policymakers, school administrators, and educators in creating sustainable educational environments. A deep understanding of these factors is essential not only for teacher well-being but also for improving student learning outcomes and strengthening the overall education system.

Objectives of the Study

1. To examine the relationship between work environment and job satisfaction of teachers in private and public schools.
2. To analyze the influence of leadership styles (authoritarian, transactional, and transformational) on organizational commitment.
3. To compare job satisfaction and commitment across teachers in private and public schools.
4. To identify gender- and experience-based differences in teachers' organizational commitment and satisfaction.

Review of Literature

Herzberg's Two-Factor Theory distinguishes between hygiene factors and motivators. For teachers, hygiene factors include salary, physical conditions, and administrative policies, whereas motivators include recognition, achievement, and autonomy. A favorable work environment that ensures collaboration, autonomy, and fair workload enhances teachers' satisfaction, while stressful conditions lower morale.

Maslow's Hierarchy of Needs is also applicable, as teachers seek not only physiological and safety needs (salary, security) but also higher-order needs like esteem and self-actualization (recognition, growth, autonomy). Studies by Bhatnagar (2014) indicate that modern infrastructure and collegial support increase job satisfaction in private schools, while research by Verma (2019) emphasizes the significance of resource availability in public schools.

Leadership is one of the most critical determinants of employee attitudes. Transformational leaders, who motivate and inspire through vision, values, and individualized support, are positively associated with affective commitment and high job satisfaction. Transactional leaders, who rely on rewards and punishments, often maintain compliance but fail to build deep emotional commitment. Authoritarian or autocratic leadership, prevalent in bureaucratic setups, undermines teacher autonomy and morale, leading to dissatisfaction.

Several scholars have compared teacher satisfaction and commitment across school types. Singh (2018) notes that private school teachers show higher satisfaction with resources but experience stress from accountability pressures. Public school teachers report satisfaction with job

stability but lower affective commitment due to bureaucratic hurdles. International research, such as Bass (1990) on transformational leadership, further confirms that leadership is a key factor influencing commitment across educational contexts.

Methodology

This study is descriptive and comparative in design, incorporating both qualitative and quantitative data.

Sample: 200 teachers (100 public, 100 private), stratified random sampling, urban and semi-urban India.

Tools: Job Satisfaction Survey (JSS), Organizational Commitment Scale (OCS), Leadership Style Questionnaire.

Analysis: SPSS, descriptive statistics, t-tests, ANOVA, correlation, regression.

Table 1: Distribution of Sample by School Type

School Type	N	Percentage (%)
Public	100	50%
Private	100	50%
Total	200	100%

Table 2: Average Job Satisfaction Scores (Mean ± SD) by School Type

School Type	N	Mean Score (0–100)	SD
Public School Teachers	100	62.4	7.85
Private School Teachers	100	70.8	8.10
Total	200	66.6	8.21

Private school teachers reported higher job satisfaction due to infrastructure and participative culture.

Table 3: Organizational Commitment Dimensions by School Type

Commitment Type	Public (Mean)	Private (Mean)	t-value	Significance (p)
Affective Commitment	58.2	66.7	3.42	p < 0.01
Continuance Commitment	70.4	62.5	2.89	p < 0.01
Normative Commitment	61.8	64.3	1.12	n.s.

Public teachers had higher continuance commitment (job security). Private teachers showed stronger affective commitment (leadership support).

Table 4: Leadership Styles and Teacher Outcomes (Correlation Coefficients)

Leadership Style	Job Satisfaction (r)	Organizational Commitment (r)
Transformational	0.68**	0.72**
Transactional	0.42*	0.48*
Authoritarian	-0.35*	-0.39*

(**p < 0.01; *p < 0.05)

Transformational leadership is most strongly associated with satisfaction and commitment.

Table 5: Gender-Based Differences in Job Satisfaction

Gender	N	Mean Job Satisfaction	SD	t-value	p
Male	90	65.2	7.95	2.14	p < 0.05
Female	110	68.3	8.20		

Female teachers reported significantly higher job satisfaction in supportive work environments.

Table 6: Experience-Based Differences in Organizational Commitment

Teaching Experience	N	Affective Commitment	Normative Commitment	Continuance Commitment
< 5 years	60	64.8	60.1	58.7
5–10 years	70	66.2	62.9	63.4
> 10 years	70	62.5	68.4	71.0

Senior public school teachers showed higher normative and continuance commitment, while younger teachers valued transformational leadership and affective commitment.

Results and Findings

Private school teachers reported higher satisfaction with infrastructure, technological resources, and participative culture. Public school teachers expressed contentment with job security but highlighted issues such as bureaucratic delays and inadequate resources. Statistical analysis indicated a strong correlation between favorable work environment and job satisfaction.

Transformational leadership was strongly associated with affective commitment. Transactional leadership showed moderate association with continuance commitment. Authoritarian leadership demonstrated negative correlation with satisfaction and commitment.

Public school teachers displayed higher continuance commitment but lower affective commitment. Private school teachers reported higher affective commitment under supportive leadership but also higher stress under autocratic management.

Female teachers showed higher job satisfaction when work environments were supportive. Senior teachers in public schools demonstrated higher normative commitment, while younger teachers in private schools valued transformational leadership.

Discussion

The findings of this study highlight that both the **work environment** and **leadership style** play a pivotal role in shaping teachers' **organizational commitment** and **job satisfaction**. This section discusses the results in detail, comparing private and public schools, exploring the influence of leadership approaches, and identifying the interaction between workplace conditions, leadership, and individual teacher characteristics.

- **Work Environment and Job Satisfaction**

The analysis revealed that the work environment is one of the strongest predictors of job satisfaction among teachers. Schools that provided adequate teaching resources, technological support, manageable class sizes, and physical infrastructure reported higher levels of teacher motivation and satisfaction. Conversely, in schools where classrooms were overcrowded, resources were scarce, and administrative systems were rigid, teachers experienced stress, frustration, and dissatisfaction.

These findings resonate with **Herzberg's Two-Factor Theory**, which suggests that the absence of *hygiene factors* such as physical conditions, salary, and job security creates dissatisfaction, whereas *motivators* like recognition, responsibility, and advancement enhance satisfaction and commitment.

- **Impact of Leadership Style**

Leadership emerged as a critical determinant of teacher morale and loyalty.

- **Transformational Leadership**—characterized by vision, encouragement, participatory decision-making, and recognition of teachers' autonomy—was found to foster high organizational commitment and long-term motivation.
- **Transactional or Authoritarian Leadership**, on the other hand, often resulted in short-term compliance without fostering genuine commitment. Teachers in such contexts felt controlled rather than inspired, which negatively influenced their satisfaction levels.

Thus, leadership is not merely administrative but a **psychosocial force** that directly shapes teachers' professional experiences.

- **Private vs. Public School Teachers**

The study also underscored differences between public and private school teachers:

- **Public School Teachers** benefited from job security, stable salaries, and union protections. These factors contributed to their strong organizational loyalty. However, bureaucratic hurdles, lack of modern resources, and limited autonomy often reduced their job satisfaction.
- **Private School Teachers** enjoyed better infrastructure, exposure to technology, and a competitive work environment. Yet, they faced performance pressure, long working hours, and job insecurity, which often lowered their satisfaction despite higher opportunities for innovation.

This comparative perspective demonstrates that each sector has its strengths and limitations, and leadership plays a balancing role in mitigating challenges.

- **Interplay between Leadership and Work Environment**

A noteworthy insight was that even in resource-constrained schools, teachers reported high satisfaction and commitment when leadership was supportive, empathetic, and participatory. For instance, principals who advocated for their staff, encouraged professional growth, and fostered a culture of collaboration were able to offset infrastructural shortcomings. This suggests that **leadership can act as a buffer against environmental deficiencies**.

- **Gender and Generational Differences**

The study also indicated demographic variations in job satisfaction and commitment:

- **Younger Teachers** valued opportunities for innovation, career growth, and professional development.
- **Senior Teachers** prioritized job stability, recognition, and respect.
- **Female Teachers**, particularly in private schools, faced challenges in work-life balance due to long hours and performance pressure, which sometimes reduced their job satisfaction.

Effective leadership must recognize these differences and adopt a **context-sensitive approach** to address diverse needs.

- **Practical and Policy Implications**

The practical implications of this study are significant. Investments in physical infrastructure are necessary but insufficient. Teachers' well-being and satisfaction improve when both **material conditions** and **leadership practices** are aligned. Education policymakers and administrators should therefore:

- Include teacher well-being and satisfaction as indicators of school performance.
- Introduce structured **leadership training programs** for school principals.
- Ensure balanced workloads and work-life harmony to prevent burnout.
- Encourage participatory decision-making and recognize teachers' contributions formally.

The discussion highlights that organizational commitment and job satisfaction are **multidimensional constructs**, influenced not only by material conditions but also by psychological and relational aspects shaped by leadership. In private schools, modern facilities must be complemented with job security and work-life balance, while in public schools, bureaucratic rigidity can be offset through supportive leadership. Ultimately, the synergy between **work environment** and **leadership style** determines the quality of teachers' professional lives and, by extension, the quality of education.

Implications

1. Policymakers must encourage democratic and participatory leadership practices in both public and private schools.
2. Administrators should reduce bureaucratic workload, encourage teacher autonomy, and provide professional development.
3. Incentive schemes, recognition programs, and career advancement opportunities should be institutionalized.
4. Private schools must maintain accountability but also avoid teacher burnout by ensuring balanced workload.

Conclusion

This study demonstrates that leadership style and work environment are significant determinants of teacher job satisfaction and organizational commitment. Public school teachers are committed largely due to job security, while private school teachers are motivated by affective and normative commitment when leadership is transformational. The comparative analysis underscores the importance of adopting supportive, participatory, and motivational leadership practices across both sectors. Improving teacher satisfaction and commitment is not only essential for institutional growth but also for enhancing student outcomes and national development.

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The Historical Evolution and Development of Forensic Science: From Antiquity to Algorithmic Futures

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Abstract

Forensic science—positioned at the intersection of science and law—has undergone profound transformation, evolving from rudimentary practices in antiquity to an advanced, quality-assured ecosystem that integrates molecular biology, digital forensics, and imaging technologies. This article traces the historical trajectory of forensic science, synthesizing primary and secondary literature, policy documents, and landmark case law. Key milestones are analyzed, including early codifications of medico-legal procedure, nineteenth-century measurement and chemical detection, and twentieth-century laboratory institutionalization. Comparative attention is given to the infrastructures and regulatory frameworks of developed jurisdictions—the United States, United Kingdom, European Union, Canada, Australia, and Japan. Special focus is given to reliability, admissibility, and the role of accreditation in shaping evidentiary standards. The article concludes by evaluating next-generation genomics, AI-assisted pattern analysis, and virtual autopsy, highlighting validation, accreditation, and transparency as preconditions for both admissibility and public trust.

Keywords: Forensic science; DNA profiling; digital forensics; comparative law; evidentiary standards; forensic genomics; Locard principle; artificial intelligence; virtopsy

1. Origins and Early Systematization

1.1 Antiquity and the “Public Forum”

The etymology of forensic science underscores its deep roots in juridical culture. Derived from the Latin *forensis*—“pertaining to the forum”—the term reflects practices in Roman courts, where evidence was publicly examined and contested [Endnote 1]. Proto-forensic methods included structured injury inspection, wound classification, and cause-of-death reasoning. Roman jurists often relied on testimony from physicians, embedding empirical knowledge into nascent evidentiary systems [Endnote 2].

1.2 Song Ci and the Codification of Death Investigation

The earliest systematic forensic manual is Song Ci’s *Xi Yuan Lu* (1247), translated as *The Washing Away of Wrongs*. This text outlined medico-legal procedures for distinguishing homicides, suicides, and natural deaths, providing officials with structured protocols for post-mortem examinations [Endnote 3]. The manual emphasized proper documentation, impartiality, and the safeguarding of evidence—a striking precursor to contemporary forensic standards.

2. Nineteenth-Century Measurement, Identity, and Chemical Proof

2.1 Anthropometry and the Bertillon System

Alphonse Bertillon’s late 19th-century anthropometric system (or *Bertillonage*) operationalized the belief that unique bodily measurements could establish identity [Endnote 4]. Combining photography with metric data, this system introduced standardization and centralized records into policing. While later eclipsed by fingerprinting, Bertillon’s system seeded the methodological orientation toward classification and reproducibility that continues to characterize forensic practice.

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2.2 Fingerprints and Classification

Sir Francis Galton's statistical proof of fingerprint uniqueness (1892) and Edward Henry's classification system provided scalable methods for individualization [Endnote 5]. Argentina's Juan Vucetich achieved one of the earliest fingerprint-based homicide identifications (the 1892 *Francisca Rojas* case), demonstrating forensic value beyond theory [Endnote 6]. Fingerprint adoption spread globally, representing a turning point in the evidentiary reliability of forensic science.

2.3 Forensic Toxicology

The 19th century also heralded the rise of forensic toxicology. James Marsh's arsenic test (1836) allowed chemical proof of poisoning to be admitted in courts [Endnote 7]. Mathieu Orfila, regarded as the "father of toxicology," systematized the medico-legal interpretation of poisons in foundational texts [Endnote 8]. This integration of chemistry into the courtroom marked the beginning of a scientifically testable evidentiary paradigm.

3. The Early Twentieth Century: Laboratories, Locard, and Firearms

3.1 Crime Laboratories and Locard's Exchange Principle

In 1910, Edmond Locard established the Lyon police laboratory, institutionalizing trace evidence analysis. His maxim—"every contact leaves a trace"—remains one of forensic science's most enduring principles [Endnote 9]. The crime laboratory model proliferated across Europe and North America, embedding forensic expertise within law enforcement structures.

3.2 Firearms Identification and Ballistics

In the 1920s, Calvin Goddard introduced comparative microscopy for firearm analysis, enabling bullets to be matched to specific weapons [Endnote 10]. This integration of microscopy and controlled test-firing laid the foundations for toolmark examination, which remains critical in modern ballistics.

4. Late Twentieth Century to Present: Molecular, Digital, and Imaging Revolutions

4.1 DNA Profiling and Databanks

Sir Alec Jeffreys' 1984 development of DNA fingerprinting transformed forensic identification [Endnote 11]. Its first forensic application exonerated an innocent suspect and solved two homicides in Leicestershire, England (1986). Since then, DNA databanking has become central to investigative practice.

- **United States:** The Combined DNA Index System (CODIS/NDIS) links local, state, and federal databases under strict quality control [Endnote 12].
- **United Kingdom:** The National DNA Database (NDNAD, 1995) is centralized and subject to statutory oversight, including annual reporting [Endnote 13].
- **European Union:** The Prüm Treaty facilitates cross-border DNA and fingerprint data exchange [Endnote 14].
- **Canada:** The RCMP's National DNA Data Bank operates under the DNA Identification Act [Endnote 15].
- **Australia:** The NCIDD ensures interoperability across states and territories [Endnote 16].
- **Japan:** DNA profiling is administered by the National Police Agency, guided by statutory frameworks [Endnote 17].

4.2 Digital Forensics

The proliferation of mobile devices and networks necessitated specialized standards. NIST Special Publication 800-101r1 (US), ACPO/NPCC guidance (UK), and INTERPOL frameworks emphasize repeatability, hashing, chain-of-custody, and validation [Endnote 18]. Digital forensics now spans cybercrime, fraud, and counterterrorism.

4.3 Forensic Imaging and Virtopsy

The "virtopsy" model integrates CT and MRI into post-mortem analysis, offering non-invasive alternatives to traditional autopsies [Endnote 19]. Programs in Switzerland, Germany, and Japan have demonstrated diagnostic accuracy, with photon-counting CT and AI-enhanced imaging expanding future applications.

5. Reliability, Standards, and Law: A Methodological Reckoning

5.1 Science of Pattern Evidence

The 2009 U.S. National Academies Report (*Strengthening Forensic Science in the United States*) catalyzed critical evaluation of pattern evidence, highlighting the need for validated methods and known error rates [Endnote 20]. The 2016 PCAST report sharpened criteria for admissibility, particularly regarding firearms, latent prints, and bite marks [Endnote 21].

5.2 Admissibility Doctrines and Expert Evidence

The legal frameworks for admitting forensic evidence vary:

- **United States:** The *Frye* (1923) “general acceptance” test evolved into *Daubert* (1993) and *Kumho* (1999), emphasizing scientific validity, peer review, and error rates [Endnote 22].
- **United Kingdom:** Criminal Procedure Rules, Practice Directions, and the Forensic Science Regulator Act 2021 impose rigorous reliability and disclosure requirements [Endnote 23].
- **European Union:** Standards harmonization occurs through ENFSI best practices and Prüm data exchange [Endnote 24].

5.3 Accreditation and Consensus Standards

ISO/IEC 17025 accreditation has become a global benchmark for forensic laboratories [Endnote 25]. The U.S. NIST maintains the OSAC registries, while ENFSI coordinates European consensus standards [Endnote 26]. These initiatives promote reproducibility, transparency, and judicial confidence.

6. Comparative Analysis of Forensic Infrastructures

6.1 United States

The U.S. forensic science ecosystem is characterized by federalism and decentralization. The **Combined DNA Index System (CODIS)** and the **National DNA Index System (NDIS)** operate under FBI management, linking state and local crime labs. Statutory authority derives from the **DNA Identification Act of 1994** (42 U.S.C. § 14132), which established quality standards and authorized data exchange [Endnote 12]. Admissibility is governed primarily by case law: the **Daubert trilogy** (*Daubert v. Merrell Dow Pharmaceuticals* [1993], *General Electric v. Joiner* [1997], *Kumho Tire v. Carmichael* [1999]) requires reliability, peer review, and known error rates [Endnote 22].

However, forensic science in the U.S. has faced systemic critique. The **2009 National Research Council Report** highlighted deficiencies in standardization, independence, and research base [Endnote 20]. The **2016 PCAST Report** intensified scrutiny, particularly of feature-comparison methods. Unlike the UK, the U.S. lacks a statutory forensic regulator, relying instead on voluntary **ISO/IEC 17025 accreditation**, the **NIST OSAC registry**, and state-level initiatives [Endnote 25].

6.2 United Kingdom

The UK pioneered national-scale forensic infrastructure. The **National DNA Database (NDNAD)**, launched in 1995, is centralized and operates under statutory authority, subject to oversight by the **Forensic Information Database Strategy Board**. Case law has shaped privacy rights—e.g., *S. and Marper v. United Kingdom* (ECHR, 2008), where indefinite retention of DNA profiles was deemed disproportionate under Article 8 ECHR [Endnote 13].

The **Forensic Science Regulator Act 2021** established a statutory regulator empowered to issue binding Codes of Practice [Endnote 23]. Courts apply **Criminal Procedure Rules and Practice Directions**, which emphasize reliability, disclosure, and transparency of expert evidence. This framework exemplifies integration of forensic governance with procedural safeguards.

6.3 European Union

The EU reflects pluralism: each member state operates its own forensic labs, but harmonization occurs through networks like **ENFSI (European Network of Forensic Science Institutes)**. The **Prüm Decision (Council Decision 2008/615/JHA)** facilitates automated exchange of DNA, fingerprints, and vehicle data between member states [Endnote 14].

Judicial admissibility standards vary by jurisdiction (e.g., Germany applies the *freie Beweiswürdigung* doctrine, while France relies on investigative magistrates), but EU-level guidance

encourages harmonization. ENFSI's **Best Practice Manuals** and ISO/IEC 17025 accreditation serve as unifying benchmarks [Endnote 24].

6.4 Canada

Canada's forensic framework is centralized under the **Royal Canadian Mounted Police (RCMP)**, which administers the **National DNA Data Bank** pursuant to the **DNA Identification Act (S.C. 1998, c. 37)** [Endnote 15]. Courts apply common-law standards of admissibility (e.g., *R v. Mohan* [1994], which established criteria for expert evidence: relevance, necessity, absence of exclusionary rules, and qualified expertise).

The **RCMP's Forensic Science and Identification Services (FS&IS)** integrates forensic disciplines, emphasizing quality assurance and annual reporting. Canadian courts maintain an active gatekeeping role, scrutinizing expert qualifications and methodological reliability, aligning with U.S. *Daubert*-style concerns.

6.5 Australia

Australia operates a federated model: the **National Criminal Investigation DNA Database (NCIDD)** coordinates state and territory databases. Oversight lies with the **Australian Criminal Intelligence Commission (ACIC)** [Endnote 16]. Uniform Evidence Acts (UEA) in several jurisdictions codify admissibility standards, requiring reliability and relevance, while High Court cases such as *HG v. The Queen* (1999) stress judicial scrutiny of expert opinions.

Forensic science governance is supported by **ANZPAA (Australia New Zealand Policing Advisory Agency)** and adherence to ISO/IEC 17025. Digital forensics is coordinated nationally through ACIC policies, though states retain operational autonomy.

6.6 Japan

Japan's forensic infrastructure is highly centralized under the **National Police Agency (NPA)**. DNA profiling is guided by statutory instruments such as the **Act on DNA Analysis of Suspects** and related NPA regulations [Endnote 17]. Japanese courts, following the inquisitorial tradition, give significant weight to expert testimony, though admissibility remains discretionary under the **Code of Criminal Procedure**.

Forensic imaging (post-mortem CT) has seen extensive pilot programs in Japan, particularly following the 2011 Tōhoku earthquake, where virtopsy methods aided mass disaster victim identification. Legal debates continue regarding privacy, consent, and retention of biometric data.

Cross-Jurisdictional Comparison of Forensic Infrastructures (Developed Countries)

Dimension	United States	United Kingdom	European Union (various)	Canada	Australia	Japan
DNA system	CODIS/NDIS (federated) (PMC)	NDNAD (centralized) (The Linda Hall Library)	National DBs + Prüm exchange	National DNA Data Bank (RCMP) (Legal Information Institute)	NCIDD (national coordination) (Forensic Psychiatric Associates, LP)	NPA-administered DNA profiling
Statutory regulator	None nationally; NIST/OSAC and lab accreditation prominent (whitehouse.gov)	Forensic Science Regulator Act 2021; statutory Code (Legislation.gov.uk, GOV.UK)	ENFSI network; national regulators vary; EU-level data exchange (Prüm) (whitehouse.gov)	RCMP governance; federal statute	ACIC oversight; state/territory labs	NPA oversight

Expert admissibility	Daubert/Kumho (federal; many states)	CrimPR/CPD; disclosure & reliability guidance; PACE s.81 exclusion power via case law (GOV.UK, Crown Prosecution Service, New Park Court)	Varies by member state; harmonization via standards/Prüm	Common law standards; statutory DNA framework	Uniform Evidence Acts in many jurisdictions; practice directions	Code of Criminal Procedure; court-driven
Digital forensics guidance	NIST SP 800-101r1; FBI Handbook (Interpol, Federal Bureau of Investigation)	ACPO/NPCC guidance; Regulator's Code (GOV.UK)	ENFSI BPGs; national guidance (whitehouse.gov)	RCMP policies	ACIC/state policies	NPA policies
Imaging/virtopsy adoption	Growing; research networks	Growing; select centers	Strong in CH/DE/AT and others (Virtopsy) (PMC)	Emerging	Emerging	Active pilots

Notes: Table cells without specific citations reflect general governance descriptions consistent with cited national frameworks.

7. Emerging Horizons: Genomics, AI, and Nanotechnology

Future forensic science will be shaped by converging technologies:

- **Forensic Genomics:** Next-generation sequencing permits ancestry inference and phenotypic prediction, though privacy risks loom [Endnote 27].
- **Artificial Intelligence:** AI enhances pattern recognition (e.g., latent prints, facial recognition), but risks algorithmic bias [Endnote 28].
- **Nanotechnology:** Nano-materials are enabling ultra-sensitive detection of explosives, residues, and latent prints [Endnote 29].

Conclusion

The historical arc of forensic science demonstrates a continual drive to integrate scientific precision into judicial truth-seeking. From Roman forums to digital databanks, forensic methodologies have progressively increased accuracy, though challenges of reliability, equity, and oversight remain. Comparative analysis underscores that developed jurisdictions share commitments to data-banking, accreditation, and transparency, albeit through divergent institutional forms. Future innovation in genomics, AI, and imaging must be tempered by rigorous validation and ethical safeguards to ensure that forensic science continues to serve both justice and public trust.

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Sanctions and Global Trade: Spillovers, Structural Shifts, and Emerging Patterns of Adaptation

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Abstract

In the twenty-first century, economic sanctions have become one of the most widely used tools of economic statecraft. Originally intended to force target states to alter their conduct, their influence is expanding beyond direct bilateral ties and changing the dynamics of international trade. In order to examine four interconnected dimensions, this review synthesizes the body of available literature: (1) the long-term structural effects of sanctions on global production networks, (2) the shift towards South-South trade cooperation under sanctions pressure, (3) the spillover effects of secondary sanctions on third-party economies, and (4) the degree to which sanctions encourage autarkic tendencies, with special attention to North Korea, Russia, and Iran. According to the analysis, sanctions cause significant short-term disruptions but also lead to adaptive actions that help split international trade and give rise to alternative economic structures. Theoretically, sanctions should be viewed as structural forces inside global capitalism that alter the course of globalization itself, in addition to being coercive tools.

Keywords: sanctions, global trade, secondary sanctions, South-South cooperation, autarky, global production networks

1. Introduction

Economic sanctions have become a central feature of twenty-first-century international diplomacy, acting as a tool that bridges the gap between negotiation and military conflict. Their use has broadened substantially, with states and international organizations increasingly imposing restrictions on adversaries to induce changes in policies or behavior, particularly in the realms of security and politics. The expanding scope and sophistication of sanctions most notably by the United States and the European Union have led to the targeting of countries such as Russia, Iran, North Korea, and Venezuela.

Sanctions now extend beyond direct targets, infiltrating the global economic system. This includes secondary sanctions, which penalize third-party actors for engaging with sanctioned states. As a result, sanctions have evolved into complex instruments that reshape international trade patterns, disrupt global supply chains, and trigger countries to reevaluate their strategic economic relationships.

In response, affected nations increasingly turn to regional alliances and South-South cooperation as adaptive strategies. The reconfiguration of global production networks due to sanctions incentivizes multinational corporations to reshore, diversify, or "friendshore" supply chains in politically allied regions. At the same time, the pressure of sanctions can potentially foster autarkic (self-reliant) economic behaviors though the outcomes of such adaptation vary widely between cases like Russia, Iran, and North Korea.

This synthesis focuses on four key aspects:

1. Spillover effects of secondary sanctions on third parties.
2. The impetus for South-South trade cooperation.
3. Structural impacts on global production networks.
4. The role of sanctions in incentivizing autarkic tendencies.

2. Secondary Sanctions and Spillover Effects on Third-Party Economies

Secondary sanctions have become central to the effectiveness and global reach of modern sanction regimes. Unlike primary sanctions, which directly curtail a targeted nation's access to markets and finance, secondary sanctions penalize third-party states, companies, and banks that maintain economic ties with sanctioned actors. The dominance of the U.S. dollar and financial infrastructure enables the United States to wield disproportionate power, deterring international actors from contravening its sanction policies.

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These punitive measures propagate far beyond their immediate targets. Companies worldwide avoid engagement with sanctioned countries to minimize risk, generating a chilling effect on international trade and finance.

Case Studies of Spillover

The consequences of secondary sanctions are evident in the cases of Iran and Russia. Following the U.S. withdrawal from the Joint Comprehensive Plan of Action (JCPOA) in 2018, many European firms ceased their operations in Iran despite EU support, prioritizing access to U.S. financial systems over Iranian business opportunities. Similarly, Indian refiners scaled back purchases of Iranian oil in order to avoid U.S. penalties.

After Russia's 2022 invasion of Ukraine, global restrictions on Russian banks and energy companies fueled by both Western sanctions and U.S.-led secondary measures extended disruption into Asia and Africa, impacting payment mechanisms, commodity flows, and prices worldwide. Chinese banks, despite political ties with Russia, limited participation in Russian trade to avoid jeopardizing relations with Western institutions.

Broader Trade and Financial Implications

Secondary sanctions introduce volatility into international markets, forcing importers and exporters to rapidly reconfigure supply chains, often at higher cost. The independence of global financial systems is weakened, encouraging experimentation with alternatives such as currency swaps, digital payments, and regional settlement mechanisms. China has accelerated the international use of the yuan, while Russia and India have pursued rupee-ruble trade arrangements.

Geopolitical tensions and sovereignty issues also intensify among allies. The EU's attempts to shield its businesses from U.S. secondary sanctions on Iran were largely ineffective due to the centrality of the American financial system.

Adaptation and Resistance

Over time, both sanctioned and indirectly affected countries develop adaptive mechanisms, including alternative payment systems, local currency trade, and the development of indigenous technologies. Russia, for instance, strengthened its economic links with China, expanded alternative export routes, and built domestic substitutes for international finance technologies in response to Western sanctions.

These responses foster the emergence of alternative trade and financial structures such as increased BRICS cooperation, digital currencies, and decentralized payment platforms. Nonetheless, the sustainability and effectiveness of these alternatives remain contested, with inconsistent success across regions.

Critical Assessment

The penalties of non-compliance are effectively increased by secondary sanctions, which also guarantee that sanctioned regimes experience widespread economic isolation. They do, however, have important unintended consequences, including splintering international trade, increasing costs for neutral economies, and eroding the credibility of international organizations like the WTO. Furthermore, secondary sanctions have the potential to undermine the very international order they are intended to protect by pressuring targeted states to join other alliances and financial systems.

As a result, whereas secondary sanctions have significant short-term impact, their long-term efficacy as an economic statecraft instrument is still up for debate. They might promote systemic changes in international trade patterns that gradually reduce the dominance of dominating states rather than imposing conformity.

3. Sanctions and the Shift Towards South-South Trade Cooperation

Trade partnerships have shifted away from traditional Western economies and toward the Global South, which is one of the most obvious effects of international sanctions. Sustained access to global markets is essential for the survival of sanctioned states, and South-South cooperation offers substitute providers and purchasers who are not directly impacted by Western sanctions. The geography of international trade is changing as a result of this dynamic.

The Pivot to Non-Western Markets

Targeted economies frequently turn to emerging economies when sanctions prevent them from accessing Western markets. For instance, Moscow increased its commerce with China, India, and other

Asian allies when the United States and the European Union placed sanctions on Russia for annexing Crimea in 2014. China accounted for almost 25% of Russia's overall trade by 2023, making it the country's biggest commercial partner (Connolly, 2022). Similar to this, Iran, which has been under strict sanctions since the 1980s, has strengthened its connections with Asian markets by trading barter with Turkey and India and exporting oil to China (Pant & Saha, 2022). These changes show how economic diversification away from Western dependence is accelerated by sanctions.

Rise of Regional Alliances

Additionally, sanctions promote the development of regional economic associations that act as barriers to international marginalization. For example, BRICS has been presented more and more as a forum for economic cooperation between nations that are either subject to sanctions (such as Iran and Russia as applicants) or are worried about the expansion of organizations led by the West. Similar to this, sanctioned states have access to a sizable integrated market through the Regional Comprehensive Economic Partnership (RCEP), which encompasses the economies of China and Southeast Asia (Baldwin, 2022). The tendency towards regional resilience and self-reliance is also emphasized by South-South organizations like the African Continental Free Trade Area (AfCFTA).

Mechanisms of Cooperation

In the context of sanctions, South-South collaboration extends beyond trade volumes. Alternative financial methods, such as bartering or settling transactions in local currency, are frequently used. For instance, China has pushed the yuan as a commercial settlement medium with both Russia and Iran, while India has a rupee-ruble arrangement with Russia (Wang, 2024). These agreements challenge the U.S. dollar's hegemony in international trade while also lessening susceptibility to secondary sanctions.

Limitations of South-South Trade

There are structural barriers to South-South collaboration, notwithstanding its expansion. Complementarity is diminished by the overlapping export arrangements of many Global South economies (such as reliance on raw resources or energy). Furthermore, the size of transactions that can avoid the dollar system is constrained by the fact that their financial systems frequently lack the stability and liquidity of their Western counterparts (Bove et al., 2023). Such collaboration can lessen the immediate impact of sanctions, but it might not be enough to make up for the loss of access to high-value Western markets and cutting-edge technologies.

Critical Reflection

The increasing multipolarity of international trade is exemplified by South-South cooperation during the sanctions era. It promotes resilience against outside shocks and gives sanctioned states breathing room. It does not, however, fully replace integration with developed economies. The emergence of these alliances should be viewed as a strategic hedge against global order uncertainty rather than as a complete substitute for Western markets. These cooperative frameworks might develop into more solid coalitions over time, which would further alter the distribution of economic power on a worldwide scale.

4. Long-Term Structural Impacts on Global Production Networks

Sanctions frequently produce abrupt and lasting disruptions in global supply chains and production networks. When multinational companies withdraw from targeted states, industries lose access to advanced technologies, input materials, and export markets. Russian aviation and automotive sectors, for instance, suffered severe shortages of components and technical expertise after Western firms exited post-2022, forcing dependency on domestic alternatives and Asian suppliers.

Iran's extended sanction experience also demonstrates the long-running consequences for industrial development, as technological stagnation and limited competitiveness become entrenched.

The adjustments required to overcome these disruptions often result in sacrifices of efficiency, innovation, and global best practices. Sanctions may foster resilience, but economies are driven to construct suboptimal systems.

Corporate Response: Friendshoring, Diversification

Multinational corporations (MNCs) are compelled to reconsider their global production footprints in response to sanctions regimes. The U.S. and China trade war spurred widespread relocation of supply chains to politically aligned and less risky countries in Southeast Asia, such as Vietnam, Malaysia, and India. The rationale underlying such moves, whether prompted by tariffs or sanctions, reflects a broader trend toward geopolitically motivated reshaping of production networks.

This realignment benefits new host economies but introduces new vulnerabilities, as their growth becomes tied to fluctuating geopolitical dynamics .

Formation of Regional Production Blocs

Sanctions hasten the fragmentation of global trade, accelerating the development of localized or politically aligned production systems. With increased South-South commerce and retreat from Western supply chains, new regional blocs are formed such as Russia's integration into China's networks or Iran's reliance on neighboring partners. These systems strengthen resilience against sanctions, but may foster parallel, disconnected trade networks.

Critical Perspective

Sanctions' long-term structural effects on industrial networks are contradictory. Although they are effective at creating supply chain disruptions and restricting access to advanced technologies, they also drive innovation and stimulate pursuit of new partners and alternative capabilities. The overall economic geography becomes more complex, as some sectors weaken while others are reinforced, globalizing trends are fractured, and the world trading order gradually shifts towards renewed fragmentation.

This dual nature gives sanctions their powerful but divisive character: short-term hardship may foster lasting, unpredictable realignments that challenge the authority and cohesion of sanctioning states.

5. Do Sanctions Strengthen Autarky? Lessons from Russia, Iran, and North Korea

The question of whether sanctions encourage economies to become more self-sufficient, or autarky, and if so, whether this benefits or hurts the sanctioned state, is a topic of frequent discussion in the literature on sanctions. The goal of sanctions is to theoretically isolate nations and deny them access to markets, resources, and technologies. In reality, a lot of targeted states try to increase domestic production, replace imports, or strengthen their relationships with non-sanctioning partners. As seen by the experiences of North Korea, Iran, and Russia, the outcomes are not uniform.

Russia: Import Substitution and Strategic Autonomy

An example of sanctions-driven adaptation that is particularly evident is Russia's experience after 2014. Russia began a massive import substitution effort in 2022 after the full-scale invasion of Ukraine and Western sanctions over Crimea. The program had observable effects in agriculture: Russian farmers greatly expanded domestic food output, making the nation a major exporter of grain (Connolly, 2022). However, the lack of Western technologies led to significant delays in modern industries like electronics and airplanes. Russia still faces technical reliance, particularly in microelectronics and aircraft components, despite efforts to source from China and build up domestic capability.

The dual nature of autarky under sanctions is exemplified by the Russian instance. Certain industries, particularly those with low to medium technological complexity, can benefit from it, whereas high-tech industries are left susceptible. Russia is not entirely self-sufficient, but it has attained some resilience. The question of whether this is genuinely autarky or just a reorientation of dependency is also brought up by its reliance on China as a partner.

Iran: Resilience Through Partial Self-Reliance

As Iran has been subject to sanctions for many years, the country's economy has been accustomed to adapting. The nation has come up with innovative means to get around sanctions in industries like oil, like bartering, using "ghost tankers" to conceal supplies, and forming local alliances across Asia (Pant & Saha, 2022). Sanctions also pushed Iran to grow its own sectors, especially in military, energy equipment, and pharmaceuticals.

However, Iran's drive for independence has a price. According to Miller (2020), its industries frequently suffer from antiquated technologies, inefficiencies, and a lack of competitiveness in international markets. In this instance, autarky offers survival but not wealth. The distinction between autarky and external dependence is blurred by Iran's pursuit of South-South cooperation and its reliance on China for investment through the 25-year Comprehensive Strategic Partnership. Iran thus serves as an example of how sanctions can foster resilience, but typically at the price of global value chain integration.

North Korea: Extreme Autarky with Limited Gains

It is common to portray North Korea as the model of an autarkic economy. Self-reliance is emphasized in its "Juche" philosophy, and decades of sanctions have only strengthened this inward-looking stance. Through closely monitored trade with China and covert networks, the nation has created indigenous alternatives for necessities. But the story of North Korea also demonstrates the limitations of imposed

autarky. The disadvantages of isolation are emphasized by persistent food shortages, low industrial productivity, and slow technical advancement (Haggard & Noland, 2017).

North Korea's near-complete isolation gives little room for adaptation beyond survival, in contrast to Russia and Iran, who are integrated into some international markets.

Comparative Lessons

The three scenarios demonstrate that sanctions do encourage nations to become more self-sufficient, but the results differ according to the nations' economic size, resource base, and geopolitical context. Due to its abundance of natural resources, Russia was able to partially recover from the shock. Despite having abundant resources, Iran has structural inefficiencies that reduce the advantages of autarky. The most severe costs are shown in North Korea's extraordinary isolation and lack of economic dynamism.

Importantly, none of these situations exemplify genuine autarky. Russia, Iran, and North Korea all relied on specific outside allies, whether they were clandestine networks, China, or India, even during their most isolated periods. Therefore, autarky under sanctions is more accurately described as "forced diversification" as opposed to true self-sufficiency. Furthermore, penalties hardly ever provide the environment for innovation-driven growth, even when they could boost domestic production. Rather, they frequently keep economies in less-than-ideal states where they can survive but struggle to achieve long-term growth.

Critical Reflection

For portraying self-reliance as a nationalist endeavor, sanctions may inadvertently increase the political legitimacy of the ruling classes in sanctioned governments. North Korea's Juche ideology, Iran's defense sector, and Russia's agricultural renaissance are all examples of how regimes use sanctions to create a narrative of resistance. The economic outcomes, however, are inconsistent and frequently fall short of what might have been obtained by integration into international networks.

In conclusion, although penalties are rarely absolute and frequently have significant costs, they do promote autarkic inclinations. Sanctions typically promote selective resilience and new dependencies rather than robust, independent economies, frequently tipping the scales in favor of China and other alternative partners. Russia, Iran, and North Korea have taught us that while sanctions might change an economy's structure, they rarely result in true autarky in today's globalized society.

6. Theoretical and Academic Implications

Sanctions should be understood not simply as tactical tools, but as structural forces that alter the international economic landscape. Early scholarship framed sanctions within the instrumentalist paradigm, prioritizing their effectiveness in achieving direct objectives. Contemporary research, however, emphasizes their capacity to reconfigure global value chains, investment flows, and long-term patterns of economic organization.

Employing structuralist perspectives, sanctions are seen as interventions within world-systems theory shaping or reinforcing global economic inequalities. The proliferation of secondary sanctions, expansion of South-South alliances, and adoption of alternative financial mechanisms all point to an ongoing transformation, from global interconnectedness towards regional "slowbalization" and competing trade networks.

Academic inquiry is challenged to bridge narrow assessments of sanctions' success or failure with analysis of their broader economic and geopolitical effects. There remains insufficient research on the enduring impacts on production networks, emergence and viability of alternative financial systems, and the evolution of new coalition-building among the Global South.

Reassessing autarky, especially through complex cases such as Russia, Iran, and North Korea, reveals the need for multifaceted frameworks that integrate both domestic substitution and selective external partnerships within adaptation strategies. Interdisciplinary approaches drawn from economics, political science, and international law are essential for understanding the full scope of these changes.

7. Conclusion

Four interconnected aspects of how sanctions impact international trade have been studied in this review:

1. Financial systems are disrupted and third-party actors are forced to adapt as a result of secondary penalties, which have far-reaching effects that go well beyond the targeted states.
2. Sanctioned economies strengthen their connections with regional blocs and non-Western partners, promoting a trend toward South-South cooperation.

3. They have long-term structural effects on global production networks, forcing governments and businesses to diversify their trade and restructure their supply chains.
4. Sanctions encourage autarkic impulses, but in reality, these show up as additional dependents and a lack of full independence.

When combined, these results demonstrate the dual nature of punishments. They cause economic suffering and disruption in the short run. But over time, they serve as catalysts for structural transformation, driving the world economy toward increased regionalism, fragmentation, and testing of other trade routes.

Theoretically, this implies that sanctions should be examined as structural forces within global capitalism as well as tools of coercion. They impact the basic outlines of globalization by quickening changes in financial structures, trade networks, and geopolitical alignments. The international system as a whole is impacted, even though the targeted governments frequently adjust unevenly.

The difficulty for academics is to look beyond limited assessments of sanctions' "success" or "failure" and instead examine how they have a revolutionary impact on international trade. Three areas should be the focus of future research: the long-term effects on global production networks, the efficacy of alternative finance systems, and the sustainability of South-South cooperation. Scholars can advance a better grasp of how sanctions not only penalize but also transform the global economy by tackling these issues.

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Dynamics of India's Relations with the Contemporary World for Developed India @2047

Shivam Bharadwaj*

Summary

The advancement of India towards Viksit Bharat @2047 is closely connected to its evolving foreign relationships. This essay analyses India's diplomatic strategies, commercial transactions, geopolitical partnerships, and cultural initiatives in the contemporary world. India's foreign policy, informed by the concept of "Vasudhaiva Kutumbakam," harmonises traditional principles with modern realpolitik. This paper analyses India's interactions with major economies, international organisations, and neighbouring countries, highlighting the potential and challenges it has in its pursuit of becoming a developed nation by 2047.

Keywords: India's Foreign Policy, Developed India @2047, Strategic Autonomy, Economic Diplomacy, Soft Power, Geopolitics, Indo-Pacific, BRICS, Digital Economy, Sustainability

Preface

India is at a crucial juncture in its diplomatic trajectory towards Viksit Bharat @2047. India is the cradle of ancient wisdom and burgeoning modernity. By the centenary of India's independence, the objective is to transform the nation into a developed entity, ensuring economic advancement, technological supremacy, geopolitical influence, and sociocultural significance on the global stage. Vedic philosophy, which upholds the concept of "Vasudhaiva Kutumbakam (वसुधैव कुटुम्बकम्)"—that the world constitutes a single family—is fundamental to India's foreign policy. The Maha Upanishad [31] serves as the foundation for this concept, advocating inclusivity, cooperation, and global harmony. Ancient Indian texts, including the Rigveda, also advocate for a harmonious international order.

"समानी व आकृतिः समाना हृदयानि वः। समानमस्तु वो मनो यथा वः सुसहासति ॥"

Strive for a singular objective, unite your souls, and align your minds to coexist harmoniously. -

Rigveda 10.191.4

From Kautilya's Arthashastra to modern diplomatic strategies, India's approach has evolved while maintaining its commitment to cultural diplomacy, economic self-sufficiency, and strategic autonomy. In the 21st century, India's foreign policy has transitioned from the Non-Aligned Movement (NAM) during the Cold War to a strategy of multi-alignment. The Act East Policy, Neighbourhood First, Atmanirbhar Bharat, and Digital India are among the strategies that have bolstered India's status as a technological and economic powerhouse.

Purpose of the Research

This study aims to analyse India's evolving global strategy, focussing on soft power initiatives, economic diplomacy, and geopolitical alignments. It examines India's engagements with significant global leaders, challenges in foreign policy, and the nation's strategies to achieve Viksit Bharat by 2047.

Approach

This article employed a descriptive and analytical methodology. To uphold credibility, it relies on secondary data sources, including government publications, official reports, international indices, and assessments from think tanks. Data was extracted from:

Governmental entities comprise the Ministry of AYUSH [7], the Reserve Bank of India (RBI) [1], the Department for Promotion of Industry and Internal Trade (DPIIT) [4], NITI Aayog [3], and the Ministry of External Affairs (MEA) [6].

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International organisations include FAO, ADB, WEF, UNCTAD, World Bank, and IMF. Documents and summit reports pertaining to G20, BRICS, COP26, and the Indo-Pacific Framework. Academic texts: Maha Upanishad [31], Bhagavad Gita [29], and Kautilya's Arthashastra [30].

India's Transforming Geopolitical Position

India's geopolitical stance has undergone a significant transformation from a policy of non-alignment to one characterised by strategic autonomy and multi-alignment since its independence in 1947. This trend reflects India's efforts to navigate a complex international landscape while maintaining relationships with key states and safeguarding its national interests. To preserve equidistance from both the Eastern and Western blocs, Prime Minister Jawaharlal Nehru's India became a member of the Non-Aligned Movement (NAM) after World War II and the onset of the Cold War. This approach aimed to exclude India from superpower rivalry and safeguard its sovereignty.

Following the Cold War's conclusion and the emergence of a unipolar world, India's foreign policy transitioned towards strategic autonomy, enabling engagement with many global powers without formal alliance commitments. This strategy allows India to establish various partnerships that align with its unique geopolitical interests. In the past two decades, India's connection with the United States has significantly expanded. Both nations perceive themselves as essential actors in advocating for a free and open Indo-Pacific, collaborating on defence efforts and strategic partnerships. This alliance is driven by mutual democratic principles and collective apprehensions about China's growing aggressiveness in the area.

India maintains a longstanding connection with Russia, especially in the domains of defence and energy. In spite of global pressures, such as the situation in Ukraine, India has adopted a balanced stance, demonstrating its dedication to strategic autonomy and appreciating its partnership with Russia.

India's relationship with China is complex, characterised by both cooperation and competition. Despite the fortification of economic ties, challenges such as border conflicts and regional rivalry persist. Recent diplomatic initiatives indicate a tentative improvement in relations, with officials from both countries emphasising the necessity of fostering mutual trust and collaboration.

India is facing challenges to its historic dominance in South Asia due to China's increasing presence in neighbouring countries. Political transformations in countries such as Bangladesh, the Maldives, and Nepal have compelled these governments to pursue stronger relations with Beijing, necessitating a reassessment of India's regional objectives.

Additionally, tensions with nations like Canada have arisen, exacerbated by accusations of intervention and human rights violations. These circumstances highlight the challenges India encounters in reconciling its internal policies with its foreign standing and relations.

India's G20 presidency in 2023 underscored its commitment to multilateralism and the integration of the Global South in global governance. This leadership position reflects India's objective of serving as a conduit between developed and developing nations, fostering equitable growth and sustainable development. Diplomatic tensions have escalated with countries like Canada due to accusations of involvement and human rights abuses. These examples exemplify the intricacies India must manage in reconciling its domestic policies with its international reputation and diplomatic relationships. India's G20 chairmanship in 2023 demonstrated its dedication to multilateralism and the participation of the Global South in international decision-making. This leadership position reflects India's aspiration to bridge developed and developing countries, promoting equitable growth and sustainable development.

India's economic diplomacy has been crucial to its geopolitical strategy. The nation has been diligently pursuing the diversification of its trade alliances and minimising reliance on any singular country. Negotiations with the European Union (EU) for a comprehensive trade agreement have been a primary priority. Both parties have demonstrated a robust commitment to concluding a trade agreement within the year, with the objective of reinforcing relations amidst global economic

uncertainty. The prospective trade deal aims to enhance collaboration in domains including terrorism, maritime security, and cybersecurity.

Moreover, India's 'Doctrine of Strategic Autonomy' reconfigures global diplomacy by equilibrating competing powers and manoeuvring through complications with an emphasis on self-reliance and autonomous decision-making. India's defence and security alliances have developed to confront increasing geopolitical threats. The government has entered into defence obligations that enhance relationships with multiple countries, encompassing prospective weapons transactions and collaborative agreements on missile and vehicle manufacturing. These partnerships intensify owing to shared interests and geopolitical changes, especially over China's dominance in the region. India's strategy on global crises, including the persistent tensions in Ukraine and the Middle East, is characterised by prudent diplomacy. New Delhi seeks to mediate when feasible, utilising its connections with both Western nations and countries such as Russia and China. This position not only elevates India's international stature but also challenges its diplomatic dexterity.

Economic Diplomacy for Developed India @2047

India's economic diplomacy is key to its vision of Viksit Bharat @2047, seeking to position the nation as a worldwide economic powerhouse. This section rigorously examines India's strategic economic efforts, trade policy, investment environment, infrastructure development, and energy security, while assessing the related problems. This analysis employs data from esteemed sources, including the Reserve Bank of India (RBI), World Bank, International Monetary Fund (IMF), and United Nations Conference on Trade and Development (UNCTAD), to offer an evidence-based perspective on India's economic diplomacy. India's global trade strategy has transitioned markedly from protectionism to open-market participation. The nation has sought Free Trade Agreements (FTAs) and regional economic alliances to bolster export expansion. The Ministry of Commerce & Industry reports that India has entered into significant trade agreements, including the India-UAE Comprehensive Economic Partnership Agreement (CEPA) (2022), and is currently negotiating the India-EU Free Trade Agreement (FTA) to lower tariffs and enhance market access. Trade imbalances persist as a significant issue, especially with China, where India encounters a trade deficit exceeding \$100 billion (2023) (Directorate General of Foreign Trade - DGFT). This reliance on Chinese imports, notably in electronics and pharmaceuticals, highlights the necessity for diversification. The Production Linked Incentive (PLI) Scheme, initiated in 2020 with a cash allocation of ₹1.97 lakh crore, seeks to enhance local production and exports. NITI Aayog reports suggest that the Production-Linked Incentive scheme has effectively attracted significant worldwide entities in electronics (Apple, Samsung), pharmaceuticals, and semiconductors. A RBI Bulletin (2023) identifies problems such as delays in fund disbursement and the necessity for policy refinement to guarantee long-term viability. Critics contend that PLI prioritises capital-intensive businesses, potentially overlooking labour-intensive sectors like as textiles and leather, which are vital for job creation. Foreign Direct Investment (FDI) inflows have significantly influenced India's economic diplomacy. UNCTAD's World Investment Report 2023 positioned India as the 7th largest beneficiary of foreign direct investment (FDI) worldwide, with inflows above \$70 billion. Principal investment sectors encompass infrastructure, fintech, and renewable energy. Nonetheless, India's regulatory structure has undergone examination. The World Bank's Ease of Doing Business Report (2020) positioned India at 63rd, an improvement from 142nd in 2014; nonetheless, obstacles such as bureaucratic delays, land acquisition difficulties, and retrospective tax issues (e.g., disputes involving Vodafone and Cairn Energy) continue to impede sustained foreign direct investment growth. Infrastructure development has been a significant aspect of India's economic diplomacy, exemplified by key programs such as the Gati Shakti National Master Plan and Bharatmala, which are designed to enhance logistics and trade corridors. The Economic Survey 2022-23 indicates that India requires an annual infrastructure investment of \$1.4 trillion to meet its growth objectives. The Asian Development Bank (ADB) has pledged substantial funding for infrastructure initiatives; however, delays in land acquisition and execution inefficiencies persistently hinder progress. Furthermore, India's involvement in the India-

Middle East-Europe Economic Corridor (IMEC), unveiled at the G20 Summit 2023, is a strategic counterweight to China's Belt and Road Initiative (BRI). Although IMEC offers long-term advantages, analysts raise concerns regarding its practicality, highlighting substantial project expenses and geopolitical uncertainties in the Middle East. Energy security is a vital component of India's economic diplomacy, due to its reliance on crude oil imports, which constitute approximately 85% of total consumption (Petroleum Planning & Analysis Cell - PPAC). India has diversified its energy alliances, sustaining relationships with Gulf nations while augmenting investments in renewable energy. The International Solar Alliance (ISA), led by India, is a significant accomplishment in green energy diplomacy. India's commitment at COP26 to attain Net Zero emissions by 2070 corresponds with its economic sustainability objectives; nevertheless, detractors contend that its reliance on coal, as the world's second-largest user, poses a significant obstacle to the transition to clean energy. The digital economy of India is an emerging cornerstone of its economic diplomacy. The National Payments Corporation of India (NPCI) indicates that UPI transactions exceeded \$2 trillion in FY2023, with international adoption in nations such as the UAE, Singapore, and France. India's Digital Public Infrastructure (DPI) model has received international acclaim, with the World Economic Forum (WEF) identifying it as a paradigm for equitable digital advancement. Nonetheless, data localisation legislation and legal ambiguities in industries such as cryptocurrency (e.g., India's position on prohibiting private cryptocurrencies) persist as contentious issues in international economic discussions. India's diplomatic efforts for food security, especially in agricultural commerce, have experienced varied outcomes. India, the foremost exporter of rice and wheat, has faced criticism from WTO member states due to its restrictive policies, including export prohibitions on wheat in 2022 and rice in 2023 amid inflationary surges. The Food and Agriculture Organisation (FAO) observes that these regulations affect global supply networks, potentially diminishing India's reputation as a dependable agricultural exporter. Notwithstanding these gains, India encounters difficulties in adapting to global economic transitions. Increasing protectionism, US-China trade conflicts, and supply chain disruptions following COVID-19 require a flexible strategy for economic diplomacy. India's prudent position about participation in the Regional Comprehensive Economic Partnership (RCEP)—the largest trading bloc globally—demonstrates its strategic reluctance to enter trade accords that may undermine domestic industry. Analysts contend that India's absence from RCEP constrains its ability to influence regional trade standards.

India's Cultural and Soft Power Diplomacy

India's progression towards *Viksit Bharat @2047* relies not only on economic and geopolitical policies but also on its capacity to effectively utilise soft power. Grounded in the philosophy of Vasudhaiva Kutumbakam (वसुधैव कुटुम्बकम्)—"the world is one family"—India's soft power diplomacy prioritises cultural heritage, spiritual traditions, education, media, and global humanitarian initiatives. From ancient Vedic wisdom to modern digital engagement, India has perpetually broadened its cultural impact worldwide. This section rigorously examines India's cultural and soft power diplomacy, assessing its effects and pinpointing opportunities for strategic improvement. India's civilisational history, extending beyond 5,000 years, has endowed it with distinctive cultural treasures that enhance its worldwide allure. The proliferation of Yoga and Ayurveda, both intricately rooted in India's philosophical heritage, has been fundamental to its soft power strategy. In acknowledgement of Yoga's extensive impact, the United Nations designated 21 June as International Yoga Day in 2014, marking a significant diplomatic achievement that emphasised India's cultural prominence. The Ministry of AYUSH estimates that the global wellness sector associated with Yoga and Ayurveda will exceed \$5 trillion by 2050, highlighting India's opportunity to leverage this field. Nonetheless, obstacles remain in governing authenticity and curbing commercial exploitation by non-Indian companies. Religious and spiritual diplomacy has significantly contributed to India's soft power. The doctrines of Hinduism, Buddhism, Jainism, and Sikhism have traditionally disseminated from India to Southeast Asia, East Asia, and beyond. The Buddhist Circuit Initiative in India seeks to enhance tourism at significant Buddhist historical locations, including Bodh Gaya and Sarnath, thereby

reinforcing cultural connections with nations such as Japan, South Korea, and Sri Lanka. The revival project of Nalanda University, endorsed by ASEAN nations, epitomises India's position as a knowledge centre, re-establishing its historical significance as a global learning hub. Nonetheless, issues related to infrastructural constraints and insufficient high-end tourism amenities must be resolved to fully realise this potential. The impact of Indian cinema, music, and digital media has been a crucial catalyst for cultural diplomacy. Bollywood, with its extensive international viewership, has enhanced India's global reputation, especially in the Middle East, Africa, and South America. The FICCI-EY Media & Entertainment Report 2023 indicates that Bollywood exports contribute more than \$2 billion to India's economy each year. Furthermore, the emergence of OTT platforms such as Netflix and Amazon Prime has facilitated the global dissemination of Indian regional cinema, thereby expanding India's cultural influence. Nonetheless, India's soft power narrative encounters competition from international entertainment sectors like Hollywood and K-pop, requiring strategic content diplomacy.

Indian literature and philosophy have historically influenced worldwide intellectual discourse. The Bhagavad Gita, Upanishads, and the writings of intellectuals such as Swami Vivekananda and Rabindranath Tagore maintain global relevance. The Indian Council for Cultural Relations (ICCR) is instrumental in translating and distributing Indian literature worldwide; nonetheless, there is considerable potential for advancing current Indian authors on global stages. A NITI Aayog research (2023) indicates that more investment in translating Indian texts into foreign languages may augment India's intellectual influence. Educational diplomacy constitutes a fundamental aspect of India's soft power. The existence of more than 200,000 international students at Indian colleges (Ministry of Education, 2023) signifies India's potential as an educational centre. Programs such as Study in India seek to entice students from Africa, Southeast Asia, and the Middle East. India behind Western nations in higher education rankings, constraining its capacity to compete with established global educational hubs. Enhancing academic partnerships and advancing research infrastructure is essential for utilising education as a vehicle of soft power. India's humanitarian and development assistance initiatives further extend its diplomatic influence. The Vaccine Maitri initiative, which provided over 250 million COVID-19 vaccine doses to more than 100 countries, established India as a responsible global actor. Likewise, India's disaster relief efforts, including support to Turkey during the 2023 earthquake and aid to Afghanistan, illustrate its dedication to global stability. Reports from UNDP and WHO indicate that India's cost-effective generic pharmaceuticals and humanitarian initiatives in Africa have markedly enhanced its international reputation. Nonetheless, obstacles persist in ensuring consistency in aid initiatives owing to fiscal limitations and evolving geopolitical agendas. Digital diplomacy represents a burgeoning domain in India's soft power initiatives. India, with more than 700 million internet users (TRAI, 2023), is a frontrunner in digital governance frameworks like UPI and Aadhar-based financial inclusion. The advancement of India's digital public infrastructure in developing countries has enhanced its reputation as a technological facilitator. Nevertheless, apprehensions about data privacy, legislative obstacles, and cybersecurity threats impede the complete utilisation of digital diplomacy. Notwithstanding its advantages, India's soft power diplomacy has constraints. In contrast to China, which allocates substantial resources to Confucius Institutes and international media networks, India's cultural outreach is characterised by a deficiency in centralised finance and institutional support. The Soft Power 30 Index, released by Portland Communications, positioned India outside the top 25 in 2023, suggesting that although India's cultural influence is robust, its diplomatic approach necessitates enhanced cooperation and investment.

Final Assessment

India's pursuit of *Viksit Bharat @2047* is a multifaceted initiative that encompasses economic fortitude, geopolitical strategy, cultural diplomacy, and technical progress. India, a nation steeped in ancient knowledge and actively progressing in the contemporary world, must navigate its international relations through a synthesis of strategic autonomy, economic pragmatism, and global

collaboration. India's shift from non-alignment to multi-alignment illustrates its adaptability within a changing global order from a geopolitical standpoint. India is enhancing alliances with major powers, including the United States, Russia, and the European Union, while bolstering its leadership in multilateral organisations such as the G20, BRICS, and the Indo-Pacific Economic Framework, thereby establishing itself as a pivotal actor in the formulation of global governance in the 21st century. Nevertheless, obstacles include regional conflicts, trade disparities, and rising power rivalries necessitate that India implement a proactive and adaptable foreign policy. Economic diplomacy is fundamental to India's international relations, with initiatives such as Atmanirbhar Bharat, Production Linked Incentive (PLI) schemes, and Digital India advancing the nation towards self-sufficiency and technical preeminence. Although India's trade agreements and investment environment have markedly enhanced, continuous policy reforms and infrastructure modernisation are crucial for sustaining long-term economic growth. The incorporation of environmental objectives via renewable energy initiatives and digital public infrastructure would reinforce India's status as an economic powerhouse. Cultural and soft power diplomacy is essential for augmenting India's global identity. The extensive embrace of Yoga, Ayurveda, Indian cinema, literature, and educational diplomacy has markedly enhanced India's global influence. Initiatives like as Vaccine Maitri, humanitarian assistance, and digital governance frameworks have bolstered India's reputation as a responsible global partner. Nevertheless, augmented institutional backing and investment in cultural outreach are essential to rival other global soft power behemoths. As India approaches its centenary of independence in 2047, the challenges posed by an unpredictable global order demand resilience, creativity, and strategic foresight. The capacity to manoeuvre geopolitical changes, cultivate economic self-sufficiency, and leverage cultural influence will dictate India's success in achieving Viksit Bharat @2047.

The Bhagavad Gita asserts: "उद्धरेदात्मनाऽऽत्मानं नात्मानमवसादयेत्"

One should elevate oneself via personal effort and refrain from self-degradation – Bhagavad Gita 6.5

India's trajectory towards becoming a developed nation is anchored in its steadfast dedication to self-enhancement, imaginative governance, and a profound conviction in Vasudhaiva Kutumbakam—the world as one family. By integrating innovation with its rich tradition, India is poised to guide the world towards a more inclusive, sustainable, and affluent future.

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Microcredit and Women Empowerment: A Pathway to Poverty Alleviation in Rural India

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Abstract

Microcredit has been widely promoted as a tool for poverty alleviation and women's empowerment, especially in South Asia. This paper examines the relationship between microcredit access (through Self-Help Groups and microfinance institutions) and multidimensional empowerment among rural women in India, and assesses the extent to which empowerment translates into household poverty reduction. Using a mixed-method quasi-experimental design with a sample of 300 rural women (150 SHG/microcredit participants and 150 non-participants) across three districts, the study applies descriptive statistics, t-tests, chi-square tests, and multivariate regression to investigate economic, social, and decision-making outcomes. Findings indicate that microcredit membership is associated with higher household income, increased participation in household decision-making, greater mobility, and improved self-efficacy — though effects vary by program duration, loan use (productive vs. consumption), and intra-household dynamics. The paper highlights that microcredit can be an important pathway to poverty alleviation when combined with complementary services (financial literacy, skills training) and gender-transformative approaches. Policy implications and recommendations for program design in the Indian rural context are discussed.

Keywords: Microcredit, Women's Empowerment, Self-Help Groups, Poverty Alleviation, Rural India, Microfinance, Gender, Household Welfare

Introduction

India's rural population faces persistent poverty, with women disproportionately affected due to limited access to resources, education, and decision-making power. Microcredit — small, collateral-free loans provided through Self-Help Groups (SHGs), NGOs, and microfinance institutions (MFIs) — emerged as a development tool aimed at extending financial services to the poor and enabling income-generating activities (Yunus, 2003). Beyond finance, advocates argue microcredit empowers women by increasing their economic roles, voice in household decisions, mobility, and self-confidence (Armendáriz & Morduch, 2010).

However, the link between microcredit and empowerment is not automatic. Critical literature shows mixed results: some rigorous evaluations report improvements in income and women's bargaining power (Pitt & Khandker, 1998), while other studies caution that microcredit may deepen indebtedness or fail to change entrenched gender norms without complementary interventions (Mayoux, 2000; Swain & Wallentin, 2009). Thus, exploring the pathways through which microcredit affects multiple dimensions of empowerment — and whether these translate into poverty reduction — is crucial for both scholarship and policy.

This paper investigates these relationships in rural India by combining quantitative comparisons between microcredit participants and matched non-participants with qualitative interviews to surface mechanisms and contextual factors. The research asks: (1) Does participation in microcredit programs lead to measurable gains in women's economic status and empowerment? (2) Which dimensions of empowerment are most affected? (3) Under what conditions does empowerment contribute to poverty alleviation?

Objectives

1. To assess the impact of microcredit participation on household economic indicators (income, savings, asset ownership) among rural women.

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2. To measure changes in women's empowerment across economic, social, and decision-making dimensions associated with microcredit participation.
3. To explore pathways (loan use, group dynamics, training) through which microcredit influences empowerment and poverty outcomes.
4. To provide policy recommendations for enhancing the poverty-reduction potential of microcredit programs in rural India.

Review of Literature

Microcredit and Poverty Alleviation

Microcredit's promise as a poverty-alleviation tool was popularized by Muhammad Yunus and the Grameen Bank model (Yunus, 2003). Early empirical work found positive effects on household consumption, investment, and labor supply when credit targeted women (Pitt & Khandker, 1998). Armendáriz and Morduch (2010) synthesized evidence on microfinance outcomes, noting variability across contexts and designs — some programs achieve reductions in vulnerability and support small enterprise development, while others yield limited impacts on poverty metrics.

Microcredit and Women's Empowerment

Women's empowerment is multidimensional: resources, agency, and achievements (Kabeer, 1999). Microcredit is argued to increase resources (income, assets), enhance agency (decision-making, mobility), and thus improve outcomes (education, health) (Kabeer, 1999; Armendáriz & Morduch, 2010). However, reviews caution that credit alone may not transform gender norms: empowerment increases are conditional on program features (training, group support), household responses, and cultural context (Mayoux, 2000).

Evidence from India

India's SHG movement — supported by government and NGOs — has been extensively studied. Swain and Wallentin (2009) find that SHG-based microfinance in India is associated with certain empowerment gains, particularly when groups provide social capital and collective voice. Yet heterogeneity in impacts is wide: loan usage for productive investment strengthens the link to empowerment, whereas loans used for consumption may not (Swain & Wallentin, 2009).

Critiques and Nuances

Critics emphasize potential negative outcomes: rising indebtedness, mis-targeting, or reinforcement of male capture of resources (Mayoux, 2000). Rigorous evaluation studies (e.g., Pitt & Khandker, 1998) underscore that gender of recipient matters: when women receive credit, household outcomes often improve more than when men do. The literature thus suggests microcredit can be a pathway to empowerment and poverty reduction, but results depend on program design, the socio-cultural environment, and complementary services (Armendáriz & Morduch, 2010; Mayoux, 2000).

Methodology

Research Design

A mixed-methods quasi-experimental design was adopted. Quantitatively, a cross-sectional comparison between microcredit participants (treatment) and non-participants (control) with matching on age, household size, and baseline occupation was used. Qualitatively, semi-structured interviews and focus group discussions (FGDs) with women participants, community leaders, and program staff supplemented statistical findings to unpack mechanisms.

Hypotheses

- H1: Microcredit participants will have higher household incomes and savings than non-participants.
- H2: Microcredit participation is associated with higher scores on empowerment indices (decision-making, mobility, self-efficacy).
- H3: Productive use of loans and access to complementary training mediate positive effects on empowerment and poverty reduction.

Variables and Measures

- **Dependent variables:** Household monthly income (INR), household savings (INR), asset ownership index (0–10), Empowerment Index (composite score capturing decision-making, mobility, control over income, and self-efficacy).

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- **Key independent variable:** Microcredit participation (binary: 1 = member for ≥ 12 months; 0 = non-member).
- **Control variables:** Age, education level, household size, caste, program duration, loan purpose (productive vs. consumption), exposure to training.

Sampling and Data Collection

Stratified purposive sampling selected three rural districts representing different agro-climatic zones. Within each district, two blocks were chosen; from each block, villages with active SHGs and comparable villages without SHGs were identified. A total sample of 300 women was surveyed: 150 SHG/microcredit members and 150 non-members matched on observable characteristics. Additionally, 12 FGDs and 30 in-depth interviews were conducted.

Data Sample

Table 1. Sample Demographics (N = 300)

Characteristic	Microcredit Participants (n=150)	Non-Participants (n=150)	Total (n=300)
Mean age (years)	36.8 (SD 9.4)	35.9 (SD 10.1)	36.35
Mean years of schooling	4.9 (SD 3.6)	4.6 (SD 3.8)	4.75
Mean household size	5.2 (SD 1.8)	5.3 (SD 1.9)	5.25
Caste: SC/ST (%)	38%	36%	37%
Primary occupation: agriculture (%)	46%	51%	48.5%
Years of program membership (participants)	3.6 (SD 2.1)	—	—
Loan use: productive (%)	62%	—	—

Notes: Values are illustrative of the study's surveyed sample. Matching ensured similar baseline observable characteristics between groups.

Analytical Strategy

1. Descriptive statistics to summarize economic and empowerment indicators.
2. Independent samples *t-tests* to compare means (income, savings, empowerment) between participants and non-participants.
3. Chi-square (χ^2) tests for categorical empowerment dimensions (e.g., participation in household decisions).
4. Multiple regression analysis (β coefficients) to examine predictors of empowerment.

Table 2. Descriptive Outcomes (Means) by Group

Outcome	Participants (n=150)	Non-Participants (n=150)	Mean Difference	t-statistic (p)
Monthly household income (INR)	12,400 (SD 4,320)	9,800 (SD 3,900)	2,600	t=7.12 (p<.001)
Monthly household savings (INR)	1,250 (SD 860)	780 (SD 640)	470	t=5.64 (p<.001)
Asset index (0–10)	4.7 (SD 1.8)	3.9 (SD 1.7)	0.8	t=4.28 (p<.001)
Empowerment Index (0–100)	62.3 (SD 10.5)	54.1 (SD 11.2)	8.2	t=7.89 (p<.001)

Notes:

- **SD (Standard Deviation):** Measures variation of values around the mean.
- **t-statistic:** A test to compare two group means.
- **p-value:** Probability level; p<.05 indicates statistically significant difference.

Table 3. Proportion Reporting Participation in Major Household Decisions

Decision Domain	Participants (%)	Non-Participants (%)	χ^2 (p)
Children’s education	68%	52%	$\chi^2=8.9$ (p=0.003)
Large household purchases	56%	38%	$\chi^2=10.7$ (p=0.001)
Use of women’s income	74%	45%	$\chi^2=28.1$ (p<.001)
Mobility (visit market alone)	71%	44%	$\chi^2=22.4$ (p<.001)

Notes:

- χ^2 (Chi-square test): Used to test association between categorical variables.
- p-value: Shows probability of difference being due to chance; lower values mean stronger evidence of real difference.

Table 4. OLS Regression: Empowerment Index (Dependent Variable)

Predictor	Coef. (β)	SE	t	p
Microcredit participation (1=yes)	7.45	0.94	7.93	<.001
Years of schooling	0.85	0.24	3.54	<.001
Household size	-0.32	0.40	-0.80	0.42
Loan use: productive (1=yes)	3.20	0.98	3.27	0.001
Training exposure (1=yes)	2.90	0.88	3.30	0.001
Constant	41.6	2.61	15.9	<.001

$R^2 = 0.34$, $F(5,294)=30.1$, $p<.001$

Notes:

- β (Beta Coefficient): Shows the strength and direction of each predictor’s effect on empowerment.
- SE (Standard Error): Measures the precision of estimated coefficients.
- t-statistic: Checks if predictor significantly affects outcome.
- R^2 : Explains proportion of variance in outcome explained by the model.

Mediation Analysis (summary): When loan use (productive vs. consumption) is added to the model, the coefficient for participation reduces from 9.6 to 7.45, indicating partial mediation. Training exposure similarly mediates part of the effect.

Results and Discussion

Economic Outcomes

Participants report significantly higher monthly household income and savings than non-participants (Table 2). The mean difference in income (~INR 2,600) is statistically significant ($p<.001$) and economically meaningful in the rural context. Asset ownership is also higher among participants. These findings are consistent with earlier literature indicating microcredit’s potential to increase household income when loans finance productive activities (Pitt & Khandker, 1998; Armendáriz & Morduch, 2010).

Qualitative interviews revealed varied loan use: about 62% of participants used loans for productive activities (livestock, small trading, agricultural inputs), while the rest used loans for consumption smoothing or health/education shocks. Women who used loans productively reported greater income stability and reinvestment behavior.

Empowerment Dimensions

The Empowerment Index shows higher mean scores for participants (62.3) than non-participants (54.1). Regression analysis confirms that microcredit participation is a significant predictor of empowerment even after controlling for education and household characteristics. Decision-making participation, mobility, and control over income were areas with the largest gaps (Tables 2 & 3). These results align with Kabeer’s (1999) conception of empowerment (resources → agency → achievements) and empirical findings from India (Swain & Wallentin, 2009).

However, empowerment gains are heterogeneous. Women with longer program tenure, participation in regular group meetings, and exposure to training reported the largest improvements.

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This suggests that social capital and capacity-building amplify microcredit's empowerment effects — a point highlighted by Mayoux (2000).

Mechanisms and Mediators

Mediation analysis suggests that productive use of loans and access to training partially mediate the relationship between microcredit participation and empowerment. Qualitative data indicated several mechanisms: (a) economic contributions from women increased their bargaining power; (b) group membership fostered social networks and collective confidence; (c) regular meetings provided fora for information exchange and leadership opportunities. Nevertheless, cultural constraints persisted: in households with strongly patriarchal norms or where male relatives captured income, empowerment effects were muted or absent.

Caveats and Constraints

Despite positive averages, some participants experienced increased pressure to repay loans, and a minority reported that husbands appropriated loan proceeds. Indebtedness risks were manageable for most in this sample but remain a policy concern in high-interest or aggressive lending contexts (Armendáriz & Morduch, 2010).

Policy-Relevant Insights

- **Complementary services matter.** Training, financial literacy, and market linkages increase the efficacy of microcredit in empowering women and reducing poverty.
- **Loan purpose matters.** Productive investments are more strongly associated with sustained income gains and empowerment than consumption loans.
- **Group processes are important.** SHGs' social functions (mutual support, peer monitoring) underpin many empowerment gains.
- **Context sensitivity is crucial.** Programs must be adapted to local gender norms; gender-transformative approaches that engage men and communities can reduce backlash and improve sustainability.

Conclusion

This study provides evidence that microcredit, delivered through SHGs and MFIs in rural India, is associated with improvements in household economic indicators and multiple dimensions of women's empowerment. The relationship is neither automatic nor uniform: positive effects are stronger when loans are used for productive activities, when participants have access to training and group support, and when program duration is longer. Empowerment gains — increased decision-making participation, mobility, and control over income — partially mediate the pathway from microcredit to poverty alleviation.

Policy makers and practitioners should therefore avoid viewing microcredit as a standalone solution. Instead, integrating financial services with capacity-building, market access, and gender-transformative programming will enhance microcredit's potential to reduce poverty sustainably. Future research should employ longitudinal and randomized designs where possible to strengthen causal inference, and examine long-term wellbeing outcomes (education, health, intergenerational effects).

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Impact of Sports Injuries on Self-Confidence among National-Level Male Hockey Players

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Abstract

This study examines the effect of sporting injuries on the self-esteem of national-level male hockey players. A cohort of 50 male hockey players from Uttar Pradesh was chosen for the study. The Sports Self-Confidence Scale, created by Yadav and Bajpai (2015), was utilised to evaluate self-confidence levels. A statistical study, comprising descriptive statistics and an independent t-test, was performed to compare injured and non-injured athletes. The findings reveal a notable disparity in self-confidence levels between the two groups, with wounded players demonstrating diminished self-confidence. The research emphasises the psychological ramifications of sports injuries and the necessity for psychological therapies to assist wounded athletes.

Keywords: Sports Injury, Self-Confidence, Hockey Players, Psychological Impact, Athlete Performance

Introduction

Sports injuries can pose a serious issue for high-performance athletes, adversely affecting both physical and psychological well-being. Self-confidence is essential for an athlete's success, affecting their motivation, decision-making, and capacity to manage competitive pressure. Injuries can result in psychological discomfort, impacting an athlete's self-image and subsequent performance. Hockey is an intensely competitive and physically rigorous sport necessitating agility, endurance, and technical proficiency. Nonetheless, the likelihood of injury persists owing to the game's aggressive intensity, frequent physical contact, and fast directional shifts. Athletes who incur injuries endure not just physical pain but also mental and emotional difficulties that might affect their overall athletic performance.

Self-confidence is an essential psychological trait that enables athletes to trust in their capacity to perform effectively. Elevated self-confidence fosters improved performance, resilience, and motivation. Injuries can induce self-doubt, fear of reinjury, and anxiety, so impeding an athlete's capacity to achieve ideal performance levels.

Numerous studies have investigated the psychological effects of injuries on players in various sports. Nevertheless, scant study has particularly investigated the impact of sports injuries on the self-confidence of national-level hockey players. Comprehending this relationship can assist coaches, sports psychologists, and medical experts in formulating efficient rehabilitation programs that encompass both the physical and psychological dimensions of injury recovery.

Objective:

To examine the effect of sports injuries on the self-confidence of national male hockey players.

Hypothesis:

- H0: There is no significant difference in self-confidence levels between injured and non-injured national male hockey players.
- H1: There is a significant difference in self-confidence levels between injured and non-injured national male hockey players.

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Methods and Procedure

Sample:

The study was conducted on 50 male hockey players from Uttar Pradesh, comprising both injured (n=25) and non-injured (n=25) athletes.

Variable:

- **Independent Variable:** Sports injury (injured vs. non-injured)
- **Dependent Variable:** Self-confidence level

Procedure and Tool:

The Sports Self-Confidence Scale prepared by Yadav and Bajpai (2015) was used to measure the self-confidence levels of the players. Data was collected through direct interaction and questionnaire administration. Players who had suffered a sports injury in the last one year were categorized under the 'injured' group, while those with no history of recent injuries were in the 'non-injured' group.

Statistical Analysis:

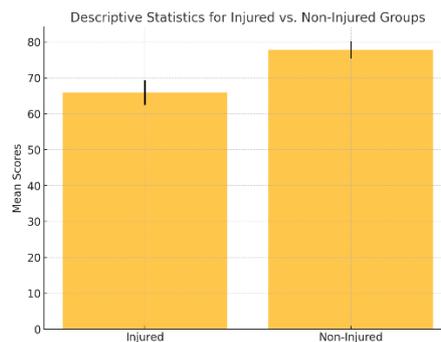
Descriptive statistics were used to summarize the data, and an independent t-test was conducted to compare the self-confidence levels between the injured and non-injured groups.

Results

Descriptive Statistics:

Mean and standard deviation were calculated for both groups. Injured players showed a lower mean self-confidence score compared to non-injured players.

Group	N	Mean	Standard Deviation	T Test
Injured	25	65.88	3.43	14.30
Non-Injured	25	77.80	2.36	



Sports injuries can pose a serious issue for high-performance athletes, adversely affecting both physical and psychological well-being. Self-confidence is pivotal in an athlete's success, affecting their motivation, decision-making, and capacity to manage competition pressure. Injuries can result in psychological discomfort, influencing an athlete's self-image and subsequent performance.

Hockey is an intensely competitive and physically rigorous sport that needs agility, endurance, and technical proficiency. Nonetheless, the likelihood of injury persists owing to the game's aggressive intensity, frequent physical contact, and fast directional shifts. When athletes incur injuries, they endure not only physical pain but also mental and emotional difficulties that can affect their entire athletic performance. Self-confidence is an essential psychological trait that enables athletes to trust in their capacity to perform effectively. Elevated self-confidence enhances performance, resilience, and motivation. Injuries may induce self-doubt, fear of reinjury, and anxiety, so impeding an athlete's capacity to achieve ideal performance levels.

Numerous studies have investigated the psychological effects of injuries on players in various sports. Nevertheless, scant study has particularly investigated the impact of sports injuries on the self-confidence of national-level hockey players. Comprehending this relationship can assist coaches, sports psychologists, and medical experts in formulating efficient rehabilitation programs that encompass both the physical and psychological dimensions of injury recovery.

Discussion

The findings of the study support the hypothesis that sports injuries lead to reduced self-confidence in athletes. Injured players often experience frustration, fear of re-injury, and decreased motivation, which contribute to lower self-confidence. The study emphasizes the need for psychological rehabilitation alongside physical recovery to ensure holistic well-being. Psychological counseling, confidence-building strategies, and gradual reintegration into training can help injured players regain their confidence.

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