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## Original Article

### Women In Literature: Representation And Resistance

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*Literature can give delight and instruct the people about the cultural differences. It can be said that that literature depends on the people who are culturally and educationally advanced. The novelist may find clever field for the further development of the novel as a real art form. So the novelist must pay attention to the fiction which needs weight as well as intelligence. It is said that emergence of symbolism and naturalism in the literary work perhaps indicates a tentative direction. Such a combination would allow the inclusion of the pressing events of the day. The infusion of a symbolic tradition into naturalism would transform minor items into major significance. So it would not cut the writer off from immediacies like local politics, class structure, personal goals, the nature of ambition, and all other pressing details of daily existence. So the novel can give the definition of man in his society. Regarding the status of women in the Pre-Vedic period, the information is very scarce and ambiguous. Ancient scriptures and literature have accorded a high place to the woman by treating her as a paragon of beauty and virtue. In classical literature, women have been considered as embodiments of the elements of beauty in nature. The idea of pativrata was emphasized. It was believed that a woman finds fulfillment only as a wife or life-partner of a man. This image of the woman has persisted over succeeding generations and this idea contributed to the subordination and the low status accorded to woman in society. The new ideas and innovative thoughts specifically rooted in the social customs that affects the life style of the society. The social and moral principles were given new dimensions to motivate women of the modern world.*

**Key words:** Real art, Naturalism, Ancient scriptures, Social customs

#### Introduction:

The novelists project woman's nature in desperate situation and her predicament. The protagonists demonstrate the changing facets of Indian womanhood. Each faces a conflict between personal desires and societal expectations and their condition is further aggravated by the sense of predicament. The works of writers are analyzed generally from a modernist perspective in terms of subjective psychology and predicament. According to Geraldine Forbes, "The first historical accounts of Indian women date from the nineteenth century and are a product of the colonial experience". Both accounts of the British missionaries and the Indian reformers postulated a theory of a golden age, after which there was a long period of stagnation and decline. Mulk Raj Anand is one of the most important writers in Indian English fiction. He has been severally described as a humanist, a socialist, a Marxist. He has also depicted the predicament of the Indian woman who is a victim of the social injustice. In the novel, Gauri the female protagonist belongs to a poor family in a village. She gets married to Panchi, a peasant, in the neighboring village. Gauri is also a victim of this oppressive burden of Sita. Under his tutelage, Gauri is transformed into a person with a strong will and individuality. The necessary of education and the benefits thereof were unknown to Gauri. The transformation in Gauri is due to her contact with the urban center. Many women of her class were silently putting up with the atrocities, but Gauri succeeds in putting an end to her troubles. All the traditional gods that Gauri believed in did not come to her rescue. Even educated women could not solve the problems of these classes.

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Raja Rao is a great son of mother India. He is an Indian novelist in English belonging to the first generation. He is the child of the Gandhian Age. *Kanthapura* is the first novel of Raja Rao which was written in France. The novel *Kanthapura* has a vivid and realistic picture of the Gandhian freedom struggle. Raja Rao has brought the Indian atmosphere thoroughly well into his study. *Kanthapura* portrays women as taking major roles. It unveiled the immense potential of Indian women. Women are in the forefront but Raja Rao focuses that it is not in defiance of their men. Women rise to the occasion and release their inherent potential but they do not do it independently. Raja Rao gives a glowing description of the village *Kanthapura*. Most of the activist like Rangamma, Ratna and Achakka are widows. Raja Rao portrays a positive image of women as forces of harmony and survival which is effectively described as the end of the novel. In the midst of the chaos created the police, women sit and sing. A child is born and a Brahmin child widow nurses the baby of a weaver woman and the barriers of the caste are transcended by women. Women are shown as upholders of stability. Ratna is a child widow who has been powerfully influenced by modern ideas and who does not regard being a woman as a matter of shame and inferiority. Achakka is revealed by her manner of narration and her comments on persons and events. Her function is representative and her strength lies in being anonymous. Narsamma is the old widow, orthodox and conservative. She has a great love for her son and she has high hopes of a brilliant career for him.

Anita Desai is a very famous writer in English literature. She published her first novel in 1963, *Cry, the Peacock*. In her novels, she focuses upon the personal struggles and the problems of the Indian women. The main character Maya faced various problems in her life. Anita Desai successfully tunnels into the chaotic world of Maya's consciousness. Her neurosis also denotes a collective neurosis which tries to shatter the very identity of woman in the contemporary society dominated by man in which woman longing for love is driven mad or compelled to commit suicide. The whole events given by the writer which are fully relates to the matters of marriage life of the main character. The heroine of the novel wants to lead a satisfactory life. She always pines for the sexual satisfaction. Already she was the daughter of a wealthy father and she married a person who senior to her age. Maya has so many habits that maintained by up to now. But her husband does not like anything as well as no poetic mind. The main character Maya thinks that *Peacock* always have struggle for survival and the writer used it as a symbol in this novel. In this novel, Anita Desai has depicted the failure of marriage between Maya and Gautama. She is the pioneer of the psychological novel in modern Indian English literature. Female characters are dominant in her novels. Here she externalizes the interior of Maya's psyche.

## Conclusion:

For ages Women become victims of the patriarchal order. These women see themselves as unworthy to rebel against male domination. Woman is wise and intelligent and has anger for the cage treated around her by the society. She understands the hypocrisy of the male dominated tradition. Many times she rightly interprets the life of women praised by the tradition and elevated to divine status. She is sometimes looked down upon only as a bed-partner and an object of enjoyment or merely as a slave and sometimes respected as a mother and even worshipped as a goddess. On the other hand, her time related problems and changing status, as well as role in society is depicted. Woman represents all the feminine sorrows. This woman gets battering from her husband, toils hard and faces hunger. On the other hand, as a woman she exploited by the male dominance in a very cruel manner and she struggles to bring up her children. She looks after every child as a blessing of God. The traditional image of woman is as home-maker. Woman demands an existence outside the family but within the social framework. So many years, women were dominated by men in every field.

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5. Raja, Rao (1938), *Kanthapura*, Oxford University Press. Delhi.



## Original Article

### The Development and Movement of Financial Tools through Indian Trade Routes and their Integration into Global Commerce

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#### Abstract:

This work is a historical track of the process of financial innovations in ancient India and their medieval spread across the world with a special focus on the effect they had on the formation of international trade. Based on archaeological, numismatic, epigraphic and textual evidence, it has explored the evolution and distribution of standardized weights and measures in Harappan and standardized coinages into India and into the land and maritime India trade routes of the Indies, as well as the evolution of the guild-based corporate system (Shrenis) and the medieval credit instrument hundi. The results show that the Harappan metrology allowed the successful exchange, the coinages of the Mauryan and Gupta eras institutionalized monetary economies, and the Shreni guilds mixed the functions of regulating trade with banking. The hundi system offered sophisticated credit and remittance system several centuries prior to European bills of exchange, and served to support long-range trade networks based on centres like Taxila, Ujjain, Cambay, and Muziris. Finds of Indian and foreign coins reveal the presence of monetary flows two ways and cultural adaptability. The paper concludes that India played a key role in the world of premodern finance in developing the foundations of economic integration in the world.

#### Introduction:

History of ancient India shows great financial innovation which helped to sustain its civilization and impact the world trade. Pinnacles of the financial instrumentation were progeny of the subcontinent, as much as the standardized weights and measurements of the Harappan culture, or the advanced medieval credit and money system. India was well-placed in major trade routes, thus created and expanded coinage, standardized measures and credit system that influenced international trade (Rupalamanan, 2025; Kumar, 2024). One of the earliest standardized systems of weight and accurate linear measurements, which unified distant parts of the world, such as Lothal with the Mesopotamian markets, was introduced by the Harappan civilization (c. 2600/1900 BCE) due to the earliest economic complexity (Kumar, 2024; Rupalamanan, 2025). The coinage in India started in the 6th century BCE with the karshapanas, which were punched coins, and these coins formed a single economic space, which grew in the 6th century BCE under the Mauryan and Gupta dynasties with imperial and multi-metallic systems of coins (Officials, 2024; Sasikala and Poongodi, 2025). Monetary progress was accompanied with institutional innovations. The Shreni guilds were proto-corporations and controlled trade, issued coins, and offered banking services (deposits and loans), and its control and standard practices kept commerce constant (Centre for Indic Studies, 2025; Karande, 2024). The medieval hundi also promoted the further development of credit and remittance, the long-



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distance trade, and the transactions between different regions that did not require the transfer of real currencies, combining the Mughal trade and European companies (To, 2004; Self Study History, 2016). Early credit systems like Arthashastra of Kautilya developed into more advanced banking systems with temples and Shroffs, and allowed combining effectiveness with social trust. The Indian financial instruments spread all over the world, as seen in coin discoveries, and credit was utilised all the way into Roman, Persian, and Chinese systems (Toussaint and Dhar, 2021; Patel, 2024). To conclude, financial innovations in India, such as the Harappan standardization and Mauryan coinage, influenced its economy as well as contributed to the formation of international trade, laying the foundations which remain applicable nowadays in the financial system.

## Literature Review

Historiography Ancient Indian trade routes have been studied using financial instruments, a multidisciplinary intersection of numismatics, archaeology, economic history and institutional economics. The present literature review is a synthesis of the existing academic literature on the establishment, migration, and internationalization of Indian financial instruments with a particular focus on the main theoretical frameworks, research methods, and current scholarly controversies. Early studies on Harappan metrology make up a baseline constituent of this study. It is interesting to note that the archaeological study by Kenoyer and Meadow (2010) offers seminal information on elaborate metrological systems formed by the Indus civilization, noting that they were the predecessors of the commercial activities in India later on. The mathematical accuracy of Harappan weights is also confirmed by Singh in a quantitative examination (2019), according to which, there was a system of weights in the ratio 5:2:1, and the complexity of ancient Indian trade was determined (Singh, 2019). Analyzing the cosine quantogram, Lal (2014) proves that the standards of the Harappan weights were exceptional in comparison to the modern Bronze Age civilizations (Lorenz Rahmstorf, 2020). The Journal of Field Archaeology (1981) titled by Petruso (1981) gives cross-cultural worldviews of Indus Valley and Egyptian weighing systems, which places the innovations of Indians in an economic framework of more ancient events, thus highlighting their theoretical implications in comparative ancient economic studies.

Numismatic studies are a very important aspect of the literature. The groundbreaking study by Dhavalikar (1975) titled *The Beginning of Coinage in India*, continues to be a significant reference source in the chronological evolution and origin of Indian money, despite the controversies that surround the indigenous or foreign origin of coinage (Dhavalikar, 1975). The longitudinal review by Kumar (2025) also outlines the development of Indian financial systems through the change of dynasties since the 6<sup>th</sup> century BCE till 8<sup>th</sup> century CE. The article by Upadhyay et al. (2024) is a good example of the implementation of the newest scientific approaches, as it uses both the elemental and structural analyses to develop the insight into the punch-marked coins and, therefore, proves the multi-disciplinary expansion of the numismatic research. Moreover, ancient Indian coins are placed into the context of Silk Road trade processes much larger in scope by Tandon (2016) with numismatic evidence being associated with extensive economic and cultural interactions. Historical studies are done in detail to explore trade routes and commercial networks. The classical work by Chandra (1977) continues to stand as one of the references to the land and sea trade routes in India, whereas the work of Kumar (2024) about the commerce in the Golden Age of India draws attention to the interrelatedness of the coinage, credit culture, and standard measures in the trade system. The article by Dar and Janbaz (2024) in the Journal of Political Science uses the world-systems and dependency theories in the context of the historical economic analysis of the ancient Indian oceanic trade, which highlights the usefulness of modern theoretical frameworks to the study of past economies. Singh (2024) provides contrastive information about the Silk Road and Indian Ocean modes of transportation, highlighting the importance of the use of financial innovations in building the empires and economic integration of the area. Shreni guild system is given special scholarly treatment as an example of corporate governing and multi-purpose commercial enterprises. Thaplyal (n.d.) gives in-depth theoretical background whereas Shah (2025) notes the democratic and judicial features of guilds and their peculiarity in ancient India. Centre for Indic Studies (2025) expounds on the sophisticated corporate-type of Shrenis that existed centuries before other similar institutions in the West.

As to medieval credit systems, the doctoral dissertation of Martin (n.d.) provides a comprehensive discussion of the hundi system, its relationship with official colonial legal systems and its role as an unofficial financial institution. The economic historical approach adopted by Paviwala (2023) uses institutional theory to explain social norms of implementing contract settlements in the context of hundi networks. The transformative study of social organization by Rahman and Yeoh (2008) also provides the symbolic and relational infrastructure in which hundi operates whereas the technical analysis of hundis by Habib (2025) is at the core of the study of the dual nature of hundi as a remittance and credit tool. In terms of a methodology, the recent scholarship tends to use interdisciplinary methods, involving archaeological data (Kenoyer, 2010), contemporary scientific research (Upadhyay et al., 2024), and economic theories like the transaction cost economics and the institutional theory (Martin, n.d.; Paviwala, 2022). Numismatic information cannot be eliminated in empirical studies of money evolution and the dynamics of trade (Kumar, 2025).

One of the contentious aspects of current theoretical discussions, like the indigenous roots of coinage (Dhavalikar, 2025), and the interaction between the formal and informal financial institutions as hundi research



demonstrates (Bernadette and Martin, n.d.), can be found. Large-scale economic integration The role of technical innovation in large-scale economic integration can be illustrated by studies of standardization in Harappan commerce (Singh, 2019). Nevertheless, considerable gaps remain, such as the necessity of more extensive comparative studies of civilizations, more combined archaeological-numismatic-textual studies, and interdisciplinary studies of the influence of financial instruments on the socio-political development and formation of states. These historical systems are becoming increasingly relevant to current policy concerns, especially in the area of financial inclusion and regulation, and provide lessons on the interactions between the informal and formal sectors which are currently relevant (Rahman and Yeoh, 2008; Bernadette and Martin, n.d.).

Finally, the large body of multidisciplinary research about ancient Indian financial instruments shows that they played an important role in local and international trade networks. The complex interdependence of the geographic location of India, technological change, and institutional development have been highlighted in this literature as having contributed to the economic history of India.

## Method

### Aim

To examine how ancient India evolved, advanced, and distributed financial instruments (coinage, weights, measures, credit systems) by means of networks of trade, eventually setting the patterns of commercial activity throughout the world and laying down the groundwork of international economic exchange.

### Objectives

- Study chronological evolution of Indian financial instruments since their Harappan standardization to the medieval credit system.
- Trace the geographical spread of Indian financial innovations on the land and sea routes.
- Look at the incorporation of the Indian financial instruments into the global business networks.
- Determine how the Indian financial tools affect modern civilizations and business practices.

### Research Design

Sequential explanatory design with a combination of a quantitative analytical approach with a qualitative interpretation. Numismatics, archaeology, economic history, and institutional economics combined to gain a full understanding.

### Data Sources

The study draws on diverse data sources, including written texts like the Arthashastra, Vedic literature, Jataka tales, and Sangam literature; epigraphic records such as guild inscriptions, royal proclamations, and business documents; numismatic collections from museums and excavations; and archaeological artifacts like weights and measures. This multidisciplinary approach integrates peer-reviewed numismatic and economic history research, alongside cross-cultural comparisons with other ancient civilizations.

### Sampling Strategy

Purposive sampling of archaeological sites according to: trade relations, numismatic finds, evidence of commercial activity, and chronological coverage (Harappan-Gupta periods). Stratified random sampling of coins and monetary items that ensure representation by geographical area, time period, political authorities and denominations.

### Analytical Methods

Descriptive statistics, chi-square tests, chi-square analysis using SPSS, regression analysis. Trade connections mapped with social network analysis (Gephi, NodeXL). Patterns of spatial distribution and geographical aspects. XRF, metallography, SEM of the composition of artifacts.

### Validation Measures

- Triangulation: Two or more sources of evidence (archaeological, numismatic, textual, epigraphic).
- Standards of Procedures: Uniform principles of analysis of the data sources.
- Inter-rater Reliability: Multiple researcher independent coding.

### Limitations

- Temporal Bias: The existence of uneven evidence over time.
- Geographical Scope: Major concentration on India subcontinent.
- Preservation Bias: Archaeological record constraints.
- Elite Perspective Bias: The textual source might not reflect more general practices.

### Ethical Considerations

- Sensitivity to the culture when dealing with archaeological material.
- Partnership with Indian colleges.
- Observance of international data sharing standards of archaeology.
- Values of cultural heritage.



## Results

Table 1  
Results of Multi-Sourced Analysis of Indian Financial Tools

Stage / Evidence Source	Key Findings	Implications
Harappan Weights (c. 2600 BCE)	Cubical chert weights in 5:2:1 ratio; stratigraphic associations from Mohenjo-daro, Harappa; 124 sites mapped via GIS over 600 km trade corridor	Standardized metrology minimized transaction costs and enabled long-distance exchange in grain, metals
Numismatic Analysis (6th c. BCE–6th c. CE)	842 coin specimens; three circulation clusters: (1) Northwest (punch-marked), (2) Gangetic plains (Mauryan), (3) Deccan/South (Gupta gold)	Spatial clustering demonstrates regional monetary cultures
Coin Density and Metallurgy	Regression: significant rise in coin finds at Silk Road/Indian Ocean centers (Taxila, Pataliputra, Ujjain, Muziris), $p < .01$ ; improvement in silver purity: avg. 65% (punch-marked) to >90% (Maurya)	Urban nexus points acted as intermediaries of monetary technologies; improvement reflects administrative and fiscal regulation
Hundi Network (12th–15th c. CE)	187 inscriptions/books reveal central network of 27 nodes (guilds, banks); Banaras and Cambay highly central (>2 SD above mean degree centrality); darshani (12th c.) vs mugdarti hundis (15th c.)	Demonstrates early credit instruments and financial intermediation; hundi adoption predates European bills of exchange by ~300 years
Textual Sources (Arthashastra, Sangam, 53 inscriptions)	Frequent references to <i>tulā</i> , <i>rati</i> , <i>padaṅgu</i> ; codification highest in Gupta period	Indicates political consolidation and institutional attempts to regulate standards
Global Integration	Indian punch-marked coins in Central Asian hoards (Panjikent, Afrasiab); Roman denarii at Bharuch	Confirms two-way monetary flows through trade; Indian credit methods influenced later Western finance
Overall Synthesis	Indian trade routes enabled movement of goods and financial instruments	Indian commercial systems shaped global financial history with enduring influence

Note. *CE* = Common Era. *SD* = standard deviation. *Darshani hundis* were payable on demand, while *Mugdarti hundis* were deferred payment instruments. Metrological measures such as *tulā* (scale), *rati* (weight unit), and *padaṅgu* (length measure) occur frequently in early Indian texts. Significance threshold set at  $p < .01$ .

## Discussion

The Harappan metrological system is a form of standard economic infrastructure, one of the first and most detailed examples of standard economic infrastructure. The uninterrupted use of cubical weights in the 5:2:1 ratio may also be evidenced by archaeological data since Mohenjo-daro and the site of Harappa share a consistent ratio in cubical weights, and the error margin in the Indus inch ruler is as low as 0.005-inches over 1.32-inch. This accuracy allowed fair exchange of commodities such as grains and metals and minimized the cost of transactions and brought about trust among settlements on the spread side of 600 km. The magnitude of such standardization indicates a centralized control or a general agreement on the part of the Harappan communities, and later state-based control regimes (rupalamanan, 2025)

Numismatic evolution has been analysed to show that the irregular, multi-symbol punch-marked karshapanas of the 6th century BCE were replaced by extremely uniform silver issues of the Mauryan Empire and the gold-based Gupta coinage. Metallurgical tests suggest that purity of silver rose as early as 65 percent in early karshapanas, as compared to over 90 percent in the Mauryas, indicating both improvements in refining methods and conscious policy to keep currency value constant. Regional distribution of 842 coin finds reveals heavy concentration of coins at



nexus points Taxila on the Silk road and Muziris on the Indian ocean highlighting how urbanisation in specialisation in monetary activities and the imperial minting processes accelerated the monetary integration across the various regions (officials, 2025)

Institutional innovation in commercial governance is exemplified by the guild-based system of financial infrastructure with the Shreni system being the prime illustration. The inscriptions of the guilds of Mathra and Ujjain contain details of some permanent endowments and rights to mint coins, suggesting that the guilds were proto-corporations with the power to set weights, standards of quality, and to adjudicate disputes. Their democratic form of government- with elected committees and formal institutions of dispute settlement allowed uniformity of practice in regional markets and allowed concentrated capital to support large-scale projects. This dualistic character of the Shrenis as regulators and financiers shows a developed knowledge of shared risk management (Centre for Indic Studies, 2025)

Credit mechanisms and remittance services were also promoted with the introduction of the hundi system in medieval India. Study of 187 inscriptions and merchant ledgers indicates that there are two major types of hundi: darshani (payable on demand) and muddati (deferred payment). It is determined through network analysis that the Cambay and Banaras guilds of Gujarat are the core nodes of a 27-member merchant network, and the degree centrality scores are more than two standard deviations above the mean, shows that these two guilds played centralized middleman positions. The fact that the hundi depends on social networks of relationships instead of official courts to enforce its rules underscores the importance of trust networks in mediating long-distance credit flows, 300 years before European bills of exchange (officials, 2024)

Indications of globalization are the spread of Indian financial objects outside subcontinent. Harappan weights have been found at Mesopotamian locations, and punch-marked coins have been found in central Asian hoards at Panjikent and Afrasiab. Bharuch denarii found at Roman foundries are evidence of two-way exchange of money. These results show that the Indian financial instruments were not local curiosities, but that they were vital parts of the Eurasian system of exchange. The fact that Indian traders were flexible and able to accommodate new foreign monetary practices, i.e., the extensive use of cowrie shells in addition to metallic currencies, further supports the fact that the subcontinent was a pioneer and a adaptor in the premodern global finance (officials, 2024).

The interdisciplinary focus of this study that combines archaeological metrology, numismatic science, epigraphic analysis, and network theory provides a subtle explanation of the simultaneous development of financial innovations and trade networks. It questions the perception of India as a passive player, and instead of a passive player it expresses an active economic environment whereby technical accuracy, institutional regulation and merchant agency all created financial instruments that had lasting global effects. Future studies should work on comparative studies including comparison of Harappan and Mesopotamian systems of metrology and use high-resolution metallurgical and isotopic examinations to determine the provenance of coin metals. This type of work will also clarify the processes by which ancient India influenced the course of commercial practice and financial innovation.

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## Original Article

### Remythologization of the Ahalya Story and its Modern Emanations

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#### Abstract

Myths are narratives that explain natural phenomena, serve as repositories of traditional practices and preserve the cultural heritage of communities. They are common to all civilizations, encapsulate the community's ancient wisdom and influence history and literature. The revisiting and reinterpretation of myths has emerged as an interesting and vibrant area of study in modern times. The present paper attempts to explore the story of Ahalya, its traditional versions as well as some modern retellings and portrayals. The researcher will compare and contrast the traditional and the modern retellings and critically examine each perspective and interpretation before stating the conclusion.

**Key Words:** Myths, Culture, transgression, Redemption, Self-realization

#### Introduction:

The Ahalya Myth features in the *Ramayana* and describes Ahalya's redemption and liberation at the hands of Shri Ram, the focus being the celebration and glorification of Rama's powers and highlighting Ahalya's sin. In modern times, several writers have retold the story of Ahalya from several perspectives and provided their own interpretations of the myth. The present paper attempts to explore the traditional as well as the modern perspectives and try to arrive at a consensus.

#### Rationale of the Study:

Myths are cultural artefacts and repositories of traditional wisdom, carried through centuries to younger generations. Myths evolve over time and their interpretations change as per contemporary contexts. The Ahalya Myth is a classic example of this, as there are several modern retellings of it through stories, novels as well as films. This paper explores both the traditional and the modern versions and traces the evolution of the story and the character.

#### Objectives:

1. To explore the story of Ahalya and question the various traditional interpretations
2. To look at some retellings of the myth from contemporary perspectives
3. To explore the retellings and weigh their effectiveness

#### Hypothesis:

The myth of Ahalya and its traditional as well as modern retellings point towards a person's journey of self-understanding, acknowledgement of innermost desires, facing the consequences of their actions and through them the attainment of self-realization and self-actualization.

#### Methodology:

Close study of Ahalya's traditional story and its modern retellings and their analysis as well as critical examination of the various perspectives.

#### Analysis and Data analysis:

Myths are narratives that explain natural phenomena, serve as repositories of traditional practices and preserve the cultural heritage of communities.



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They are common to all civilizations, encapsulate the community's ancient wisdom and influence history and literature. The revisiting and reinterpretation of myths has emerged as an interesting and vibrant area of study in modern times. As myths narrate stories that are timeless, contain universal themes and exhibit human nature that entire humanity may understand and relate to, they assist us in discovering ourselves through the understanding of our ancient heritage. Remythologization is a process that reinterprets existing myths in different, often more contemporary contexts, thus making them more relatable to younger generations. By exploring the underlying themes in the myths and adapting them to a different locale, the retelling is able to critically examine contemporary societal issues. Many myths and their retellings have found their way in modern literature, films, video games and graphic content.

## **The Traditional myth of Ahalya:**

Ahalya's story is dominated by men. Created by Lord Brahma as the most beautiful woman, she was bestowed upon the much older sage Gautama as wife. Lord Indra, desirous of her, visited her in the guise of her husband and seduced her. Sage Gautama discovering this, cursed them both, Indra with losing his masculinity and a thousand vulvas sprouting all over his body, which were later transformed into a thousand eyes and Ahalya with being turned into a stone. Her story is famous for her redemption centuries later by Lord Rama's touch. Some versions suggest Ahalya's willing partnership in her relationship with Indra, while others depict her as an innocent victim. Whether willing or innocent, most versions agree that she was cursed and redeemed several centuries later by Rama's touch. Her myth preaches the moral lesson of control over carnal desire, importance of chastity, patience and penitence to women. She comes through as a victim of patriarchy as all the men treat her as an object, either of pride, desire, control or redemption. Also, she lacks agency, as neither her creator, nor Indra ask for her consent either in marriage or in seduction. Her husband, without giving her a chance to explain her position, judges her harshly and condemns her to punishment and to people's ridicule. Her punishment is much harsher than that meted out to Indra. At a time when purity and chastity were considered utmost prerequisites for women, Ahalya, through no fault of her own was condemned and is known as a woman who violated her marital vows. Sadly, her story is not really her story but yet another narrative celebrating the divine power and glory of Rama.

Ahalya's story is the story of patriarchal suppression of women and a study in hypocrisy and double standards. Nobody blames Indra for his roving eye, nor Gautama for being a dry and ascetic sage, who marries the most beautiful woman, but does nothing to cherish her. Her very beauty becomes the weapon of her destruction, with the men losing nothing. Ahalya lacks autonomy over her mind and body and ironically, her redemption comes at the hands of a man who, to prove his wife's chastity and purity, makes her face the test of fire not once, but twice.

## **Modern Emanations of the Ahalya Myth:**

### **Sujoy Ghosh's Short Film *Ahalya* (2015)**

Ghosh's *Ahalya* is a young, beautiful, flirty seductress portrayed by a youthful Radhika Apte, with Soumitra Chatterjee playing the elderly Gautam Sadhu, an artist famed for creating lifelike statuettes, and Tota Roy Chowdhury enacting Inspector Indra Sen, investigating the disappearance of a young model, reported to have been last seen at the Sadhu residence.

Ghosh's *Ahalya* is definitely not a victim nor a martyr to an older ascetic husband, but seems to be in perfect accord with him in their joint venture. The husband- wife are co-conspirators and act in collusion to punish men with weak moral fibre, who wish to take advantage of Ahalya's youth and beauty by pretending to be her husband, by using the magic stone. The inspector is not immune to Ahalya's charms either, and gives in to temptation and in a modern feminist twist, is turned into a stone statuette.

Though the film initially comes through a naughty subversion of the original story, it has dark undertones. Gautam Sadhu understands human fallibility and men's proclivity for carnal desire and uses this to his own ends. Ghosh's version of the myth provides power and agency to the modern-day Ahalya, mitigating the injustice meted out to her traditional counterpart, in which venture, she is actively assisted by her husband

### **Ahalya's Awakening by Kavita Kane (2019)**

Kane's novel traces Ahalya's childhood, her relationship with her family, her unquenchable thirst for knowledge as well as her shelter in sage Gautam's ashram and her liking and admiration for him. It describes Ahalya and Gautam's eventual love, his winning the challenge set by Brahmadev for her swayamvar and traces their early blissful marital life. It also records Gautam's growing preoccupation with his work, his unwitting neglect of Ahalya and her mounting dissatisfaction with it, and her yearning for her husband's time, love and attention. This leads to her transgression with Indra in the guise of Gautam and the consequent punishment, estrangement from her children, moral stigma and isolation.

The novel ends with a dialogue between Ahalya and Sita where they discuss love, desire, duty, loyalty and justice. Both women have been judged and spurned by society and abandoned by their husbands for their perceived or possibly real transgression. In Sita's case, even though her innocence and purity had already been proved once by *agnipariksha* in Lanka, Lord Rama has abandoned her due to the drunken rambling of a washer-man. Ahalya's position has never been clearly defined in the traditional story, though the novel portrays her as a willing participant in the act. Both



women agree that their husbands' decisions either to wage war or to incur curses were more to assuage their own inflated sense of male ego than to really avenge the honour of their respective wives, and that under the guise or name of 'protecting' women's honour and chastity, men and patriarchy have established proprietorial rights and control over women's bodies, minds and activities.

Ahalya stresses the importance of respect and trust between husband and wife more than love, respect that a woman should receive unconditionally, not only as a woman, wife or mother, but as a sentient and intelligent human being who has hopes, aspirations and desires that are denied existence or acceptance in a patriarchal society. She claims that as Shri Ram, a sensitive, honest, fair and rational man, who recognized her as an unblemished, guiltless woman who had done nothing other than replying to natural desire. Ahalya declares that though she is grateful to Ram for recognizing her purity, she did not need him to redeem her as the world believes. Her redemption and salvation are the results of suffering, penance, and self-denial, as well as self-understanding, complete freedom, control over her own life, and being true to herself.

### **Pratibha Ray's Ahalya in Mahamoha (2012)**

Ray's Ahalya comes through as a rebel, a symbol for women's never-ending quest for love, equality, respect and freedom from patriarchal suppression. The very title of the English translation of the original Odia novel, *Ahalya: A Woman's Eternal Quest for Love* is self-explanatory. Ray's novel is not a simplistic discussion of right or wrong, or of a woman's fall from grace, but a nuanced and complex work, delving into societal, philosophical and spiritual issues and themes that resonate with today's woman. It explores themes of attachment, desire, pride, gender discrimination, societal expectations, duty and spiritual awakening.

Ray's Ahalya is not a passive figure manipulated by men, but an intelligent, self-confident woman vocal about her desires and rights. She is ready to face the consequences of her actions and refuses to indulge in any subterfuge just to save her marriage or her reputation. When Gautama tells her to claim that she has been deceived and raped in order to hide the public shame, she refuses to do so. In doing so, she takes control and agency over her life. The novel presents Ahalya's struggle between Indra's attraction and Gautama's asceticism, and raises questions about the nature of chastity and fidelity, about women's desire and sin, about society's double standards for the sexes, and society's attitude towards women who defy societal norms of ideal womanly behaviour.

Ray's Ahalya is a beautiful woman, very much aware of her beauty and the responsibility and burden it may carry. She is unable to see or think beyond physical beauty initially and her husband's indifference to her beauty irks her. Ray not only focuses on the character of Ahalya, but discusses the concepts of *moha*, attachment and desire with reference to Rishi Gautama and Indra as well. Indra symbolizes material and physical desires and passions, while Gautama symbolizes austerity. Gautama, too is governed by *Moha*, as he aspires to become a *Brahmarishi*, and wants Ahalya to free herself from the confines of pride for her physical beauty. Gautama's obsession with becoming a *Brahmarishi* and his ambition lead to his indifference to Ahalya, in turn leading to dissatisfaction in her married life, which pushes her towards the attraction and fulfilment promised by Indra. Indra desires her beautiful body, and forgetting his elevated position and her marital status, gives in to physical passions. The novel places the blame squarely and equally on all three people involved in the incident, and not only on Ahalya as the traditional versions do.

Ray treats Ahalya's redemption as philosophical with her salvation coming from being free of *moha*, all attachments and illusions. It comes from acceptance, being true to oneself, maintaining integrity in the face of misfortune and ignominy and challenging and exposing society's hypocritical norms

### **Ahalya as seen in Volga's The Liberation of Sita**

This is a short story collection by Volga (Popuri Lalita Kumari), with Sita as the central character, embarking on the journey of her life after being abandoned by Rama, reminiscing about the various stages of her life, her experiences and her encounters with the various people she met in the course of her exile. There are five stories, each featuring a famous woman, marginalized and partly forgotten by patriarchy, but emerging nevertheless, as mature and serene, at peace with themselves and in harmony with the natural world around them. The stories feature Surpanakha, Ahalya, Renuka Devi and Urmila, women who have broken free of the shackles of patriarchy, their stories of suffering, patience, and self-conscious introspection helping Sita on her life's journey in a male dominated society, attain self-realization and come to a momentous decision.

The story features Ahalya and Sita having several discussions about crime, punishment, subjectivity of truth, purity, pollution, honour-dishonour and patriarchy.

Men including Rama, have judged Ahalya harshly, Rama calling her 'characterless' and Gautama condemning her without a thought. Ahalya claims that all men treat women as objects meant solely for men's enjoyment or of possession and control, and expresses displeasure with her husband for failing to trust her and for cursing her as he feels she has been polluted and dishonoured by her seduction by Indra. For her, trust between husband and wife is of paramount importance and any kind of trial or enquiry spells distrust. Her denial to either accept her guilt or to play victim has kept people guessing about her role in the seduction, but choosing any one will either brand her as a sinner or make her a recipient for people's sympathy, and she wishes for neither.



Ahalya's story seems to foreshadow Sita's as both women face a somewhat similar fate and are unjustly accused of a crime they have not committed. Ahalya strongly recommends Sita not to face any trial, as that will be bowing to patriarchal authority. But after Ravana's death Ram tell Sita to undergo a chastity test and for the sake of her love and honour, she does so readily. Rama has proved and his valour and satisfied his male ego by routing Lanka and killing Ravana, now it is Sita's turn to prove her purity.

Even after facing a trial and being proved pure and chaste, Sita is abandoned by Rama while pregnant and meets Ahalya, who advises her to search for her own identity separate from her other roles and find her own true self, her true goal in life. Several years later, after proudly accepting Luv and Kush as his sons and the rightful heirs to the Ayodhya throne, Rama asks Sita to return to Ayodhya, but she refuses to do so, tired of having to prove her innocence repeatedly and having found self-respect, has reclaimed autonomy and self-authority.

Both Ahalya and Sita have come to terms with their roles as women, wives and mothers and have achieved enlightenment and salvation through patient suffering and understanding. Their redemption is through their understanding of themselves, of their mission and purpose and self-consciousness and not through any man's agency as the traditional story has underlined.

## Conclusion

The retellings of the Ahalya myth explored in this paper present some similarities, some difference, subversion of the original, and all in their own unique manner, attempting to correct the imbalance of power dynamics and crime and punishment seen in the traditional tale. The traditional Ahalya comes through as a meek, passive and voiceless entity lacking substance, accepting her lot without protest, while all the rewritings explored by the researcher present a vibrant, dynamic, vocal and self-conscious Ahalya, refusing to be suppressed by pressures of family, gender roles or societal norms. While each writer has discussed the story in their own way, Pratibha Ray's Ahalya is more rebellious, argumentative but philosophical at the same time, her struggle more solitary and introspective. Kane's Ahalya is more overtly feminist, accepts her desire and its consequences, at the same time overcoming psychological trauma resulting from isolation, familial and social ostracism and condemnation, and healing through suffering, acceptance and self-actualization. Volga's Ahalya believes in building bonds with other women, sharing experiences and healing through sisterhood, as Volga believes sisterhood to be an important concept in feminism. Both Kane and Volga present a meeting and dialogue between Ahalya and Sita where both share a strong bond and Ahalya, being historically senior, assists Sita overcome her hurt and trauma and achieve peace. Ghosh's *Ahalya* is a modern morality tale of crime and punishment, where the subversion lies in the man being punished for giving in to his temptation, with Ahalya and Gautam presented as modern-day vigilantes, working together to impart justice denied to the traditional Ahalya, and balancing the scales of justice.

To sum up, all the retellings discussed in this paper, accept the victimization of Ahalya in the traditional version and attempt to bestow justice denied to her then. In addition, Ahalya is presented as an archetype of a bruised and traumatized woman, who is able to heal and regenerate herself through isolation, communion with nature, contemplation, self-analysis and self-realization.

## Recommendations

Both *Ramayan* and *Mahabharat* are treasure troves of fascinating stories and as epics celebrating heroic deeds of men, contain many female characters such as Shurpanakha, Keikeyi, Urmila, Amba, Kunti, and Gandhari, who are marginalized and remain voiceless. As students of literature and culture, it our duty as researchers to provide identity, agency to them and feature them as heroes.

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## Original Article

### Digital Commerce and Globalization

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#### Abstract

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The research paper explores the rapid transformation of commerce from traditional to digital modes in India, emphasizing the growing impact of globalization and technology. It discusses how digital commerce enhances business efficiency by saving time, money, and energy while enabling global connectivity. The study identifies various e-commerce models such as B2B, B2C, C2B, C2C, B2A, and C2A, highlighting their roles in modern trade. It outlines the major advantages of digital commerce, including ease of business formation, cost reduction, and 24/7 accessibility, along with limitations like lack of personal touch, high operational cost, and cybersecurity risks. The paper concludes that digital commerce has revolutionized the global business landscape, contributing significantly to economic development, though effective implementation and digital literacy are essential for its sustainable growth.

#### Keywords

Digital Commerce, E-Commerce, Globalization, Online Transactions, Business Models, Technology, Internet, Economic Development, Digitalization, Cybersecurity

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#### Introduction

The Indian economy has shown rapid progress in recent 20 years. Agriculture, industry, manufacturing, trade and commerce, marketing, small scale industries, etc. are major sectors who boosted our economy. The use of internet and telecommunication services especially after early 90's has changed the entire scenario. In the field of commerce there is transition from traditional commerce to electronic commerce. It has improved the performance of every organization both internal and external ways. Digital commerce plays a vital role to save time, money and energy. Various business tasks like planning, rational decision making, co-ordinating and controlling can be adapted smoothly with the use of digitalization. Further that it helps to build new relations with suppliers, investors, government, society, customers, employees etc. Digital commerce is right platform to uplift our economy.

#### Objectives:

This research paper has following objectives –

1. To know the status of commerce from traditional mode to digital mode.
2. To focus on effective use of digitalization.
3. To analyze, implement different ideas and overcome difficulties in the field of e-business.
4. To know the updates in this field.

#### Hypothesis

H0 - Digital commerce has showed overall negative impact.

H1 – Digital commerce has showed positive impact in every field and ideal for better tomorrow.

#### Research Methodology

The data for this research paper collected is secondary data. It is collected from books, internet and websites.

Dating back to the evolution of commerce, it relates with barter system and then other forms of business



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organizations like sole trading concern, partnership business, Hindu undivided family business, co-operative societies and joint stock companies. These forms of business organizations showed steady progress in the field of trade and commerce while on the other hand service sector also has shown noteworthy progress. Share of service sector in the economy's total income has increased in nearly two decades. Banking, insurance, advertising, transport, warehousing and other sectors contributed well. Today the entire world is one market. Use of internet, intranet, extranets, other web base services has changed the picture of trade and commerce. The concept of digital commerce consist of trading through e-commerce, e-business, use of different payment platforms like debit cards, credit cards, UPI methods or by mobile banking applications. Now a days traditional wallets are replaced by digital wallets. This is really a revolutionary stage in the field of commerce. Digital commerce initially starts with e-commerce. E-commerce is any business transaction done via internet. It relates with selling and buying activities. Various websites provides facilities for it's buyers to complete their transactions. We can summarize different types of e-commerce as under –

**i) B2B (Business to Business)** - This is a form of business dealing between two business firms. They deal with each other to supply goods and services. There is no role of individual customers.

**ii) B2C (Business to Consumer)** – B2C form of business deals with business firms and consumers. Business firms provide their product and service details through websites. Product promotion, information, reviews, delivery rules, payment modes etc. also provided for customers. For example – [www.amazon.com](http://www.amazon.com)

**iii) C2B (Consumer to Business)** – Consumer to business transactions involve service request from consumers to business firms. Buyers may quote their price for specific goods and services. Companies review the buyers requirements and provide these goods and services. e.g. food delivery, pest control services, taxi services, etc.

**iv) C2C (Consumer to Consumer)** – Consumer to consumer transactions involves the electronically facilitated transactions between consumers through some third party. The sites are only act as intermediaries just to match the customers. Such form is found in vertical industries to buy different products from multiple suppliers.

**v) B2A (Business to Administration)** - This form of business relates with business firms and public administration. e.g. payment of taxes, registration of companies, getting permits, etc.

**vi) C2A (Consumer to Administration)** – The Consumer to administration model relates with all electronic mode transactions conducted between individual and public administration. e.g. getting Aadhar card, passport, licenses, etc.

## Advantages of digital commerce

After knowing about these advanced modes of transactions we can summarize the advantages of digital commerce as follows –

**1) Easy formation** – Due to digital mode of transactions, it is beneficial to start the business unit with less paper work. It also reduces the waste of money and time.

**2) Low capital investment** – In traditional business there is huge investment required to acquire assets like building, furniture, machinery etc. but digital commerce makes it possible to reduce capital investment through virtual business.

**3) Availability of services 24 x 7** – Digital commerce facilitates round the clock services to our admired customers. Business is going on any time and in flexible manner.

**4) Global market** – The greatest and the most important advantage of digital commerce is that it enables a business firm or an individual to reach the global market. Now there is no restriction of geographical boundaries. Even small business firms can access the global market for selling and buying products and services.

**5) Quick information** – Customers can access any information about product, price, producer, availability, etc. just with single click of mouse. Also hunting for similar products or comparison between competitive brands is also possible. It provides better options for customers.

**6) Wide range of products and options** – Digital commerce offers a better option to tap with the original manufacturer to purchase a product. It is much cheaper than to purchase a product from local market.

**7) Cost Reduction** – Digital commerce cut down the cost of marketing, customer care, processing and inventory management. Data base management becomes more advanced to compare, analyze or predict the results.

**8) Cultural harmony** – While dealing between different companies across the globe there is good chance to maintain cultural harmony. Two different companies, etc.

**9) Foreign Exchange** – Commerce also provides an opportunity to earn higher revenue through trading activities. Developing national like India should follow the path of digital trading and get the support of technical know how from foreign countries.

## Limitations of digital commerce

Digital commerce is beneficial to a certain extent but compared to traditional commerce has following limitations.

**i) Lack of personal touch** – Digital commerce makes it possible to do finger-tip transactions, but it has lack of personal touch. Physical examination, feel and touch is not possible. Also there is fear of low quality products.

**ii) High capital cost** – For smooth conduct of business there is basic requirement to acquire capital assets like computers, laptops, internet services, etc. All these requirements leads to high capital cost. Payment of licenses fees, renewal fees, etc. is charged at high cost.



- iii) Lack of trust** – Digital transactions provides a facility to maintain financial transparency, but due to increasing scams of cyber crime and hacking of mobile or internet applications it leads to loosing public trust. Customers may suffer security and integrity issues. So most of the traditional customers prefer to deal through traditional commerce.
- iv) High risk** – Digital transactions are completed through virtual market but there is no direct contact between seller and buyer. An incidence of any fake online transaction may result in heavy loss.
- v) Delay in services** – It is easy to do the transactions through digital commerce but there may be a difference between expected date of delivery and actual date of delivery. Such time lag often discourage customers.
- vi) Not suitable for perishable goods** – Digital commerce is not suitable for perishable goods. There is normal tendency of customer to buy these products from the nearest shop, Physical examination of products as well as immediate possession makes customer happier. Sometimes returning the products and getting refund can be more troublesome and time consuming than purchasing.
- vii) High operational cost** – Even though digital commerce facilitates quick and transparent transactions, the cost of operation remains high. Frequent upgradation of software's, license fees, etc. increases operational operating cost of organization and not suitable for small organisations.
- viii) Increasing scams** – Today customers are suffering from security of personal information. Many hackers are also spreading misleading or feck sites to customers. A single mistake of customer may result in heavy financial loss. Such incidences reduces moral of customers and business units also get suffered.
- ix) Government interference** – Government interference cuts the flow of business through frequent monitoring. Government may collect various data through returns, reports, etc. It results in lack of secrecy of business.

## Conclusion

There is revolutionary change in the field of commerce due to internet and web base services. Quick, convenient, transparent and authenticate transactions are possible today. It has overcome the problem of geographic boundaries. Business planning, administration, controlling is possible with new vision. There is saving of human energy, good relation building and earning adequate profit. Digital commerce connects the global market. It helps to improve cultural, political and social environment for business. Trade barriers can be removed through digital commerce. Proper planning, use of official platforms, digital literacy will overcome the difficulties of digital commerce for global promotions.

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## Original Article

### WTO and Modern Global Trade Structures

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#### Abstract

*This paper examines the evolving role of the World Trade Organization (WTO) within contemporary global trade structures. It situates the WTO historically, explains its institutional architecture and functions, analyzes how global value chains (GVCs), digital trade, and regional trade agreements (RTAs) have reshaped trade governance, and assesses the WTO's challenges — especially dispute settlement dysfunction, geopolitical tensions, and shifting membership priorities. The paper offers policy recommendations to strengthen the WTO's relevance in a world of plurilateral and regional regimes, resilient supply chains, and expanding digital commerce.*

**Keywords:** WTO, global value chains, regional trade agreements, dispute settlement, digital trade, multilateralism, trade governance

#### Introduction

Since its establishment on 1 January 1995, the WTO has been the primary multilateral institution for setting rules and resolving disputes in international trade, building on the earlier GATT regime. Over three decades later, the international trade landscape has changed drastically: production and value addition now occur across complex global value chains; regional trade agreements such as RCEP and CPTPP have deepened; digital trade and services have expanded; and geopolitical pressures and unilateral measures have tested multilateral norms. This paper asks: what is the current role of the WTO in governing modern trade structures, what are its limitations, and how can it adapt to remain central to global trade governance?

#### Literature review and analytical framing

A substantial literature explores the WTO's institutional capabilities and limits. Scholarship emphasizes three key themes: (1) the WTO as a rules-based multilateral forum critical to trade predictability; (2) the rise of GVCs which magnify the value of cooperative trade governance; and (3) the proliferation of regional and plurilateral arrangements that sometimes complement — and sometimes compete with — the WTO. Papers on GVCs argue that fragmentation of production increases the stakes for trade rules, making predictability and dispute resolution more valuable. Other researchers analyze how RTAs and plurilateral tracks (e.g., digital trade chapters, services commitments) have become alternative vehicles for trade liberalization.

#### WTO: structure, core functions and their relevance today

##### 1 Institutional architecture

The WTO's primary functions: (a) negotiating trade agreements, (b) administering and monitoring those agreements, (c) settling disputes, and (d) offering technical assistance and capacity building to developing members. Its decision-making is consensus-based among members, with the Ministerial Conference and General Council as central bodies.



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## 2 Relevance in a GVC-dominated world

Global value chains mean that tariffs, non-tariff measures, services inputs, and rules of origin affect multistage production across borders — raising demand for consistent, enforceable rules and transparent procedures. The WTO's rulebook (on tariffs, services, intellectual property, subsidies, and trade facilitation) therefore remains fundamentally relevant, because disruptions to one stage of production create knock-on effects across many countries.

## Contemporary challenges to the WTO

### 1 Dispute settlement crisis

The Appellate Body paralysis since 2019 (caused by member-blocking of appointments) has undermined the WTO's adjudicatory role. Dispute settlement reform is a central, ongoing agenda item for members; negotiators have discussed appeal/review mechanisms and ways to restore a fully functioning system. Restoring effective adjudication is widely seen as crucial to credibility and predictability.

### 2 Erosion of consensus and internal divisions

Increasing divergence among members — developed vs developing, US vs China/EU, differing priorities on industrial policy and special & differential treatment — challenge consensus decision-making. Proposals to change decision rules or carve out plurilateral tracks are contentious.

### 3 Geopolitics and unilateralism

Recent high-profile trade disputes and unilateral measures (e.g., tariffs and export controls) demonstrate that major powers sometimes prefer unilateral tools or bilateral pressure over multilateral adjudication, straining the WTO's authority. Notably, state actions and funding decisions by large members affect WTO operations and reach.

### 4 Proliferation of RTAs and plurilateral agreements

Regional agreements (RCEP, CPTPP, EU FTAs, USMCA) have advanced deep rules — often faster than the WTO — on investment, e-commerce/digital trade, and regulatory cooperation. These RTAs can both complement WTO rules (by pioneering new norms) and divert negotiating energy away from the multilateral track

## Role of the WTO vis-a-vis Global Value Chains (GVCs)

GVCs make trade policy highly cross-border and interdependent. The WTO can help by:

Ensuring tariff liberalization and rules of origin that reflect modern supply chains.

Promoting trade facilitation and customs efficiency to reduce frictions in cross-border shipments.

Providing disciplines on subsidies and state support (important where inputs are subsidized in upstream stages).

Offering a forum to negotiate standards that affect intermediate goods and services.

Research shows that the value of multilateral cooperation increases with fragmentation: dissolving the WTO would impose large costs because many firms rely on predictable rules across their distributed production stages. Thus, GVCs arguably raise the social value of a functioning WTO.

## Digital trade, services, and trade governance gaps

Digital trade and services exports are increasing share of global trade. The WTO's General Agreement on Trade in Services (GATS) and Trade-Related Aspects of Intellectual Property Rights (TRIPS) provide a starting framework, but there are gaps on data flows, source code, digital taxation, cross-border data transfers, and platform regulation. Many RTAs already include digital trade chapters that go beyond current WTO coverage. There is now increasing interest in plurilateral discussions and potential WTO modernization to better cover digital commerce, though divergent national regulatory approaches (privacy, data localization, national security) complicate negotiability

## Regional Trade Agreements (RTAs) and the changing geography of trade governance

RTAs such as RCEP (regional Asia-Pacific), CPTPP, the EU's network of FTAs, USMCA, and AfCFTA are reshaping trade architecture. RCEP, in particular, is a large and influential agreement that demonstrates how regional frameworks can provide stability and deeper integration even as multilateralism faces headwinds. RTAs may act as laboratories for rules that could later be multilateralized — or they may create trade governance “blocs” with divergent norms. Policymakers must therefore manage complementarities and frictions between RTAs and the WTO.

## Case studies

### 1 US–China tariffs, WTO recourse and practical limits

High tariffs imposed in 2018–2025 cycles led China and other affected countries to use WTO dispute settlement channels. But the process is slow, and enforcement depends on cooperation and remedial measures. When major economies deploy tariffs for strategic reasons, the WTO faces limits — especially when adjudication institutions are weakened. Recent WTO complaints and consultations highlight continued reliance on legal channels, but also the political reality of delayed remedies.

### 2 RCEP as an example of regional leadership

RCEP's breadth across Asia Pacific offers a large-scale platform for tariff liberalization and rules harmonization, strengthening regional supply chains. Its development is often presented as complementary to multilateral norms,



though questions remain about its depth on services, labor, environment, and state enterprise disciplines. RCEP underscores a world where regionalism is central to trade governance.

## **Reform options and policy recommendations**

To restore and modernize the WTO's centrality, members and stakeholders could pursue a pragmatic mix of reforms

### **1 Restore credible dispute settlement**

Conclude negotiations for an effective appeal/review arrangement and restart Appellate Body appointments or an alternative multilateral appeal function with agreed procedural safeguards. This is foundational to credibility.

### **2 Modular, plurilateral approaches for new issues**

Use plurilateral or plurilateral-plus tracks (open to all but not mandatory) for digital trade rules, e-commerce, and regulatory cooperation. This allows like-minded subsets to advance rules while preserving WTO universality as a long-term goal.

### **3 Strengthen WTO support for GVCs**

Update rules of origin, expand trade-facilitation implementation support, and adopt clearer disciplines on subsidies that distort upstream inputs used across borders. Technical assistance to developing countries for GVC integration should be scaled up.

### **4 Interface RTAs and the multilateral system**

Encourage "declaratory" processes where RTA innovations that are compatible with WTO objectives are documented and candidate provisions considered for multilateralization. This reduces fragmentation and incentivizes convergence.

### **5 Financial and governance stability for the WTO**

Major contributors should stabilize voluntary funding and dues to ensure the Secretariat can function independently and deliver capacity building — political decisions on funding should not unduly handicap operational capability. Recent pauses/arrears weaken institutionally important functions and negotiation logistics.

## **Discussion: prospects for multilateralism**

Multilateralism faces pressures but remains uniquely valuable for addressing global public-goods aspects of trade such as dispute resolution, trade facilitation, and setting common standards for complex cross-border production. The WTO may no longer be the sole locus of trade rule-making, but its normative core retains value. A pragmatic path — combining reform to restore adjudication, accepting plurilateral experimentation for new issues, and actively linking RTAs to multilateral norms — would preserve the WTO's relevance while accommodating contemporary trade realities

## **Conclusion**

The WTO remains central to the architecture of global trade but must adapt. Global value chains, digitalization, and regional agreements have changed both the subject matter and political economy of trade governance. Restoring credible dispute settlement, pursuing modular plurilateral approaches for emergent issues, enhancing support for GVC integration, and managing the interplay between RTAs and multilateral rules are practical steps to renew the WTO's role. Without adaptation, the multilateral system risks marginalization; with prudent reform, the WTO can continue to provide indispensable predictability for an interconnected world.

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## Original Article

### Literature as a mirror of Trade and Commerce in Amish Tripathi's Ramchandra Series

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#### Abstract

This research paper delves into trade and commerce aspects treated in the literature especially in Amish Tripathi's Ramchandra Series. Amish Tripathi's Ramchandra Series is a mythological novel blended with fiction. Therefore, a reader feels that it should only deal with Gods and Goddesses and the stories around them but Amish Tripathi has beautifully blended each aspect of economic condition and discussed the minutest thing of trade. One of the main characters of the Ramchandra Series - Raavan has been portrayed as the greatest and successful trader after Kubaer. Raavan was a small trader and no one can think that one day he will be a character much sought after. Raavan with his trading skills reached a higher level. He achieved huge success through trade and commerce and became a King of Lanka. Due to his trading skills, he was one of the richest and strongest Kings in India. Also, he made his place in the literary world, in one of the great Epics of India. He made his kingdom the 'Golden Lanka'. This, Amish Tripathi has shown trade and commerce in his Ramchandra Series in a real form as a mirror reflects reality.

**Keywords:** Amish Tripathi , Ramchandra Series, Raavan, trade, commerce, Literature, Success, King.

#### Introduction

Many genius authors have penned down the story of the most sacred epic - *The Ramayana* in various ways. We find in this Literary galaxy one contemporary author - Amish Tripathi who has blended fiction into this great epic. He has used fiction with mythology, thus, creating a vast expanse of mythological story. He has touched all the dimensions of the story. He has not only focused on the story of Gods and Goddesses but also minutely described the life story of the villain . He has depicted the story in a balanced way. He didn't give highest importance to the good ones . Instead, he balanced the depiction of both good and bad in a very noble way. This made his work better for the young readers and presentable in today's scenario. He has judged each part of life of each person in a fair manner and as a perfect craftsman set an example of a glorious and an accomplished craftsmanship. He has touched the life of Raavan - a villain in every way. He has projected his bad qualities but at the same time did not forget to praise his skills of a great poet, musician, painter, devotee of Lord Shiva and the most knowledgeable person in the world. Along with these qualities, Amish Tripathi has painted Raavan's character in political, social and economical fields too. Politically, he was a powerful, strong and abled leader .



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Socially, if we see, the author had shown the respect which Raavan had gained from his subjects. Economically also, Raavan was supreme leader in trade and commerce due to which he became wealthy. To explore the life story of a character, Amish Tripathi has minutely described each detail of the trade in his literary work. Thus, making literature a mirror of trade and commerce. Trade, trading place, people involved in it, the advantages gained by the rulers through it, the rulers hated traders, the traders' retaliation and the outcome of all this is beautifully explored and depicted in his Ramchandra Series.

Naarad was a trader in Lothal, an important port city of the Sapt Sindhu. As he has been described: 'Naarad was a brilliant trader, but also a lover of art, poetry, and the latest gossip.' (War of Lanka, 29)

## Trading places

Chilka lake is a prosperous trading place. Its physiography, climate and drainage made it a rich trading centre. Chilka is a vast lagoon and it is considered as one of the largest lagoons in the world.

"... In reality, while agriculture was indeed a munificent source of the kingdom's richest, its overflowing coffers were the result of brisk trade with other regions, near and far." (Raavan - Enemy of Aryavarta)

And the centre of this trade was Chilka lake. There were numerous ports along its shores. The ships could easily sail into it. The heavy traffic of vessels were deviated because there were small islands which acted as minor ports for the smaller ships. Chilka had an apt harbour which gave access to richest hinterland in the world. From Chilka lake, one could even carry out the trading through waters upto South Kosala and then can go towards north into Sapt Sindhu. Numerous ships anchored in the lake. There were traders always negotiating. Cargo used to be loaded and unloaded. Custom officers used to collect tax revenues. This place was the hub of traders, always sprawling with the din of vessels, traders and prosperity all around.

## Trading Partners

Kubaer was a trader who had agreement with the other kingdoms to do trading in their kingdoms and in return he used to give them a share of profits. This was accepted by many kingdoms. Amish Tripathi's Ramchandra Series has explicitly explained this trading business as it was the base of achieving a lot of wealth. King Dashrath - Emperor of Sapt Sindhu hated this class as he felt achieving wealth through war is far better than squeezing profit from the people. The traders were not liked by him and he tried that the children of his kingdom should become warriors rather than traders. He had a hard core dislike for them. There were very few traders in Sapt Sindhu. Taking the advantage of the situation, he became the leader of all the traders of Sapt Sindhu and also made an agreement to do trading with the kingdom. "Kubaer struck a deal with the emperor of the Sapt Sindhu, and its subordinate kingdoms, by which he took over all their trading activities and paid the empire a large share of the profits." (Raavan - Enemy of Aryavarta, 52, 53)

All the kingdoms of Sapt Sindhu had agreed to do trading with Kubaer but the kingdom of Kalinga did not accept the leadership of trader Kubaer in the trading business because they were following the footsteps of King Dashrath who himself followed an anti-trader approach and started levying restrictions on trading activities. Kalinga appointed a Naharin administrator. He was from north-west of Babylon, in Mesopotamia. His name was Krakachabahu. He was given the post of governor of Chilka to run Chilka by himself. But the condition of the traders was not good because of oppressive restrictions.

"Soon traders in Kalinga began suffering the same tax terrorism and countless regulations that their fellow traders endured in the other kingdoms of Sapt Sindhu." (Raavan - Enemy of Aryavarta, 54)

Amish Tripathi in Ramchandra Series has left no stone unturned to give information of trading in Sapt Sindhu during those times. He had explained the traders, trading areas, their relation with the kings, their work load, problems, solutions, etc. Hence, using literature as a mirror of trade and commerce.

The traders' condition was not good in Kalinga and some even thought of leaving trading but they thought that they cannot do any other business. So they were thinking of finding the solution to it. Many products were smuggled but it could be confiscated if the products don't possess customary permits. When Raavan and Mareech first moved here, they took up the job of dock workers and gradually with his talent and daring quality, Raavan was famous among the traders. He had owned ships and through it carried out many smuggling missions, supplied goods far and wide and earned a lot of wealth.

The north Indian ports did not allow free trade and they started putting many restrictions. So Raavan, a foresight trader, moved towards the south and decided to make Gokarna his main trading base at the port of Lanka. This place was favorable for ships and trading. Gokarna port was useful in all the seasons. This makes it more profitable for the ships to lay down their anchors. Here, Kubaer was a trader King and people were happy with his rule. Raavan won Kubaer's confidence and even decreased the profit allowance to be paid to Dashrath, the Emperor of Sapt Sindhu. As a result, there was a war of Kharachpa in which traders turned warriors - Kubaer and Raavan won the battle. There are various trading places mentioned in this Literature namely, Sapt Sindhu, Chilka lake, and Nicobar Islands which is an important sea English route to South - east Asia. This shows that literature acts as a mirror to know about various places in India famous for trading.



Traders like Kubaer, Krakachavahu, Akampana and Raavan were smart in their business tactics and even resorted to smuggling to gain profit in lump sum. They became famous because of their trading tactics. The people used to call Raavan a trader- prince and he also liked it. To earn more wealth through trade and commerce was the main aim of Raavan and he got the secret of the superfast ship of Akampana that he bought from him. Akampana told Raavan, “ There is a special material that has to be ground and mixed with oil - an oil from Mesopotamia - and rubbed on the hull once every twenty years,” said Akampana, “ It keeps barnacles and other sea creatures away. It’s as simple as that.” Raavan immediately set a meeting with the owners of the cave material and bought the cave material from the Malyaputras on the pretext of using it in Pushpak Vimaan so that it can be used for trading purposes. A shrewd trader, he did not let his secret out. ‘Raavan had guessed that the Malyaputras were not aware that the cave material helped prevent biofouling on ships or they would have been using it on their own vessels... If all went well, he would be the only one with the competitive advantage of superfast ships.’ ( Raavan - Enemy of Aryavarta)

## Real Trading

The common thing about all the traders is that they can go to any extent to earn profits. Raavan tried to gain more profits by making his ship superfast and on the other hand, Kubaer also said no to any opportunity for making profits. Raavan overtook Lanka from Kubaer and became the King of Lanka. Through trade and commerce, Raavan transformed his life from rags to riches. Lanka focused all its resources on two fronts: trade and warfare. Most of the Lankans prefer either to become businessmen or warriors. They had to import foodgrains from Sapt Sindhu as Lanka did not grow foodgrains. They used to import high quality and cheap foodgrains from Sapt Sindhu and they focussed on warfare or trade. The traders of Lanka did not offer any resistance to the Ayodhyan navy. On the contrary, the Lankan businessmen understood that it is useless to offer resistance. Instead, they felt it was better to surrender to the invaders. We can see from the extract given in the Series that Lankans were traders and businessmen to the core.

“ True to its mercantile spirit, senior officials from the Gokarna trading guilds had gathered at the main port quay to welcome the Ayodhyan navy. Businessmen in this Lankan port city were determined to remain pragmatic. To business-focused minds, everything is negotiable.” Lankans were worried about their trade and business. They took the situation from the business point of view. They did not want to suffer any loss. So when the Ayodhyans invaded Gokarna, ‘the Gokarna trading guilds allowed the soldiers free passage to Sigiriya in return for their safety and security.’ They allowed the soldiers to pass from there but being the businessmen they also asked for their safety and security in return. In Lanka, women were also active in business. Cotton and Silk Guild was the richest guild in Gokarna and the senior managing partner of the guild was a woman whose name was Manigrama.

“Most manufacturers, merchants and traders across the Indian subcontinent were organised into guilds: essentially corporations composed of members pursuing a common craft or trade.” (War of Lanka, 174)

Those who wanted to join guild as an apprentice and through amassing a lot of profits, they attained higher positions of managers, ship captains and then partners. Then an election was held every two years and five managing partners were elected by the members. The annual profits were distributed to each member. They had an office where all the accounts were kept for all to refer to. They also built their in-house militia to guard their ships or even they took the help of the Lankan army. Thus, to attain and to protect the profits were the motives of the traders.

## Conclusion

We get all the information about the trade, business, import, export, and the other aspects from the literature. Amish Tripathi in his Ramchandra Series has deeply dealt with all the aspects of trade and commerce and answered all the questions related to it in a very practical way. Amish Tripathi has used literature as a mirror to show trade and commerce and its variables in an amazing form. He did not forget to show that even the female group was active in this field thus, showing the mirror to the society that trade and commerce is not only confined to the menfolk but it can also be competently handled by the female group. Amish Tripathi through Ramchandra Series has explored the ways to tackle the economical problem tactfully and one can rise from rags to riches, from follower to a leader and from leader to an emperor. The ancient trade and commerce aspects have been widely and minutely explained. He has dealt with various situations in a positive manner to come out of any problem related to the business and it has taught the upcoming businessmen or business women to refer to his literary work to get the transparent and clear solution of all the economical problems

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## Original Article

### Use of Artificial Intelligence in Libraries and Information Centers: Global and Indian Perspectives

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#### Abstract

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This paper reviews the current and emerging uses of Artificial Intelligence (AI) in libraries and information centers, combining global reports and surveys (IFLA, ARL, ALA/PLA, OCLC) with Indian-specific sources (INFLIBNET, DELNET). It presents facts and figures in table format, analyzes benefits and ethical challenges, and provides policy and training recommendations for libraries seeking to integrate AI responsibly. Key quantitative findings are drawn from ARL polls (2023), PLA 2023 Public Library Technology Survey, and institutional reports and brochures from Indian networks.

#### Introduction

Artificial Intelligence (AI) — including machine learning, natural language processing (NLP), and generative models — is reshaping how knowledge is organized, discovered, and delivered. Libraries and information centers are exploring AI for cataloging, metadata enrichment, virtual reference, discovery, accessibility, and user education. This paper synthesizes global and Indian evidence to provide an actionable overview for library leaders, practitioners, and policymakers.

#### Literature Review

Major library bodies and research groups have published guidance and survey results on AI in libraries. The IFLA Trend Report (2024) identifies AI transforming society as a core trend, urging libraries to prepare for shifts in trust and skills. The Association of Research Libraries (ARL) conducted two polls in 2023 showing rapid evolution in attitudes and planning for AI in research libraries. The American Library Association (ALA) and Public Library Association (PLA) report on public library technology capacity and preparedness (PLA Technology Survey, 2023). Indian networks such as INFLIBNET and DELNET have discussed AI implications for academic and networked libraries, and DELNET materials indicate provision of access to emerging AI tools.

#### Applications of AI in Libraries

Common AI applications include:

##### 1. Automated Cataloging and Metadata Generation

AI and machine learning algorithms can analyze bibliographic data, full texts, and digital resources to automatically create or enhance metadata records. This automation reduces human effort in cataloging, minimizes errors, and speeds up processing of large digital collections. Systems like OCLC's WorldCat leverage machine learning for subject tagging and authority control, improving consistency across library networks.

##### 2. Enhanced OCR and Image Recognition for Digitized Collections

AI-driven Optical Character Recognition (OCR) and computer vision technologies significantly improve the quality and searchability of digitized materials. They can handle low-quality scans, handwritten texts, and historical manuscripts more effectively than traditional OCR.

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Advanced tools can even recognize regional scripts and languages, enabling broader access to cultural and archival collections.

### 3. Discovery and Recommendation Systems

AI-powered discovery layers and recommender systems personalize users' search experiences by learning from their behaviors and interests. These tools analyze metadata, usage patterns, and contextual data to suggest relevant books, articles, or digital resources. As a result, information retrieval becomes faster, more precise, and aligned with users' academic or professional needs.

### 4. Virtual Reference and Chatbots

Natural Language Processing (NLP)-based chatbots and virtual assistants provide 24/7 support to library users. They can answer routine queries, guide users to resources, and offer step-by-step help with catalog searches or research databases. By automating frontline interactions, virtual reference tools free librarians to focus on complex or specialized information requests.

### 5. Accessibility Services (Auto-Captioning, Text Simplification)

AI supports inclusive access through tools that automatically generate captions for audiovisual content and simplify complex texts for diverse readers. Libraries use such tools to make educational resources accessible to users with disabilities or limited language proficiency. These services strengthen libraries' commitment to equity, inclusion, and universal design.

### 6. User Education and AI Literacy Programs

Libraries increasingly act as centers for AI and digital literacy by offering workshops, tutorials, and awareness sessions. Through guided instruction, users learn to understand AI technologies, evaluate their ethical implications, and apply them responsibly in study and research. Public and academic libraries thus contribute to developing informed, AI-literate communities.

## Facts & Figures

Source (year)	Metric	Statistic / Finding	Notes
ARL Polls (April & Dec 2023)	Libraries actively implementing generative AI (Dec 2023)	12%	Shift from exploring→implementing: Dec 2023 results show 12% actively implementing; 60% exploring. (ARL, 2024)
ARL Polls (April & Dec 2023)	Libraries exploring potential AI applications (Dec 2023)	60%	Indicates active exploration across research libraries. (ARL, 2024)
PLA Technology Survey (2023)	Public libraries offering digital literacy training	95%	Most U.S. public libraries report offering some form of digital literacy training. (PLA, 2024)
PLA Technology Survey (2023)	Libraries with digital media production equipment	24.6% overall	City libraries: 58.9%; Suburban: 38.2%; Town/Rural: 18%. (PLA, 2024)
IFLA Trend Report (2024)	IFLA key trend related to AI	AI transforming society; renegotiation of trust	Qualitative trend guidance for global libraries. (IFLA, 2024)
ALA (Center for the Future of Libraries)	Guidance & advocacy on AI literacy	Multiple initiatives and resources	ALA highlights role of libraries in AI literacy and ethical integration. (ALA, 2024-25)

The data from Table 1 show a clear trend of growing interest and gradual adoption of AI in libraries worldwide. While only about 12% of ARL libraries were actively implementing generative AI as of December 2023, a much larger proportion (60%) were exploring its potential. This indicates that AI adoption is still in an experimental phase for most research libraries. Public libraries, as reflected in the PLA 2023 survey, focus heavily on digital literacy, with 95% offering related programs, suggesting that AI literacy could be naturally integrated. IFLA's qualitative guidance



emphasizes the societal transformation potential of AI and the importance of building trust with patrons. Overall, global libraries are at a transition point, balancing innovation with ethical and operational considerations.

Source (year)	Metric	Statistic / Finding	Notes
DELNET brochure (2025)	Institutions in DELNET network	~9,500 institutions	DELNET connects universities, colleges, R&D organizations across India; brochure notes provision of emerging AI tools access. (DELNET, 2025)
INFLIBNET CALIBER (2019) paper	AI prospects in academic libraries	Qualitative: growing interest and pilot projects	Survey/overview of AI applications in Indian academic libraries; recommends capacity building. (INFLIBNET, 2019)
Indian national developments (news 2025)	INFLIBNET expansion & digitization initiatives	Active national-level digitization & e-resource programs	Government & INFLIBNET initiatives to strengthen digital resources for universities; supports AI-readiness indirectly. (News/INFLIBNET, 2025)

Table 2: India-specific indicators and institutional facts

Indian libraries are gradually engaging with AI through networks such as DELNET and INFLIBNET. Table 2 highlights that approximately 9,500 institutions are connected through DELNET, providing access to emerging AI tools and resources. While structured quantitative adoption data are limited, INFLIBNET’s 2019 CALIBER paper suggests growing interest in pilot AI projects within academic libraries. National digitization initiatives further strengthen the ecosystem for AI-enabled services. These figures indicate that Indian libraries are preparing infrastructure and institutional readiness, but systematic tracking of AI adoption and impact is still required to measure progress effectively.

Benefits	Representative evidence / metric	Challenges / Risks
Automation of routine tasks (cataloging, metadata)	ARL & OCLC case examples; time savings reported in case studies	Bias in training data; accuracy issues in autogenerated metadata
Improved discovery & recommendations	User experience improvements in pilot systems (reported qualitatively)	Opaque algorithms; privacy risks in personalized services
24/7 virtual reference (chatbots)	ARL & PLA references to chatbots & virtual assistants	Quality control; need for AI literacy to evaluate responses
Enhanced OCR and access to digitized collections	Technological improvements reported by OCLC / academic projects	OCR errors in historical documents; languages and scripts coverage (Indian languages are a concern)
Community AI literacy programs	PLA & ALA recommendations; ARL training frameworks	Resource & staff training capacity; funding constraints

Table 3 synthesizes key advantages and potential risks of AI integration. Benefits include automation of routine tasks, improved discovery and recommendations, and 24/7 virtual reference services, which collectively enhance operational efficiency and user experience. However, challenges such as algorithmic bias, transparency issues, privacy concerns, and limited staff capacity underline that AI adoption is not without risk. In particular, the coverage of regional languages in OCR, accuracy of auto-generated metadata, and equitable access are critical for Indian and multicultural library contexts. The table underscores the need for libraries to implement structured evaluation and mitigation strategies alongside technological deployment.

Integrated

Analysis:

Combining insights from all three tables, the evidence suggests that AI adoption is accelerating globally but remains uneven. Research libraries are experimenting with generative AI, while public libraries focus on digital and AI literacy. Indian libraries are in the early stages, emphasizing infrastructure and training. Across contexts, there is a clear need for



policy frameworks, staff development, and continuous evaluation to maximize benefits while minimizing ethical, legal, and operational risks.

## Analysis and Discussion

The data show that while a minority of libraries have moved to active implementation (e.g., ~12% among ARL respondents in Dec 2023), a majority are actively exploring AI use-cases (ARL: 60% exploring in Dec 2023). Public libraries prioritize digital literacy and access (PLA: 95% provide some digital literacy training), which positions them well to include AI literacy. In India, networks such as DELNET and INFLIBNET are building infrastructure that can help libraries access AI tools, but comprehensive national statistics on AI adoption by Indian libraries are limited and merit systematic study.

## Ethical, Legal, and Practical Challenges

Key concerns include algorithmic bias, transparency, data privacy (patron confidentiality), copyright issues around AI training data and generated outputs, and the digital divide (unequal access to AI-enhanced services between urban and rural libraries). ARL and IFLA recommend transparent governance frameworks and AI literacy initiatives to mitigate risks.

## Recommendations

Based on the evidence, libraries should:

1. Develop clear AI policies addressing privacy, transparency, and accountability (draw on ARL guiding principles).
2. Invest in staff training and AI literacy programs for patrons (use PLA/ALA frameworks).
3. Pilot AI applications with evaluation metrics (accuracy, equity, impact on services).
4. Prefer open-source or transparent AI tools where feasible and document use cases for community benefit.
5. For Indian libraries: leverage networks (DELNET, INFLIBNET) for shared infrastructure and collaborative pilots.

## Conclusion

AI offers transformative potential for libraries but requires careful, ethical, and context-sensitive implementation. Global surveys indicate broad interest and active exploration, while Indian networks show institutional readiness to support AI adoption. Libraries that combine pragmatic pilots, staff training, and transparent governance will be best placed to harness AI for improved access, discovery, and learning.

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## Original Article

### Erythrina indica seed oil: sustainable biodiesel production

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#### Abstract

This study examines the viability of *Erythrina indica* (Indian Coral Tree) seed oil, a non-consumable resource, as a substrate for second-generation biodiesel production. The seeds exhibited a notable oil content of 38 % (w/w). Crude oil was transformed into Fatty Acid Methyl Esters (FAMES), referred to as EISOMES (*Erythrina indica* Seed Oil Methyl Esters), by a base-catalyzed transesterification process using 1% KOH, resulting in a substantial practical yield of 90.2%. <sup>1</sup>H-NMR spectroscopic investigation validated the conversion, with an estimated result of 92.46%. The produced biodiesel underwent a thorough assessment of its fuel characteristics. Significant discoveries encompass an extraordinarily elevated Cetane Number (58.2), a high Flash Point (172°C), and a kinematic viscosity of 3.6 mm<sup>2</sup>/s, all of which conform to the stipulations of international standards including ASTM D6751, BIS 15607, and EN 14214. The Higher Heating Value was established at 39.6 MJ/kg, while the Cloud Point was recorded at 2.6°C. This work offers a comprehensive examination of these features, linking them to the distinctive fatty acid profile of the feedstock, and compares them with recognized non-edible feedstocks. The findings strongly suggest that *Erythrina indica* is a very viable and competitive feedstock for the production of sustainable, high-quality biodiesel, necessitating further exploration of its agronomic and economic potential.

**Keywords:** *Erythrina indica* seed oil, Biodiesel, Fatty acids, Transesterification, Fuel properties

#### Introduction

The 21st-century global energy landscape is characterized by a significant reliance on fossil fuels, a situation that poses serious economic, geopolitical, and environmental difficulties. The transportation sector predominantly depends on petroleum-derived fuels, with oil anticipated to be the primary energy source for global fleets in the foreseeable future. This dependence engenders susceptibility to price fluctuations and supply chain interruptions, while also contributing to the exhaustion of limited geological resources. The combustion of fossil fuels is the primary catalyst for anthropogenic greenhouse gas (GHG) emissions, chiefly carbon dioxide (CO<sub>2</sub>), which is the foremost contributor to global climate change. The scientific consensus emphasizes the imperative to decarbonize the energy sector and shift towards clean, renewable, and sustainable energy sources to alleviate the most severe consequences of climate change and maintain global warming below the critical limit of 2°C. In response to this necessity, a collection of alternative fuels and innovative vehicle technologies has developed [3]. Liquid biofuels, particularly biodiesel, have attracted considerable interest as a direct, "drop-in" substitute or blending agent for traditional diesel fuel. Biodiesel is characterized as a fuel consisting of mono-alkyl esters of long-chain fatty acids obtained from renewable lipid sources, such as vegetable oils or animal fats. Its advantages are numerous: it is renewable, biodegradable, non-toxic, and demonstrates a markedly enhanced emissions profile, characterized by reduced emissions of particulate matter, unburnt hydrocarbons, and carbon monoxide. Biodiesel functions within a "Carbon Neutral Cycle," where the CO<sub>2</sub> emitted during combustion is theoretically balanced by the CO<sub>2</sub> absorbed from the atmosphere by the biomass feedstock during its growth, hence adding insignificantly to net greenhouse gas accumulation.

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The capacity to utilize biodiesel in current compression-ignition engines and fuel infrastructure with minimal modification renders it a technologically feasible and readily implementable solution for diminishing the carbon footprint of the transportation sector [4-7].

Non-Edible Oilseeds as a Promising Frontier for Biodiesel Production In the varied realm of second-generation feedstocks, non-edible oilseeds constitute a notably advantageous and direct avenue for biodiesel production. These oilseeds are derived from plants whose oils are unfit for human consumption due to toxins or undesirable fatty acids, however they are abundant in triglycerides essential for biodiesel production. The principal motivator for their adoption is economic: feedstock costs are the predominant element of biodiesel production, representing 70-90% of the end price [8-11]. The use of inexpensive, non-consumable oils is crucial for attaining economic equivalence with traditional petrodiesel and securing the sustained commercial feasibility of the biofuel sector [12]. Several non-edible oilseed species have been thoroughly studied and are regarded as standards in the area. These encompass:

- *Jatropha curcas* (Ratan Jyot): A drought-resistant perennial shrub lauded for its ability to thrive on marginal lands with minimal inputs. Its seeds contain a high oil content, typically ranging from 27% to 40%, making it one of the most widely studied non-edible feedstocks globally.
- *Pongamia pinnata* (Karanja): A leguminous tree known for its high tolerance to salinity and drought, and its ability to fix atmospheric nitrogen, thereby enriching the soil. Its seeds yield an oil content of 30-40%, and its robust nature makes it suitable for cultivation in diverse agro-climatic zones.
- Other notable examples include *Madhuca indica* (Mahua), which is abundant in the tribal regions of India and produces seeds with 30-40% oil, and *Melia azadirachta* (Neem), a versatile tree whose oil has both biofuel and pesticidal applications. The exploration of this wide variety of species is crucial for identifying regionally appropriate and high-potential feedstocks for a decentralized and resilient biofuel economy [13, 14].

This study examines a new and mostly uninvestigated possibility for biodiesel production: *Erythrina indica*, or the Indian Coral Tree. This deciduous tree, part of the Leguminosae family, is native to the tropical jungles of India and can reach a height of 18 meters. Its seeds are inedible, categorizing it as a second-generation feedstock and therefore circumventing the food-versus-fuel dilemma. Initial observations indicate that its seeds possess a significant oil content, rendering it a strong candidate for systematic assessment as a biodiesel source. Notwithstanding its ubiquity, a thorough characterisation of its seed oil and the fuel characteristics of its resultant biodiesel has not been thoroughly documented in the scientific literature [15, 16].



**Figure.1** *Erythrina indica* seeds

This study aims to address this knowledge gap by providing a thorough and systematic analysis of *Erythrina indica* as a biodiesel feedstock. The specific objectives of this research are:

- To perform solvent extraction of oil from *Erythrina indica* seeds and accurately quantify the oil content.
- To characterize the fundamental physicochemical properties (e.g., acid value, viscosity, density) and the detailed fatty acid profile of the crude *Erythrina indica* seed oil (EISO).
- To synthesize biodiesel in the form of *Erythrina indica* Seed Oil Methyl Esters (EISOMEs) via a base-catalyzed transesterification process and to determine the conversion yield using both gravimetric and spectroscopic methods.
- To conduct a comprehensive evaluation of the critical fuel properties of the produced EISOMEs, including cetane number, kinematic viscosity, flash point, cloud point, density, and higher heating value.
- To critically assess the viability of *Erythrina indica* as a competitive biodiesel feedstock by benchmarking the properties of EISOMEs against established international fuel standards (ASTM, BIS, EN) and other prominent non-edible oil sources.

## Material and Methods

### 1 Feedstock material

The principal raw material for this study, the seeds of *Erythrina indica*, were collected from the Etapalli & Armori forest area in Gadchiroli district (Maharashtra), India. Subsequent to collecting, the seeds underwent a standardized preparation technique to guarantee optimal oil extraction. This entailed extensively desiccating the seeds in direct sunshine to diminish moisture levels, essential for averting hydrolytic reactions and enhancing storage stability. The desiccated seeds were further subjected to mechanical grinding to produce a fine powder, hence augmenting the surface area for solvent interaction [17-21]. Oil extraction was conducted via the Soxhlet method, a recognized and highly effective laboratory technique for continuous solid-liquid extraction. A specified mass of powdered seed material was placed in a thimble and subjected to continuous extraction using 95% n-Hexane (boiling range 55-65°C) as the solvent. Upon completion of the extraction procedure, the solvent was retrieved using distillation, resulting in the residual crude *Erythrina indica* seed oil (EISO). The oil content percentage was determined gravimetrically utilizing Equation (1):

$$\text{Oil content (w/w \%)} = \frac{\text{Weight of the oil obtained}}{\text{Weight of the seeds taken}} \times 100 \quad (1)$$

The examination indicated a significant oil content of 38 % on a weight/weight ratio. The elevated yield is a fundamental and essential attribute, as it directly affects the economic viability of a feedstock. An oil content of 38 % positions *E. indica* competitively against other notable non-edible feedstocks, such *Jatropha curcas* (27-40%) and *Pongamia pinnata* (30-40%), hence highlighting its substantial potential as a feedstock [22].

### 2 Physicochemical Analysis of Crude *Erythrina indica* Seed Oil (EISO)

Prior to biodiesel conversion, the crude EISO underwent a series of physicochemical analyses in accordance with the standard protocols established by the American Oil Chemists' Society (AOCS). These preliminary characterizations are essential for assessing the quality of the crude oil, choosing the suitable conversion method, and forecasting the characteristics of the ultimate biodiesel product. The key characteristics are encapsulated in Table 1. The Acid Value (AV) of the oil was determined to be 6.5 mg KOH/g, equating to a Free Fatty Acid (FFA) concentration of 3.25%. The Free Fatty Acid (FFA) level is a crucial factor in biodiesel generation, especially when employing a base catalyst. Elevated free fatty acid (FFA) levels (>1-2%) may interact with the alkaline catalyst, resulting in soap formation through a process termed saponification. This side reaction depletes the catalyst, diminishes biodiesel yield, and poses considerable difficulties in separating biodiesel from the glycerol phase due to emulsion formation. The recorded FFA of 3.25% is beneath the frequently referenced threshold of 5%, rendering a single-step base-catalyzed transesterification process viable, yet sufficiently elevated to necessitate meticulous process management. The Saponification Value (SV), indicative of the average molecular weight of fatty acids, was established at 195.6 mg KOH/g. The saponification value (SV) is inversely related to the chain length of fatty acids; a greater SV signifies a lower average molecular weight. The moderate EISO value indicates a predominance of medium-to-long-chain fatty acids, characteristic of vegetable oils [23-24]. The Iodine Value (IV) of EISO was 74.8 g of I<sub>2</sub> per 100 g. The IV quantifies the extent of unsaturation, namely the quantity of double bonds, in the oil. This is a vital determinant of the ultimate stability of biodiesel. Oils with elevated iodine values are more prone to oxidation, resulting in polymerization and the accumulation of gums and deposits during storage and engine running. The European biodiesel standard EN 14214 establishes a maximum limit of 120 for the iodine value of the finished fuel. The relatively low IV of the raw EISO is a highly advantageous attribute, indicating that the resultant biodiesel will exhibit superior oxidative stability [25].

It was established that the crude oil had a kinematic viscosity of 28.9 mm<sup>2</sup>/s when it was heated to 40 °C. When compared to the value of regular diesel fuel, this value is around ten to twelve times higher. One of the primary factors that makes the direct utilization of vegetable oils in modern diesel engines problematic is the elevated viscosity of these oils. This leads to insufficient fuel atomization, incomplete combustion, and carbon deposition on the components of the engine. This result demonstrates very clearly how important it is for the transesterification process to reduce the viscosity to a level that is suitable for use in engine applications [26].

**Table 1.** Physicochemical properties of EISO

Property	<i>Erythrina indica</i> seed oil
Oil content (%)	38
Molecular weight (gm/mol)	879.42
Density at 25°C (Kg/m <sup>3</sup> )	902
Viscosity at 40°C (mm <sup>2</sup> /s)	28.9
Iodine value (mg I <sub>2</sub> gm/oil)	74.8
Saponification value (mg KOH gm/oil)	195.6
Acid value (mg KOH gm/oil)	6.5

## 2.3 Fatty Acid Profile of EISO

The fatty acid content of a feedstock is the fundamental chemical fingerprint of the feedstock, and it is the major factor that determines the fuel qualities of the finished biodiesel. An analysis of the fatty acid profile of EISO was carried out, and the results are presented in Table 2. Following the completion of the examination, it was discovered that the oil is primarily made up of monounsaturated and saturated fatty acids. The monounsaturated acid oleic acid (C18:1), which accounts for 45.5% of the total, is the fatty acid found in the greatest quantity. This is a highly desirable quality, as oleic acid offers a favorable balance between cold-flow properties (superior to those of saturated acids) and oxidative stability (superior to those of polyunsaturated acids) [27–28]. Additionally, the oil has a substantial proportion of saturated fatty acids, which collectively amount to around 36.4% of the total. Behenic acid (C22:0) accounts for 14.2%, palmitic acid (C16:0) for 9.8%, stearic acid (C18:0) for 7.4%, arachidic acid (C20:0) for 4.0%, and hexadecanoic acid (C16:0) for 3.4% of the total composition. The presence of these long-chain saturated fatty acids is expected to have a positive effect on the cetane number and contribute significantly to the oxidative stability of the biodiesel [29]. Linoleic acid (C18:2) is found at just 6.8% of the total, which is important because the proportion of polyunsaturated fatty acids remains quite low. Since these molecules are the most prone to oxidation and polymerization—processes that can deteriorate fuel quality over time—low levels of polyunsaturated fatty acids (with two or more double bonds) are advantageous for fuel stability. One of the most important findings of this research is the identification of a distinctive and well-balanced fatty acid profile, which will be further examined in relation to the key qualities of the resulting biodiesel fuel.

**Table 2.** Fatty Acid Composition of Erythrina indica Seed Oil (EISO)

S.No.	Fatty Acid	Composition (%)	Molecular Formula	Molecular Weight (g/mol)
1	Oleic acid	45.5	C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	282.50
2	Behenic acid	14.2	C <sub>22</sub> H <sub>44</sub> O <sub>2</sub>	340.59
3	Eicosenoic acid	8.9	C <sub>20</sub> H <sub>38</sub> O <sub>2</sub>	310.40
4	Palmitic acid	9.8	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256.40
5	Stearic acid	7.4	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	284.60
6	Linoleic acid	6.8	C <sub>18</sub> H <sub>32</sub> O <sub>2</sub>	280.45
7	Arachidic acid	4.0	C <sub>20</sub> H <sub>40</sub> O <sub>2</sub>	312.60
8	Hexadecanoic acid	3.4	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256.40
	<b>Total</b>	<b>100.0</b>		

Data sourced from Kadam et al., 2023 and Pathak & Dey, 1956. Note: The original table in the source document contained some inconsistencies in molecular formulas and ordering. The data has been corrected and reordered by composition for clarity. Hexadecanoic acid is another name for Palmitic acid; the distinct entry is retained from the source.

## 3 Production of Biodiesel

The process of transesterification was utilized in order to accomplish the transformation of the high-viscosity EISO into the low-viscosity biodiesel. Through the utilization of an alcohol (methanol) and the presence of a catalyst, this chemical reaction facilitates the transformation of the triglycerides present in the oil into fatty acid methyl esters (FAMES) and glycerol. In light of the fact that the FFA content of the EISO was 3.6%, which is lower than the 5 percent standard, a base-catalyzed procedure with a single step was utilized. The reaction was carried out under the conditions that were optimized as follows:

- **Reactant Molar Ratio:** An oil-to-methanol molar ratio of 1:6 was used. The stoichiometric requirement is 1:3, but a significant excess of methanol is used to shift the equilibrium of the reversible reaction towards the product side, thereby maximizing the conversion of triglycerides to FAMES.
- **Catalyst:** Potassium hydroxide (KOH) was used as the homogeneous base catalyst, at a concentration of 1% by weight of the oil. KOH is a highly effective and commonly used catalyst for this process.
- **Reaction Conditions:** The oil was preheated, and the reaction mixture was maintained at a temperature of 65°C, which is close to the boiling point of methanol, to ensure a high reaction rate. The mixture was continuously stirred at 500 rpm for a duration of 3 hours to ensure proper mixing and mass transfer between the immiscible oil and

methanol phases [30].

The mixture was then moved to a separating funnel after the reaction was complete, and it was left to settle for the entire night. There were two separate layers that formed as a result of changes in density: the upper layer was composed of the crude biodiesel (EISOMEs), while the lower layer was composed of glycerol, excess methanol, and dissolved catalyst. The glycerol layer that was lower was removed by draining. After that, the remaining layer of crude biodiesel was put through a purification process, which consisted of multiple washings with warm distilled water. This essential stage eliminates any soap, catalyst, and methanol that may have been left behind, so assuring that the finished fuel satisfies the quality requirements.

## 5 Spectroscopic Confirmation and Yield Calculation

Using Proton Nuclear Magnetic Resonance (<sup>1</sup>H-NMR) spectroscopy, the purified product was examined in order to verify that the conversion of triglycerides into methyl esters was successful. The <sup>1</sup>H-NMR spectrum is an effective instrument for determining the conversion efficiency and gives definitive information regarding the structure of the substance studied. The spectrum that was produced as a result exhibited two important signals that indisputably confirm the synthesis of FAMEs. Figure 2 in the source paper is an example of this. The signal that was the most distinctive was a crisp singlet that appeared at a chemical shift of 3.59 parts per million. This peak is a representation of the protons that are associated with the methoxy group (-OCH<sub>3</sub>) of the methyl esters, which is not present in the initial structure of the triglyceriding compound. Furthermore, a multiplet that was found at a concentration of 2.13 parts per million was attributed to the protons of α-carbonyl methylene (-CH<sub>2</sub>-COOCH<sub>3</sub>), which further validated the structure of the ester. A quantitative determination of the conversion percentage was made by utilizing the established Equation (2), which was derived from the integrated areas of the pertinent peaks in the <sup>1</sup>H-NMR spectrum:

$$C = 100 \times \frac{2 \times \text{Area intergration of methoxy protons}}{3 \times \text{Area intergration of methylene protons}} \quad (2)$$

Where, C = conversion percentage of triglycerides to methyl esters.

In this equation, the variable C represents the percentage conversion, AMe represents the integration area of the methoxy protons (at a concentration of 3.59 ppm), and ACH<sub>2</sub> represents the integration area of the α-methylene protons (an amount of 2.13 ppm).

A conversion of 92.46% was obtained by the computation that was based on the spectroscopic data collection. This result demonstrated a high degree of concordance with the gravimetric yield of 90.2% that was practically realized. This yield was calculated by weighing the finished purified biodiesel product. It is clear that the synthesis and purification technique that was used in this investigation was quite effective, as evidenced by the strong connection that exists between the spectroscopic yields and the practical yields [31].

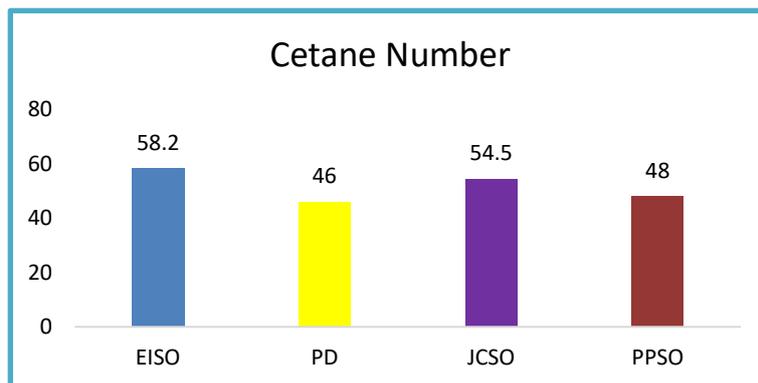
## 3. Results and discussion

### 1 Analysis of Key Fuel Properties of EISOMEs

The successful synthesis of EISOMEs was followed by an in-depth analysis of the important fuel qualities that these compounds possessed respectively. The performance, emissions, and safety features of the biodiesel are determined by these attributes, which also decide whether or not the biodiesel is suitable for integration into contemporary compression-ignition engines. Following the presentation and discussion of the findings, comparisons are made between the results and the major international biodiesel standards as well as conventional petrodiesel.

#### 1.2 Ignition Quality: Cetane Number (CN)

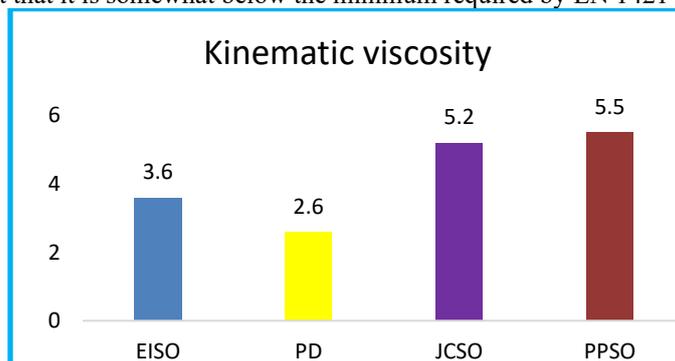
Due to the fact that it evaluates the autoignition characteristics of diesel fuel, the Cetane Number (CN) is widely considered to be the most significant feature that determines the quality of diesel fuel. 58.2 was discovered to be the value of the CN that was estimated for EISOMEs as shown in Figure 2. This number is not only much higher than that of normal petrodiesel (CN ~46) but also comfortably exceeds the minimum requirements of all major international standards, including ASTM D6751 (minimum 47) and the more demanding EN 14214 (minimum 51). There is a clear correlation between a high cetane number and a shorter ignition delay period. The ignition delay period refers to the amount of time that passes between the injection of fuel into the combustion chamber and the beginning of combustion. A shorter delay results in a combustion process that is smoother and more controlled, which translates into several tangible benefits for the performance of the engine and the emissions it produces on the road. The engine will make less noise and "knock," it will be easier to start the engine cold, and the combustion process will be more complete. A higher CN leads to an increase in the efficiency of combustion, which in turn results to a reduction in the emissions of dangerous pollutants from the tailpipe. These pollutants include unburned hydrocarbons (HC), carbon monoxide (CO), and particulate matter (PM). The very high CN of 58.2 is a main indicator that EISOMEs have the potential to act as a premium-quality diesel alternative, potentially giving greater combustion performance in comparison to conventional diesel. Because the feedstock contains a high concentration of long, straight-chain saturated and monounsaturated fatty acids, this high value is a direct result of the feedstock's fatty acid profile [32-35].



**Figure.2** Cetane Number of EISO in comparison with petrodiesel and reported biodiesel

### 1.2 Flow Characteristics: Kinematic Viscosity

The transesterification procedure resulted in a significant reduction of the fuel's kinematic viscosity by more than 90 percent. This reduction went from 30.25 mm<sup>2</sup>/s for the raw oil to 3.6 mm<sup>2</sup>/s for the final EISOMEs when they were heated to 40 °C. This figure is quite close to the lower limit of the BIS 15607 standard, which is within the range of 2.0 to 4.62 mm<sup>2</sup>/s as shown in Figure 2. It is also well within the range that is prescribed by ASTM D6751, which is between 1.9 and 6.0 mm<sup>2</sup>/s. It is slightly lower than the range that is specified by EN 14214, which is between 3.5 and 5.5 mm<sup>2</sup>/s. There is a crucial parameter known as viscosity that is responsible for regulating the flow behavior of the gasoline within the injection system of the engine. It is difficult for the fuel to produce a thin spray when it is injected because of its very high viscosity, as can be observed in the raw EISO. This results in poor atomization, which in turn causes larger fuel droplets that do not mix well with air. This leads to incomplete combustion, which in turn leads to increased fuel consumption and the creation of carbon deposits on injectors and cylinder walls. One of the key goals of biodiesel manufacturing is to successfully reduce the viscosity of the fuel to a level that is acceptable for diesel engines. The fact that EISOMEs have a value of 3.6 mm<sup>2</sup>/s suggests that they will have flow qualities that are acceptable for contemporary high-pressure fuel injection systems, which will ensure that atomization and combustion are carried out effectively. It is anticipated that this will not result in substantial operational concerns and may even contribute to finer atomization, despite the fact that it is somewhat below the minimum required by EN 14214.

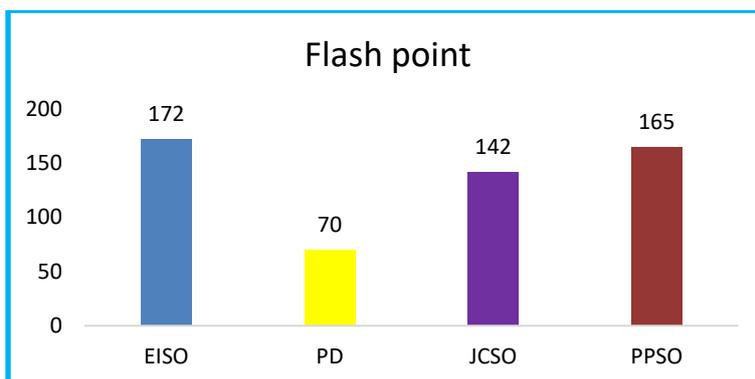


**Figure.2** Kinematic viscosity of EISO in comparison with petrodiesel and reported biodiesel

### 1.3 Safety and Handling: Flash Point (FP)

It was established that the Flash Point (FP) of the EISOMEs that were created was 172 °C. This is a significant increase in comparison to the flash point of petrodiesel, which is normally somewhere around 70 °C as shown in Figure 3. The most significant thing is that it surpasses the minimal safety limits that are established by international biodiesel standards, such as ASTM D6751 (>130°C) and both BIS 15607 and EN 14214 (>120°C). The flash point is the lowest temperature at which a liquid creates sufficient vapor to make an ignitable mixture with air. This is the standard definition of the flash point. The fire hazard that is connected with the storage, transportation, and handling of a fuel is evaluated using this parameter, which is an essential evaluation tool. Due to the extremely high flash point of EISOMEs, it is classified as a material that is not flammable and does not pose any hazards. As a result, it is substantially safer to handle than normal diesel fuel. In addition, the flash point is an essential quality control indication that is utilized in the context of the manufacture of biodiesel. In the event that residual methanol from the transesterification process is not completely eliminated, it has the potential to significantly reduce the flash point of the final biodiesel. Methanol having a flash point of roughly 11 °C is extremely low. The extraordinarily high value of 168 °C that was measured provides strong indication that the purification technique, which consisted of washing with warm

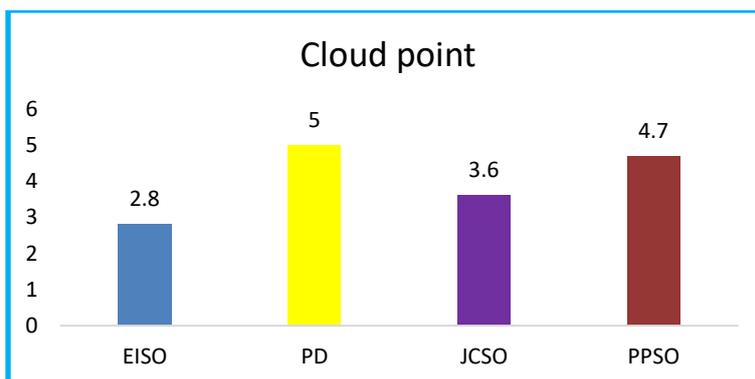
water, was highly effective in eliminating unreacted methanol, which ultimately resulted in a product that was both pure and safe [36].



**Figure 3.** Flash point of EISO in comparison with petrodiesel and reported biodiesel

#### 1.4 Cold Weather Performance: Cloud Point (CP)

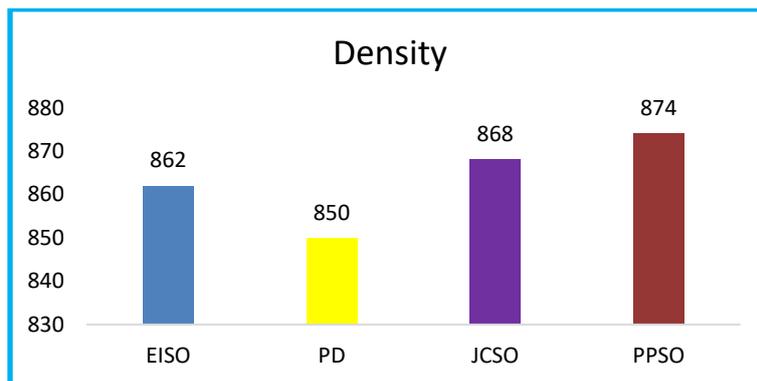
It was determined that the Cloud Point (CP) of the EISOMEs was 2.6 °C. This figure is higher than the range that is recommended by the ASTM D6751 standard for usage in temperate areas, which is -3 to -12 °C as shown in Figure 4. However, this value is within the average range for petrodiesel, which is -15 to 5 °C. The temperature at which wax crystals first begin to form as the fuel is cooled is referred to as the cloud point. These crystals give the fuel a cloudy or hazy look. These crystals have the potential to clump together and clog fuel lines and filters, which can impede the flow of fuel and result in serious problems with the engine's capacity to function when the temperature is low. Because of this, the cloud point is a significant element that reduces the amount of biodiesel that may be used in colder climates [37]. At a temperature of 3.1 °C, it appears that pristine EISOMEs (B100) would be adequate for use in tropical regions throughout the entire year. However, in order to ensure dependable operation during the winter months in temperate countries, it may be necessary to incorporate cold flow improver additives or blend with winter-grade petrodiesel (for example, in B20 blends). This attribute is a direct trade-off that is related to the chemical structure of the fuel; the same long, saturated fatty acid chains that contribute favorably to the high cetane number also have higher melting points and are responsible for the creation of wax crystals at relatively higher temperatures when the temperature is relatively higher [38].



**Figure 4.** Cloud point of EISO in comparison with petrodiesel and reported biodiesel

#### 1.5 Fuel Injection and Combustion: Density

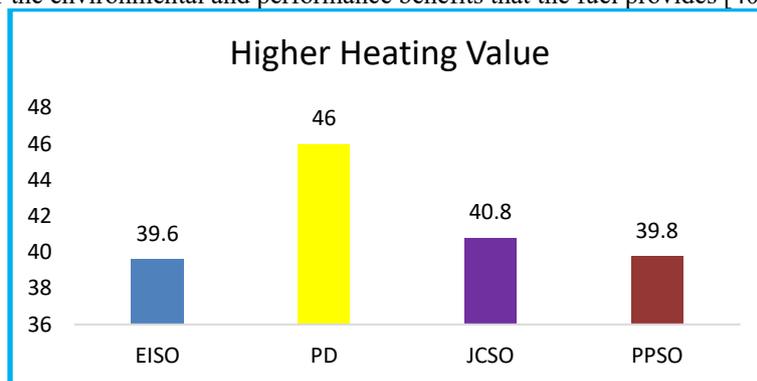
At a temperature of 15 °C, the density of the EISOMEs was determined to be 865 kg/m<sup>3</sup>. This is slightly higher than the density of petrodiesel, which is 850 kg/m<sup>3</sup>, and it comes neatly within the permitted range that is stated by the Bureau of Indian Standards (BIS 15607), which is between 820 and 860 kg/m<sup>3</sup> as shown in Figure 5. The density of the fuel is an important property that has an effect on the performance of the engine as well as the process of fuel injection. Given that diesel fuel injection systems measure fuel by volume, a fuel with a higher density will result in a slightly greater quantity of fuel being delivered into the combustion chamber for a given injection volume. This is because diesel fuel injection systems measure fuel by volume. As a result of this greater mass of fuel, biodiesel's reduced energy content can be somewhat compensated for, which provides assistance in maintaining engine power output. It is also the case that density, in conjunction with viscosity and surface tension, has an effect on the properties of the fuel spray. These qualities include droplet size and penetration depth, which in turn have an effect on the process of air-fuel mixing and the overall efficiency of combustion. The density of 859 kg/m<sup>3</sup> that was observed is well within the standard range for biodiesels and shows that it is also fully compatible with the fuel systems that are already in place for engines [39].



**Figure.5**Density of EISO in comparison with petrodiesel and reported biodiesel

### 1.6 Energy Content: Higher Heating Value (HHV)

After doing the calculation, the Higher Heating Value (HHV), which is also referred to as the calorific value, was determined to be 39.6 MJ/kg for EISOMEs. Compared to the HHV of petrodiesel, which is roughly 46.0 MJ/kg, this is significantly lower, as was to be expected as shown in Figure 6. During the process of complete combustion of a unit mass of fuel, the HHV is the total quantity of thermal energy that is released into the atmosphere. Compared to their petroleum-based competitors, biodiesel fuels have a lower energy content by their own nature, often ranging from 10 to 12 percent less. The presence of oxygen atoms inside the molecular structure of methyl esters of fatty acids is the reason for this phenomenon. These oxygen atoms contribute to the molecular weight of the methyl esters, but they do not contribute to the energy that is produced during combustion. Despite the fact that this molecular oxygen is advantageous for lowering emissions of soot and carbon monoxide and facilitating more complete combustion, the lower energy density that it produces is a consequence of its presence. There is a little rise in the brake-specific fuel consumption (BSFC) as a practical consequence of a lower HHV. This means that a slightly larger volume of biodiesel is required to be used in order to generate the same amount of engine power as petrodiesel. The high-heat value (HHV) of 40.1 MJ/kg is common for a biodiesel that is based on vegetable oil. This value represents a fundamental and well-understood trade-off for the environmental and performance benefits that the fuel provides [40].



**Figure 6.**HHV of EISO in comparison with petrodiesel and reported biodiesel

## 2 Correlating Feedstock Characteristics with Biodiesel Properties

It is not enough to just characterize the end fuel in order to conduct a comprehensive evaluation of a novel biodiesel feedstock; rather, it is necessary to have a fundamental understanding of how the inherent qualities of the raw oil affect the performance of the biodiesel that is produced. There is no coincidence behind the exceptional quality of EISOMEs; rather, it is a direct result of the one-of-a-kind chemical makeup of the seed oil derived from the *Erythrina indica* plant. The fatty acid profile of EISO, which may be found in Table 2, indicates a composition that achieves a profoundly favorable equilibrium between qualities that are frequently in conflict with one another. The considerable fraction of long-chain saturated fatty acids, which accounts for around 33.8% of the total, is the primary contributor to the high cetane number of 58.2. This is due to the fact that compressed molecules that are longer and more saturated are more likely to ignite. On the other hand, a high concentration of saturated fats often results in very poor cold-flow characteristics, which in turn leads to a high cloud point. On the other hand, feedstocks that are abundant in polyunsaturated fats may have excellent cold-flow qualities; nonetheless, they are characterized by low cetane numbers and poorly stable oxidative processes. Through the use of the EISO profile, this trade-off is avoided. As a natural moderator, the monounsaturated oleic acid, which makes up 45.5% of its composition, is the predominant component. It makes a positive contribution to the cetane number while having a melting point that is significantly lower than that of its saturated counterparts. As a result, it prevents the cloud point from getting overly high. When this occurs, a

"balanced profile" is produced, which means that the fuel is able to reach outstanding ignition quality without significantly affecting its performance in cooler temperatures.

Furthermore, the characteristics of the raw oil can be used to make a direct prediction regarding the oxidative stability of the fuel, which is an essential criterion for the long-term storage of the fuel and the health of the engine. The most important factor that contributes to the instability of biodiesel is the oxidation of double bonds, which is especially prevalent in polyunsaturated fatty acids. The total amount of double bonds can be directly measured using the Iodine Value (IV), which is an abbreviation. There is a clear indication that the final biodiesel will be extremely resistant to oxidation because to the low amount of polyunsaturated linoleic acid (6.8%) and the low IV of the raw EISO, which is 70.6 grams of ionizing radiation per one hundred grams. Due to the intrinsic stability of EISOMEs, they are less likely to come into contact with gums, sediments, and acidic compounds while being stored. These substances have the potential to clog filters and cause engine components to corrode. The findings of this study suggest that a straightforward and low-cost method of determining the iodine and saponification values of an unidentified raw oil can function as an effective instrument for making predictions. It makes it possible to conduct a speedy screening of potential new feedstocks, finding those that have the greatest promise for producing stable biodiesel with a high cetane content. This is accomplished without the requirement for a comprehensive synthesis and testing methodology for each and every candidate under consideration. This approach has the potential to considerably speed up the process of discovering and validating previously unknown biofuel resources that are sustainable [41].

### 3 Comparative Assessment with International Standards and Other Feedstocks

The features of EISOMEs were benchmarked against worldwide fuel standards as well as other prominent non-edible biodiesel feedstocks in order to contextualize the performance of EISOMEs and thoroughly analyze its quality. In Table 3, a direct comparison is made between EISOMEs and petrodiesel, as well as the standards of ASTM D6751, BIS 15607, and EN 14214.

**Table 3:** Comparison of Fuel Properties of EISOMEs with Petrodiesel and International Biodiesel Standards

Property	EISOMEs (Modified Data)	Petrodiesel	ASTM D6751	BIS 15607	EN 14214
Cetane Number	58.2	46	47 min.	51 min.	51 min.
Kinematic Viscosity @ 40°C (mm <sup>2</sup> /s)	3.6	2.6	1.9- 6.0	2.0 – 4.62	3.5 – 5.5
Density @ 15°C (Kg/m <sup>3</sup> )	865	850	880	820 – 860	900
Flash Point (°C)	172	70	>130.	>120 .	>120
Cloud Point (°C)	2.6	-15 to 5	-3 to -12	Report	Report
Higher Heating Value (MJ/Kg)	39.6	46.0	Report	Report	Report

Data for EISOMEs, Petrodiesel, and standards sourced from Kadam et al., 2023. Note: "Report" or "ND" in original sources indicates the standard does not specify a limit for this property.

The information shown in Table 3 makes it abundantly evident that EISOMEs either reach or surpass the requirements for all of the essential parameters that are established by the major standards. The fuel is of a premium quality, as evidenced by the fact that both the cetane number and the flash point are significantly higher than the minimum criteria. Both the viscosity and the density are well within the ranges that are often used for specifications. The cloud point is the single distinguishing feature that should be mentioned; although it is acceptable in many areas, it would need to be managed in order to be used in colder climes. This is a trait that is shared by many high-quality biodiesels [42]. In Table 4, *Erythrina indica* is compared to two of the non-edible feedstocks that have received the most attention from researchers: *Jatropha curcas* and *Pongamia pinnata*. This comparison is made in order to evaluate the competitiveness of *Erythrina indica* within the field of second-generation biofuels.

**Table 4:** Comparative Analysis of Key Fuel Properties of Biodiesel from *Erythrina indica*, *Jatropha curcas*, and *Pongamia pinnata*

Parameter	<i>Erythrina indica</i>	<i>Jatropha curcas</i>	<i>Pongamia pinnata</i>
Feedstock Oil Content (%)	38	28 – 42	32 – 41
Biodiesel Yield (%)	~91	~87 – 97	~92
Cetane Number	58.2	53.0 – 54.5	~48
Flash point (°C)	172	142	165
Higher heating value (MJ/Kg)	39.6	40.8	39.83
Kinematic Viscosity @ 40°C (mm <sup>2</sup> /s)	3.6	4.1 – 5.2	5.5
Density @ 15°C (Kg/m <sup>3</sup> )	862	~868	874
Cloud Point (°C)	2.8	1.9 – 3.6	4.7

According to the findings of this comparison investigation, *Erythrina indica* is a feedstock that is not only exceptionally competitive but also outstanding. Its oil content and biodiesel yield are comparable to those of other sources that have been established. The quality of its fuel, and particular the cetane number, is, nevertheless, the component that offers the most significant advantage. It is superior to the typical values that are recorded for both *Jatropha* and *Pongamia* biodiesel, with a value of 58.2, which indicates that it has greater ignition quality. Furthermore, its kinematic viscosity of 3.5 mm<sup>2</sup>/s is significantly lower than that of both *Jatropha* and *Pongamia* biodiesels, which indicates that it has superior atomization and flow characteristics. Both its density and cloud point are comparable to those of *Jatropha*, with *Pongamia* being slightly superior in both respects. The information shown here clearly shows that *Erythrina indica* is not only another possible choice; rather, it is a high-potential candidate that requires major attention for the purpose of further development and commercialization [43].

In the course of this exhaustive inquiry, it was effectively proved that the non-edible seeds of *Erythrina indica* may be used to produce and characterize high-quality biodiesel. According to the findings of the study, the seed oil content was found to be 38 % (w/w), and it was successfully transformed into *Erythrina indica* Seed Oil Methyl Esters (EISOMEs) with a practical yield of 90.2% by the utilization of a standard single-step, base-catalyzed transesterification process. In order to prove the high conversion efficiency, which was 92.46%, spectroscopic confirmation using <sup>1</sup>H-NMR was performed. As a result of the subsequent study of the fuel qualities of the biodiesel, it was discovered that EISOMEs are a high-performance fuel that either fulfills or surpasses the specifications of important international standards. These standards include ASTM D6751, BIS 15607, and EN 14214. Notable discoveries include a high flash point of 172 °C, which guarantees safe handling and storage, and a very high cetane number of 58.2, which indicates excellent ignition quality. Both of these findings are extremely significant. Other essential characteristics, such as kinematic viscosity (3.6 mm<sup>2</sup>/s) and density (865 kg/m<sup>3</sup>), were found to be well within acceptable limits, so demonstrating that the fuel is suitable for use in contemporary diesel engines.

## Conclusion

In the course of this exhaustive inquiry, it was effectively proved that the non-edible seeds of *Erythrina indica* may be used to produce and characterize high-quality biodiesel. According to the findings of the study, the seed oil content was found to be 38 % (w/w), and it was successfully transformed into *Erythrina indica* Seed Oil Methyl Esters (EISOMEs) with a practical yield of 90.2% by the utilization of a standard single-step, base-catalyzed transesterification process. In order to prove the high conversion efficiency, which was 92.46%, spectroscopic confirmation using <sup>1</sup>H-NMR was performed. As a result of the subsequent study of the fuel qualities of the biodiesel, it was discovered that EISOMEs are a high-performance fuel that either fulfills or surpasses the specifications of important international standards. These standards include ASTM D6751, BIS 15607, and EN 14214. Notable discoveries include a high flash point of 172 °C, which guarantees safe handling and storage, and a very high cetane number of 58.2, which indicates excellent ignition quality. Both of these findings are extremely significant. Other essential characteristics, such as kinematic viscosity (3.6 mm<sup>2</sup>/s) and density (865 kg/m<sup>3</sup>), were found to be well within acceptable limits, so demonstrating that the fuel is suitable for use in contemporary diesel engines.



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## Original Article

### The 'New Woman' Before Her Time: Sue Bridehead as Proto-Modern Feminist in Jude the Obscure

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#### Abstract

This paper will discuss Sue Bridehead, the key female protagonist of *Jude the Obscure* by Thomas Hardy (1895) as a multifaceted representation of the late Victorian New Woman. The paper explores intellectual rebellion, emotional uncertainty, and social deviance of Sue as both expressions and critique of modern patriarchal values through a feminist literary lens based on gynocriticism by Elaine Showalter, existential feminism by Simone de Beauvoir, and gender theory prescribed by psychoanalysis. Placing the character in the context of socio-cultural discussions of the 1880s-1890s regarding marriage, education, and sexual freedom, the analysis will examine how the narrative of Hardy swings between sympathy and vengeance to show that he is ambivalent in the emancipation of women. The reason why the tragedy of Sue was one of her weaknesses according to the paper is because of the structural inflexibility of Victorian moral codes, which makes feminist self-actualization impossible. Being a transitional figure who is both Victorian and Modernist, Sue foreshadows the psychological nuances and self-awareness of the later feminist heroines of later works by Virginia Woolf and D. H. Lawrence. Finally, the feminist aspect of Hardy portraying Sue Bridehead reveals the boundaries of the patriarchal mind and opens the literary landscape of femin Keywords: Sue Bridehead, Thomas Hardy, New Woman, feminist literary criticism, Victorian literature, gender studies, modernism.

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#### Introduction

Roles of women as the heroes of the literature have changed the history of passive characters into active and self-conscious people who can choose their destinies. Women in early literature were even more commonly pushed to the margins, either idealized as symbols of virtue, or victims of the world that was created by formerly dominant male protagonists. But, with the development of the society and the emergence of the voice of women, literature was able to mirror this change. Since the nineteenth century, authors like Jane Austen, Charlotte Brontë and George Eliot portrayed women with rich detail and insight and emotional depth. Their heroines challenged the confines they were shaped by patriarchal traditions and wanted to be an individual and not as expected by a marriage and housewifery. This would be later reflected in the writings of Thomas Hardy and Virginia Woolf in which women would be depicted as complex psychologically and struggling with the conflict between individual and social restraint. This development reflects the general feminist awakening that required equality and respect of the intellectual and moral autonomy of women. The heroine of the modern times is not determined only by her relations to other people but her consciousness, desires and own decisions. Literature follows the path of struggle of identity, independence, and self-determination.

#### Research Problem / Purpose

Although Hardy is a part of a patriarchal literary tradition, Sue Bridehead defines a very feminist awareness. Her personality anticipates the freedom of mind, freedom of sexuality,



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and fighting with the fixed institutions, opposing the Victorian norms of marriage, morality, and obedience to the man. The article is an attempt to explore how Hardy uses Sue as a manifestation and criticism of the New Woman ideal, exposing conflicts between feminist desire and patriarchal domination. Sue thus emerges as an object of ideological negotiation - Hardy trying to conceive but also restrict the possibilities of feminine emancipation - through this two prism (Showalter, 1982; Ledger, 1997).

## Objectives

The three main purposes of the given work are as follows:

1. To examine the characterization of Sue Bridehead in terms of the feminist literary theory, it is important to point out her intellectual subversion and social rebellion.
2. To seek her internal struggle between her mind, her heart and social norms, which discloses the constraints of the Victorian gender ideology.
3. To make Sue a transitory figure who would situate the sensibility of Victorian realism and that which would become symbolic of Modernist feminist fiction, the psychological self-awareness (Schaffer, 1991).

## Methodology / Framework

The present study applies the literary and textual analysis of *Jude the Obscure* as the main method of the study. The theoretical framework combines central lines of feminist literary criticism, including gynocriticism as a concept of interpreting literature by Elaine Showalter (1977), which predicts the feministic approach; *Sexual Politics* by Kate Millett (1970), which highlights patriarchal patterns in literature; and the existential feminism of Simone de Beauvoir (1949), which deals with the question of how women get to be socially constructed bodies. This strategy places Hardy in more general socio-historical arguments of the late Victorian period- especially those of marriage reform, female education and moral agency. The purpose behind reading Sue through these intertwined critical and historical prisms is to explain how Hardy foreshadows and frustrates early feminist debate in her work.

## History and Cultural Background.

The late nineteenth century phase of the Victorian Britain was a dramatic shift in the social, intellectual and moral life of the country. The emergence of the so-called New Woman of the 1890s, a symbol of modernity, female education, and social self-assertion, which defied the patriarchal norms and redefined the gender identities. This cultural change took place in the context of industrial growth, urbanization, and intellectual revolution of the evolutionary theory, secularism, and women suffrage movement (Bunting, 2018). The Victorian notion of womanhood, which had hitherto been controlled by the discourse of domesticity and moral righteousness, was being threatened by a new discourse that promised to usher in the idea of autonomy, intelligence and sexuality equality.

The Victorian Woman Question, as it was commonly called in the press and the fiction, was a major focal point of discussion in the literature, in journalism as well as politics. Essays and fiction about the rights of women to an education, marriage legislation and the right to work were written regularly in periodicals like *The Yellow Book* and *The Woman- Signal* (Stetz, 2001). The New Woman was not just a literary cliché but a social phenomenon in this lively media culture, and a representation of the fears of changing gender roles and moral authority. According to scholars, the women were at the same time sensationalized and demonized by the late-Victorian press, who regarded these women as the menace to the status quo and to moral decay (Stetz, 2001; Larson, 2000).

Thomas Hardy, who wrote at this period of ideological disturbance, was highly aware of those tensions. His novels reflect the clash of the Victorian ethical standards with the slowly developing feminist awareness. The fiction of Hardy, as Larson (2000) notes, is also concerned with the same ethical and social issues that New Woman writers like Mona Caird and Olive Schreiner had addressed, but with a tragic sense of its own. In *Jude the Obscure* (1895), Hardy places the quest of the person in search of emotional and intellectual freedom against the tyrannical confines of the Victorian marriage and religion and illuminates the hypocrisy of the social institutions (Abbasi & Salman Saleh, 2015). There were also profound contradictions in the late Victorian life: it glorified scientific advances and moral reform, and maintained repressive gender systems. Women education which was considered as unnecessary or even dangerous started to be justified through new institutions and reforms. However, Mahbub (2025) concludes that intellectual agency of women was a common problem to reconcile with the social norms of marriage and motherhood even in the works of progressive writers. The conflict between personal and societal morality turned out to be the highlight of the literature of the period.

Besides, the imperial culture-gender crossbreeds further complicated the status of the New Woman. Feminist modernity and imperial ideology usually reflected one another in a desire to use expansion, on the one hand, rights and intellect, and on the other, domination and control. The given parallelism shows that the New Woman was an emancipatory and ambivalent figure that had been created through the contradictions of modernity and empire (Neilson, 2004). The controversies of motherhood, reproductive freedom, and eugenics were used to demonstrate how uneasy the feminist ideas were in co-existing with conservative beliefs about social order (Bunting, 2018). Simply put, the historical and cultural context of the end of the nineteenth century served as the ideological basis to the multi-layered female characters of Hardy including Sue Bridehead, the symbol of intellectual freedom and moral



contradiction of the New Woman. Her fight with the patriarchal power and her refusal to live traditionally as a wife are not only the signs that Hardy criticizes the Victorian morality but also the feminist awakening which was the mark of fin de siècle Britain. His representation of Sue allows Hardy not only to engage in the gender politics of his time but to also critique contemporary gender politics, the society was in a state of transition, just between repression and reform.

## **Sue Bridehead: Characterization and Contradiction. Intellectual and Spiritual Rebellion.**

In *Jude the Obscure*, Sue Bridehead is brought out as one of the most intellectually vibrant and psychologically complicated heroines of the Victorian fiction. Sue is an educated, agnostic, intellectually inquisitive woman and the embodiment of the rebellion against the traditional authority of a New Woman. She reads Comte, Mill, and Darwin, she gets familiar with the secular, humanist, and positivist conceptions of the late nineteenth century that were circulating among the radicals of that era (Ahmad, 2019). There is a belief that the social institutions distort genuine human experience that makes her criticize marriage and religion, which is captured poetically when she says that social moulds civilization makes us fit have no more to do with what we really are than the standard shapes of the constellations do with the real star-patterns (Hardy, 1895/2006, p. 221).

The intellectual rebellion of Sue places her as a feminist rationalist in the early times, who disapproves of the ecclesiastical dogma and commercialization of women in marriage. According to scholars like Armstrong (2004) and Morgan (2014), the description of Sue by Hardy is not only a sympathetic account of feminist ideas but also thought about the psychological price of enlightenment. The secularism that separates her against the moral community of conformity makes her a visionary and exile.

## **Ambiguity of Emotions and Sex.**

The independence of Sue is accompanied by emotional insecurity and ambivalence to sexuality. Her fear of flesh has been seen as repression or resistance, but critics today know it to be a psychological resistance to sexual control by patriarchy (Kucich, 1994). Whereas the tragedy of Tess Durbeyfield is written on her body, that of Sue is played on her mind; she carries with her the struggle between intellectual freedom and emotional desire. This is her polarity that does not make her prudish or passionless but symbolic of a woman who tries to redefine intimacy beyond patriarchal structures of possession (Dutta, 2016).

The scene that Hardy creates where Sue is described as sexually ambivalent is, therefore, an indirect criticism of the Victorian merging of womanhood and sensual submissiveness. Regarding the emotional instability manifested in the ups and downs of her affection and withdrawal, as Casagrande (1982) points out, this attribute is signs of a deep-seated moral awareness defective neurosis. Her opposition to marriage and motherhood is both personal and ideological: a survival strategy in the culture that does not grant women dominion over their own bodies.

## **War- The Battle between Ideals and Reality.**

In Sue, Hardy dramatizes the failure of feminist idealism in a moral order that is unkind. Her downfall is not her inability to adapt to the Victorian constraint of the mind and heart but rather the inability to harmonize the two. The turning against the church, her non-marital union with Jude, and non-compliance with ecclesiastical guidelines by rebelling with her husband, ends up with despair after the tragedy that befell her children. This series highlights the brutality of the society that deals with the transgressions of women by retaliating using moral and psychological justice (Ahmad, 2019; Millgate, 2006).

Hardy reveals the dialectic of emancipation and repression as tragedy in the ultimate surrender of Sue, who is going back to Phillotson and repentance. Opponents like Gagnier (1991) see the collapse of Sue as a symbol of late-Victorian fears of female independence: of how intellectual freedom can destroy moral stability. But the irony in the story by Hardy, is such that the failure of Sue, instead of her ideals, incriminates the society. Her tragedy is a reflection of hypocrisy of the Victorian age, the spiritual price that was refused.

## **Feminist Interpretations of Sue Bridehead.**

### **Gynocritical Perspective (Showalter)**

According to a gynocritical perspective as put forward by Elaine Showalter (1977), Sue Bridehead is a paradoxical figure a feminist consciousness in the eyes of a male writer. Gynocriticism, as put forward by Showalter, insists on doing away with the male perspective on the female experience as it is portrayed by women authors, but in the case of Hardy, the converse occurs: Sue turns into a male-written phenomenon of feminine resistance.

Sue expresses a feminine sense of self which is uncharacteristic of Victorian heroines, and she transcends domestic, religious, and marital norms (Morgan, 2014). Nevertheless, the plot of the story by Hardy shifts back and forth between sympathy and punishment - a contrast that reveals his ambivalence to female autonomy (Ahmad, 2019). According to critics, the voice of Sue, despite being intellectually emancipated, is being mediated through the patriarchal frame set by the author. The emancipation of Sue, as described by Hardy, is put to the test as she eventually gives in, as Dutta (2016) notes, and this radical subjectivity is only given the leeway of the tragedy.



To this extent, Sue can be seen as the so-called feminine phase as defined by Showalter, the in-between literary character of both obedience and self-identity. Her eloquent resistance is the sign of the emergence of special feminine awareness in the Victorian fiction despite the authorial control of Hardy that recreates the patriarchal imprisonment.

### **Existential Feminism (de Beauvoir)**

The struggle of Sue Bridehead can be viewed through the existential prism of Simone de Beauvoir (1953) according to which the reader can exemplify the dictum, One is not born, but becomes, a woman. Her mental autonomy and moral cynicism makes her a woman who wants to become herself in a society where she is dictated by the male relationships she has with Jude, Phillotson and the clergy.

The idea of woman as the Other by De Beauvoir can also be heard in the alienation of Sue who is intelligent and self-aware but is always marginalized in the social structures which minimized her to a moral or erotic icon (Morgan, 2014). Her sexual deviance and rejection of marriage is an existential rebellion of freedom - a revolt against the deterministic roles of wife and mother. But the sadness of her eventual acquiescence to societal norm depicts how ineffective existential autonomy is when it is controlled by male demands (Ahmad, 2019).

In the career of Sue, Hardy foresees the confusion of de Beauvoir in regards to the challenges the emancipated women had to face: the freedom that did not belong to society is one more exile. Sue in her rebellion displays the possibilities and danger of existential feminism in a moral order that fails to recognize female subjectivity.

### **Psychoanalytic Theory and Gender Role Theory.**

A psychoanalytic interpretation of Sue Bridehead reveals internalization throughout the process of control by means of patriarchal guilt. Her swinging between insurrection and guilt as well as forgiveness resonates with what Weissman (2010) calls the failure of emancipation, which is the turn of the Victorian ideology into self-punishing female desire. The success of the internalized repression at the expense of the moral redemption is indicated by the nervous anxiety of Sue, self-blame, and the ultimate regression of her religious beliefs (Kucich, 1994).

Shuttleworth (1984) understands the sexual reluctance in Sue not as prudishness but the psychic symptom of cultural conditioning: she is haunted by the body resisting the mind. Her repulsion to sensuality is the struggle of intellectual identity with socially constructed feminine notion of purity. Such inner conflict is made worse by the fact that this is idealized by Jude as a spiritualized woman, which only strengthens the very gendered binaries she attempts to avoid.

In terms of a gender role approach, the sense of self-fragmentation in Sue reflects the social contradiction of womanhood in late Victorian society, the need to be independent and subordinate. Her failure is not so much of character as it is of psychology, as Dutta (2016) would argue, the cost of living according to mutually exclusive gender scripts.

### **Sue as Proto-Modern Feminist**

#### **Prediction of Modern Feminist Themes.**

Sue Bridehead is a kind of a transitional character between the Victorian New Woman and the Modernist feminist heroine, symbolizing the psychological and social contradictions that were to shape the literature of the first half of the twentieth century. Her inner self, her ethical doubts, and her identity disintegration prefigure the sober self-exploration of Virginia Woolf and D. H. Lawrence. According to Schneider (2017) and Morgan (2014), this split self of Sue as presented by Hardy foreshadows the stream-of-consciousness approach to female subjectivity that Woolf would later master.

This autonomy, that Sue is seeking, which is manifested in refusing to marry, in questioning the moral dogma, in demanding her definition of herself, is a feature of proto-modern feminist individuality and selfhood (Ahmad, 2019). Nevertheless, her disillusionment is similar to the skepticism of the modernist age on idealism and reason. According to Childs (2001), modernism came about as a result of a loss of faith in social and moral systems; and by the time of her artistic expression, Susan is a catalyst of epistemological crisis, seventy or seventy years before its artistic embodiment in Mrs Dalloway or *Women in Love*.

Comparing Sue with Clarissa Dalloway, critics find that the two women are anxious about the frontiers of the self and society. These two characters exist between liberation and bondage and have trouble balancing the freedom of the self and the duties of morality (Marcus, 1994). In a similar way, Sue predicts Ursula Brangwen in *The Rainbow*, a woman who wants to find spiritual completeness, outside the patriarchal explanation of love. The psychological realism proposed by Hardy thereby becomes a prophecy of Modernist interiority, as a prelude to new rebellions as consciousness (Schneider, 2017).

### **Social and Political Relevance.**

In addition to the psychological aspect, the fact that Sue does not want to be a wife and a mother places her in the context of the overall feminist political ideology. Her comment on the institutional marriage is similar to the modern discussions of the Matrimonial Causes Act (1857) and the newly formed feminist movement that demanded divorce reform and women equality in education (Millgate, 2006). According to Dutta (2016), Hardy relates the



predicament that Sue was in to question the way in which the Victorian moral ideology used domesticity to oppress intellectual women.

The fact that Sue does not conform is a personal rebellion as well as political statement: by stating that love cannot be legislated, the author makes the institution of marriage to shake. This principle presupposes the first-wave feminist demands of economic and moral autonomy, whereas her mental breakdown predetermines second-wave feminist demands of internalized oppression and conditioning (Kucich, 1994).

Her intellectual boldness also indicates the perplexed legacy of Enlightenment humanism: she is convinced in rational development but finds out that social structures use morality as a tool to perpetuate gender-based inequalities. The fact that Hardy portrays Sue as such takes the social realism of the nineteenth century and the feminist modernism of the twentieth century as it is very conscious that she uses her own consciousness to dramatize the shortcomings of both the progress and the faith.

## **The Feminist Ambivalence of Hardy.**

### **Authority Sympathy vs. Narration Punishment.**

The attitude of Thomas Hardy to feminism is deeply ambivalent, though he was a sympathetic witness of the misfortunes of women and a storyteller of patriarchal tragedy at the same time. His portrayal of Sue Bridehead swings between respect of her thought and moral autonomy, and a predetermined requirement of her pain as narrative closure. According to Ahmad (2019) and Morgan (2014), this is the paradox in the book: Hardy develops Sue as a radical visionary questioning moral and religious codes of her era, but laments her to a mental and spiritual breakdown. It is a kind of tension that Ingham (2003) follows with Hardy as having his gender paradox - both the criticism of social injustice and the imaginative adherence to gendered punishment. The ultimate self-abnegation of Sue in her remorse in going back to Phillotson is not mere narrative closure but rather the reestablishment of the Victorian moral orthodoxy in the very critique of the same in the novel.

The sympathetic realism expressed by Hardy in his psychological depiction of the rebellion of Sue is plain. Her refusal to wed and subscribe to an institution of religion can be seen as the result of her profound intellectual belief, and Hardy could be seen as a supporter of early feminist discourse (Dutta, 2016). Nevertheless, Kucich (1994) states that Hardy displaces female desire with moral disaster, and he dramatizes repression instead of freedom. This trend is recapitulated in *Tess of the d'Urbervilles*, in which the only way to make Tess pure is to make her suffer and in the case of Sue, the only way to make Sue rebel is to make her neurotic and despairing.

In this way, the art of Hardy is subversive and conservative at the same time, he reveals the inhumane nature of the patriarchal society and in the end he can not conceive of something outside of it. He makes Sue humanized through his empathy, yet his form of telling the story strengthens the gendered fatalism she tries to avoid.

## **Social Contextualization**

One cannot help but consider the conflicts within Hardy's character as reflecting Victorian social ideology, where the "New Woman" was a figure that created fear and anxiety in terms of morality, sexuality, and the household order. The press and public opinion of the 1890s often characterized liberated women as the main reason for the disintegration of the social fabric, a viewpoint that Hardy expresses through the tragic fate of Sue (Langland, 1995).

Gatrell (1993) and Millgate (2006), through their respective analyses of Hardy's letters and prefaces, conclude that the novelist was in sympathy with women's causes—he even went as far as to advocate for their education, legal equality, and to denounce the double standards in sexual morality. Still, the fact that he lived during such a time, Hardy's fiction to a certain extent remains bound by the Victorian determinism, which punishment for rebellion it prescribes. In this way, Sue's punishment, at the same time, represents and is part of the cultural backlash against the "New Woman," thus turning her personal tragedy into a social allegory.

Shuttleworth (1984) sees Sue's breakdown as more than just a moral lesson; rather, he views it as a symptom of social psychosis—individuals are crushed by the weight of quiet moral codes. Hardy compels the reader to face the ethical dilemmas of modern times: sympathy without freedom, critique without settlement. His portrayal makes Victorian readers ponder about the moral conformity of society that communication of personal freedom through the whole destruction of it is, in fact, justifiable.

## **Conclusion**

Sue Bridehead is one of the most interesting and tragic women in Thomas Hardy who represents what an intelligent and an independent woman is going through in a strictly patriarchal society. The struggle between intellectual freedom and the moral convention, the desire of a person and the social responsibility, can be seen in her path in the book *Jude the Obscure*. At first the image of a representative of modernity and spiritual revolt, the ultimate submission of Sue to religious guilt and social disapproval shows us the devastating ability of the Victorian moral code to suppress the individuality of women. In her, Hardy reveals the emotional and psychological price paid by a culture in which women have no right to make their own decisions about their own bodies and minds. The unfortunate transformation of Sue, who tries to be defiant but ends up being despairing, can be used to highlight the scanty options



that women have when they want to be free and accepted at the same time. She is an eloquent symbol of the early feminist movement courageous, questioning, and ultimately shattered by the world she was meant to change.

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## Original Article

### Legacy Waste Dumpsite's Remediation Methods and Challenges

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**Abstract**

India is facing a huge challenge of managing the waste. The management of waste is not easy task due to the huge amount of waste generated on daily basis and along with it the management of decade long dumped waste in the open dumpsites or the unscientifically operated landfills. Which is known as Legacy waste. The present landfills are already overloaded with the mixed waste. The decade long waste dumped is creating huge environmental impact through leachates generation, fires at the dumpsites, foul smell, spread of diseases leading to public health impact. And along with it the fresh waste generated on daily basis is dumped over the legacy waste aggravating the problem further. Legacy waste management is very crucial as it is harming the environment creating hazards leading to impact on the public health. According to the solid waste management rules, 2016 it is mandatory to remediate the legacy waste dumpsites. The Swachh Bharat Mission 2.0 also advocates the remediation of the legacy waste dumpsites and landfills. This review study is undertaken to understand the composition of the legacy waste, review the methods and challenges in remediation of legacy waste dumpsite. The study recommends the integrated waste management method, consideration of circular economy, technological innovations to overcome the challenges in remediation of legacy waste dumpsites.

**Keywords:** Legacy waste, remediation, dumpsites, circular economy, leachates.

**Introduction**

The amount of waste generation is increasing with the increase in population. Industrialization added to the quantity of waste generated along with the urbanization. Managing this huge amount of waste is a major concern. Management of waste is a global challenge. Earlier before 1970s, the waste generated was converted into the compost and was going back in the soil. The farmers were collecting even the waste generated in the urban areas to add it in their agricultural field. Later in seventies when the plastic waste got mixed in the waste the urban waste was not being taken by the farmers as that was affecting their agricultural field.1 The mixed waste was dumped in the open dumping sites. Today in India, after almost three decades the waste is collected into heaps of mountains in almost more than 3000 open dumping sites. These heaps of waste are way higher than the permissible limits of 20 meters. All the opens dumps are even filled beyond their carrying capacity. India is facing two major challenges with respect to the effective waste management

- a. Generation of huge amount of waste on daily basis,
- b. Treating the decade long neglected waste

On daily basis more than 1,60,000 metric tons of waste as per CPCB is generated. Before effective management of the generated waste is completed, the same huge amount of waste is collected the next day. Also, the landfills which are present are already overloaded like for example, Ghazipur landfill in Delhi, has reached the height of around 69 meters, Bhalswa reached height around 56 meters, Okhla reaching height of 55 meters.1

These piles of waste have not only occupied the several hectors of land but they are leading to generation of leachates due to anaerobic decomposition of the mixed waste lying in the landfills.



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The leachates percolates under the ground and are contaminating the groundwater. The surface runoff of it is leading to contamination of surface water. This has resulted in spread of water borne diseases affecting public health. Methane one of the major green house gases is also released due to the rotting of the waste over the period of time. The methane gas has 21 times more potential in global warming compared to carbon dioxide. These landfills are major contributors to the total methane emission in the country. The air pollution is also one of the major concerns due to the frequent fires which takes place at such open dumping grounds with the mixed waste piled up leading to emissions of dioxins, carbon monoxide, VOCs, PM<sub>2.5</sub>, PM<sub>10.11</sub> The open dumps attract rodents and many other insects leading to spread of various diseases like malaria, dengue, plague. Also, the aesthetics of an area is getting affected due to huge amount of waste seen over a large landscape.

The management of these mountains of waste collected over the period of time referred to as “Legacy Waste” at the earliest will help in reducing our national methane emission, reducing the water and air pollution helping in improving public health. The management of legacy waste will also help in creating space for the present waste left for final disposal.

## Objectives

1. To gain the insights on the composition of legacy waste.
2. To review the methods and challenges in remediation of legacy waste dumpsite.
3. To find out whether the practice of legacy waste mining and treatment is a sustainable practice.

## Literature review

Krishnan and Sharma suggested that the mining of legacy waste can lead to economic benefits and a good way to reduce the hazards generated by the same.

As per the review conducted by Anusree and Sivakumar the criteria for remediation of dumpsite mining are not given. The study proposed the criteria to select the appropriate remediation methods to overcome the problems like leachate generation, the emission gases. The study even highlighted the challenges faced in managing the waste and the site. It also recommended the strategies to overcome these challenges through the legislative support, integrated waste management, moving towards circular economy and sustainable innovative practices.

According to the authors, Vivek Ojha, Apurva Sharma, Ved Prakash Ranjan, Rahul Rautela, Aachal Dhawral, Sunil Kumar in their paper highlighted that the Recovery Index Potential is a key to know the type, quality and composition of the material recovered through dumpsite mining. Landfill mining can lead to sustainable solution but also may lead to huge environmental contamination if not carried out properly.

A case study of Pune city for legacy waste management, the authors Mr. Vishal Madhukar Bhandare, Mr. Shrikant M Bhosale, Dr. Y M Patil concluded that optimisation of cost still requires more research and if done properly then the income generation can be more than the expenditure, benefiting the Municipal corporation and generating more employment.

## Methodology

The legacy waste dumpsites contain a heterogenous mix of waste including the plastic, glass, metals, organic matter, textile and other things<sup>10</sup>. The waste which needs segregation and treatment. The dumpsites lack leachate management as these dumpsites where not scientifically constructed so no underground lining. Open dumping at such sites attracts the rodents, insects, release of foul smell takes place affecting the environment and public health. In the absence of effective waste management strategies, the methods of waste disposal like open dumping, burning of the waste, unsanitary landfills will further aggravate the issue.

This study focuses on understanding the legacy waste, its composition. It also reviews the potential of the recovered waste in the circular economy. The challenges faced in the legacy waste mining.

## Legacy Waste

The legacy waste is the aged waste from the dumpsites or the landfills. The waste which is lying on the land or in the landfill for years together. It is a waste which is partially or completely decomposed material, plastic, metals, glass, textile and any other material found in the dumpsites.

## Composition of Legacy Waste

The legacy waste is lying on the ground or in the landfill for a long period of time. Depending on the time period of the waste dumped in the legacy waste dumpsites the composition of the waste differs. In India, the dumpsites contain the legacy waste and the fresh waste the composition of both the waste is different. The microorganisms act on the biodegradable legacy waste and it is broken down into simple inorganic material. The process depends on the various factors like size of organic material, temperature and moisture content, air passage in the landfill or the dumpsite. This makes the fresh and the legacy waste different. The decomposition also helps in deduction in the mass and volume of the waste in the landfill.

The legacy waste dumpsites constitute 40 to 60% of fines. The fines are the small fractions of mineralized organic waste mixed with the silt, dust, cement dust from demolition waste. The amount of fines present in the dumpsite

depends on the age of the dumpsite and the region where it is located. 75% of fines are found in the older dumpsites present in the Delhi where the organic matter present got degraded for a longer period of time. As compared to the dumpsites in Mumbai which are comparatively new has less amount of fines present.<sup>2</sup>

One-third of the dumpsite contains the inert waste. The inert waste is a nonreactive waste found mixed in the legacy waste dumpsites. Also, contains combustible material such as paper, textile, cardboard, plastic which forms around 15 to 20 %.

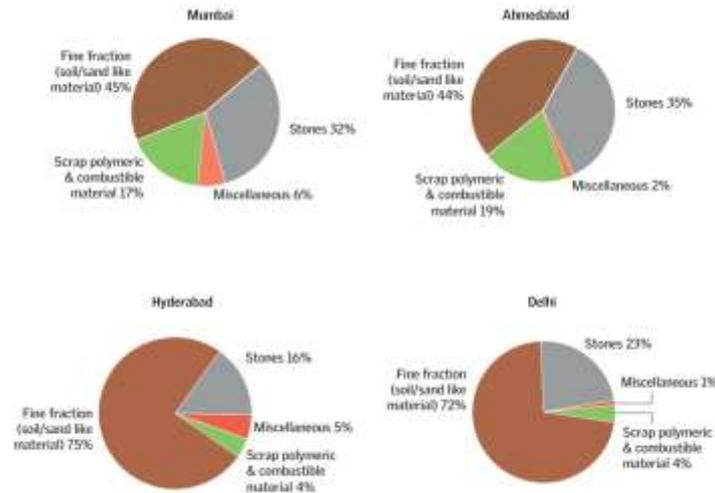


Fig 1. Legacy waste composition in dumpsites in different states.

Source: Toolkit legacy waste management and dumpsite remediation in India and CSE.

The broken pieces of glass, cement bricks coarse material is also recovered. The fig. 1 shows the composition of the legacy waste at different dumpsites where miscellaneous items refer to sanitary waste, diapers, razors, needles.<sup>2</sup>

The Solid Waste Management Rules, 2016 are framed for effective management of solid waste under Government of India. Under this rule, the provisions for the managing old dumpsites of municipal solid waste are given. It states that it is the responsibility of the local authorities to take necessary steps to manage all the open dumpsites through Bio-mining and Bioremediation where ever possible. And where these techniques are not feasible their scientific capping of the dumpsites should be done.

### **Biomining and Bioremediation**

Biomining is a scientific process of excavation of material its scientific treatment with the help of micro-organisms, segregation and utilization of it is referred to as biomining. The treatment of the waste by living forms where organic matter is converted into inorganic form is bioremediation. Bioremediation helps in stabilization of the material which facilitates further segregation of the waste.

### **Steps in Biomining and Bioremediation**

1. Initial study: survey through maps and drones of the dumpsite, the amount of waste present, survey of the area for approaching the site. Risk assessment, Baseline data collection of the present conditions of the soil, water, air. Characterization waste and establishing tie ups.
2. Excavation: Systematic excavation through sophisticated techniques, identifying the depth of excavation, use of PPEs
3. Stabilization of waste: creating windrows, spraying bio-culture, removal of moisture
4. Screening and utilization: segregation of waste and further processing of the waste as per the size and composition.
5. Utilization of the land: cleaning the recovered land and utilizing it.

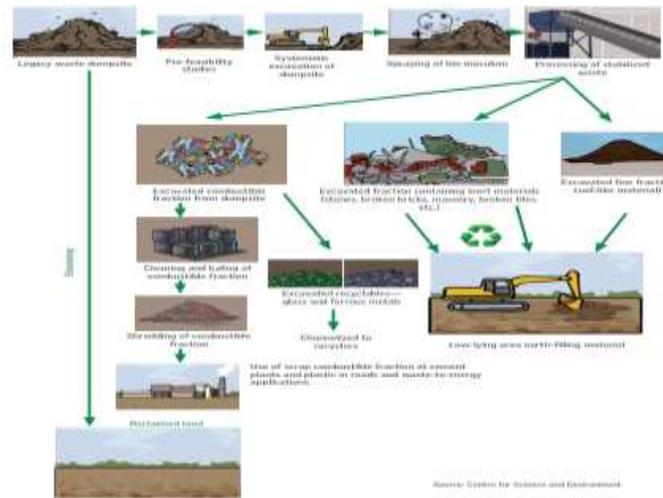


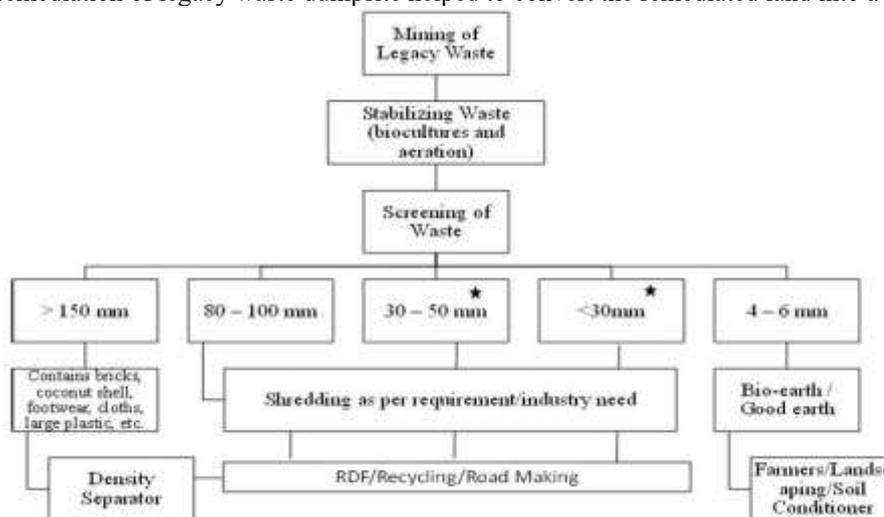
Fig.2. Steps in Biomining

### Process of Biomining and bioremediation

In biomining of legacy waste, the waste is excavated which leads to loosen the dump and then windrows of the waste are made by spreading the waste in large areas so that the waste is dried under the sun. The windrows are then mixed with the bio-culture which helps in speeding up the process of decomposition which helps in converting the organic matter into inorganic form which is in the form of gases like carbon dioxide and water vapors. This process is referred to as bioremediation. The waste thus reduces in volume by 35-40 %.

The process of decomposition releases heat which further helps in drying of the waste when the waste is completely dried and no more heat is generated due to decomposition process. This is referred to as waste stabilization. The next stage is screening of the stabilized waste. While the waste is windrowed the large materials visible are even handpicked. The stabilized waste becomes convenient for screening as different sizes of waste can be separated and further channelized or process. The very fine particles remaining after screening is the bio-earth is a very good compost, which can be used in the agricultural activity by farmers, it is a soil conditioner, can be used for land scaping. The large course material recovered after screening is the bricks, cement blocks, stones, other waste dumped like piece of cloth, large plastic. This large course material can be spread on density separator which separates the plastic and other lighter material from the heavy ones.

The remaining fraction of waste is in between the fine and large material which can be shredded as required and use for road construction, recyclables can be recycled and combustible can be used as refuse derived fuel. The dumpsite from where the waste is excavated can be used for dumping fresh waste or can be used for totally different purpose. In the Gorakhpur, the remediation of legacy waste dumpsite helped to convert the remediated land into a dense forest. 4



★ In Case of RDF (With Size Up to 50mm) shredding is not required

Source: CPCB guidelines, 2019

Fig 3. CPCB guidelines on Biomining

Thus, the biomining and bioremediation is one of the recommended methods to treat the age-old waste dumped unscientifically in the landfills. It helps in reducing the methane emissions as it digs in the site and moves the waste creating air movement within the heaps. Biomining helps in recovery of the material which can be put to use again like the polymeric fractions can be used as refuse derived fuel (RDF) to generate energy leading to energy recovery from the waste, the large fractions for road filling, also it helps in land recovery which can be used to dump the fresh waste where the concern for landfilling of the current waste is high.

### Challenges in biomining and bioremediation

The major concern for effective implementation for biomining is the heterogenous type of waste in the landfills. Most of the dumpsites are been burdened with the dumping of fresh waste over the legacy waste. This becomes a major challenge as the decomposition rate for the age-old waste and the fresh waste differs, which affects the rate of stabilization of the waste. It even increases the cost of the treatment due to increase in the quantity of waste, where already the amount of legacy waste is too high and the fresh waste adds to it.

The recovered material needs to be tested before putting it to use. The recovered inert fraction used for soil conditioning may have traces of heavy metals or organics. This may lead to leaching after use. The environmental and public health may further get affected due to recovered legacy waste. At the same time the cost of treatment of the legacy waste increases for testing the recovered waste before use.

Another major challenge is the recovered waste need to be fully utilized or their will be a burden of the recovered waste. There should be takers for the recovered waste so that further utilization of the waste as resource is done.<sup>5</sup> Only the waste which cannot be further treated or utilized should go in the sanitary landfills reducing the burden on the sanitary landfills.

### Deonar Dumping Ground

Deonar dumping ground is one of the oldest and the largest dumping ground operating since 1927. It is located in the eastern suburbs of Mumbai. It is around 311 acres of land parcel. Earlier before urbanization, the nearby area of the dumping ground was an open area. Later as the settlements started and the inhabitants in the areas of Deonar, Mankhurd, Govandi, Shivajinagar started increasing in 1990s.

On daily basis, the dumping ground received 3000 MT of waste.<sup>12</sup> Frequent fires at the piled-up waste led to the air pollution and the environmental hazard. As per the reports, the life expectancy of the people in the nearby locality has reduced and increase in the number of tuberculosis was seen.<sup>12</sup> In January 2015, a massive fire breakout took place at the dumping ground and later even in March 2016 which lasted for days together leading to huge environmental and public health damage.<sup>12</sup> The order of closure of the dumping ground was passed by the Bombay High Court looking at the impact created due to the piled-up waste and the saturated site. The BMC and Ministry of Housing and Urban Affairs decided to close the Deonar dumping site through Bioremediation. The project is to be executed as per the Solid Waste Management Rule, 2016 and CPCB guidelines. The project involves the bioremediation of 2 crore tones of legacy waste through excavation, segregation of legacy waste. The testing of the material recovered will be done to comply with the environmental regulations. The processing of the waste will be done by adding bio culture for speeding up the bioremediation process. The recyclables will be channelized to the authorized recycling units. Transport of Refuse Derived Fuel (RDF) will be done to the cement making factories or alternatively to the Waste-Energy-Recovery plants. The excavated soil will be used for leveling the low-lying areas. Also, out of the total land parcel of 311 acres which will be remediated State Government designated 124 acres for Dharavi Redevelopment Project, 136 acres for BMC and a rest unusable.<sup>12,14</sup> The project contract is been awarded to Navayuga Engineering Ltd. for Rs. 2,540 crores above the BMC estimate of Rs. 2,368 crores for the period of 3 years as per the Times of India reports.<sup>13</sup>

### Conclusion

Biomining as well as Bioremediation are the solutions which are sustainable for managing the legacy waste by reducing the volume and reducing the environmental hazard. They also help in recovery of the material. Biomining and Bioremediation techniques help in aligning with the principles of circular economy as they convert waste to usable material like compost, Refuse derived fuel etc. Along with the land reclamation. However, there are various challenges in applying the techniques. As reviewed, the old waste getting mixed with the fresh waste and both being heterogenous waste further increases the challenge. Thus, increasing the cost of treatment, testing of recovered waste which are a concern while management of the legacy waste. There need to be sufficient funds, involvement of public and private parties along with locals as reviewed the Deonar Dumping ground remediation project. In such case the remediations methods can become a sustainable practice.



## Recommendations

1. Adopting Legacy Waste Remediation Program nationwide.

A time-bound nationwide program for management of legacy waste need to be adopted by the government and the local authorities. The funding and monitoring mechanism should be in place for systematic implementation across states.

2. Segregation and testing of the recovered material:

After excavation proper segregation through appropriate waste characterisation should be done. That will help in prevention of contamination and maximum recovery of recyclable material.

3. Integration of Circular Economy:

The recyclable items should be channelised for economic gains through authorised market partnership and tie-ups with the industries and other sectors for maximum utilisation of recovered waste is recommended to prevent the burden of recovered waste.

4. Strict enforcement of rules and regulations:

There should be strict enforcement of Solid Waste Management Rules, 2016 along with training for scientific ways of implementation of the remediation techniques.

5. Awareness among the public:

Spreading awareness regarding the significance of managing the legacy waste through the techniques like biomining and bioremediation. Education the people about the same for public participation. Importance of segregation of waste at source should be advocated through campaigns to reduce the further issues and challenges.

6. Research:

To optimize the cost of the biomining and bioremediation techniques more research is needed. Also, further research is required for the optimum utilisation of the recovered material. For more viable and sustainable practices.

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## Original Article

### Issues of Gender Formation and Challenges in Mahesh Dattani's Dance like A Man

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#### Abstract

Mahesh Dattani has examined the collective and personal consciousness of individuals confined by patriarchal norms within the context of Dance Like a Man. In 1989, the play was staged for the initial time. It could be seen as a symbol of the intense conflict between the dominant and individual identities within the framework of a family drama. This relates to an era in Indian history when dance was seen as a profession that belonged to the lowest class of society. The issue of gender formation is explored by Dattani's Dance Like a Man, a play in which the protagonist is male instead of female. Not Ratna so but Jairaj, is the one who has to deal with the consequences of gender politics. The one who is unsuccessful as a dancer and an alcoholic is Jairaj; he is overshadowed by his bride and kept on a leash by his father. Despite his best efforts, his father and his wife have colluded to further their own agendas, reinforce their own insecurities and maintain antiquated biases. What makes Jairaj's decision to work in a field that is "right" for women?

**Keywords:** Issue, Gender, Formation, Dance, Like, A, Man

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#### Introduction

The fair and equal representation of individuals of different genders is referred to as gender diversity. Although it also encompasses individuals of intersex gender, it is most commonly used to refer to an equal gender ratio. Gender identities that show a breadth of expression outside the binary paradigm are grouped together under the term "gender diversity." For many people who identify as gender non-conforming, the idea of binary gender—having to decide whether to portray oneself as male or female—is restrictive. Those who have changed or are changing their physical sex to match their gender identity are known as transsexuals. Drag queens drag kings and transvestites often dress in ways that are considered socially acceptable for the 'other' gender, even when it's for entertainment purposes. The family, as Dattani portrayed in "Dance Like a Man" (1989), is the most tangible and dynamic reality in middle-class Indian life. Families are the most active and tangible aspect of middle-class Indian existence. The three generations that reside there often rely on the home because of its physical presence which establishes standards for their everyday existence. In this work, Dattani also examines complex familial ties. Ratna and Jairaj, a dancing pair, practice and become proficient in the dance at their home against the warnings of Jairaj's father, Amritlal Parekh. Lata, their daughter, is similarly encouraged by Ratna to pursue her dancing career and achieve success. Subsequently, Amritlal tricks his son by allowing only his daughter-in-law to dance, hoping to sour their relationship and deter his son from following suit.

As their miscommunication deepens, Ratna accuses her husband of jeopardizing his own career and family life. She goes to the performance by herself, ignoring her spouse. Consequently, the dancing pair breaks up.



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## **Tradition, Relationships, Career and Society**

Dissimilarities between the physical characteristics of men and women have persisted throughout history and manifest in various forms in every culture. The innate disparities between the sexes have served as a basis for biological categorization ever since Homo sapiens first evolved on Earth. This has always been the case on Earth ever since people started showing up. Things like hunting and other physically demanding outdoor pursuits used to be more common among men (Eagly, 1987). Women, historically viewed as the weaker sex, were expected to do menial tasks like cooking, gathering berries, cleaning and child care due to their inherent strength and ability to support their own bodies (Eagly, 1987). Nevertheless, due to their extensive existence spanning millennia and the entirety of human history, these gender roles have grown increasingly solid and stable. There has always been and will always be, an assumption that men and women should act in traditionally separate ways.

When discussing the meaning of the terms "gender" and "sex," the former is typically set against the latter. Although cultural factors influence whether we are perceived as feminine or masculine, our biological composition ultimately determines whether we are classified as female or male. Gender, then, is best defined in terms of learned patterns of behavior and activity rather than those determined by biology. Crucially, assuming that biology is the sole determinant of gender is not required. This is meant to suggest that while there are universal and naturalistic features that classify a person as male or female, the ways in which men and women display their gender will vary between cultures. Since the year 2005, according to Das. Some have hypothesized that families are universally desirable and that all civilizations have a basic need for nurturing and providing for one another's material and psychological well-being. Like in any business, certain members of a family in our culture are entrusted with specific tasks that help the whole family move forward. It is the man's duty to earn money to pay the bills but it is the woman's duty to meet the emotional needs of her family by tending to their physical needs (such as feeding and clothing them) and showering them with maternal love and care. According to society's unwritten rules, it is inappropriate to flip between these duties. Consideration is paid to the unique attributes that each gender possesses when assigning the obligations that have been mentioned, so that they can carry them out appropriately. It is easier for men to go out and earn a living because, for example, society assumes that men are physically stronger than women. Consequently, they have the power to control the opposite sex. However, it was believed that women could better care for their families since they were emotionally stronger. Consequently, they exhibited more altruism in their behavior to swiftly satisfy the needs of others. The expectation that an individual would develop traits associated with their gender and subsequently transmit those traits to their offspring creates a self-perpetuating cycle.

## **Symbol of the intense conflict between the dominant and individual identities**

Mahesh Dattani has examined the collective and personal consciousness of individuals confined by patriarchal norms within the context of *Dance Like a Man*. In 1989, the play was staged for the initial time. It could be seen as a symbol of the intense conflict between the dominant and individual identities within the framework of a family drama. This relates to an era in Indian history when dance was seen as a profession that belonged to the lowest class of society. Think about what happened to Jairaj, an Indian man, to show how widespread this social hypocrisy is. Jairaj defied the prevailing gender norms of his day by deciding to become a professional dancer. Dramatically, the play's use of him deconstructs masculinity's defining roles and projects its executorial constraints.

## **Issue of gender formation Dattani's *Dance like a Man***

Dattani's *Dance Like a Man*, a drama with a male protagonist rather than a female one, examines the problem of gender formation. The person who must deal with the fallout from gender politics is Jairaj, not Ratna. Jairaj is the alcoholic and failing dancer; his father keeps him under control and his bride overshadows him. His father and his wife have conspired to retain outdated prejudices, reinforce their own fears, and push their own agendas despite his best efforts. Why is it so unfortunate that Jairaj chose to work in a field that is "right" for women rather than him? For this reason, his father supports Ratna as a dancer. When boys in traditional Indian culture decide they want to be dancers instead of doctors, engineers or businesspeople, they face a lot of pressure from their parents and other members of society to pursue more financially secure careers. Aspiring male dancers are stereotyped as an alien "other" due to their femininity and lack of experience in the field. The play Dattani challenges the assumptions and norms around masculinity. Based on his views on "erotic numbers," Jairaj seems to disagree with his father's view of gender roles which raises the question of whether or not he has really embraced his father's thinking about gender roles.

Before telling her father, "There are erotic numbers," Lata reassured him. "You make it sound so crude." There is zero foul language involved, Jairaj. It was the same dance that I did when serving in the military. We were pleased with the quantity of money that came from a program that our friend organized. Your mother was too terrifying and all they wanted was a woman. As a result, I danced while clad in your mother's clothing, a wig and anything else was necessary to give the impression that I was a woman. It was treasured by them. Their enjoyment increased dramatically once they learned I was a man.

So, according to Dattani, the idea of a creative artist seeking artistic achievement is at odds with the categorization of masculinity and femininity within the framework of an Indian household. In these forms of creative



pursuits, the artist is often confined to their own possessions and compelled to conform to the preconceptions that are there. Unfortunately, Jairaj falls prey to the patriarchy and sexism that permeate Indian stereotypes. His struggle to prove his manhood persists even if he has made Bharatnatyam his profession. But he can't grow as a person or realize his ambition because of the cultural limitations to which he is subject. His sense of self as an artist and more importantly, a decent guy, is shattered throughout this battle. That Jairaj's outer consciousness becomes paralyzed when faced with life's difficulties is evidence of this. Jairaj protests his father's dominance and Ratna's neglect in Act II of the play. As a means of degrading him, Ratna calls him a timid youth who spent more than 48 hours cooped up in his father's house. This has a devastating effect on their personal relationship, causes them to argue and leads to deep animosity between them. He tells Ratna how he feels:

By little by little. It was a poor decision on your part to insist on having prime time airtime in all of your shows. You promptly appropriated my weakest attributes the moment you forced me to dance with them. Taking charge of the situation occurred when you adjusted the lighting to the point where I appeared to be dancing in your shadow. Furthermore, I felt humiliated when you made fun of me in front of their parents. Those people whose names I would be ashamed to reveal in private. This means that other people's hopes and dreams shape Jairaj's life in various ways. In contrast to his father's attempt to mold Jairaj into his ideal shape, Jairaj's wife Ratna takes a different tack in her efforts to give her husband the manhood that his father seeks. No one gives him permission to do what he wants with his life. His sorrow has become a tragedy of the spirit because of this terrible thing. He gives in to his drinking because he is always overcome with feelings of worthlessness.

### **Choice between Dreams and Reality**

All three times frames—the past, the present and the future—are seamlessly interwoven throughout the play. By doing so, we may forecast the results of three generations while simultaneously dissolving the numerous time shifts. Jairaj starts to absorb his struggle the second he considers his past. He can still vividly remember the day he and Ratna set out on their adventure together, the turning point in his life. They shared a common goal as Bharatnatyam dancers: to reach the pinnacle of their craft. While Ratna achieves great success in her creative pursuits, Jairaj fails miserably due to his inability to transcend the patriarchal influence of his father. Being a successful dancer herself, Ratna is placing her whole faith in her daughter Lata's performance. Through Lata, she aspired to achieve everything she had failed to do in her life. She strengthens herself by winning Lata over, but Jairaj becomes more and more helpless as a result. Prejudice against women is a common issue in Indian literature, whether written in English or another Indian vernacular language. Furthermore, a girl child's internal struggle with her own identity is at the heart of *Tara*, a problem play that explores themes of gender discrimination. As a reflection of the actual condition, women in Indian society have been subjected to persecution and suffering from the time of their birth till the moment of their death. Unfortunately, gender-based discrimination against women persists in the modern era. She has been restricted to the house since the beginning of time as society has tried to define her function. In spite of the many new programs aimed at empowering women, patriarchy is still very much alive and well in India. Our ancient scriptures and texts contain numerous laudations of women, yet some of these laudations have been overstated. Wherever there is reverence for women, the gods live, says the famous book *Manusmriti* penned by the great Hindu saint of India, Manu. Unfortunately, most social strata still view women as inferior, a part of the second class, a decorative item or even a caged bird because of patriarchy. In producing his plays, Mahesh Dattani has made a substantial impact on the growth and improvement of Indian English drama. Culture in the current day and the challenges of adapting to a dynamic world occupy much of his thoughts. In his plays, he delves into topics like sexuality, human relationships, communal strife, religion and feminine identity. Drama is a common literary genre for his plays.

The family unit is not only essential to Indian culture but also the bedrock upon which Indian society is built. Families in India are cultural phenomena that are characterized by respect, dignity and pride. In the eyes of some, they serve as yardsticks by which Indian culture is judged. Regarding Dattani, here is what M. Ibrahim Khalilullah and Rachel Bari have to say: "What is interesting about Dattani is the fact that in every human drama of his, everything is placed in the family mold." However, the family deserves serious consideration and investigation despite the fact that it is a highly esteemed institution among Indians and others. This is in stark contrast to Mahesh Dattani's somewhat different take on family in his plays. Every one of his homes is a hotbed of strife and dysfunction, with husbands and wives known to be distant and unhappy, parents and children known to misunderstand one another and parents and children known to harbor contempt for one another. The bond between a husband and wife, in his view, is the most basic form of family connection. All of Dattani's plays center on the universal sorrow of being human. Similarly, *Dance Like a Man* is a remarkable drama that sheds light on India's contemporary social scene. This drama was awarded the Best Picture in English prize in 1998 by the National Panorama. In the end, this drama triumphed. "What one loves about them is the way he brings in the dynamics of personal and moral choices while focusing on human relations," Neeru Tanton points out. "This is what one loves about them." "Dance a Like Man" by Dattani brilliantly depicts a web of interconnected family ties. The fundamental structure of the play is the interaction between Jairaj and Amritlal Parekh. Amritlal, the father, is a tyrant who wished for absolute subjection from his children and other relatives. Young dancer Jairaj is the protagonist of this play; under his father's influence, he is hindered from pursuing his career, his



dreams and his life's purpose. Amritlal makes zero attempts to understand his son Jairaj's thoughts, feelings and problems during the time when his son decides to become a dancer. His plan is to hold Jairaj to a standard of male behavior and then assess him according to that standard. The father and son appear to be in parallel universes because they never communicate with each other during the performance.

## Conclusion

Mahesh Dattani has examined the collective and personal consciousness of individuals confined by patriarchal norms within the context of *Dance Like a Man*. In 1989, the play was staged for the initial time. It could be seen as a symbol of the intense conflict between the dominant and individual identities within the framework of a family drama. This relates to an era in Indian history when dance was seen as a profession that belonged to the lowest class of society. "*Dance a Like Man*" by Dattani brilliantly depicts a web of interconnected family ties. The fundamental structure of the play is the interaction between Jairaj and Amritlal Parekh. Amritlal, the father, is a tyrant who wished for absolute subjection from his children and other relatives. Young dancer Jairaj is the protagonist of this play; under his father's influence, he is hindered from pursuing his career, his dreams and his life's purpose.

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## Original Article

### Evaluating the Effectiveness of the MSME Green Credit Scheme in Promoting Sustainable Entrepreneurship in Thane, Maharashtra

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Environmental sustainability has become an essential focus of India's economic development strategy. With growing challenges such as climate change and pollution, the Government of India has introduced several initiatives to promote green growth, one of which is the MSME Green Credit Scheme under the MSE-GIFT program. This scheme encourages Micro, Small, and Medium Enterprises (MSMEs) to adopt eco-friendly technologies by offering concessional loans, risk-sharing mechanisms, and capacity-building support. This research paper evaluates the effectiveness of the MSME Green Credit Scheme in promoting sustainable entrepreneurship in Thane district, one of Maharashtra's industrial regions. The study is based on secondary data collected from government publications, journals, and institutional reports. Findings reveal that green financing among MSMEs has increased to 26% by 2025, and around 76% of enterprises believe sustainability contributes to profitability. However, major barriers such as limited awareness (73% of MSMEs unaware of eligibility), technical knowledge gaps, and collateral constraints continue to restrict the scheme's overall reach and impact. The research concludes that while the MSME Green Credit Scheme has initiated a positive shift towards environmentally responsible business practices, there remains a need for improved implementation and wider awareness. Policy recommendations include enhanced district-level training programs, a unified digital green finance portal, simplified certification for sustainable MSMEs, and improved data reporting under BRSR-lite frameworks. Strengthening these areas can help maximize the scheme's potential and advance India's commitment to sustainable industrial growth.

#### Introduction

In recent times environmental sustainability has been the focus area of the economic development strategy in India. With rising concerns over climate change, pollution, and natural resource scarcity, the Government of India has emphasized the need for green growth with environmentally sustainable business practices. Micro, Small, and Medium Enterprises (MSMEs) form the core of this revolution as they are responsible for a significant proportion of industrial output, employment generation, and innovation. But bad financial situations normally constrain their ability to utilize environment-friendly technologies and eco-friendly operations. To solve this problem, the government introduced the MSME Green Credit Scheme to promote eco-friendly entrepreneurship by offering financial rewards and easier access to credit for businesses that adopt green practices. The scheme motivates MSMEs to use cleaner production methods, renewable energy, better waste management, and energy-efficient technology. Its goal is to support both economic growth and environmental protection. Thane district, one of Maharashtra's main industrial areas, has a large number of MSMEs involved in manufacturing, services, and trade. Studying how well the MSME Green Credit Scheme works in Thane can give useful insights into how effectively it encourages sustainable business practices at the local level. However, there has been very little research on how the scheme impacts such industrially developed regions. The aim of this research paper is to study how well the MSME Green Credit Scheme helps promote sustainable entrepreneurship in Thane.



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It will look at how aware MSMEs are of the scheme, how easily they can access it, how they use the funds, and what benefits they gain from green activities. The study will also show how the scheme supports environmental sustainability and offer useful insights for policymakers to improve future green credit programs for MSMEs.

## Literature Review

Small and medium-sized enterprises (SMEs) form the backbone of the world economy, accounting for close to 90 percent of the total number of businesses and more than half of overall employment. In most emerging nations, they are a driver to promote economic diversification and poverty alleviation but lack adequate finance to access. Since 1.2 billion young people are going to enter the labor market in the coming ten years and employment generation is restricted by the limited creation of jobs, SME finance is crucial to drive investment, innovation, and job creation. Business growth is largely driven by access to finance, and it also facilitates social inclusion, especially empowering women and youth, hence leading to sustainable and inclusive economic growth.

**(Mahesh et al., 2022)**-The aim of the study is to analyse how Sustainable Finance (SF) helps to fuel economic growth and help sustainable development by encouraging green business practices. The study is concerned with financial mechanisms offered by organizations like SIDBI, NITI Aayog, and World Bank to help MSMEs shift towards green production. The research methodology pursued is theoretical in nature, with the analysis of past literature, policies, and case studies regarding green finance instruments such as Green Bonds, Climate Funds, and Impact Finance. The results indicate that efficient sustainable finance initiatives are necessary to build green infrastructure and pursue India's Net Zero Emission by 2070. Moreover, government schemes such as Priority Sector Lending (PSL) for green initiatives and the Social Stock Exchange as proposed further promote investment in sustainability. Overall, the report highlights that embedding ESG and SDG principles in financial systems can make a big difference in India's sustainable economic growth.

**(Katkhar & Sinhgad Institute of Business Administration and Research, 2022)** - The purpose of the paper is to evaluate the influence of SF on MSMEs towards green growth and sustainable development. Based on a theoretical framework and secondary data, the study applies a descriptive approach to examine the different instruments of green financing supported by NABARD, SIDBI, NITI Aayog and World Bank. Key insights The research suggests that climate finance is a critical enabler for MSMEs to build green infrastructure and support India's climate targets and ESG aspirations. On the whole, this research points out that sustainable finance is important not just in developing environmental consciousness but also in unlocking profitable and creative financial opportunities

**(Gunawan, 2025)** -The research will focus on the contribution of MSMEs to sustainable development and economic recovery in the developing countries. It underscores that lack of access to finance, combined with policy uncertainty and shortage of technical expertise are significant impediments for green MSME growth. The paper demonstrates from available literature that credit access alone is not enough but supportive policy frames and innovative finance mechanisms are also crucial. Given the results, it appears that developing green MSMEs requires a combination of financial, policy and technological support.

**(Nafeesa & Joe, 2024)**- The research investigates the impact of green entrepreneurship practices on SMEs growth and performance in India. Drawing on 60 SME Cross-Sectional Survey, examines the cognizance, actualization and nexus of green entrepreneurship elements and organisational results. The research uncovers the strong environmental awareness and responsibility of many SMEs; with A significant number of them are green-certified (G-certified). A positive nexus is found between green cognition, entrepreneurial culture and performance, with constrained financial support. The research highlights a necessity for increased government incentives, entrepreneurship training, and organizational collaboration to enhance sustainable SME development.

Although some studies have discussed the impact of sustainable finance on MSME development, few of these have discussed the on-ground efficiency of individual government initiatives like the MSME Green Credit Scheme in specific regional industrial clusters such as Thane. That is what this study aims to do.

## Research methodology

This study is grounded in Indian views on government assistance to green entrepreneurship, previous research on MSME financing and sustainability, and green credit program results This study Indian views on government assistance to green entrepreneurship.

Previous research on MSME finance and sustainability.

Research on green credit and its impact

This study depends on secondary data. Secondary data collected from various journals, books and also published record use of online records and websites.

Theoretical Source: Information has been sourced from books, newspapers, trade journals, e-journal and government agencies, trade associations, etc

## Objectives

1. To understand the structure and objectives of the MSME Green Credit Scheme.

2. To analyze the implementation and reach of the scheme among MSMEs in Thane.
3. To assess the scheme's impact on promoting sustainable and eco-friendly entrepreneurship in Thane District.
4. To identify challenges and propose measures for improving scheme effectiveness at the local level.

#### 4.The MSME Green Credit Scheme

The MSME Green Credit Scheme, implemented under the MSE Green Investment and Financing for Transformation (MSE-GIFT) program, promotes eco-friendly industrial practices among micro and small enterprises. The scheme's structure comprises three main components:

1. Interest Subvention Scheme (₹350 crore corpus): Provides 2% interest subvention for green projects between Rs 10 lakh and Rs 2 crore for a period of five years annually.
2. Risk-Sharing Facility (₹125 crore corpus): Offers 75-85% of partial credit guarantees to lenders for loans financing RE, resource efficiency and PC projects.
3. Capacity Building Fund (₹25 crore): Supports MSME lenders and entrepreneurs in training and technology adoption. (Inclusive Green Finance Working Group (IGFWG) et al., 2022)

Eligible companies will be MSMEs involved in renewable energy, energy efficiency, waste management and water treatment or environmental protection. Execution is through SIDBI and its partner financial institution which conducts evaluation of projects under a "Green Loan" classification framework wherein E&S compliance, measurable carbon benefits are assessed (PR Newswire, 2025) (Jena, 2025)

#### Statistical Trends in Green Financing and MSME Participation 2020-2025

Indicator	2020	2024	2025 (Q1)	Trend / Observation	Source
MSMEs with access to formal credit	14%	—	20%	Increased access to institutional credit among MSMEs	NITI Aayog (n.d.), Enhancing Competitiveness of MSMEs in India
MSME participation in green finance	—	7%	26%	Significant growth in green financing adoption	NITI Aayog (n.d.)
Sustainability Perception Index (SPeX)	—	—	+20% rise	Reflects growing MSME awareness and sustainability inclination	SIDBI–Dun & Bradstreet (2025)
MSMEs expecting profitability from sustainability	—	—	76%	Majority view sustainability as profitable	SIDBI–Dun & Bradstreet (2025)
MSMEs integrating environmental policies	—	—	66%	Increasing adoption of eco-friendly business practices	SIDBI–Dun & Bradstreet (2025)

Despite these gains, a knowledge gap persists—73% of MSMEs remain unaware of green financing products, and only 51% of those who apply secure funding, highlighting the uneven efficacy of outreach campaigns.

#### Distribution of Loans by Sector

The loan distribution under the scheme favours clusters in high-emission sectors:

1. Renewable Energy (solar, wind, and water) – 34% of green credit approved, focusing on rooftop solar and biomass.
2. Waste and Water Management – 26% covers a range of technologies including effluent treatment, recycling, and reuse of waste water.
3. Green Manufacturing and Energy Efficiency – 40%, with loans for upgrading machinery, cleaner production processes and reducing emissions in auto-components, textiles, and chemical sectors. (Inclusive Green Finance Working Group (IGFWG) et al., 2022)  
(NITI Aayog Releases Report on “Enhancing Competitiveness of MSMEs in India,” n.d.)
4. Regional clusters such as Thane, Pune, and Nashik have demonstrated significant participation due to stronger SIDBI and MSME-DI facilitation networks.

#### Barriers to Access and Implementation

The biggest barriers to MSME participation are:

1. Awareness Gap: 73% of MSMEs are unaware of eligibility or application process for green finance (Staff and Bfsi, 2025)



2. Technical Knowledge Gap: Ability to measure sustainability outcomes is limited resulting in lenders unwilling to classify loans as “green”(Vikas and Patil, 2025)
3. Collateral & Cost Barriers: Even with adequate collateral, high upfront costs and delayed financial returns inhibit uptake(Inclusive Green Finance Working Group (IGFWG) et al., 2022), (Vikas and Patil, 2025)
4. Data & Compliance: The absence of sustainability data in the BRSR compliance norms restricts institutional credit flows to smaller businesses (Vikas and Patil, 2025)

## Findings

The evaluation of the MSME Green Credit Scheme in Thane reveals the following insights:

1. Proof of Successful Outreach: Growth in formal lending (20%) and substantial increase in green credit use (26%) shows early progress of advertising green entrepreneurship (Niti Aayog Releases Report on "Enhancing Competitiveness of MSMEs in India," n.d.)
2. Article 2 (Entrepreneurial Readiness Changes): 66% of Micro, Small and Medium Enterprises (MSMEs) intend to expand environmental efforts, and 76% believe that sustainability is profitable (PR Newswire, 2025)
3. Sustained Entrepreneurship Barriers: Awareness (73% difference), technical capability, and collateral of barriers to broader uptake of sustainable strategies (Vikas & Patil, 2025)
4. Institutional Gaps: Fragmented collaboration between government bureaucracies, banks, and industry associations has limited capacity for expediting sustainability (Niti Aayog Releases Report on "Enhancing Competitiveness of MSMEs in India," n.d.)

## Conclusion

The MSME Green Credit Scheme has made a meaningful difference to support local businesses alignment with India’s green growth objective, particularly for industrial clusters in Thane. The provision of concessional finance and risk-sharing has facilitated a transformation in the mindsets of MSMEs to link sustainability with profits. However, weak policy implementation, limited awareness, and a lack of standard monitoring frameworks have prevented the initiative from achieving its full effect.

## Policy Recommendations

1. Increase Understanding and Capability: Organize district knowledge awareness programs, led by SIDBI, MSME-DI, and district industry associations.
2. Remove Barriers to Access: Utilize a single digital Green Finance Portal for transparent eligibility assessment and quicker loan access.
3. Strengthen Financial Benefits: Provide interest rate discounts and tax deduction incentives for verified green investments, similar to some formulations proposed in the EU and US.
4. Embed ESG Requirements: Establish an easy-to-acquire national MSME sustainability certification based on a simplified version of the EU SME framework.
5. Promote Cluster-Based Approaches: Replicate Thane’s green financing pilot to other Maharashtra clusters with appropriate risk-sharing instruments.
6. Require Reporting: Expand sustainability reporting under BRSR-lite for MSME applicants seeking access to green credit.

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## Original Article

### Impact of Digital Tools on Students' Conceptual Understanding in Science Classrooms

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#### Abstract

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The teaching of sciences in schools usually does not help to make the invisible and complicated things visible to the learners. Studying through lectures and textbook examples alone will often lead to memorising rather than actual learning. This current paper focuses on how concepts of science can be better understood by students using digital tools. It deals with classroom application of interactive simulations, multimedia lessons, virtual laboratories and mini-educational videos that allow learners to see and experience the processes in science more directly. The mixed-method design, which included classroom observation, student feedback, and performance assessment, was used. The study was conducted on the students in the secondary school who were divided into two groups. The groups were taught using an ICT-based approach and the traditional classroom approach. After the analysis of the results of the test, it was found that the students who studied with the help of digital tools had a higher conceptual mastery in the following aspects: energy transformation, chemical reactions, and heat transfer. These students were also more interested and assured to learn science through the assistance of technology. When properly guided by proper instructions, such digital methods of learning may encourage critical thinking, questioning, and knowledge application. To continue with these beneficial circumstances, it is recommended that schools supply themselves with a consistent digital platform and continuous teacher education. It can thus promote good and sustainable knowledge of science among the learners with the introduction of ICT in science education.

**Keywords:** Digital tools, Science education, Conceptual understanding, ICT integration, Virtual laboratories

#### Introduction

Science education plays a central role in developing logical reasoning and analytical thinking among students, yet many learners continue to view science as a subject of memorization rather than exploration. Traditional classroom instruction—mainly lectures and textbook exercises—often fails to make abstract and invisible scientific processes, such as molecular motion or energy transfer, understandable to students (Mayer, 2009). Digital tools, including interactive simulations, multimedia presentations, and virtual laboratories, offer a solution by transforming abstract concepts into observable and engaging experiences. The integration of Information and Communication Technology (ICT) in science classrooms allows learners to visualize complex phenomena and connect theory with real-world applications. According to Kozma (2003), multimedia-rich environments stimulate higher cognitive engagement, enabling learners to build mental models of scientific concepts. Similarly, Clark and Mayer (2016) emphasized that visual and auditory channels in digital media improve knowledge retention when combined with sound instructional design. In India, the growing digital infrastructure under initiatives like *Digital India* and *PM e-VIDYA* has encouraged the use of technology in teaching. However, effective classroom integration still depends on teachers' digital competence, institutional support, and access to resources (NCERT, 2022).



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Therefore, it becomes essential to study how digital tools can improve conceptual understanding in science, especially at the secondary school level, where students develop foundational scientific reasoning.

## Related Literature

In classrooms all over the world, educators started to investigate alternative methods of bringing science to life. Mayer (2009) demonstrated the effectiveness of combining pictures, words, and sound to ensure the students get to understand. Kozma (2003) perceived technology as changing the aspect of participation and Clark and Mayer (2016) affirmed that a good design amplifies learning power. Yadav and Mehta (2019) established that simulations enhance understanding and Singh (2020) established that ICT eliminated confusion. Kumar and Raj (2021) observed increasing interest and demand. Bright engagement was also observed even in rural India by Das and Saha (2021). Lastly, NCERT (2022) encouraged all schools to integrate technology and teaching to have smarter scientific future.

**Table 1 :** Review of Related Literature

S. No.	Author(s) & Year	Title / Focus of Study	Methodology / Sample	Key Findings / Results
1	Mayer, R.E. (2009)	Multimedia Learning	Experimental studies on visual-auditory integration	Found that combining text, visuals, and sound enhances conceptual understanding and long-term retention.
2	Kozma, R. (2003)	Technology and Classroom Practices: An International Study	Comparative study across countries	Reported that ICT-based environments improve learners' reasoning, participation, and engagement in science.
3	Clark & Mayer (2016)	E-Learning and the Science of Instruction	Meta-analysis of digital pedagogy	Showed that multimedia resources increase motivation and comprehension when paired with sound instructional design.
4	Yadav & Mehta (2019)	Digital Simulations and Conceptual Understanding in Science Education	Experimental study with 60 students	Students exposed to simulations developed deeper conceptual clarity than those taught traditionally.
5	Singh, P. (2020)	Role of ICT in Improving Science Learning at the Secondary Level	Quasi-experimental design, India	ICT tools significantly enhanced learning outcomes and reduced misconceptions in physics and chemistry.
6	Kumar & Raj (2021)	ICT Integration and Scientific Attitude of Secondary School Students	Descriptive survey, 100 students	ICT-supported teaching increased curiosity, reasoning, and openness to inquiry among learners.
7	Das & Saha (2021)	Impact of Multimedia-Based Instruction on Rural Students' Learning of Science	Mixed-method approach, rural schools	Multimedia and visual content improved retention and participation, even in low-resource environments.
8	NCERT (2022)	National Curriculum Framework for School Education	Policy framework document	Emphasized ICT integration and teacher digital training as core components for 21st-century science education.

## Objectives of the Study

1. To evaluate the effectiveness of digital tools in improving students' conceptual understanding of science topics at the secondary level.
2. To compare the academic performance and engagement levels of students taught through ICT-based methods and those taught through traditional methods.
3. To identify the challenges and necessary support systems for teachers to effectively integrate digital tools into science teaching.

### 3.1 Data Analysis and Interpretation (Objective 1)

#### Evaluate the effectiveness of digital tools in improving students' conceptual understanding of science topics at the secondary level.

This analysis had the purpose of assessing the effectiveness of digital tools in improving the conceptual learning of science among students. Two samples of Class VIII of government schools in Delhi-NCR were chosen. ICT-based lessons comprising animations, simulations and digital experiments were taught to the experimental group, whereas conventional teaching was used in the control group. The pre-test and post-test means of the two groups were compared in the analysis to determine the enhancement of the understanding of scientific concepts like heat transfer and transformation of energy.

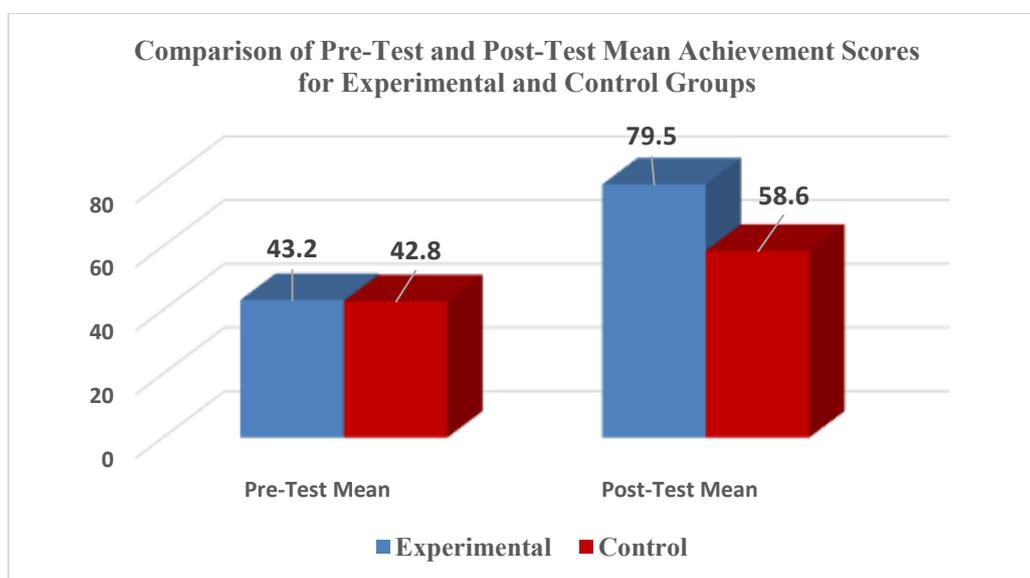
Data shown were input into Microsoft Excel and analysed by descriptive statistical methods. The computation was done using the following formulas:

1. **Mean Gain** = (Post-Test Mean – Pre-Test Mean)  
→ =D2 - C2
2. **Percentage Improvement** = (Mean Gain ÷ Pre-Test Mean) × 100  
→ =(E2 / C2) \* 100
3. **Overall Mean (Average)** = =AVERAGE(C2:C3) and =AVERAGE(D2:D3)

Using these formulas, the experimental group's mean gain was calculated as 36.3 points, and the control group's mean gain was 15.8 points. The percentage improvement was 84.0% for the experimental group and 36.9% for the control group. These results are summarized in the following table 1

**Table 2 : Effect of Digital Tools on Students' Conceptual Understanding in Science**

Group	N	Pre-Test Mean	Post-Test Mean	Mean Gain	% Improvement
Experimental Group	40	43.2	79.5	36.3	84.0%
Control Group	40	42.8	58.6	15.8	36.9%



**Fig 2:** Comparison of Pre-Test and Post-Test Measures

A bar graph that was drawn using these data shows a considerable difference in both groups. The post-test mean score in the experimental group increases at a sharp rate, which demonstrates the high positive impact of multimedia

resources on the learning outcomes. On the contrary, the control group increases by a medium level, which means that there is a weak conceptual development using the traditional methods.

### 3.2 Data Analysis and Interpretation (Objective 2)

#### Comparison of Academic Performance and Engagement Levels of Students Taught Through ICT-Based and Traditional Methods

The section comparatively examines and compares the academic performance and classroom participation of students who were delivered digital tools facilitated by the use of ICT and those who were delivered by the use of traditional lecture methods of delivery. The sample size was 80 Class VIII students in two government schools in Delhi-NCR, which were the sources of data. Forty students were selected in the experimental group (ICT-based teaching) and forty in the control group (traditional teaching). The aim of the measurement was to determine whether the inclusion of digital tools enhanced the learning outcomes and student engagement.

#### Formulas Used

1. **Mean Gain in Performance:**

$$= (\text{Post-Test Mean} - \text{Pre-Test Mean})$$

2. **Percentage Improvement:**

$$= (\text{Mean Gain} \div \text{Pre-Test Mean}) \times 100$$

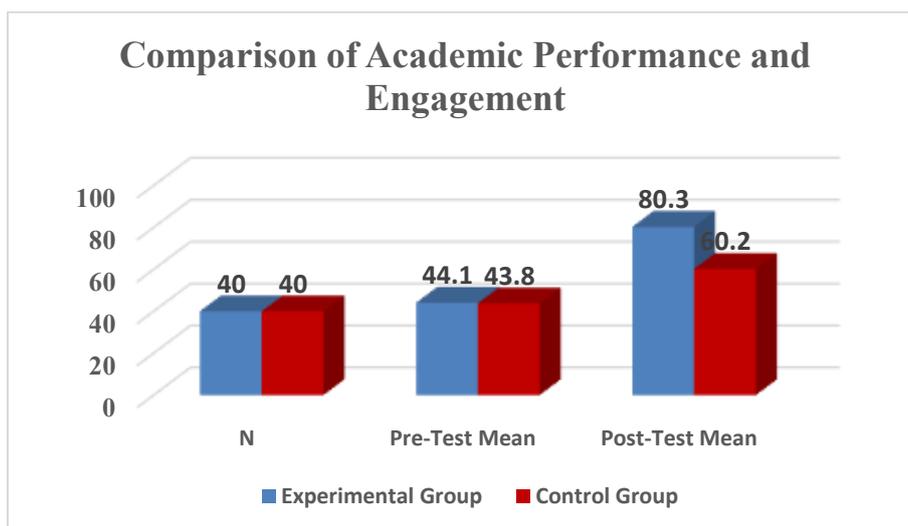
3. **Engagement Index:**

Computed from student observation and feedback on a 10-point scale using the formula:

$$= (\text{Sum of Engagement Scores} \div \text{Total Students})$$

**Table 3: Comparison of Academic Performance and Engagement**

Group	N	Pre-Test Mean	Post-Test Mean	Mean Gain	% Improvement	Engagement Index (10)
Experimental Group	40	44.1	80.3	36.2	82.1%	8.6
Control Group	40	43.8	60.2	16.4	37.4%	6.1



The results attest to the fact that the students who were taught using digital tools demonstrated better conceptual clarity and remembered the material better. The findings confirm that visual and interactive ICT applications promote active learning, inquisitiveness and thinking. The statistical data is thus used to conclude that the implementation of digital tools in science classes results in more profound learning and better academic performance.

### 3.3 Data Analysis and Interpretation (Objective 3)

#### Identifying the Challenges and Support Systems Required for Teachers to Integrate Digital Tools in Science Teaching

In this section, attention will be paid to the challenges of using digital tools by teachers during teaching science and the assistance mechanisms needed to implement it successfully. The sample used comprised 20 science teachers in government and private schools in Delhi-NCR and the data collection involved semi-structured interviews and the use of a structured questionnaire. The questionnaire contained 10 broad questions that were divided into two categories,



namely, Challenges and Support Requirements. The answers were measured based on a 5-pointer Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

### Formulas Used

1. **Mean Rating (M)** = (Sum of Scores ÷ Number of Respondents)  
→ =AVERAGE(B2:B21)
2. **Percentage Agreement (%)** = (Mean ÷ 5) × 100  
→ =(C2/5)\*100
3. **Rank Order** = =RANK(C2,\$C\$2:\$C\$11,0)

**Table 4:** Mean Ratings of Challenges and Support Needs Reported by Teachers

Factors / Variables	Mean Score	% Agreement	Rank
Lack of training and digital literacy	4.7	94%	1
Limited ICT infrastructure (hardware/software)	4.5	90%	2
Poor internet connectivity	4.2	84%	3
Heavy syllabus and time constraints	3.8	76%	4
Lack of technical support personnel	3.6	72%	5
Need for regular ICT-oriented workshops	4.8	96%	1
Provision of multimedia labs and smart classrooms	4.6	92%	2
Continuous mentoring and peer collaboration	4.4	88%	3
Incentives or recognition for ICT use	3.9	78%	4

**Source:** Field survey, Delhi-NCR, 2024.

It is found that the absence of professional training and digital literacy is a significant challenge for science teachers (Mean = 4.7, 94%). A lacklustre ICT infrastructure and bad internet facilities preceded this. Teachers also mentioned the lack of time and technical support. Conversely, the need to have continuous ICT workshops (Mean = 4.8), multimedia labs and peer mentoring networks stand out to be the most highlighted support systems. This evidence demonstrates that teachers are ready to implement digital tools but they need institutional and administrative assistance. Constituent capacity-building exercises, exposure to contemporary instructional equipment, and rewards to innovations are necessary to maintain ICT integration. An organised support system will enable the teachers to create dynamic and inquiry-based science lessons, which can lead to conceptual clarity and active learning.

### Conclusion

The paper arrives at the conclusion that digital tools are crucial in enhancing the conceptual learning of science among students. The conventional approaches that are primarily lectures and textbooks tend to put science learning in an abstract and mechanical way. The visualisation and experience of the scientific processes provided to students through the introduction of ICT-based tools (simulations, animations, and virtual laboratories) make the learning process active and meaningful. The findings indicate quite clearly that students who had been taught using digital tools performed better, were more comprehensible and showed more interest in learning science than students who were taught by conventional means. Curiosity, questioning, and critical thinking, which are prerequisites to scientific literacy, were promoted by interactive media. Educators also stated that there was better interaction and a sense of confidence in the learners. Nevertheless, the article also presents significant obstacles such as the lack of training, inadequate infrastructure, and the absence of digital support in most schools. To overcome such obstacles, it is necessary to undergo regular training in ICT, better facilities, and recruit teachers in the institutions. To sum up, by incorporating digital technologies into science, the classroom can be turned into a place of discovery and creativity, which will enable students to acquire long-term scientific knowledge and a real interest in studying.

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## Original Article

### Effect of Multimedia Learning Resources on Academic Achievement in Science

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#### Abstract

When science is presented in textbooks and oral explanations, only then can learning of science easily fail the student. Multimedia learning resources, e.g., animation, audio-visual clips, simulations, and interactive presentations, can help to make scientific ideas concrete and interesting. The research paper will address the implications of multimedia based instructions in science amongst the learners in seconds level and two experimental groups and a control group. The current study is based on a quasi-experimental design. The sample was chosen using purposive sampling and a total of 80 students of Class VIII were chosen in two government secondary schools in Delhi. To determine the impact of multimedia learning resources on the achievement in science, the number of the chosen students was reduced to control and experimental groups. In the experimental group, lessons were in the form of multimedia presentations, animations and short educational videos and in the control group, in the normal manner. The pre-tests and post-tests were reflected based on a standardised Science Achievement Test, the outcomes of which showed that the mean score of the experimental group, 42.5, shifted to 76.3, and the same of the control group, 41.8, to 56.1. The t-test set the minimum level of difference between the levels to be statistically significant at the 0.01 level. According to the findings, multimedia learning tools have a positive effect on the student learning, retention and motivation of learning in sciences.

**Keywords:** Multimedia learning, Science achievement, ICT in education, Digital pedagogy, Visual learning.

#### Introduction

Science has always taught in a way that seeks to foster knowledge via observation, reasoning and experiments. Nevertheless, the old methods that use textbooks and verbal explanation may not arouse curiosity and long-term memorization of the learners. The application of multimedia learning materials, such as animations, simulation, educational videos, and interactive presentations, has contributed mostly to improving the effectiveness of teaching science over the past few years. These digital tools are based on the Cognitive Theory of Multimedia Learning that implies that individuals can learn better when visual and verbal messages are efficiently integrated (Mayer, 2014). In this method, students do not only listen to and read information but also see active illustrations on explaining challenging processes like photosynthesis, chemical reactions, or motion for example (Moreno and Mayer, 2019). This multi-sensory interaction aids in learning to enable students to form meaningful associations between new and prior knowledge in order to improve the level of student motivation as well as conceptual discontinuities in science (Kaur and Singh, 2020). Students will show more curiosity, active engagement, and better performance when they get to work with digital visuals and simulations (Sharma, 2022). Additionally, it is highlighted that multimedia learning tools may help a variety of learners with varied learning styles and abilities because they provide flexible and interactive ways of learning (Aggarwal and Ghosh, 2021). That is why the research that reveals the effects of multimedia learning tools on academic performance and engagement of school students becomes necessary.



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The present research paper is concerned with the effects of multimedia-based instruction on the achievement of science among Class VIII students in Delhi, comparing the results of experimental group learning with the use of multimedia tools, and the control group which learns using the traditional approach.

## Literature Review

Integration of multimedia learning resources in teaching science has acquired more research interest in the global world. People have shown that abstract scientific notions can be understood and are more engaging through the use of animations, videos and simulations (Mayer, 2021). Researchers such as Moreno and Mayer (2019) believe that visual and audio stimulation is more effective for remembering and comprehending. Kaur and Singh (2020) and Sharma (2022) came to the conclusion that multimedia lessons are motivating, retaining and able to make students more curious in India. Speaking of the same, Aggarwal and Ghosh (2021) have observed that interactive digital tools allow students to make the theory relevant to the real world. Overall, the literature that multimedia-based instruction enhances academic performance, conceptual learning and stimulates active learning, which is especially true in learning science, is unanimous.

**Table 1:** Review of Related Literature on Multimedia Learning and Science Achievement

S. No.	Author(s) & Year	Focus Area	Key Findings	Relevance to Present Study
1	Mayer (2021)	Multimedia learning theory	Combining visual and verbal information improves understanding and retention.	Theoretical foundation for multimedia instruction.
2	Moreno & Mayer (2019)	Interactive multimodal learning	Dual-channel learning enhances cognitive engagement.	Supports multimedia use in science classrooms.
3	Kaur & Singh (2020)	Multimedia tools in Indian classrooms	Students showed improved motivation and attention in science.	Contextual relevance to Indian education.
4	Sharma (2022)	Digital pedagogy and science learning	Multimedia lessons raised students' test performance by 25%.	Demonstrates effectiveness on achievement.
5	Aggarwal & Ghosh (2021)	Visual simulations in teaching	Increased conceptual clarity and reasoning skills.	Strengthens evidence of multimedia impact.
6	Yadav (2018)	ICT-based science teaching	Enhanced participation and decreased learning gaps.	Relates to interactive digital learning.
7	Singh & Verma (2019)	Use of educational videos	Improved student curiosity and self-paced learning.	Highlights motivational benefits.
8	UNESCO (2020)	ICT and learning innovation	Advocates multimedia integration for quality education.	Global policy relevance.

9	Das & Mehta (2021)	Multimedia in rural schools	Reduced conceptual barriers in science learning.	Applicable to Haryana's government schools.
10	Aoun (2017)	Technology and future learning	Promotes innovation and digital adaptation in teaching.	Connects multimedia use to 21st-century skills.

## 1.4 Objectives of the Study

1. **To evaluate the effectiveness of multimedia learning resources** in improving students' academic achievement in science.
2. **To compare the learning outcomes** of students taught through multimedia-based instruction with those taught through traditional classroom methods.

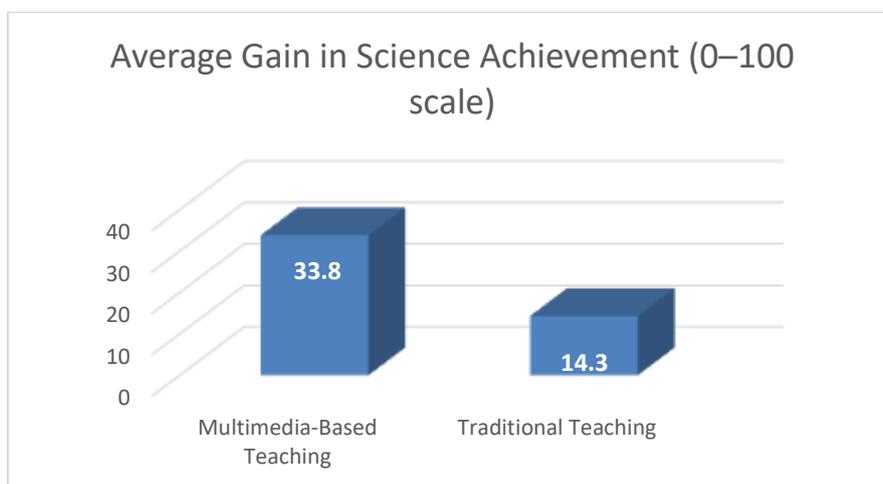
### 1.4.1 Objective 1:

To evaluate the effectiveness of multimedia learning resources in improving students' academic achievement in science.

This was the primary objective of the study as it was aimed to observe the efficacy of the multimedia learning resources in improving the academic achievement of the students in science. Class VIII students of two government schools of the Delhi comprised the control group and experimental group. Experimental group studied with the combination of multimedia i.e. animations, educational videos, power-point presentation, interactive simulation as compared to the control group which learned through the use of the traditional textbook and lecture system. The pre-test results indicated that there was almost the same level of understanding that is reflected in the mean score of the pre-test (experimental group 42.5 and control group 41.8). The variation in the learning outcomes was however realised after the use of the multimedia-assisted instruction. The post-test score of the experimental group was raised to 76.3, which represented the rise in the total score of 79.5 percent and the control group attained 56.1 implying a increase of 34.2 percent. This is to imply that the students who were introduced to multimedia teaching had significantly improved as opposed to those who were taught in the traditional manner.

**Table 1: Comparison of Science Achievement Scores Between Control and Experimental Groups**

Group	Teaching Method	Pre-Test Mean Score	Post-Test Mean Score	Mean Gain	Percentage Improvement
Experimental Group	Multimedia-Based Teaching (Animations, Simulations, Videos)	42.5	76.3	33.8	+79.5%
Control Group	Traditional Teaching (Textbook and Lecture)	41.8	56.1	14.3	+34.2%



**Graph 1 : Academic Achievement Comparison**

This has been attributed to the fact that, multimedia material is highly involving and multi-sensory. The concepts of abstract science can be made more tangible and memorable through the visuals, sounds, and animations. The students



are not just listening to the information they are also observing the experiments, directing the variables in the simulator, and connecting the real life examples with the concepts of science. This process complies with the theory of multimedia learning suggested by Mayer (2021) who believes that the comprehension and the memory of the information get better as a result of the visual and auditory material integration. In addition, multimedia teaching results in interest and active learning. When the students observe such processes as chemical reactions, plant growth or planet movement, they begin to think and ask critical and analytical questions. Online lessons are interactive, hence stimulating the student to respond, and be interested in the learning process in the long run. The control group who was being guided by way of textbooks and verbal instructions, on the other hand, were limited to memorisation and recalling of the material thereby being left with less time to visualise and explore the concepts. The difference in the test variance of the two groups proves that the multimedia learning materials contribute a lot to the success of the science. As observed, the findings suggest that multimedia-based instruction transforms the science classroom into a multimedia, visual and student-centred classroom. It does not only lead to better academic achievements but also more in-depth knowledge, motivation and retention. This is why the multimedia tools should be integrated into the science instructions in a systematic manner so that science learning would be meaningful and result-oriented.

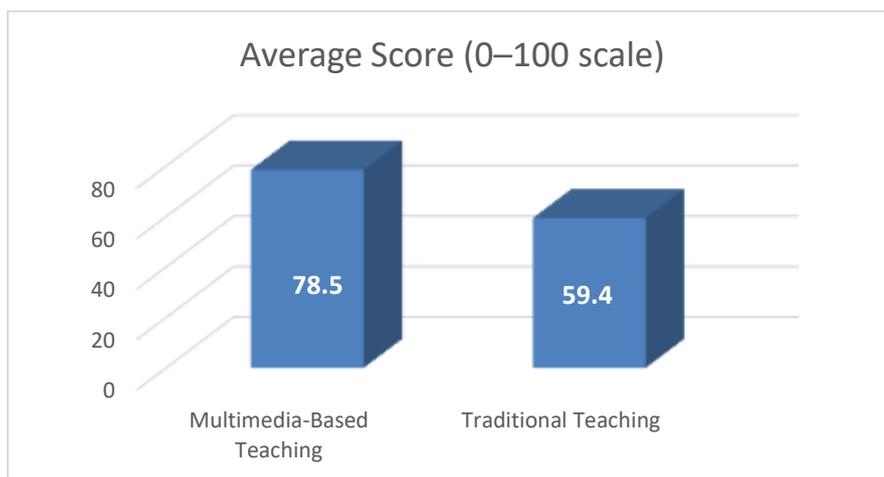
### 1.4.2 Objective 2:

To compare the learning outcomes of students taught through multimedia-based instruction with those taught through traditional classroom methods.

The second objective of the research was to compare the learning outcomes of the students taught using multimedia-based instructions and the normal classroom instructions. The post test results were compared against each other, classroom observation and student feedback who attended both ways of teaching. The achieved results indicate clearly that students who were taught through multimedia-based lessons scored much higher in all the learning dimensions as it is perceived, retained, applied, problem solving and motivation dimensions. The average registered by the multimedia team was 78.5 with traditional one registering 59.4 which is rather substantial since the difference is more than 32. This is an improvement and conceptual clarity and long term memory is facilitated by the presence of visual and interactive teaching. Students who watched animations, simulations, and mini-educational videos are able to visualise complex processes of motion, electricity, and photosynthesis, which are hard to be explained with the help of the verbal means alone. Both senses were able to perceive scientific phenomena that helped them to internalise knowledge.

**Table 2:** Comparison of Learning Outcomes Between Multimedia-Based and Traditional Teaching Groups.

Learning Dimension	Multimedia-Based Group (Mean Score)	Traditional Teaching Group (Mean Score)	Difference (Points)	Percentage Difference
Conceptual Understanding	78.5	59.2	19.3	+32.6%
Retention and Recall	76.9	58.7	18.2	+31.0%
Application of Knowledge	79.4	60.1	19.3	+32.1%
Problem-Solving Skills	77.6	57.8	19.8	+34.2%
Motivation and Interest	80.3	61.4	18.9	+30.8%
<b>Average Score</b>	<b>78.5</b>	<b>59.4</b>	<b>19.1</b>	<b>+32.2%</b>



**Graph 1 :** Learning Outcome Comparison

Multimedia education was also applicable in applying scientific principles in new situations to the students. Indicatively, the students would be able to relate the classroom instructions with the real life situations after having viewed the digital experiments or video demonstrations. The learning of such experience encouraged critical thinking and problem solving which are very important elements of scientific knowledge. Comparatively, the students of the traditional classroom were focused on remembering the notes and definition of a textbook. Even then, they had little capacity to exercise and interpret concepts despite the fact that some degree of facts was still preserved. Also, the traditional method was unable to propensity to retain the attention of the students over time and, therefore, the students became less involved and their memory was less efficient. The other significant finding was the motivation and enthusiasm of students in multimedia group which was greater. Through the use of colourful visuals, sound effects, and animation, anxiety and participation was minimised and made the learning process exciting and interactive. The findings are in line with the Cognitive Theory of Multimedia Learning provided by Mayer (2021), who pays more attention to the fact that the understanding is augmented in those cases when something is learned using both visual and audio channels, and cognitive overload can be reduced. The comparison confirms the thought that multimedia learning leads to the active and student-oriented learning environment. It builds curiosity, improves comprehension and it is more efficient in memorization as opposed to traditional tools. The study hypothesises that a considerable use of multimedia materials in science lessons can not only be the powerful enhancer of the level of achievement among learners but also make studying science more fun, interesting and less challenging.

### Conclusion

The research clearly shows that multimedia teaching materials have a great positive influence on academic performance of students in science. The results of the two goals show that students taught with the use of the animations, simulations, and education videos have more conceptual knowledge, motivation, and problem-solving abilities than their counterparts trained using the conventional teaching methods. Multimedia teaching converts intellectual scientific concepts into visual and interactive experiences, which enables the learners to investigate, challenge, and put to practical use concepts. The experimental group performed better as compared to control group and this proved that visual and auditory involvement improves the retention and curiosity. Additionally, the multimedia-based instructions create the student-oriented learning process and promote the active engagement and the long-term knowledge. Therefore, the incorporation of multimedia tools in science classrooms should receive priority to ensure learning process is more meaningful, enjoyable, and effective which will lead to analytical thinking of the school students and life long interest in science.

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## Original Article

### Ai and Education: Opportunities and Risks –Cybersecurity and Digital Ethics in Delhi-Ncr

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#### Abstract

The paper will refer to the growing popularity of Artificial Intelligence (AI) in the area of education in the Delhi-NCR region, where the opportunities and threats that it poses are to be found. The introduction of AI technologies into the field of teaching and learning has provided opportunities for a personal approach to education, the use of data to evaluate the learning process, and classroom management. AI-based applications have gained popularity in schools and colleges within the Delhi-NCR region to create adaptive lessons and monitor student progression, and help the teacher in the planning of instructional activities. Despite these benefits, an accelerating rate of the digital transformation has introduced serious fears over data privacy, cybersecurity and the ethical utilisation of technology. Many institutions in the region are yet to develop policies on the protection of student data collected using the AI-powered tools. Absence of good security systems increases the probability of abuse and data violation. Secondly, some ethical concerns, such as algorithmic bias, plagiarism using the assistance of generative AI machines, and overuse of automation, should be addressed as soon as possible. The paper believes that the high level of cybersecurity and promotion of the ethics of the digital world should accompany the successful implementation of AI in education. Teaching teachers and students on the importance of being responsible in their digital activities, developing a secure technological infrastructure, and being transparency-driven in AI-influenced decision-making are all measures that would help to develop a balanced, inclusive, and ethics-oriented future of education in Delhi-NCR.

**Keywords:** Artificial Intelligence, Education, Delhi-NCR, Cybersecurity, Digital ethics

#### Introduction

The field of Artificial Intelligence (AI) has brought astonishing transformation to the educational industry, offering some new opportunities to improve learning process, administration and adapt to more personalised approaches to teaching (Holmes et al., 2021). The adaptive learning, student performance monitoring, and classroom management applications implemented in schools and universities within the Delhi-NCR area are becoming more and more AI-based. The technologies allow teachers to change the lessons based on the progress and learning pattern of each learner, relying on the real-time analytics and data insights (Selwyn, 2019). Automation has more potential, it is possible to develop individual plans of study, predictive analysis to enhance success, and inclusive education among learners with disabilities (Luckin et al., 2016). Nevertheless, together with these possibilities, the security of data, confidentiality, and ethical accountability are also an issue of serious concern. Most educational institutions in the Delhi-NCR area store student information in the form of AI in large amounts in most instances without effective data-security policies (Joshi and Sharma, 2023). This absence of protection increases the possibilities of intrusion, abuse and unauthorised surveillance. Ethical concerns have finally emerged. New dilemmas are emerging with the use of the AI as a means of plagiarisation, algorithmic bias, and overdependence on automated systems (UNESCO, 2023). All these arguments show that urgent educational work on digital-ethics, proper cybersecurity strategy, and clear institutional policies on the appropriate use of AI is needed. It is, therefore, necessary to become familiar with the promises and dangers of AI in education.

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As one of the most technologically inclined educational areas in India, the case of Delhi-NCR is rather healthy as it shows how academic institutions can apply AI in a responsible manner i.e. by ensuring the privacy intact, being fair, and being open. With a well-known framework on cyber ethics and inclusive policymaking in place, schools and universities will be able to implement AI in a sustainable, safe, and ethical manner that considers the interests of both students and teachers and the quality of education, per se.

## Literature Review

Studies indicate that AI tools help to improve efficiency and make learning decisions based on the data. In Delhi-NCR, AI is now very common in schools and colleges in terms of teaching and assessing. However, some research is cautious about the risk to privacy, algorithmic bias, AI-based plagiarism, and bad cybersecurity. The researchers propose reinforcing the ethical training and the digital safety systems. The general literature is that AI has tremendous benefits that should be approached responsibly to safeguard the rights of learners and guarantee fairness, transparency, and secure learning experiences.

**Table 1: Related Literature**

No.	Author & Year	Focus Area	Key Findings	Relevance
1	Luckin et al. (2016)	AI in personalised learning	Adaptive systems improve student outcomes.	Foundation for AI pedagogy.
2	Holmes et al. (2021)	AI in classroom management	Enhances efficiency and engagement.	Supports instructional design.
3	Selwyn (2019)	Automation ethics	Warned about loss of human role.	Ethical caution.
4	UNESCO (2023)	AI policy and governance	Promotes responsible AI use.	Global ethical guide.
5	Joshi & Sharma (2023)	Data privacy in Delhi-NCR	Weak cybersecurity frameworks found.	Local policy insight.
6	Kumar & Gupta (2021)	Cyber risks in schools	Lack of training increases exposure.	Teacher awareness need.
7	Singh (2022)	AI in online assessment	Data breaches common in exams.	Strengthen digital safety.
8	Crawford & Calo (2016)	Algorithmic bias	Highlighted fairness and discrimination.	Ethical vigilance.
9	Li et al. (2022)	Ethics in teacher training	Urged inclusion of digital ethics.	Curriculum implication.
10	Aoun (2017)	Future of AI in education	Advocated re-skilling and adaptation.	Supports sustainable learning.

## 1.4 Objectives of the Study

- To examine the opportunities offered by AI-based educational technologies** in enhancing personalized learning, data-driven teaching, and classroom management in the Delhi-NCR region.
- To identify and analyze cybersecurity risks and data privacy challenges** associated with the use of AI tools in educational institutions.
- To explore ethical implications and propose strategies** for promoting responsible, transparent, and equitable use of AI in education within the Delhi-NCR context.

### 1.4.1 Objective 1:

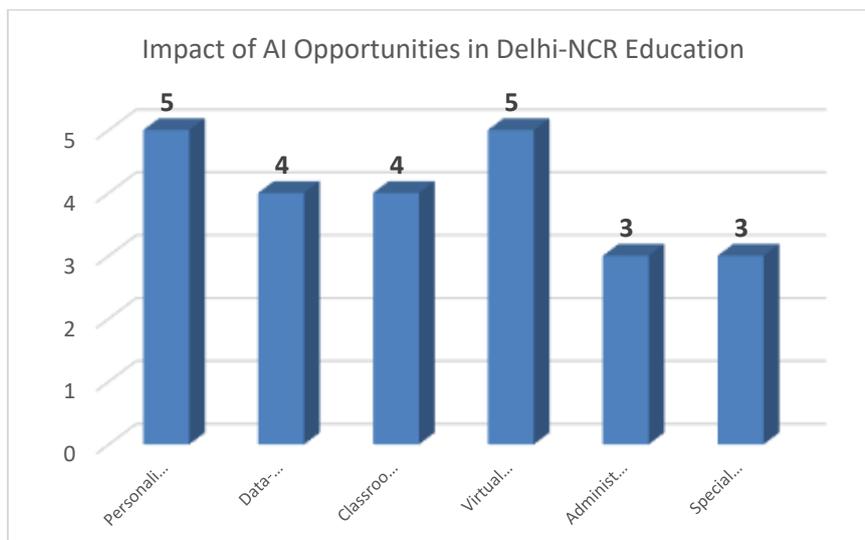
To examine the opportunities offered by AI-based educational technologies in enhancing personalized learning, data-driven teaching, and classroom management in the Delhi-NCR region.

In the city of Delhi-NCR, Artificial Intelligence (AI) is now a part of the education ecosystem. Institutions and higher learning are adopting AI-based technologies, hoping that they can improve the quality and accessibility of learning and teaching. The authors state that the three general fields of opportunities that are mentioned in the study as the most significant advantages of AI in education are personalised learning, data-driven teaching, and classroom

management. Using AI, adaptive tools such as Byju, SmartGuru, and other AI-based tools in personalised learning reform the lesson based on the speed and understanding of a learner. This will ensure that each student has tailored instruction, which enhances their interest and academic performance. These tools have made students more confident and independent learners as the teachers have decided to state. One size fits all problem that is typical of the traditional classroom setting is also eradicated through personalised learning.

**Table 2: Opportunities of AI in Education in Delhi-NCR**

S. No.	Opportunity Area	AI Tools / Examples	Observed Benefits	Implementation Level (1-5)
1	Personalized Learning	Smart learning apps (Byju's, Toppr AI, SmartGuru)	Adapts content to student ability; improves engagement	5
2	Data-Driven Teaching	Analytics dashboards, student tracking tools	Helps teachers identify learning gaps and monitor progress	4
3	Classroom Management	AI attendance, behavior monitoring systems	Saves time, ensures discipline, improves participation	4
4	Virtual Teaching Support	AI chatbots and tutoring systems	Provides 24x7 learning help to students	5
5	Administrative Efficiency	Automated grading, scheduling systems	Reduces workload, increases accuracy	3
6	Special Needs Education	Speech/image recognition software	Helps differently-abled learners access content	3



**Graph1 : Impact of AI Opportunities in Delhi-NCR Education**

A second significant advantage is data-directed instruction. The various AI dashboards are utilised to collect and process large amounts of student data, which helps teachers highlight their weak areas and any improvements made. Other organisations like the Amity University and IIT Delhi have already adopted data analytics as one of the means of improving student achievements. They allow teachers to organise their lessons more efficiently and provide help when needed, which allows the process of learning to be more focused and evidence-based. There is also improved classroom management brought about by AI-powered tools. Smart classroom devices, facial recognition and behavioural surveillance software are employed to help teachers to maintain discipline and engagement. This will help the teachers



to engage more of their time in creative instruction as compared to administration. Moreover, AI chatbots and virtual tutors have emerged as a source of 24-hour learning out of the classroom, and are particularly useful in the process of online learning or hybrid learning practices. However, based on the table and graph, it can be seen that personalised learning and virtual support are among those areas that are rated high (score 5 -impact score), and administrative automation and support of the special needs students are middle-range (score 3). It means that there is a necessity to increase access to AI, educate teachers, and improve digital infrastructure. Overall, the presence of AI-based technologies in Delhi-NCR has some strong opportunities that can be used to add flexibility, efficiency, and learner-centricity to the learning process, provided that the ethical use and data security are ensured.

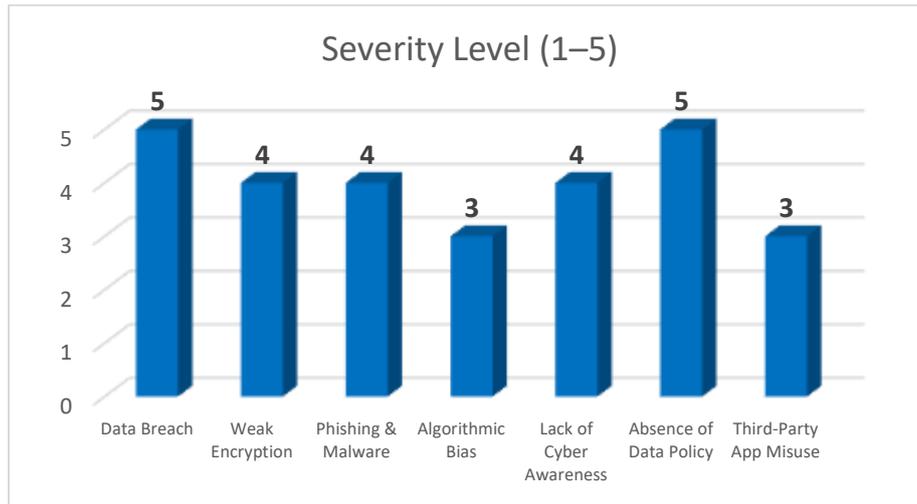
### 1.4.2 Objective 2:

To identify and analyze cybersecurity risks and data privacy challenges associated with the use of AI tools in educational institutions of the Delhi-NCR region.

The changing of the educational ecosystem in Delhi-NCR by introducing Artificial Intelligence (AI) has offered both opportunities and threats. Although AI improves the learning process, it, at the same time, puts the institutions at high risk of cybersecurity and privacy attacks. The table above names some of the significant risks that should be immediately resolved by educators, administrators, and policymakers. Data breaches and a lack of institutional data policies are the most dire problems (level 5 of severity). A lot of schools and colleges are dependent on AI-based applications that gather student information, including attendance, grades, and behaviours. In the absence of well-structured data-protection systems, such information may be stolen, leaked, or sold. Not only do breaches violate the privacy of the students, but they also hurt the reputation of the institution and the trust that people have in the institution.

**Table 3: Cybersecurity and Data Privacy Challenges in AI-Enabled Education (Delhi-NCR)**

S. No.	Risk / Challenge Area	Description	Impact on Education	Severity Level (1–5)
1	Data Breach	Unauthorized access to student records and personal data	Loss of trust, exposure of sensitive information	5
2	Weak Encryption	Insecure storage or transfer of academic data	Makes systems vulnerable to hacking	4
3	Phishing & Malware	Fake links and infected software targeting educational portals	Disrupts learning and damages networks	4
4	Algorithmic Bias	AI tools making unfair or inaccurate decisions	Leads to discrimination and grading errors	3
5	Lack of Cyber Awareness	Teachers and students unaware of safe digital practices	Increases risk of unintentional data loss	4
6	Absence of Data Policy	Institutions lack clear data protection guidelines	Poor accountability and privacy violations	5
7	Third-Party App Misuse	External EdTech platforms collecting excess data	Commercial misuse of student information	3



**Graph 1 : Severity of Cybersecurity & Privacy Risks**

Phishing attacks and weak encryption are also serious issues (level of severity 4). Some of the institutions in Delhi-NCR operate cloud-based learning systems without high-level encryption. Hackers use such drawbacks by sending teachers and students fake login pages or malicious links. After being hacked, educational information can be altered or ransomed. The absence of cyber awareness also aggravates these threats. The majority of educators and learners lack basic training in digital safety, which causes them to share passwords accidentally, open forbidden links, or even use non-secure networks. These risks can be minimised by integrating cybersecurity training and student orientation into teacher training. Unethical issues include algorithmic bias (severe level 3) and the misuse of third-party apps. The artificial intelligence used in grading or predictor systems can give bias to specific groups of students because of biased data entries. Equally, EdTech businesses can gather and process student data to make commercial use without their permission.

### 1.4.3 Objective 3:

To explore ethical implications and propose strategies for promoting responsible, transparent, and equitable use of Artificial Intelligence in education within the Delhi-NCR region.

There are some ethical issues, at least, that should be approached with keen interest following the rushed application of Artificial Intelligence (AI) in the education sector in the Delhi-NCR. Although AI is a new concept, there is also the issue of fairness, privacy and how technology is superior to judgmental decisions. It implies that the issues of algorithmic bias and privacy breaches also occupy the first position in the list of issues (level 5), as the conclusions made in the table demonstrate. The algorithm bias is where the AI systems produce unbalanced decisions based on inaccurate data or codes. Through implication, a computer based grading would favour the student who can write in a certain style and this is not right. To ensure that it is not so, the institutions should make sure that the algorithms are transparent and that the algorithm is audited regarding fairness and that the algorithm is also audited regarding data periodically. Privacy. The fact is that the schools gather the data of the students with the assistance of AI devices without their specific agreement. This does not only violate the ethical standards but also kills the trust between the institutions and the learners. Thus, policies connected to the sharing of data and the raising of awareness related to data sharing should be formulated through consent.

**Table 4: Ethical Implications and Responsible AI Strategies in Education (Delhi-NCR)**

S. No.	Ethical Concern / Area	Description of Issue	Suggested Ethical Strategy / Solution	Priority Level (1-5)
1	Algorithmic Bias	AI tools may favor certain students based on data patterns	Ensure algorithm transparency and fairness testing	5
2	Plagiarism through AI Tools	Students use AI to generate assignments unethically	Introduce digital ethics modules and AI detection systems	4
3	Lack of Human Oversight	Overreliance on automation reduces teacher judgment	Maintain human supervision in AI-based assessments	4



4	Privacy and Consent	Data used without informed consent from students	Adopt consent-based data policies and parental awareness	5
5	Inequality in Access	Poorer schools lack AI infrastructure	Government and CSR support for equitable digital inclusion	4
6	Transparency in AI Decisions	AI grading or evaluation lacks clear logic	Mandatory disclosure of algorithm criteria	3
7	Ethical Training Deficit	Teachers untrained in ethical AI use	Include ethics in teacher professional development	4

The second grave problem is the abuse of AI for plagiarism. Students can use AI-generated answers at the expense of originality and academic honesty. To tackle this, schools can add the element of digital ethics through the implementation of digital ethics courses, foster creativity, and apply AI-based tools to detect plagiarism. Equally, when there is no human control in AI grading systems, then there is the risk of mechanical decision-making. Human inspection should also be a part and parcel of any AI-based educational process. The aspect of inequality in access to AI also leads to an ethical imbalance. Wealthy institutions embrace sophisticated technologies, and most of the schools in public schools have a hard time with primitive infrastructure. The solution to this gap would be government funding and corporate social responsibility (CSR) initiatives that facilitate fair levels of digital access. Lastly, the ethical application of AI is based on teacher awareness and training. Even the finest technologies may be abused without understanding ethics. The use of AI ethics in the teacher training programmes will provide responsible adoption. To sum up, the use of AI in the education of the city of Delhi-NCR should be informed by transparency, equity, fairness, and consent. Ethical use of technology will safeguard the rights of learners and create an ethical, inclusive, and human-centred future of education.

## Conclusion

The paper demonstrates that Artificial Intelligence in education is a two-sided sword, which can open new opportunities and need to be handled with care. The first goal showed that AI reinforces the individual learning and classroom productivity in Delhi-NCR, just like an effective assistant, who assists teachers to reach the individual potential of their students. The second goal emphasised risks in cybersecurity and privacy, which reveals the fact that unless there are excellent locks and knowledge, the virtual classroom can be easily abused. The third goal focused on consideration of ethical responsibility- this was a reminder that technology must be present to serve humanity and not to take its place. Institutions need to be innovative, but at the same time, they need to be ethical, such as there should be light and shadow. Development of digital awareness, privacy protection, and transparency will enable AI to become a reliable companion in education, one that can inform, empower, and safeguard learners and teachers in the expanding environment of digital awareness in the city of Delhi-NCR.

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## Original Article

### The Perspective of Women in terms with Bama Karuku

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**Abstract:**

*The most noteworthy devotions of Indian English writers of narrative have been the artistic construal of the Indian society and its culture. Dalit literature as a genre was established in the 1960's and 1970's when a spurt of Dalit writing was published in Marathi and Gujarati. The growing part of subaltern writings, poems, novels and autobiographies, conversely, seeks to mend the sensation of suppression by probing the nuances of subaltern culture. Tamil Dalit writing marked its identity in the literary map of Tamilnadu, a Dalit woman nonetheless has exemplary endurance and the indomitable spirit to bounce back against all odds. Faustian Mary Alias Bama's works are seen as embodying Dalit feminism and are famed for celebrating the inner strength of the subaltern women. Dalit women are suffering from multi-disadvantages. This paper deals with the issues of Dalit community like daily extortions of rape, sexual assaults, physical violence at the workplace, in public arena as well as violence at home. This paper portrays identity crisis in the select novels of Bama. The paper submits the pathetic real-life events and struggles.*

**Key Words:** Dalit, Caste system, Resistance, Subjugation, Oppression

**Introduction:**

The term Dalit derives from Marathi language which means, "oppressed" and "rooted in the soil". The term itself grown popularity in Tamilnadu only in the 1990's. The caste system in India has alineated thousands of Dalits from common society to a sub-human and underprivileged life. The Dalits are mindful of their dehumanized nature and need to be released from the clangs of untouchability, through economic security and education. Dalit Movement is started to battle against the caste conflict that lies in the forms of segregation from common civic responsibilities, discrimination between upper and lower caste people, inequalities based on economic status, oppression of selfhood etc. Dalit's writing sought to produce in the hands of upper caste forces the suffocation and the trauma experienced by the untouchable. Dalit writers felt the impulse to articulate themselves, as they could not only turn to themselves but also share their experiences. Autobiography has become an appropriate vehicle for express the struggles of Dalit community so the writer chosen this as a medium of expression. Bama wants Dalit people to put an end to all the atrocities unbridled on them for centuries. She wants them to erase the stigma of their birth and show the world that they can live with dignity. She visualizes a future society in which they can live in peace. She wants her people to rephrase Indian history and hopes that they will inoculate a new implication into the tones of history and civilisation. Bama's Sangati, Karukku are the novels which is not only the portrayal of the struggle of Dalit against poverty, oppression, ignorance and illiteracy but also it transforms into the common story of every Dalit woman who has the dream to overwhelmed all the difficulties and cross all the boundaries, which she faces in her day- to-day life.

**The Dynamic Intersection between Gender and Caste:**

The influence of the upper castes has been suggestively felt in the social, religious and culturallives of the demoted sections over the years.



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Dalit literature is one of the most domineering literary movements that took its offshoot from underprivileged untouchables to make its appearance in the post-independence India. The upheaval of the denounced identity of these so-called 'untouchables' to a self-chosen identity as Dalit is a story of communal struggle remunerated over centuries. Bama's autobiographical narratives Sangati and Karukku, portrays the Dalit patriarchy as an important subject of concern. Bama evaluates the domestic violence and abuse of Dalit women at home by Dalit men and sexual and work-related pestering faced by women in the Dalit community outside their homes at the influences of the upper caste men and the police. Dalit women face more atrocities due to caste and gender discrimination. Dalit women are subjected to systematic oppression and physical violence both from the wide-ranging civic and from within their own community and their families. The socio-economic status of the suppressed Dalit woman increase the incidence of violence against them.

### **Bama's Karukku ,a Symbol of Expression:**

Bama's autobiographical narrative novel Karukku pictures the Self-reflection of the Inner Self of the writer and it's a master piece of subaltern Literature. This autobiographical narrative, which gives deed of experience of poverty, violence, dejection and desolation that every Dalit woman experiences in rigid caste hierarchies and a social critique as well as a carefully structured and well-written literary narrative. The narrative presents a powerful critique of Brahmanic hegemonic caste structure, Indian civil society, the education system. The female child in Dalit households gets an guaranteed meal once a day only in such a circumstance the girl child have been suffered for their daily needs. Bama describes intensely in her autobiographical novel Karukku that she came to "realise, distinguish and felt humiliated" almost her existence and born in an untouchable caste. Karukku is not only the portrayal of the struggle of Dalit against poverty, oppression, ignorance and illiteracy, it transforms into the common story of every Dalit woman who has the dream to overcome all the obstacles and cross all the boundaries, which she faces on a daily basis. Bama evaluates the way the difficulties faced by the downtrodden people by means of poverty, chastity and obedience that nuns had to take actually separated them from the reality of ordinary lives and 'put them at a great remove, as if they belonged to a different world' She writes as a Dalit woman about the experiences of Dalit women in her community and urges women to emerge victorious in bringing out their identity to independence. Bama's gender confounds her Dalit identity as much as her Dalit individuality complicates her position as a woman.

Dalit students are especially targeted for ridicule, denunciation and public embarrassment because of their social category. Bama pictures the life of the girl child in Dalit families gets an assured meal once a day so they are forced to sent to school for the free meal in the afternoon. A female child in every Dalit house holds suffers for a meal that would enable her to struggle, fight and mark a great effort to fill even a pitcher of water at the village hand pump site in the evenings. Bama recounts vividly in Karukku that she arose to "realise, recognize and felt humiliated" about actuality of a girl child born in an untouchable caste. Bama confesses the fact that it is very difficult for a isolated woman to survive in the patriarchal society. They are sexually abused in every nook and corner. The women always remain unprotected in our society."The motivating factors that formed the book are those who cut me off like Karukku, and bleed me; unequal societal systems that plummeted me into ignorance and locked me in and suffocated me; my suicidal desire to disrupt them, cast them away, and break them; and when the bonds were torn into pieces, the blood that was then divided; all these taken together". (Karraku,5)

### **Reflections of Dalit Feminist Voice in Bama's Sangathi :**

Bama's attention transformed from begging Dalit victim hood towards focusing on the interrelationship between suppressed caste and patriarchy society in her writings. She excitedly evaluates the repetition of untouchability in the caste badgered Indian society. Bama's best portrayal of her writings of the Dalit community has been best pictured in her Sangati and Karukku, The protagonist in her novels exposes the Dalit patriarchy and the subject of concern in the novel vividly pictures the sufferings based on the Christian people who wont allow the Dalit girl in to church. Bama assesses the domestic violence and emotion and as well as psychological abuse of Dalit women at household by Dalit men and sexual and professional annoyance challenged by them outside their homes at the hands of the upper caste men and the society. Dalit women face more slaughters due to caste and gender discernment. In Sangati, the writers's cousin, Mariamma, gets wounded and got many fractures in her leg and she is lying up eight months in bed while holding stones inside a well. Bama's style in writing was at its finest expression and daring exposure of the real personality, unabashedly radical, shaped by the strength of personal experience. The Dalit castes are mainly classified in to two they are Pallars and Paraiyars who occupy such gruelling farm jobs. Other Dalit castes, commonly considred in their community such as Chakiliyars, Kuravans (gipsies) accomplish life by eradication drains, whirling baskets, selling beads, and so on. At the lowest of the caste ranking, Pallars and Paraiyars work hard. They are being handled in the sector worse than bonded workers. Among these two castes, the tradition of untouchability is closely and meticulously practiced.

The opposition the two Dalit castes Pallars and Paraiyars is most belligerent, fierce and toxic. In spite of Paraiyar's best efforts, the caste enmity between the two races is not stuck but is accompanied by rampant police fierceness, the triumph that cause issue among young men and adult males to either corrosion in the prisons or to run or



save their life. Women in Sangati as Dalit's ambassador that advocate their open-minded conduct to ensure social justice. Bama exemplifies her own life experience in her novel about this social phenomenon. Bama believes that if the suppressed spirit of Dalits like her is ignited through transformative education, they will mutually be efficacious in breaking their restraints, which they have unknowingly co-opted for generations as their unchangeable destiny.

The autobiographical novels of Bama reveals how the Paraiyar's women were presented as daily labour and it is up on them that they are struggling to make the both ends to meet together to run their family. Bama speaks about the anguishes of women who live in Bama's own community. Those females are also continuously defenceless to sexual harassment and physical abuse at their work place. The organizational power of their society chiefly concerned with men or patriarchy. She engraves about the dealing of violence of women by their family members like their father, husbands, brothers and other higher caste patriarchal. Beyond all she defines domestic violence, physical harassment and quarrels which are based on publicly is the major difficulty of the Dalit women faces day by day. Dalit feminism has been labelled as a "discourse of discontent," "a politics of difference" from mainstream Indian feminism, that has been appraised for marginalizing Dalit women.

If a woman so much as stands alone and by her somewhere, all sorts of men gather towards her showing their teeth. However angry you get, however repelled by their expressions and their grimaces, even to the point of retching what can you do on your own...We are compelled to wander about, stricken and unprotected. (Sangati, 102)

It clearly sends a message that education and self-reliance are vital to uplift social status and achieve empowerment. The life struggle of Bama swears to the assumption that education plays the role of a catalyst in women's development by enabling women to transform themselves into free intellectuals and, progressive through the medium of rational development, they become audacious enough to progress ahead for liberating and uplifting themselves. Dalit feminism and Black feminism both evolved out of the ramifications of exclusion from the mainstream and are intrinsically analogous in aiming at restructuring, re-formulating, re-conceptualizing and re-framing the existing stereotypical social hierarchy.

## Conclusion:

In India, Dalit literature is a weapon that challenges the various caste system, the experiences of discrimination, inequality, violence, injustice and poverty of the Dalit community. The imbalanced position of men and women that is being unremitting and besides strengthened in sovereign India is due to the faulty way of approach in implementing laws and guidelines towards the society. Bama is more than a writer; she is 'a chronicler and recorder of Dalit life and struggle. The overpowering of the upper caste people is being projected from her view that hard work and other tedious labour are intended only for those who want to work hard. Bama's writing booms on minimalism and, probably for someone who has traditionally been seen as non-literary or even using impolite language, she more often makes her points with a certain indirectness, almost without emphasizing them, proving her ability to fight for Dalit community.

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## Original Article

### The integration of Artificial Intelligence in Cross-Border E-Commerce

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**Abstract**

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*In present day's international trade, Cross-Border E-Commerce (CBEC) plays a crucial role. With the development of artificial intelligence (AI) technology, essential changes were emerged in CBEC business flow. The Cross-Border E-Commerce artificial intelligence market size is valued at USD 7.25 billion in 2024 and is estimated to reach around USD 64.03 billion by 2034, growing at a CAGR of 24.34 per cent from 2024 to 2034. The market for Global Cross-Border E Commerce is rising at a high growth rate chiefly because of increasing internet and smartphone penetration worldwide. NLP applications comprise real-time translation of product descriptions, customer feedbacks and reviews, and website content, making contributions accessible to a global audience. ML is the engine behind many of the developed capabilities driving cross-border e-commerce, chiefly in predictive analytics and personalization. Computer Vision, a branch of AI that allows computers to "see" and interpret images and videos, is considerably enhancing cross-border e-commerce. This technology is transforming how products are presented and how quality is continued throughout the supply chain. This paper points out Companies operating AI in E-commerce Market, CBEC AI market size from 2023 to 2024, and role of AI in CBEC market.*

**Keywords:** Artificial Intelligence, Cross-Border E-Commerce, Integration, Global.

#### Introduction

The Cross-Border E-Commerce (CBEC) market is experiencing exceptional growth, estimated to reach trillions of dollars by the end of the decade, with AI playing a crucial role. With the development of artificial intelligence (AI) technology, essential changes were emerged in CBEC business flow. AI, by improving operational efficiency and enhancing user experience, assists foster the new CBEC ecosystem. The Global Cross-Border E Commerce is anticipated to be valued at USD 1.47 Trillion in 2025 and touch USD 4.81 Trillion by 2032, presenting a compound annual growth rate (CAGR) of 18.4 per cent from 2025 to 2032. The market for Global Cross-Border E Commerce is rising at a high growth rate chiefly because of increasing internet and smartphone penetration worldwide. Besides, other factors pushing the market growth rate consist of rising online shopping habits, ease of buying international products, and increasing cross-border logistics and shipping undertakings. The emergence of e-commerce platforms as new international markets and initiation of better foreign trade policies by various governments have further widened the scope for the growth in cross-border e-commerce market globally during the past few years. North America led the artificial intelligence E-commerce market in 2024. The estimation of the global AI-assisted e Commerce market is \$8.65 billion as of 2025. It is anticipated that this market will further reach \$22.60 billion by 2032, compelled by a compound annual growth rate of 14.60 per cent from 2024 to 2032.

#### Cross-border e-commerce with artificial intelligence

Artificial intelligence in E-commerce refers to applying AI technologies and techniques to enhance various aspects of online shopping and improve the overall customer experience in electronic commerce.



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AI is used in E-commerce to improve the customer experience, increase sales, optimize operations and reduce costs. Cross-border e-commerce with artificial intelligence (AI) denotes utilization of AI technology to enhance and automate the complex activities involved in selling products internationally. It assists businesses to overcome the hindrances in global trade, such as language differences, varied customer preferences, and complex logistics. CBEC integration with AI improves efficiency, improves the customer experience, and leads to innovation in business growth.

### Objectives of study

1. To point out Companies integrating Artificial Intelligence in E-commerce Market
2. To study Cross-Border E-commerce AI market size from 2023 to 2024
3. To study the role of Artificial Intelligence in Cross-Border E-Commerce.
4. To point out suggestions in the hindrances faced by Artificial Intelligence in E-commerce Market.

### Research Methodology

The present study is based mainly on the secondary sources of data which is collected from various websites relating to Cross-Border E-Commerce and Artificial Intelligence.

### Hypotheses

H0: The integration of artificial intelligence in Cross-Border E-commerce has no significant impact on its growth.

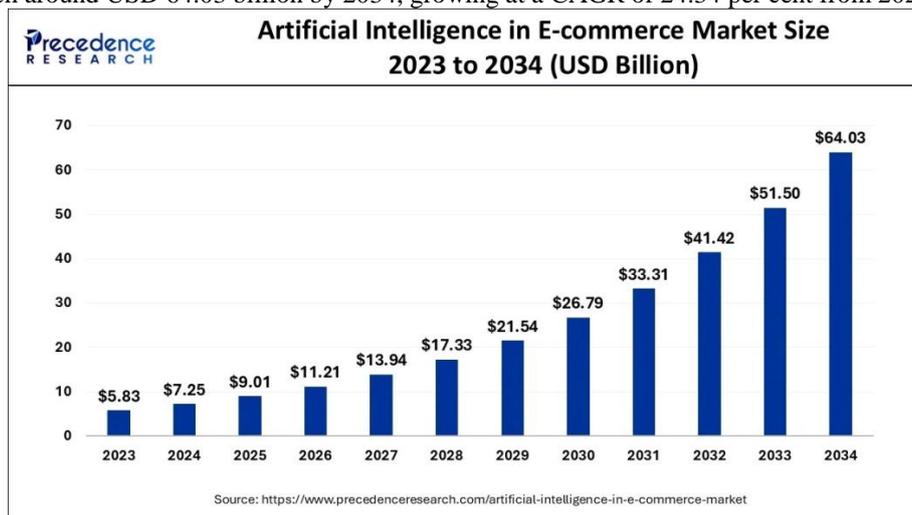
H1: The integration of artificial intelligence in Cross-Border E-commerce has significant impact on its growth.

### Artificial Intelligence in Cross-Border E-commerce Market Companies

Major companies operating in the artificial intelligence in e-commerce market are Apple Inc., Google LLC, Microsoft Corporation, Amazon Web Services Inc., Siemens AG, Intel Corporation, The International Business Machines Corporation, Oracle Corporation, SAP SE, Nvidia Corporation, Sentient Technologies, Bloomreach, Aidaptive, Coveo, Dynamic Yield, Persado, Emarsys eMarketing Systems, Syte, Bluecore, Twigggle, Kindred AI, ViSenze, Gorgias, Layer 6 Inc., Nauto.

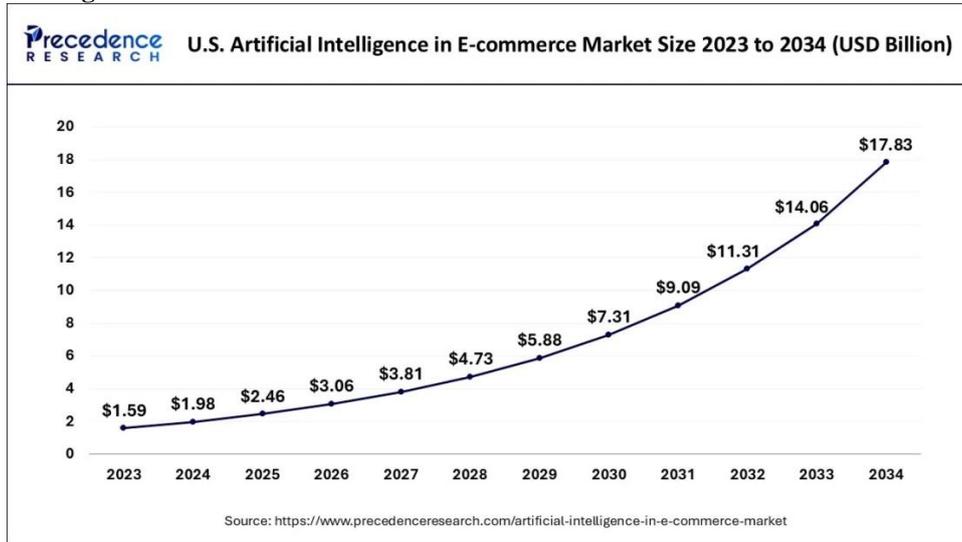
### Artificial Intelligence in E-commerce Market Size and Forecast 2024 to 2034

The Cross-Border E-Commerce artificial intelligence market size is valued at USD 7.25 billion in 2024 and is estimated to reach around USD 64.03 billion by 2034, growing at a CAGR of 24.34 per cent from 2024 to 2034.

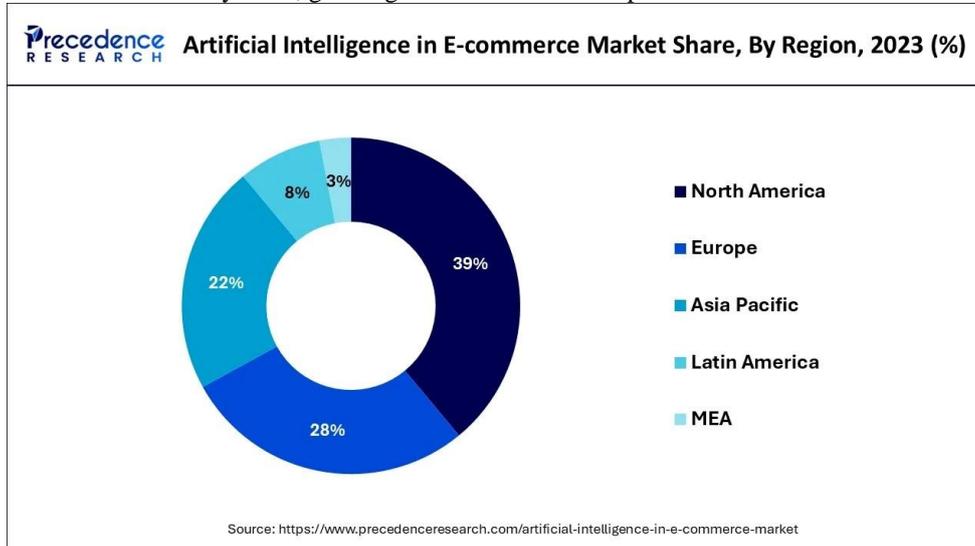


The anticipated growth in the Cross-Border E-Commerce artificial intelligence market size from 2023 to 2024 is mainly due to the factors such as increasing emphasis on customer data analytics, rise in investments in the AI in e-commerce, increasing demand for AI-powered product recommendations, increase in use of AI in supply chain management, and in fraud detection.

## U.S. Artificial Intelligence in E-commerce Market Size and Growth 2024 to 2034



The U.S. artificial intelligence in e-commerce market size is valued at USD 1.98 billion in 2024 and is anticipated to be worth around USD 17.83 billion by 2034, growing at a CAGR of 24.58 per cent from 2024 to 2034.



North America led the market in 2023 with share of 39 per cent and is likely to stable its position during the forecast period, due to its high expenditure on artificial intelligence solutions in the government and public sector. Europe, Asia Pacific, Latin America and MEA gained subsequent positions with 28,22, 8 and 3 per cent respectively. Moreover, throughout the forecast period, the integration of artificial intelligence (AI) technology for the mechanization of industrial machinery is likely to enhance the market for artificial intelligence (AI) technology in e commerce. On the other hand, Asia-Pacific region is anticipated to rise significantly during the forecast period as a result of the region's economic and technical improvements, which are estimated to boost the expansion of artificial intelligence solutions in the area in future years. The Middle East, Africa, and Latin America are likely to growth significantly in the following years due to growing young population and a quickly developing internet purchasing sector. North America, Europe, Asia-Pacific, and the rest of the world are some of the geographical areas that are used to further evaluate the worldwide AI in e-commerce market. In 2023, North America made major contributions to the worldwide market for AI in e-commerce. From e-commerce to agriculture, the US is considered as the leading adopter of cutting-edge technology in all fields. Many businesses in the US have embraced AI-driven e-commerce solutions, including Netflix, which makes tailored app recommendations using AI. Additionally, the nation is investing a sizable number of money in technology with a focus on developing the uses of AI in every industry. In addition, Asia-Pacific is anticipated to develop at the quickest rate throughout the forecast period in the worldwide AI in e-commerce market. Asia-Pacific is making a mark in AI-driven solutions across several industries, including e-commerce.

## Role of Artificial Intelligence in Cross-Border E-Commerce

### 1. Personalized Customer Experiences at Scale

Today's AI algorithms deeply penetrated into customer data, exhibiting buying patterns, preferred payment systems, browsing behaviours, and cultural nuances. This enables brands to deliver hyper-personalized product suggestions and marketing campaigns that resonate with local tastes. For instance, a European skincare brand expanding into China can rely on AI-driven insights to highlight locally beloved ingredients and adapt its messaging to reflect local beauty trends.

### 2. Effortless Cross-Lingual Communication

Cross Border linguistic barriers have always been a hindrance. There were hindrances relating to translating product listings, managing customer enquiries in different languages, and safeguarding subtle brand messages. AI-driven language engines now provide real-time, highly accurate translations. This AI technology offers European sellers craft faultless Mandarin product descriptions and enables Chinese brands to involve with European consumers in their native languages. As a consequence, brands avoid costly miscommunications, increase trust, and build stronger cross - border consumer connections.

### 3. Streamline in Regulatory Compliance and Fraud Detection

Following the network of regulations and guidelines that govern cross border e-commerce, such as customs duties, GST and VAT standards, and product labelling requirements, has always been a challenge. Besides this, the growing sophistication of fraud attempts has also aggravated the situation. At this juncture, AI-driven compliance solutions and its automated fraud detection systems provide assistance to retailers in upholding legal compliance. These technologies can suspect and detect trends before they turn into full-fledged breaches and automatically provide product information to ensure compliance with local legislations. As a consequence, more efficient flow of commodities can possible across cross borders.

### 4. Intelligent Inventory Management and Fulfilment

The major challenges facing by cross border e-commerce includes balance in inventory levels, handling of unpredictable consumer demand, and directing complex logistics networks across international borders. This may lead to shortage of stock and delay in delivery, and consequently reduce customer satisfaction, while overstocking of inventory drains resources affecting negatively on profit. AI-driven demand forecasting and logistics optimisation helps business houses to maintain optimal inventory levels and predict demand shifts by analysing previous sales, seasonal trends, promotional calendars, and even real-time weather data.

### 5. Around-the-clock Customer Support and Chatbots

When businesses react slowly towards customer needs, it reduces trust towards businesses. Potential buyers shift themselves elsewhere. Advanced AI chatbots and virtual assistants offer around-the-clock customer service. They can easily handle simple queries, from sizing guides for shoppers of one country to warranty questions for buyers of other countries. By bridging the time zone gap, businesses ensure that queries are resolved in time, resulting in happier and more loyal customers—irrespective of wherever they are in the world.

## Findings

1. Artificial Intelligence In E-commerce market size has valued at \$8.06 billion in 2024. This market size has developed at very rapid rate in recent years. It will rise from \$8.06 billion in 2024 to \$9.12 billion in 2025 at a compound annual growth rate (CAGR) of 13.2 per cent. It will further grow to \$16.3 billion in 2029 at a compound annual growth rate (CAGR) of 15.6 per cent. (Artificial Intelligence In E-commerce Global Market Report 2025)

2. Higher internet penetration speed up AI in E-commerce by providing more data, increasing the customer base, and enhancing the shopping experience, operations, and competitiveness. As for example, in September 2023, according to Broadband Search report, a US-based company that constructs a database of internet and TV providers and plans, IT is estimated that 93.79 per cent of the population, approximately 311.3 million individuals are utilizing the internet currently in the United States. Thus, increasing penetration of internet pushes the artificial intelligence in the E-commerce market.

3. Artificial intelligence in E-commerce is assisted in online shopping to improve the customer experience and facilitate business processes for pricing optimization and inventory management. As for instance, in August 2023, reports from Shopify Inc., a Canada-based E-commerce company, the global E-commerce market is estimated to reach \$4.8 trillion by 2025 and is predicted to continue grow in the following years. This tendency shows the increasing profitability of cross-border E-commerce for online retailers. By 2027, approximately 23 per cent of total retail sales are projected to take place online. Therefore, the spurt in online shopping is pushing the growth of artificial intelligence in the E-commerce market.

4. Natural Language Processing (NLP) is a foundation technology enabling effective cross-border e-commerce in 2025. In e-commerce, NLP applications comprise real-time translation of product descriptions, customer feedbacks and reviews, and website content, making contributions accessible to a global audience. Another technology - Machine Learning (ML) is the engine behind many of the developed capabilities driving cross-border e-commerce, chiefly in

predictive analytics and personalization. Computer Vision, a branch of AI that allows computers to "see" and interpret images and videos, is considerably enhancing cross-border e-commerce. This technology is transforming how products are presented and how quality is continued throughout the supply chain.

5. A significant obstacle in AI-driven cross-border e-commerce is directing the complex and ever-evolving regulatory settings and safeguarding data privacy. Different countries have distinct laws regarding collection of data, its storage and usage, and cross-border data transfer, along with, definite regulations governing AI and e-commerce operations.

### **Suggestions in the hindrances faced by Artificial Intelligence in E-commerce Market**

- A thorough assessment of current e-commerce operations - customer service, marketing, or logistics, to be identified where AI can show much impact and a clear AI strategy is to be developed to align with overall business goals.
- Research is to be carried on selection and development of AI-powered tools and platforms that best suited to cross border e commerce businesses.
- AI driven solutions are to be tested in controlled environments. These include refinement of algorithms, validation of results, and providing training to staff before full-scale deployment.
- The performance of AI implementations are to be monitored continuously. Feedback on the performance is to be collected.
- The adoption of AI across different departments and markets in cross-border e-commerce is to be evaluated to ensure ongoing adaptation to evolving market dynamics and consumer expectation.
- Care should be taken in ensuring data privacy, and maintaining transparency. These are pivotal for building trust and long-term success in global markets.

### **Conclusion**

As AI continues to progress, its influence on cross-border e-commerce will only grow. Businesses aim to compete on the global stage must invest in AI-driven solutions. This initiative is not only optional but is very essential. Those nations who harness the power of AI will be in well position to lead in the next era of cross border e-commerce. In present times, the blend of AI with global e-commerce is not only a trend but is a transformative power empowering businesses and customers alike. Beginning from tailored product recommendations to effortless language translations, AI is reshaping businesses connect and collaborate across continents. the integration of AI into cross-border e-commerce is no longer an option but a strategic imperative for survival and growth in the global marketplace of 2025 and beyond. Hence H<sub>0</sub> (The integration of artificial intelligence in Cross-Border E-commerce has no significant on its growth) is rejected and H<sub>1</sub> (The integration of artificial intelligence in Cross-Border E-commerce has significant impact on its growth) is proved and accepted.

### **Acknowledgment**

I would like to express my deep sense of gratitude to all those who have contributed to the completion of this research work on "The integration of Artificial Intelligence in Cross-Border E-Commerce".

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### **Conflicts of interest**

The author declares that there is no conflict of interest regarding the publication of this paper.

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## Original Article

### The Quality of Services Provided By Veterinary Dispensaries in Satara District

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#### Abstract

Animal husbandry is a critical component of agricultural economies worldwide, especially in developing countries where livestock serves as a significant source of livelihood, food security, and employment. Globally, the livestock sector contributes approximately 40% of the global value of agricultural output and supports the livelihoods and food security of almost 1.3 billion people. The Food and Agriculture Organization (FAO) highlights that demand for livestock products is expected to double by 2050 due to population growth, urbanization, and rising incomes. International bodies have emphasized sustainable livestock development, disease control, and improved breeding practices to enhance productivity and ensure food safety. Additionally, climate change mitigation through better livestock management is increasingly a priority in global animal husbandry policy discussions.

**Keywords-**Service Quality, Livestock, Veterinary Dispensaries

#### Introduction

In India, the animal husbandry sector is a vital pillar of the agricultural economy, contributing significantly to rural incomes and national GDP. According to the 20th Livestock Census (2019), India has a livestock population of over 535.78 million. The sector contributes about 4.5% to the total Gross Value Added (GVA) and around 30% to the agricultural GVA. India ranks first in milk production globally, with an annual output exceeding 210 million tonnes. Government initiatives such as the Rashtriya Gokul Mission, National Livestock Mission, and Animal Husbandry Infrastructure Development Fund aim to improve breed quality, provide veterinary healthcare, and enhance the infrastructure required for animal product processing and marketing. The government also focuses on improving fodder availability, managing livestock diseases, and encouraging dairy entrepreneurship among youth and women. Satara district is located in the Indian district of Maharashtra, which western India. The district has a long history of animal husbandry and agriculture, and veterinary services have played a crucial role in the growth and development of the area. One of the primary roles of the government in providing veterinary services is to ensure the health and welfare of animals. This includes the provision of animal health care services, such as vaccination, treatment, and surgery. In many countries, the government plays an active role in providing these services, either directly or through partnerships with private veterinarians. In some countries, the government may provide veterinary services free of charge to farmers or subsidize the cost of veterinary services. This is particularly common in developing countries, where farmers may not have the financial resources to pay for veterinary care. In other countries, veterinary services may be provided by private practitioners, but the government may regulate the profession and ensure that standards of care are met. The government plays an essential role in providing veterinary services and animal health care

#### Objectives of the study

1. To study the role of the government in veterinary services.



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2. To suggest remedies for making improvements in the veterinary services provided in Satara the district.

### Scope of the Study

This study is useful for various government dispensaries as well as it also help to identify the factors that influence the selection of various veterinary services. It also helpful to the farmers whose livelihood is depends on livestock.

### Data collection

For this study secondary data will be collected from the government veterinary hospitals and animal husbandry departments such as the annual budget, veterinary services provided by government veterinary dispensaries, statements of receipts and payments and annual reports, etc.

### Measurement

It is based on expert's opinions, situation specific condition, available information on internet. This study based on conceptual in nature, qualitative as well as exploratory study is done in this research.

### Theoretical framework

Quality of veterinary services can be defined as the extent to which services meet the needs and expectations of animal owners, in terms of both the technical quality of the services provided and the level of customer satisfaction. Technical quality refers to the knowledge, skills, and equipment used by veterinary professionals, while customer satisfaction is influenced by the communication skills of veterinarians, the availability of services, the cost of services, and the perceived value of the services provided.

There have been several studies on veterinary services in India. Here are a few examples:

1. Quality of Veterinary Services
2. Factors Influencing the Quality of Veterinary Services
3. Assessment of the Quality of Veterinary Services

**Here are some qualities that are generally considered important for high-quality veterinary services as following:**

#### 1.Compassion:

Veterinarians should show empathy and understanding towards their patients (animals) and their owners.

#### 2.Expertise:

Veterinarians should have a high level of knowledge and skill in their area of practice, including diagnostic and treatment techniques.

#### 3.Communication:

Veterinarians should be able to effectively communicate with pet owners, providing clear explanations of diagnoses, treatment plans, and prognosis.

#### 4.Collaboration:

Veterinary services should collaborate with other veterinary specialists, such as radiologists, anesthesiologists, and surgeons, when necessary to provide the best care for their patients.

#### 5.Transparency:

Veterinary services should be transparent with their pricing, policies, and procedures.

#### 6.Cleanliness:

Veterinary facilities should be clean and well-maintained to ensure the health and safety of the animals and their owners.

#### 7.Availability:

Veterinary services should be available when pet owners need them, including providing emergency services.

#### 8.Personalization:

Veterinary services should be tailored to the specific needs of each individual animal and their owner, taking into account factors such as the animal's breed, age, and health status.

#### 8.Continuing education:

Veterinarians should keep up-to-date with the latest research and developments in their field and continually seek to improve their knowledge and skills.

#### 9.Professionalism:

Veterinary services should conduct themselves in a professional manner at all times, demonstrating respect for their clients and their profession.

### Factors influencing the quality of veterinary services

Several factors can affect the quality of veterinary services, including the availability of resources, the level of education and training of veterinary professionals, the level of public awareness about animal health issues, and the regulatory environment. Inadequate resources, such as limited funding and lack of equipment and medicines, can lead to substandard care. In addition, low levels of education and training can result in poor diagnostic and treatment practices, while a lack of public awareness can lead to a lower demand for services. Finally, the regulatory



environment, including licensing and accreditation requirements, can also have an impact on the quality of veterinary services.

There are several factors that can influence the quality of veterinary services, including:

- Competence and expertise of the veterinarians delivering the services
- Availability of modern diagnostic and treatment equipment
- Adequate staffing and resources to provide high-quality services
- Effective communication and collaboration among veterinary professionals, animal owners, and other stakeholders
- Adoption of evidence-based practices
- Continuous quality improvement
- Access to appropriate drugs and other medical supplies
- Effective record-keeping and data management systems
- Compliance with regulatory standards and guidelines
- The use of appropriate biosecurity measures
- Availability of emergency care services
- Attention to animal welfare considerations
- Provision of client education and support services
- Availability of referral services for specialized care
- Integration of veterinary services with other animal health and management services, such as nutrition and housing.

There are several factors that influence the quality of veterinary services, and investing in these factors can lead to several advantages, including:

#### **1. Competent and skilled veterinarians:**

The expertise of the veterinarians delivering the services is a crucial factor influencing the quality of veterinary services. Investing in the education and training of veterinarians can lead to higher-quality services, better disease diagnosis and treatment, and improved animal health outcomes.

#### **2. Access to modern diagnostic and treatment equipment:**

The availability of modern diagnostic and treatment equipment can significantly improve the quality of veterinary services. Access to such equipment can help veterinarians diagnose and treat diseases more accurately and effectively, leading to better health outcomes for animals.

#### **3. Adequate staffing and resources:**

Adequate staffing and resources are necessary to provide quality veterinary services. Investing in these resources can lead to more efficient and effective services, reduced waiting times, and higher satisfaction among clients.

#### **4. Effective communication and collaboration:**

Effective communication and collaboration among veterinary professionals, animal owners, and other stakeholders are critical for providing high-quality veterinary services. Encouraging open and effective communication can help identify and address problems more quickly, leading to improved outcomes for animals.

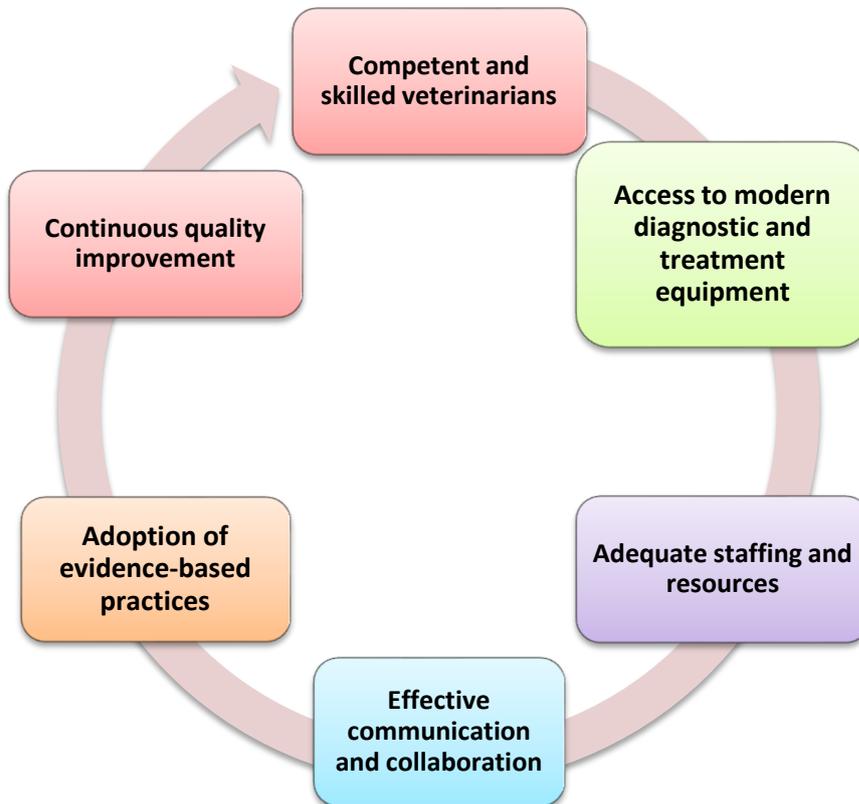
#### **5. Adoption of evidence-based practices:**

Evidence-based practices are supported by scientific research and are proven to be effective. Investing in research and the adoption of evidence-based practices can help ensure that veterinary services are based on the best available science, leading to improved animal health outcomes.

#### **6. Continuous quality improvement:**

Perpetual improvements in quality are the constant assessment and enhancement of the performance of good services provided. Investing in continuous quality improvement can lead to more efficient and effective services, higher client satisfaction, and improved animal health outcomes.

Related studies Factors Influencing the Quality of Veterinary Services in India:



**Fig1.1: Factors influencing Quality of Veterinary Services**

Above diagram shows that the assessment quality of veterinary services. It will help to boost the performance of veterinary dispensaries.

### Research Gap

To identify research gaps, it's important to conduct a literature review to understand what research has been done in this area. Some research gaps in this area could include:

**1.Limited research on the quality of veterinary services in Satara district specifically:** While there may be some research on the quality of veterinary services in other districts or regions, there may be limited information on Satara district specifically. This gap could be addressed by conducting a study specifically focused on veterinary services in Satara district.

**2.Lack of comprehensive data on the quality of veterinary services:** Even if there is research on veterinary services in Satara district, there may be gaps in the available data that make it difficult to fully understand the quality of services. For example, there may not be data on the number of veterinarians in the district, or on the types of services they provide. This gap could be addressed by collecting comprehensive data on veterinary services in Satara district.

### Findings

1. Both government dispensaries and private practitioners must to make certain that the facilities and equipment at their disposal are contemporary and up to date
2. It is important for the government to provide education and training opportunities for veterinary professionals
2. There needs to be better communication between those who provide veterinary services and farmers so that farmers are aware of the services that are available to them and how they may make use of those services to their advantage.
3. Service providers have a responsibility to maintain information regarding the quality of the services they offer, including the prices of those services and the treatment plans.
4. To raise the standard of veterinary care provided in the Satara District, Government Dispensaries and Private Practitioners ought to work together sharing best practices and developing a more complete and efficient animal healthcare system.

### Suggestion

The study reveals a shortage of qualified and experienced veterinary staff. More veterinarians and paramedical staff must be recruited to meet the growing demand. Many cattle owners expressed concerns over the cost of private services. A graded fee system based on income levels and livestock ownership can be implemented to ensure inclusivity. As the responses indicate, awareness about government schemes, veterinary rights, and services is low.



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Launching awareness drives through local media, WhatsApp groups, community events, and printed leaflets in Marathi will be beneficial.

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## Original Article

### Impact of Tourism Policies in Sustainable Development: A Critical Analysis

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**Abstract**

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India is promoting sustainable tourism through initiatives. Ensuring long-term economic performance and delivering equitable socio-economic benefits to all stakeholders. Creating stable employment and income opportunities for local communities, as well as contributing to social services and poverty alleviation. Minimize damage to the natural environment, reduce plastic use, and respect wildlife. Preserve and promote local culture, products, and heritage. Involve local communities in the development of sustainable tourism. There are several policies for sustainable tourism in India, including preserving natural and cultural heritage, providing economic benefits to local communities, and promoting environmentally friendly practices. Tourism fully considers its current and future economic, social and environmental impacts, meeting the needs of tourists, the industry, the environment and the host community.

**Key words:** Tourism, Heritage, Environment, Development, Community, Economic, Natural, Sustainable, Employment, Services, Policy etc.

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#### Introduction:

Tourism is a significant contributor to India's economy, but its rapid growth also presents environmental and socio-economic challenges. Recognising this, the Ministry of Tourism has formulated a National Strategy for Sustainable Tourism, focusing on key pillars that ensure responsible travel while preserving natural and cultural heritage. Encouraging eco-friendly tourism practices, reducing carbon footprints, and promoting conservation initiatives. Safeguarding natural ecosystems, ensuring responsible wildlife tourism, and preserving fragile habitats. Supporting local businesses, creating employment opportunities, and fostering inclusive economic growth. Preserving local traditions, engaging indigenous communities, and maintaining cultural heritage. Establishing certification systems to recognise and reward responsible tourism operators. Enhancing awareness through Information, Education, and Communication and strengthening governance frameworks.

#### Problems of the Study:

Tourism development creates a need for services such as restaurants, shops, transportation services, entertainment, accommodation, medical services, trade, banking, etc. Providing these various services to tourists provides employment opportunities to people in the relevant sectors. It is an aspiration to acknowledge all the impacts of tourism, both positive and negative. It aims to minimize the negative impacts and maximize the positive impacts. Negative impacts on a place include economic loss, damage to the natural environment, and overcrowding. Environmental degradation causes many serious problems such as air pollution, water pollution, biodiversity loss, land degradation, global warming, and resource depletion, which in turn threaten human health, Plant and animal life are negatively affected and the entire natural balance of the Earth is disrupted.



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## Objectives of the Study:

The main objective of this research is to study the current status of tourism policies and government policies for sustainable development in India, and some specific objectives have been given by the researcher as follows.

1. To Study sustainable development in India.
2. To Study the impact of tourism on sustainable development in India.
3. To Study the tourism policy of the government in detail.

## Significance of the Study:

Tourism has both positive and negative impacts on the health of local people. The impacts are related to the density of tourist arrivals, traffic congestion, overcrowding, crime levels, and other stressors. Environmental problems include climate change, pollution, resource depletion, and biodiversity loss. The solution to this is the use of green energy, waste management, reduction of plastic use, recycling, conservation of natural resources, and raising awareness about the environment. Environmental problems are the depletion of natural resources, pollution, and loss of biodiversity. These problems can have serious consequences for life on Earth. The main causes of environmental problems are human naturalization, such as industrialization, urbanization, and overconsumption.

## Scope of the Study:

Consequences of Environmental Degradation When the environment becomes polluted, it can cause many health problems for humans. Air pollution caused by excessive carbon emissions, factory smoke, and vehicle exhaust can cause respiratory problems such as asthma, lung cancer, and other respiratory diseases. The main types of tourism are divided according to the purpose of travel, such as domestic tourism, international tourism and in addition to travel, adventure tourism, cultural tourism, religious tourism, health tourism, educational tourism. There are many other types, such as ecotourism and marine tourism, which are tailored to the interests and purposes of tourists.

## Limitation of the Study:

Tourism management refers to the planning, management, and supervision of related activities such as travel, accommodation, hospitality, and leisure in the tourism industry. This includes meeting the needs of tourists, making effective use of resources, and promoting sustainable development. Tourism geography is the study of travel and tourism as an industry and a social and cultural activity. The geography of tourism includes the environmental impact of tourism, Includes the geography of tourism and spatial economies, issues of tourism industry and management, and the sociology of tourism and tourist destinations.

## Period of the Study:

Researchers have reviewed data from 2025 to study the contribution of government tourism policies to India's sustainable development.

## Research Methodology:

The researcher has used various types of secondary resources to conduct this research. These include research papers, articles, journal articles, newspapers, books, audio videos, reference books, serial books, annual reports etc. Sustainable development in India is very important in every sector, the strategic role of tourism in it is very important from the government's point of view. Since tourism policy plays an important role in achieving sustainable development, the researcher has attempted to conduct this research using a variety of secondary resources.

## Research Method:

The main objective of this policy is to achieve inclusive and carbon-neutral development of the tourism industry while preserving natural and cultural heritage. It is the need of the hour for a developing nation like India to develop sustainably from a holistic perspective and to formulate a unique development plan to implement tourism policies. Researchers have used a descriptive analysis method to develop a sustainable development plan based on tourism. Focuses on economic, socio-cultural and environmental sustainability.

## Results and Discussion:

Major environmental issues include air pollution, water pollution, deforestation, land degradation, biodiversity loss, climate change, and plastic pollution. These issues negatively impact human life, health, and the natural balance of the Earth. To conserve the environment, you can use fewer natural resources, reuse and recycle to reduce waste, and use public transportation or cycling to save energy. In addition, it is also important to conserve water and electricity and reduce the use of plastic. To achieve control, it is necessary to conserve natural resources, properly manage waste, recycle, and adopt an environmentally friendly lifestyle. The main causes of environmental degradation are increasing population, industrialization, urbanization, deforestation, pollution, overuse of natural resources, poverty, poor agricultural practices, and natural phenomena, which reduce the quality of the environment and lead to loss of biodiversity.



## **Tourism and Sustainable Development:**

Tourism and history are closely linked; many tourist destinations are of historical importance, such as ancient cities, forts, and monuments, which offer tourists a glimpse into the past. Tourism and sustainable development are interdependent; they involve three main principles: protecting the environment, preserving local culture, and generating economic benefits. This includes protecting the natural environment, preserving biological diversity, maintaining the balance of ecosystems, and minimizing waste production. This includes preserving local culture and traditions, involving the community in decision-making processes, and providing them with social and cultural benefits.

## **Local Community Development:**

Tourists play a key role in the development of sustainable tourism by boosting local economies, preserving culture, and reducing environmental degradation. This includes boosting the local economy, creating jobs, and delivering long-lasting economic benefits to the local community. This boosts the local economy and creates employment opportunities. It helps in conserving natural resources and ecosystems. Local traditions, arts and culture are preserved. It helps reduce poverty by providing economic benefits to the local community. Local people are trained in hospitality and other tourism-related professions. Awareness is created among tourists about sustainable tourism, so that they travel responsibly.

## **Tourism Development:**

Tourism is a large and complex industry that involves every sector of the country. The goal of tourism development is to raise the standard of living through economic benefits, develop infrastructure for tourists and residents, and establish appropriate development in tourist centers. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is very important. It helps businesses and economies grow in the long run. When businesses use sustainable practices, they perform better, save money, and delight customers. Sustainable growth in the economy can create new jobs and encourage new ideas.

## **Technological Development:**

Sustainable development is a process of change in which the exploitation of resources, the direction of investment, the direction of technological development, and institutional change are all consistent and enhance present and future capacities to meet human needs and aspirations. To protect the environment, conserve biodiversity, mitigate climate change, eradicate poverty, promote social inclusion, and drive long-term economic growth. By adopting sustainable practices, we can create a more inclusive, equitable, and resilient future. Sustainable development improves the well-being of individuals and communities and protects the planet for future generations. The Global Goals and the 2030 Agenda for Sustainable Development aim to end poverty and hunger, realize human rights for all, achieve gender equality and the empowerment of all women and girls, and ensure the permanent protection of the planet and its natural resources.

## **Tourism and Lifestyle:**

Sustainable projects and outcomes are projects that balance environmental, social, and economic considerations not only in their immediate outcomes but throughout their entire life cycle. Tourism and lifestyle are closely related, where tourism affects an individual's lifestyle and lifestyle affects the tourist's travel patterns. Tourism facilitates the exchange of cultures, languages, and lifestyles, which strengthens people's social ties and enables personal development. Experts suggest that life can be enriched by adopting a Sattvic lifestyle and understanding local culture through domestic tourism. Increasing tourism forces local people to change their lifestyles so that they can meet the needs of tourists.

## Chat No. 1 Factors Affecting on the Impact of Tourism Policy



### Environmental Degradation:

Environmental degradation is the loss of ecosystem quality, air, water, land, and other natural resources due to human and natural processes. Problems like pollution, deforestation and climate change lead to environmental degradation, which has serious impacts on living organisms. To prevent this degradation, it is necessary to protect the environment and manage resources properly. Natural resource degradation is the degradation of the environment due to the depletion of resources such as air, water, and soil. Agritourism is about bringing urban tourists to rural areas and giving them an experience of farming, rural life, and culture.

### Conclusion:

Tourism is an important medium for exchanging different cultures, languages and lifestyles. Tourism stimulates the intellect of an individual, enhances creativity and helps in achieving personal development. People in wealthy regions experience a need for entertainment due to their sedentary lifestyles, which increases the role of the travel and tourism sector, says Tourism Notes. The policy establishes India as a responsible tourism destination globally. Long-term benefits can be achieved by promoting the development of local communities and conserving natural resources. Provides a strong framework for making the tourism industry resilient, inclusive and carbon neutral. Conserving natural resources and preserving biodiversity. Creating opportunities for local businesses, increasing employment, and strengthening the local economy. Preserving local culture and traditions and connecting tourists with local communities. Ensuring the participation of all relevant stakeholders in the development of tourism.

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## Original Article

### Environmental Narratives in Thomas Hardy's Novels:

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**Abstract:**

Thomas Hardy's novels represent a powerful environmental narrative. It intertwines the natural world into the moral, emotional, and social fabric of human life. Nature presented in Hardy's novels are not passive backdrop but an active presence. It shapes and often challenges human behavior. His treatment towards rural landscapes, changing seasons, and ecological cycles show his deep sensitivity to environment. He is also concerned about its impact on human existence. Hardy's works, such as *The Woodlanders*, *The Return of the Native*, and *Tess of the d'Urbervilles* can be seen as ecological narratives. It explores the tensions between traditional rural life and the encroachment of industrialization. Hardy highlights humanity's estrangement from the natural environment. Through his novels he narrates modern ecocritical discourse. He portrays nature as nurturing as well as destructive, harmonious yet indifferent. Hardy has an environmental vision, which makes him a significant voice against ecological disruption. He is a pioneer in representing the moral and emotional interconnectedness of humans and the natural world.

**Key Words:** Eco-literature, Nature, characters, landscape.

**Introduction:**

Thomas Hardy represented a class of writers who had stepped ahead of Victorian conventions and prejudices. His outlook was modern due to contemporary scientific theories, philosophical realism and the deterministic philosophy prevalent in his time. whatever may be passed on it from a philosophical point of view no English novelists of our age has been affected by science than Hardy. Born and bred in the country, he had observed the peasant life closely, and projected the same through his Wessex country. Hardy was architect by profession, hence gave to his novels a design that was architectural employing each circumstance in the narrative to one accumulated effect. By the end of 19th century, Hardy had produced fourteen novels (the Wessex series) and three collections of short stories, after which he published no more fiction. His novels are closely related to nature and environment. Hardy work can be classified under three aspects: as an interpreter of nature \_the descriptive artist; as an interpreter of character \_ the analytical artist; as an interpreter of life \_the philosophic artist. Hardy's great distinction lies in his putting on one side the romantic point view, and adopting a deliberating and scientific observant method of treating the life of the country \_side. The immutability of nature, the mutability of human life ; the bigness of nature, the littleness of man; the inexorable character of natural laws, the puny struggles of human personalities trying to evade them. His novels are a mirror of ecological consciousness.

**Hardy on Nature:**

His interpretation of nature gives us the clue to his outlook on men and women. Surely his men and women are the most vividly actualized when they are simple, primal character.



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To understand the self sacrificing love of Marty South we must realize the spell of the brooding woods, the magic of quit, enduring trees, whose life she knew so well. To understand the attraction of the Reddleman, with his vagrant aloofness, we must first be made to feel the fascination of Egdon heath in all moods. Hardy's sensitive tactility shows that he is supreme. He has great connection with nature, his intimate knowledge of natural phenomena, he can make us feel good, by his delicate and multifold allusiveness, the significance of the country's life. His knowledge of country life added colour, life and newness to his novels'. The individuality of the damp and fragrant woods; the meaning of the wind's voice, whether for storm or piece; the premonition of the tempest, the spirit of the heath at every hour of the day and night; above all the mystic relation between the toiling peasants and the hills and valleys where they live and move and have their being. Hardy presents nature as a force that directs and determines the fate of human characters.

### **Novels of Character and Environment:**

His novels are set within the semi-fictitious landscape of 'Wessex'. The reader can easily identify the scenery and towns described in the narrative located within the southwest of England, which incorporates Dorset and the surrounding counties. The specific sense of place detailed in Hardy's fiction is very important as it provides a realistic, countrified backdrop against which his many characters live out their lives and struggle against their circumstances. His knowledge of Eco-writing is praiseworthy. Hardy's intense study and accurate portrayal of nineteenth-century rural society in Dorset and surrounds - the 'Wessex' of his novels - presents a microcosm of human life through which Hardy intended to comment on the universal condition of human existence. In Hardy's fiction, the natural world is often described in great detail, and it serves more significant than a mere setting against which the narrative unfolds. Hardy establishes a reciprocal relationship between environment and character; an interaction which serves to demonstrate the changing position of humans in the post-Darwinian Victorian period. His writing is environment centred in many of his novels. Hardy's narrative voice depicts the natural world in the same way the appearance of different individuals are described, and vice versa. This technique removes the sense of authority from human hands, placing humans within the natural world rather than ruling above it.

Hardy's depiction of nature mirrors it's beauty as well as its majestic power. He portrays the landscapes like Egdon Heath's brooding vastness, Talbothays' idyllic pastures, Hintock's dense woods. It reflects a great environmental awareness, anticipates modern concerns about ecological degradation and human detachment. His work also portrays the industrial exploitation of rural landscapes, it can be observed in the mechanized timber trade of *The Woodlanders* or the desolate fields of *Tess*. Simultaneously, the female characters of Thomas Hardy, such as *Tess Durbeyfield* and *Marty South*, reflect ecological concerns, such as the exploitation mirroring the subjugation of the natural world. Hardy's narration often reveals nature's haunting duality. It is both nurturing and terrifying, as observed in the profound terror of *Far from the Madding Crowd*'s storms or the oppressive isolation of urbanizing landscapes in *Jude the obscure*. By the integration of these frameworks, this study highlights the nuanced critique of Hardy at industrial, patriarchal, and anthropocentric systems, and to position his novels as a perfect example of ecological and social tensions that endures the relevance of contemporary environmental and feminist discourses.

For example, in *The Return of the Native* (1878), Egdon Heath is personified in the narrator's description: 'the face of the heath'. In a parallel characterization which highlights the connection between the heath folk and their environment, the faces of certain individuals are portrayed in terms of the landscape. The human characters are left at nature's mercy. The words: 'pits', 'cavernous', and 'ravines', are used to depict the aged, wrinkled faces of some of the revellers around the Rainbarrow fire. The description of nature in the writings of Hardy plays a vital role. Personification is used in *The Woodlanders* (1887) to describe the vast woodland in which the village of Little Hintock is nestled. Mossy tree roots are 'like hands wearing green gloves', and, on certain trees, 'huge lobes of fungi grew like lungs'. Whilst following Grace and her father to the bark auction, Giles Winterborne hears the voice of the auctioneer through the woods. This voice is described as 'shouting intermittently in a sort of human bark'. The human voice is thus associated with the surrounding woodland and the bark covering the trees.

The interconnectedness between humans and environment can be observed through his novels. In his autobiography, Hardy identifies the important correlation between humans and their environment, highlighting the significance this interaction has in our understanding of the landscape. Hardy claims: 'an object or mark raised or made by man on a scene is worth ten times any such formed by unconscious Nature. Hence clouds, mists, and mountains are unimportant beside the wear on a threshold, or the print of a hand'. Hardy thereby reveals an awareness of time and history, whilst underlining the significance of the human subject. Hardy outlines the impact of human actions on the environment. He uses the metonym of corporeal

fragments - the print of a hand - to represent the importance of human existence in transforming landscapes, and it is by this transformation that meaning is imparted to nature. Hardy's emphasis on environment demonstrates the influence of Darwinian theory. The role of fate and circumstance are important features of the plot, echoing the stress evolutionary ideas place upon chance, extinction, and survival. Darwin argued that natural selection is without intent. He presents nature as sublime, shaping human fates. He claimed selection arose from variation in individual members of the species, incidentally sustained by the surrounding environment which favours certain traits and characteristics.

Environmental degradation is highlighted through many of his novels. For example, in *Tess of the d'Urbervilles*, the lush Talbothays Dairy represents a pastoral ideal. But its transience presents the decline of rural economies, as Tess's little happiness is overshadowed by industrial realities at Flintcomb-Ash. It is a place where "the whole field was in colour a desolate drab". The *Woodlanders*, an interesting novel, further critiques industrialization through the Hintock woods. The region where mechanized timber trade disrupts the organic harmony of rural life. As observed in Giles Winterborne's struggle against economic forces. In *Jude the Obscure*, the rapid urbanization of landscapes of Christminster contrast with the rural Wessex. It symbolizes nature's displacement and Jude's isolation. Industrialization as well as modernization are often major concerns in his novels. The ecocritical vision of Hardy portrays nature as a force that repels human control and critiques the environmental cost of modernity. Darwin's emphasis upon the power of circumstance to alter the outcome of natural selection is evident in Hardy's fiction. Human forces are ultimately rendered inconsequential against the unseen powers that appear to govern their immediate environment. If we degrade nature, nature will not spare us. The final sentences of the penultimate chapter in *The Return of the Native*, in which Clym speaks to Diggory Venn about his feelings of responsibility for Eustacia's death, reveal the emphasis Hardy placed on chance, and show that human will is not free but restrained, governed by factors of coincidence and fate:

"But you can't charge yourself with crimes in that way," said Venn. "You may as well say that the parents be the cause of a murder by the child, for without the parents the child would never have been begot." "Yes Venn, that is very true, but you don't know all the circumstances. If it had pleased God to put an end to me it would have been a good thing for all. But I am getting used to the horror of my existence'.

Hardy classified his novels into three groups; the biggest section named 'Novels of Character and Environment' includes the works discussed in this essay, plus some of Hardy's other major novels. Hardy's classification clearly shows us the importance he placed upon the interaction between human life and immediate surroundings, and the role of environment in determining the lives of the characters that inhabit it. Nature is treated as an entity and not a mere backdrop. Hardy's novels are rich in description, scene painting from nature. In *Tess* and *Far from the madding Crowd*, nature has a vital link in stimulating the impulses of his characters. One finds Eustacia in *The Return of the Native* all wild and disorderly like the wilderness around. Nature dominates and prevails over the moods of his characters. Environment is of great significance. The quiet rural side also to the serious and tragic intensity in his works. Thomas Hardy's sense of pity is perhaps more acute than that of any modern writer. As a story teller he allies rich inventive power with a sense of symmetrical development, which as a rule characterizes our lesser not our greater men. Scott, Dickens, Thackeray, so productively fertile in invention, show often little perspective on their constructive side. Hardy can be recognized as nature lover or an environmentalist. For all the minuteness of method, Hardy never loses sight of the harmonious side. Here he shows the economy of the great artist. Futility of life is more evident in his verse. There is a dignity and beauty about his best work. He represents nature as supreme entity. Reading this reminds us, Mr. Hardy's loving knowledge of earth, we have the kingdom of Hardy. There will be differences of opinions of Hardy as a critic, but as an artist, he is among the greatest in literature.

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## Original Article

### Folktales of Assam: A Study of Cultural Heritage and Oral Tradition

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#### Abstract:

*Folktales represent the beliefs, imagination, values of a community. Though written purely for entertainment purposes it is deeply embedded with moral and ethical lessons. North-East India, especially Assam, is a land of various ethnic tribes with their indigenous habits, festivals, faiths, imaginations and aspirations which are different from the other parts of India. The themes of these tales are simple yet universal. The Assamese society has been shaped and guided by these tales from early period. They represent the connection of people with nature, supernatural beliefs, mythologies, prevailing in the society, moral values, customs, ethics and ideals of the Assamese people. Folktales enrich the cultural heritage and build a strong foundation of moral framework of the people of Assam. Known as Loka Katha, Assamese folktales are a store-house of knowledge for the society. The present paper aims to focus on how folktales are a living document of social realities of the rural Assamese people, their history and culture.*

**Key Words:** Folktales, Assamese society, ethnic tribes, customs, moral.

#### Introduction

Folk tales reflect the values, faiths, ethos and traditions of a community and an unavoidable part of the cultural heritage of a society. It originates from oral traditions based on mythologies and social experiences of a community. It was solely created and practised for the purpose of entertainment, but moral values and spiritual instruments were also deeply embedded in them. It guided the rural and simple people to live a hassle-free life without any complexity. People remember and reflect upon the moral lessons taught by the characters or the incidents from the tales. Assam as well as the North-Eastern part is a land of many tribes with their unique and distinct backgrounds, languages and customs making it significantly different from the other parts of India. The various tribes like Ahoms, Bodos, Rabhas, Mishimis etc. along with their diverse ethnic identities, vibrant festivals, rituals, habits, beliefs and long-standing oral traditions have enriched and colourfully weaved the folktales of Assam. The folk tales of Assam are vibrant expressions of the state's diverse ethnic and cultural identity and long-standing oral traditions. Passed down through storytelling, often by elders to younger generations, these narratives incorporate the collective wisdom of Assamese people and universality. This study focuses on how these orally transmitted stories function as a foundation of Assamese cultural heritage, serving as a connection with the historical, social, and ethical foundations of society. Folktales preserve the cultural diversity, traditions, customs and beliefs of a community. The new generations can learn the moral and enhance its range of ethical knowledge to live a happy life. In the modern scenario, people are often seen living a life seeking only physical comfort and material prosperity. The western education leaves a huge impact upon the indigenous social life as well as cultural surroundings.

#### Objectives:

- 1.To study the various types of Assamese folktales.
- 2.To explore the folktales as carriers of cultural heritage.
- 3.To discuss the essence of folktales in the modern relevance.



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## Methodology:

In this paper, both analytical and descriptive methods are used. The researcher has tried to highlight the folktales of the Assamese society and its importance in the life of the common people. Though the paper mainly focuses on the written books, journals etc., it also tries to emphasize how these tales are orally transferred to generation from generation.

## Discussion:

North-East India along with Assam is a land of wonderful myths, supernatural beliefs where animals talk in human language, can transform into human beings. The supernatural themes may be found in a tree or mysterious entities, may be living near the villages etc. The natural settings, full of streams, rivers, hills, wild animals of this land enhance the mystical elements of traditional storytelling and make it more lively and interesting. The rich culture of the tribes like the Ahoms, Bodos, Rabhas, Tiwas also complete this charm with their colourful and vibrant cultural identity. Oral literature traces back to a long period of history when written words were not accessible to the rural Assamese folk. While converting the tales from mouth to mouth, they taught the young generation about moral values, spiritual upliftment and educational functions. It continues to be a medium to educate children on moral values and cultural norms from the past. They reflect how the people of Assam are deeply connected with nature and how they have an influence of the indigenous mythologies. The oral tradition of Assam is extensive and includes various forms, such as folk songs (*lokageet*), proverbs (*lokabani*), ballads, and tales of different types. Many of these traditions are still alive today, despite the pressures of modern civilization.

Before the arrival of mass media, oral transmission was the primary medium for preserving culture in Assam. Storytelling, often passed down by elders, was an integral part of family and community life. The stories were told by the grandparents in the evenings near the fire-place in the winter season and in the open yard in the summer season. These tales not only served to entertain the children but they were passing education, imparting moral lessons and shaping the ethical values of them. 'Folk' implies a collective group of people with common factors. The folktales narrate the history, culture, society, celebration, religion aspirations, imaginations, sorrow, fears and superstitions etc. of the common people in their day to day life. This traditional prose narrative acquired its written form with the advent of modernity. According to Alan Dundes, "Folktales are the living record of people's imagination, morals and history." (Dunde 1980) He says that folktales serve as a mirror to reflect the cultural identity and social norms and they preserve collective wisdom and values. In *Folk Tales of Assam* Mira Prakash says that folktales can tell certain things about a particular group of people. She also says that folktales preserve the lives of certain people as well as teaching them moral values with fantastic imaginary tales. Maheswar Neog in *Asamiya Sahityar Ruprekha* says that rural socio-cultural pictures can be found in the folktales. He says that a true picture of the lives of unsophisticated rural people can be found in these tales.

The Tradition of storytelling in Assam can be traced back to pre-Ahom and Ahom periods, when various indigenous tribes like Bodo, Karbi, Dimasa Tiwas and Mishing communities enriched the folklore of the region. For centuries, Assamese folk tales thrived in oral form, with the storytelling often by the elderly women (*Burhi Aai* or grandmother), captivating the audience with their narratives. These were known as '*Sadhukatha*' which, according to Lakshminath Bezbaruwa, is the word of the saints. Assamese folk tales attained a systematic shape with the publication of the collection of folk tales *Burhi Aair Xaadhu* (Grandmother's Tales), published in 1911 which has thirty '*Sadhukathas*'. This proved to be a crucial step for Assamese culture which immortalized many of the oral traditions of Assam, bridging the gap between the oral and written word. This compilation is considered a landmark achievement that ensured the survival of these stories for future generations.

### 1. Categories of Assamese Folk Tales

Assamese folk tales are rich in variety and theme and they reflect the complex and diverse socio-cultural landscape of the region. They can be divided into various categories like animal tales, mythological tales, moralistic and heroic tales and humorous tales.

**Animal Fables:** One special feature of the Assamese folk tales is animal tales where animals are employed as allegorical characters. These tales present humorous effect and teach moral lessons. The tale of the Fox and the Monkey or *Xial aru Bandoror Sadhu* or The Old Man and the Fox or *Burha aru Xialor Sadhu* are some of the tales which deliver comic taste to the audience along with moral teachings. In these tales animals talk and behave like human beings and sometimes they can transform into different appearances. Stories like "*The Monkey and the Fox*" teach valuable lessons about wit and the consequences of deceit. These tales also showcase the cleverness of certain characters in outsmarting their adversaries. They celebrate intelligence and wit as crucial survival tools.

**Mythological Tales:** Many folk tales are intertwined with Assamese mythology and legends. There are many tales that feature gods, spirits, deities and other supernatural elements. The love story of **Usha and Aniruddha** is one such tale, recounting the union of Usha, daughter of King Banasura, with Aniruddha, the grandson of Lord Krishna. This narrative, often retold in Bihu songs, features elements of romance, mysticism, magic, and divine intervention. The goddesses like Manasa, Devi Kamkhya are other characters who are prevalent in the folk tales of Assam.

**Moralistic and Heroic Tales:** Most of the Assamese folktales serve as a vehicle for imparting ethical lessons. The tale of *Tejeemola*, a popular Assamese "Cinderella," is a prime example. Tejeemola is harassed and killed by her wicked stepmother. But eventually she triumphs through several magical rebirths and finally returns to her own self from being bird symbolizes the victory of goodness over cruelty, the inevitability of justice, and the resilience of the human spirit. The tale *Tula and Teja* is another example of a virtuous girl's triumph against her evil step mother. *Budhiyak xiyal* (The Clever Fox) describes a clever fox who outwits the most powerful Tiger with its cunningness and intelligence. These stories convey lessons on honesty, justice, diligence, compassion and kindness. Most of the folk tales end with an appropriate proverbial wisdom.

**Supernatural Tales:** Assamese folklore has gained its unique touch of magic with supernatural elements. The characters and incidents often clash and crash with diverse cast of spirits, mythical creatures, and malevolent entities. These stories have been for many generations serving as cautionary tales and they explain the natural phenomena. These factors reflect the deep connection between the Assamese people and their relationship with natural environment. Assamese folklore is concentrated with tales of mythical creatures and spirits, both benevolent and malevolent. *Bira*, a spirit which is kept as a pet to take revenge on enemies, *Jokhini*, a female spirit or witch who can change her appearance to fulfil her evil intentions. These tales collectively highlight the spiritual landscape of Assamese culture, where the supernatural is interwoven with the everyday world.

**Humorous Tales:** Many folk tales showcase the wit and humour of both human and animal characters. These tales contain light-hearted stories that use satire and wit to entertain as well as to teach moral values. *Lotkon* is the story of a cunning man who uses his wit to deceive other villagers for his own profit. *Lame Goat* tells about a clever goat which is injured and became lame. But it is able to live a peaceful life even in the jungle full of dangerous animals using its wit. These comic tales provide the audience amusement and makes them aware of frauds.

## 2. Folk Tales as Cultural Barometers

The folk tales of Assam are not mere stories; they are cultural barometers that reflect the values, customs, beliefs, and history of the Assamese people. The tales provide fundamental moral instruction and life lessons for individuals. Many stories like *Champavati*, Biral Tapaswi (The Ascetic Cat) teach moral values and life lessons. They offer a glimpse into the socio-cultural fabric of past Assamese society, portraying the daily life, beliefs, superstitions, and simple wisdom of its people. Many tales, such as the story of Tejimola's reincarnation through natural elements, demonstrate the deep connection Assamese communities feel with their environment. In The Ou Princess, the protagonist, a young and beautiful girl, is found inside an *Outenga* tree (elephant apple), whereas the tale Paanesoi, showcases another beautiful and mysterious girl Panesoi, who resides within a piece of wood. Nature is an unavoidable part of Assamese folktales. Some stories contain fragments of historical information, offering insights into early Assamese society and its interactions with neighbouring communities. They show how good can triumph over the evil, how nature and animals should be respected, how some things should be left to fate and divine justice. Assamese folk tales reflect a blend of Hindu beliefs and tribal traditions, offering a fascinating glimpse into the collective imagination of the Assamese people.

Assamese folk tales remain relevant even in the modern scenario. They have ensured their presence in the lives of the next generation through various mediums like literature, animation and digital media. But the advent of modern media and the decline of traditional storytelling posed a threat to the preservation of these narrations. However, the translation of the folk tales into print and digital media also raises the questions of authenticity and adaptation and losing the oral aesthetics. Efforts to preserve and promote this cultural heritage are very important. Even in a rapidly modernizing world, the wisdom of the past as well as the practice of storytelling is invaluable.

## Conclusion:

The folk tales of Assam are not merely relics of the past but living cultural treasures of the values and wisdom. They serve as a bridge between the past and the present, rural and urban. The effect of folktales can be felt in the beliefs and thinking of the Assamese society. Folk tales must be promoted and preserved for maintaining the cultural identity of the people of Assam.

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## Original Article

### Theme of Gender reflected in Mahesh Dattani's Bravely Fought the Queen

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**Abstract:**

*This paper investigates Mahesh Dattani's renowned play, "Bravely Fought the Queen", from gender point of view. Dattani's plays are the mirror of contemporary Indian society. Family is the most important theatrical space in Mahesh Dattani's plays including Bravely Fought the queen. The dramatist depicts the battles being fought among the members of same family at home. The play seeks to presents women's exploitation by the male. The play also depicts the issue of homosexuality in a very bold manner and the issue of morality, financial depreciation in the lives of the Trivedi brothers residing in a posh suburb of Bangalore. It portrays the complexity in the husband-wife relationship, mother-son, daughter relationship and brother-sister relationship. The play presents the shifting Indian values and dramatizes conflict between traditional and contemporary cultures.*

**Keywords-** Gender, patriarchy, society, homosexual, morality, financial burden, conflict

**Introduction:**

Mahesh Dattani, actor, director, playwright, dancer and screenplay writer was born in Bangalore on August 7, 1958. He studied in the elite St. Joseph's college at Bangalore. He worked primarily as a copywriter and formed his theater Playpen in 1984. Mahesh Dattani frequently takes his subject from complicated dynamics of the modern urban family. His characters struggle for some kind of freedom and happiness under the weigh of tradition, cultural constructions of gender and repressed desire. His plays mirror the aspiration and the frustrations, the conflicts and the compromises that characterize the contemporary middle class Indian's life. Bravely Fought the Queen was first performed at the Sophia Bhabha Hall, Mumbai on 2<sup>nd</sup> Aug 1991. The play has a multi-layered thematic technique. The play centers on the Trivedi family with its two brothers Jiten and Nitin and their wives Dolly and Alka. The playwright has divided the play in three acts with titles for each. The title of the first act is 'The Women', the second act is 'The Men' and the third act is 'Free to All'. Jiten has control over the family both as elder son and brother. Dolly and Alka are sisters. It is a joint family venture in terms of the domestic scenario as well as the advertising business. All the relations are powerfully maintained under the dictates of patriarchy. The third important family in the play that meets members of Trivedi family is that of Lalitha and Sridhar. The first act of Bravely Fought the Queen presents the position of the women and the drawing room of the Trivedi family. This family has a mother, Baa; her two sons, Jiten and Nitin, two daughters-in-law Dolly and Alka and one grand daughter Daksha. The play depicts contemporary life with strong under currents of dark family secrets surfacing through the interaction of characters. Baa is an old woman who has suffered a stroke. She is confined to bed and alternates between the houses of her sons, Jiten and Nitin, whose wives Dolly and Alka look after her by turns. Baa is strong and dominating character in the play. She controls and dictates her sons and their wives -lives through bullying, blackmailing and instigating one against the other. Baa is giving too much trouble to Alka and Dolly because Baa's husband very badly treated her. Beautiful Baa married



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with uncouth, rough and loutish person. He married Baa for money because Baa was rich singer. He often beat her up and Baa would plead with him not to hit her on the faces, "Hit me again. The children should see a demon you are. Aah! Jitu ! Nitin ! Are you watching? See your father ! No! No! Not on the face. I beg you. I beg you! Hit me but not on --- aah!" (Dattani, 2000:278). Face is very important, its mirror which presents the miseries of a person very clearly. But being a woman psychologically she wants to cover her miseries and does not want show anybody. Sujata Sen points out about women in the book titled Gender Studies, "Women tolerate all the torture silently keeping it all within themselves in order to keep the family fabric and prestige intact". (Sen, 2012:101). Baa's two sons, Jiten and Nitin, were a witness to these ugly scenes. L. Amritashwari Devi writes in "Women as victims in Mahesh Dattani's Bravely Fought The Queen" for Baa, "Baa's husband was a dominating and violent man who had not only prevented her from singing but also used & beat her up time and again. He also ill-treated their sons. His nature towards Baa and their sons was so rude and brutal that she becomes affected even after the death of her husband whenever she recalls him of making her unable to live in the present." (Devi, 2011:190). Psychologically behaviour, mentality and cruelty of Baa's husband created hatred, anger, dispute in her mind and that same hatred is continued with their sons. Baa has instilled the feeling of hatred for his father in Nitin right since his childhood. Very strangely Nitin has grown up to be a homosexual and Jiten is rough, boorish and uncouth like his father. Both Nitin and Jiten ill treated their wives. Nitin and Jiten indirectly continued past of their father.

Dattani presents a nuanced portrayal of two women Dolly and Alka, who navigate societal expectations and personal desires in a patriarchal setting. Alka is a spirited young woman in her early thirties. She is a wife of Nitin and the victim of patriarchal society. First, she suffers at the hands of her brother, Praful and then her husband and mother-in-law's hands. Once annoyed, Praful dragged her into the kitchen and pushed her face in front of burning stove and burnt her hair. She was frightened and tried her best to save her face. Face is an identity of both Baa and Alka. Alka's marriage is adjustment because her husband Nitin keeps homosexual relations with her brother Praful. Alka's marriage is get pass for both Nitin and Praful to continue this act safely. The play depicts the issue of homosexuality in very bold manner, as well as suffering of the wife due to her husband turning out to be a gay. Alka's anguish and agony is aggravated when she comes to know that Nitin, her husband, has homosexual relationship with her brother. On account of dry marital life, Alka has become a boozier. She drinks wine to forget all, but in vain; she is completely frustrated and depressed by constant beating and torture of Nitin and threatening her again and again to go out of the house. Alka has lost all her status and identity.

Dolly is the victim of patriarchy. Dolly has been married for fifteen years to Jiten who has always ill-treated and beaten her up. Dolly reminds him how, at Baa's instigation, he had beaten her up and kicked her when she was pregnant. As a result she gave birth to a premature and spastic Daksha who is now studying in a special school and wants to be a dancer. Dolly hides the reality of Daksha. In the play Alka says, "Having leach for a husband. A saint for a brother and a leach for a husband."(Dattani, 2000:300). Her husband has no time for her. He is always busy doing fruitless things and involved in outside women for physical satisfaction. Her dilemma is sharply presented by Alka, "Poor Dolly, sitting by herself, looking pretty and ... wastes. With only a half-dead mother-in-law for company." (Dattani, 2000:208). To involve herself and to overcome on trouble she takes interest in listening Naina Devi's thumari, Dolly and Alka also create an imaginary character. Kanahiya as her lover. Both Dolly and Alka tells false story to Lalita.

Daksha the third generation of Trivedi family also suffers because of patriarchy. The future generation has to suffer because of the conflicts and frustrations of the elders. Baa repents as she leaves her property in the name of her grand daughter and makes Praful the trustee. As Nitin gets to know this he is disappointed at being disinherited. Jiten has been totally dehumanized at the hands of the system and violence has become an integral part of his life.

Dattani's use of the bonsai is an interesting trope in the play. On the one hand it reflects on the nurturing aspects of Lalitha. On the other it also unveils the attitude of a power ridden society towards women. The women in the play are creations like Lalitha's bonsais. Their desires are constantly cut so that they spread any to a particular level. They don't have any scope to spread. This is also the case with the women in this play. They too are trimmed in different ways to create desired effect. Alka, Dolly and Lilitha are all bonsais each of different kind.

The past of a person affects his/her life badly. But when it is the past of a women it affects her more than a man. In the case of Dolly and Alka same thing happened. Their father was not living with their mother. He deceived her and lived with her former wife and four children. At the time of marriage of Dolly and Alka Praful told that his father was dead. But after marriage accidentally, Baa came to know about the reality of their father. Baa became angry and insulted Dolly and Alka by calling them the daughter of a mistress or a keep. In the words of Baa, "Your mother is a keep ----- a mistress! My sons have married the daughters of whore!" (Dattani, 2000:311). Baa used this dirty word and insulted all women. Dolly suffered a lot because of this lie matter. Baa tells Jitu, "Throw out her as well. Whore" (Dattani, 2000:311). Baa forced Jiten to bit Dolly during the pregnancy. Alka is thrown out form the house by Nitin after the revelation of her family secret.



Sridhar is uncomfortable with the approach of the Trivedi brothers. He tried his level best to defend the rights of the consumer. Sridhar is probably torn between the two and is unable to gauge the new nuances of the situation in which, like Dolly, and Alka he too is a puppet.

Dattani's choice of the advertising agency as a patriarchal construction, the sale of products for women, and most of all women as targets for the male gaze is apt.

Lind L. Lindsay presents the plight of women in her home through a proverb, "Men have careers, women have jobs. Men are breadwinners, women are bread bakers. Men are Sexual Leaders, women are sexual followers. A man's home is his castle!" (Lindsey, 2011; 241).

Dolly and Alka both are rich, they are living their life according to the desire, wish of their husbands. In the eyes of Jiten and Nitin, a woman is a commodity and an enjoyable thing. Men can never think women as human as they are always victimizing them; because they are showing their superiority over them.

## **Conclusion :**

The suffering of women at the hands of men is an age old suffering. In the modern context the suffering of women may be different from the suffering of Baa, Dolly, Alka, Daksha, Lillita, Dolly and Alka's mother, but women have been suffering continuously in the patriarchal structure. L. Amritashwari Devi minutely remarks, "The subjugation, the torture or the way our women suffer maybe different but the age old system of dominance over women by men will never end and they are and will always be victims in our male chauvinistic society!" (Devi, 2011:196).

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## Original Article

### Intersectional Oppression: A Comparative Analysis of Enslaved Black Women's Experiences in *Wench* and *Yellow Wife*

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*This paper examines the representation of intersectional oppression in Dolen Perkins-Valdez's *Wench* (2010) and Sadeqa Johnson's *Yellow Wife* (2021), two contemporary neo-slave narratives that illuminate the complex experiences of enslaved Black women in antebellum America. Drawing on Kimberlé Crenshaw's intersectionality framework and Patricia Hill Collins's concept of the matrix of domination, this comparative analysis explores how race, gender, class, and colourism intersect to create unique systems of oppression and resistance for enslaved women. Both novels centre protagonists who navigate the treacherous terrain of the "fancy trade"—the trafficking of light-skinned enslaved women for sexual exploitation—revealing how enslaved women occupied precarious positions within slavery's racial and sexual economy. Through close textual analysis supported by historical scholarship on sexual violence, and resistance strategies, this study demonstrates how Perkins-Valdez and Johnson employ neo-slave narrative conventions to expose the multidimensional nature of Black women's oppression while simultaneously highlighting their agency, resilience, and survival strategies. This research contributes to critical conversations about Black feminist literary traditions, historical memory, and the enduring legacy of slavery's intersectional violence on contemporary understandings of Black womanhood.*

**Keywords:** intersectionality, neo-slave narratives, enslaved women, fancy trade, oppression, resistance, agency.

#### Introduction

Contemporary African American literature continues to grapple with slavery's traumatic legacy through neo-slave narratives. Two recent novels, Dolen Perkins-Valdez's *Wench* (2010) and Sadeqa Johnson's *Yellow Wife* (2021), centre the lives of enslaved Black women who navigated intersecting systems of racial, gender, and sexual oppression in antebellum America. These narratives illuminate what legal scholar Kimberlé Crenshaw identified as intersectionality: the phenomenon whereby multiple systems of oppression—racism, sexism, classism "mutually construct one another to produce unique adversities" for those positioned at the margins of society. The two novels concentrate on light-skinned enslaved women who found themselves in the fancy trade, which was a profitable business where the enslaved women were sold directly into sexual servitude and forced concubinage. The present comparative analysis explores how both novels use intersectional frameworks to shed light on the multidimensional nature of oppression that enslaved Black women face and, at the same time, show how they exercise their agency, exhibit resistance, and employ survival strategies.

#### Research Problem

The research problem guiding this analysis is: How do *Wench* and *Yellow Wife* represent the intersectional nature of enslaved Black women's oppression, and what forms of resistance and agency do these novels reveal?



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## Literature Review

### Intersectionality as Analytical Framework

Intersectionality emerged from Black feminist scholarship as a critical response to single-axis analyses of oppression that failed to account for the unique experiences of women of colour. Crenshaw introduced the term in her seminal 1989 article “Demarginalizing the Intersection of Race and Sex,” arguing that Black women’s experiences could not be understood through race or gender alone but required examination of how these categories interact to create distinct forms of marginalisation. As Crenshaw notes, discrimination against Black women “cannot be explained as a simple combination of misogyny and racism, but as something more complicated.”

Patricia Hill Collins expanded this framework in *Black Feminist Thought* (1990), conceptualising intersecting oppressions as a “matrix of domination” where race, class, gender, and sexuality function as interlocking systems of power. Collins emphasises that understanding Black women’s experiences requires recognising how “multiple systems of inequality, dominance, and subordination intersect and co-constitute one another.” Recent scholarship has applied intersectionality to historical analyses of slavery, revealing how enslaved Black women occupied unique positions within slavery’s political economy that subjected them to racialised, gendered, and sexualised violence simultaneously.

### The Fancy Trade and Sexual Economy of Slavery

Gordon defines the fancy trade as “the sale of light-skinned black women for the exclusive purpose of prostitution and concubinage,” arguing that it represented “the marketing of hybrid whiteness, or ‘whiteness made salable by the presence of Blackness.’” Alexandra J. Finley’s *An Intimate Economy* (2020) demonstrates how slave traders categorised women as “types”—fancy, seamstress, concubine, housekeeper—as part of capitalism’s technologies of standardisation, processes that fundamentally “disregard[ed] personal and bodily integrity and sanctity.”

### Neo-Slave Narratives and Literary Resistance

Neo-slave narratives emerged in the late twentieth century as contemporary writers reimagined slavery through modern storytelling techniques. Ashraf Rushdy emphasises that these works “assume the form and adopt the conventions, and take on the first-person voice of antebellum slave narrative,” creating bridges between historical testimony and contemporary interpretation. These narratives challenge historical erasures by imagining what Marisa Fuentes calls the problem of “archival power to narrate the experiences or recover the voices of enslaved people,” using fiction to access emotional and psychological truths unavailable in official records.

### Rationale of the Study

In the traditional historical and literary representations of the slavery the plight of enslaved Black women has been often overshadowed. Contemporary African American neo-slave narratives reclaim this suppressed past and give voice to the marginalized. The present study throws light on intersectional oppression in the contemporary neo-slave narratives *Wench: A novel* and *Yellow Wife* and compares analytically.

### Objectives

To examine the depiction of enslaved Black women’s lived experiences in the select novels.

To explore how intersectionality of race, gender, class and sexuality cause to the oppression of Black women in the novels.

To compare and contrast the strategies of resistance, survival and agency of the Black women employed by the authors in the novels.

### Hypothesis

The select novels *Wench* and *Yellow Wife* are expected to portray the pathetic experiences of the Black women characters as products of intersectional oppression. It is further assumed that both the authors of the novels Dolen Perkins Valdez and Sadeqa Johnson reclaim the voices and identities of historically silenced enslaved Black women by revealing their agency, resistance and resilience within the slavery.

### Methodology

The qualitative research methodology is adopted for this comparative textual analysis. An intersectional feminist framework is employed to examine how *Wench* and *Yellow Wife* represent enslaved Black women’s experiences. The analysis proceeds through close reading of both novels, identifying key themes related to intersectional oppression, agency, and resistance. These textual insights are then placed in dialogue with historical scholarship on the fancy trade, sexual violence, and women’s resistance strategies. The paper relies on both primary and secondary sources such as scholarly articles, historical monographs, and critical race theory to build upon a complex vision of the topic.

### Data Analysis

#### The Intersectionality

Both *Wench* and *Yellow Wife* illustrate how intersectionality worked in antebellum slavery through the experiences of their main characters at the intersection of two or more oppressive systems. Lizzie in *Wench* and Pheby in *Yellow Wife* take up a place that throws light on what Collins terms interlocking systems of oppression in which race, gender, class, and sexuality lead to distinct kinds of vulnerability and exploitation.

## Gender and Sexual Vulnerability

Gender creates specific forms of vulnerability for enslaved women that differ from those of enslaved men. Both novels unflinchingly depict the sexual violence endemic to slavery. In *Wench*, Lizzie’s relationship with her enslaver, Drayle, involves what historians would classify as rape. However, the novel explores her complicated emotional responses to a man who exercises absolute power over her. In *Yellow Wife*, Pheby experiences repeated sexual assault from the Jailer, violence euphemistically described through his claims to “love” her.

## Class and Colourism within Slavery

Both novels explore class hierarchies within enslaved communities, particularly how light skin created an ambiguous position of relative privilege that nonetheless remained fundamentally unfree. In *Wench*, Lizzie’s position as Drayle’s mistress grants her better clothing, lighter labour, and protection from the worst plantation violence—advantages that create tensions with darker-skinned enslaved people who labour in the fields. In *Yellow Wife*, Pheby’s early life on the plantation involves education and relative comfort, setting her apart from field labourers until her sale into the fancy trade strips away these precarious benefits.

This internal stratification reveals what Gordon identifies as colourism’s role in creating “a whole Fancy Trade” where “women of light-skinned complexions were sold into that trade.” However, as both novels demonstrate, any privileges associated with lighter skin within slavery remained contingent and exploitative, tied directly to white men’s racialised sexual desires and fetishisation of “whiteness made salable by the presence of Blackness.”

To understand how these multiple systems of oppression operated simultaneously, the following table synthesises the manifestations of intersectional oppression as depicted in both novels alongside their historical contexts:

**Table 1: Intersectional Oppressions in the Fancy Trade**

System of Oppression	Manifestation in Both Novels	Historical Context
<b>Racism</b>	One-drop rule; racialisation regardless of appearance; legal categorisation as property	<i>Partus sequitur ventrem</i> laws, ensuring children follow their mother’s status; the legal definition of Blackness.
<b>Sexism</b>	Sexual violence; reproductive exploitation; exclusion from idealised womanhood	Enslaved women denied legal protection from rape, forced reproductive labour.
<b>Colorism</b>	Light-skinned women are trafficked explicitly for sexual purposes; fetishisation of “nearly white” women.	Fancy trade specifically targeting light-skinned women; hierarchies within enslaved communities.
<b>Class Oppression</b>	Position as property; economic value tied to reproductive potential and sexual desirability	Women’s bodies commodified through auction; reproductive capacity as capital
<b>Sexual Exploitation</b>	Forced concubinage; rape disguised as “relationships”; sexual access as enslaver privilege	The legal system provides no recourse for sexual violence against enslaved women.

Sources: Crenshaw, Kimberlé. “Demarginalizing the Intersection of Race and Sex”; Gordon, Tiye A. “The Fancy Trade and the Commodification of Rape”; Collins, Patricia Hill. *Black Feminist Thought*.

## Representations of the Fancy Trade:

### *Wench*: Tawawa House and Contradictory Spaces

Perkins-Valdez’s *Wench* centres on Tawawa House, a historical resort in Free Ohio where Southern plantation owners vacationed with their enslaved mistresses. This setting creates a liminal space where the contradictions of the fancy trade become starkly visible. The women exist in an in-between zone—neither fully enslaved in the traditional sense nor free, neither wives nor prostitutes, neither Black nor white in the eyes of those who fetishise their mixed-race appearance.

The novel is a story of four women in slavery, Lizzie, Reenie, Mawu, and Sweet, who develop sisterhood bonds as they negotiate their more complicated relationships with their enslavers. The relationship Lizzie is in with Drayle illustrates a psychological depth of fancy trade relationships: she has given him children, runs his household, and feels what someone would consider affection with him, but is treated as his legal property, which he can sell, rape, or even kill without facing charges.

The resort setting in free territory heightens the novel’s exploration of freedom’s meaning. The women walk freely through the town, interact with free Black people, and glimpse possibilities for escape. However, they remain bound by invisible chains—love for children left on plantations, fear of violent punishment, uncertainty about survival as fugitives.

### **Yellow Wife: Devil’s Half Acre and Commodified Bodies**

Johnson’s *Yellow Wife* presents a darker vision of the fancy trade through Pheby’s forced bondage at Richmond’s Devil’s Half Acre. In this notorious slave jail, enslaver Rubin Lapier (the Jailer) buys, sells, and breaks enslaved people. Pheby becomes Lapier’s “yellow wife,” a term that encapsulates both her racial categorisation and her forced concubinage. Unlike the mobile space of Tawawa House, the jail represents total confinement and surveillance.

The novel explicitly depicts the fancy trade’s violence. Pheby witnesses other light-skinned women being sold to white men who desire them specifically for sexual purposes, their bodies displayed and commodified like merchandise. Johnson describes the grotesque spectacle of slave auctions where women are examined, their teeth checked, their skin colour evaluated, their reproductive potential assessed—processes that Finley identifies as capitalism’s “technologies of standardisation” that fundamentally deny enslaved people’s humanity.

Pheby’s position as the Jailer’s forced partner grants her certain powers—she manages his household, influences decisions about which enslaved people to sell, and uses her position to help others occasionally. However, these responsibilities come at the cost of repeated rape, psychological manipulation, and the constant threat that her children will be sold if she disobeys. The novel thus reveals how even positions of relative power within slavery remained fundamentally exploitative, with any “agency” constrained by the ever-present threat of violence.

### **Agency and Resistance**

Although the two novels portray the brutal oppression of the enslaved people with extraordinary vividness, they also shed light on the multiple ways these women resisted and had agency, even though the system is intended to deny them any power.

### **Everyday Resistance**

The theory of everyday resistance, as developed by Stephanie Camp, helps to shed light on minor but meaningful ways in which enslaved women asserted control. This is the women of *Wench* and their nightly parties, their underground dialogue, how they negotiated minor freedoms. The eventual escape of Mawu is the result of such resistance, which is established based on information acquisition, connection creation, and the strength of courage under the support of the community.

The everyday resistance manifested in *Yellow Wife* includes Pheby sheltering other enslaved individuals against the worst violence of the Jailer, the enslaved children learning to read, and her own literacy as a form of mental resistance. She exploits her post to get information, assist her fellow humans in escape attempts, and retain her identity amid dehumanising circumstances.

The wide variety of approaches towards resistance taken by enslaved women in both novels can be grouped to demonstrate the patterns of agency in response to oppression:

**Table 2: Forms of Enslaved Women’s Resistance**

Type of Resistance	Examples from <i>Wench</i>	Examples from <i>Yellow Wife</i>	Historical Documentation
<b>Everyday Resistance</b>	Secret gatherings; information sharing; negotiating small freedoms	Teaching literacy; protecting others; strategic compliance	Camp, Stephanie. <i>Closer to Freedom</i>
<b>Reproductive Control</b>	Knowledge of contraceptive herbs; discussions of pregnancy prevention	Using plants for contraception/abortion; delaying pregnancy	Perrin, Liese. “Resisting Reproduction”
<b>Community Building</b>	Bonds among four women; mutual support; shared planning	Information networks; communal care despite isolation	Holden, Vanessa. <i>Surviving Southampton</i>
<b>Strategic Negotiation</b>	Lizzie’s careful management of the relationship with Drayle	Pheby’s manipulation of the Jailer’s emotions for children’s protection	West, Emily. <i>Enslaved Women in America</i>

Sources: Camp, Stephanie. *Closer to Freedom*; West, Emily. *Enslaved Women in America*; Holden, Vanessa. *Surviving Southampton*; Perrin, Liese. “Resisting Reproduction in the Old South.”

### **Conclusion**

The examples of *Wench* by Dolen Perkins-Valdez and *Yellow Wife* by Sadeqa Johnson demonstrate that the neo-slave stories of the 21st century use intersectional theories to show a multidimensional experience of oppression and resistance of enslaved Black women. Focusing on protagonists trapped in the fancy trade—that vicious meeting point of

racialised sexual violence, reproductive exploitation and economic commodification--both novels demonstrate that individual axis approaches are insufficient to comprehend the lives of enslaved women. Their lives cannot be described as mere racism or mere sexism, but have to be interpreted through what Crenshaw termed as the varied manifestations of marginalisation that occur when several oppressive regimes interact.

The comparative analysis has shown that these texts share some experiences and have different representations. The two novels portray the psychological depth of relationships between enslavers and enslaved women, rejecting all simple classifications but making it clear that power imbalances do not allow for any real consent. Both portray the different kinds of resistance to show that enslaved women were agents even in a system where they were denied all their power.

Wench emphasises a liminal space of free territory to allow possibilities of imagining freedom that are blocked in the claustrophobic environment of *Yellow Wife* in jail. *Wench* focuses on community and slavery among women, whereas *Yellow Wife* explores the psychological impact of isolation. The constricted time frame of *Wench* leads up to a dramatic escape, whereas the decades-long story of *Yellow Wife* portrays the lifetime trauma of being a slave.

These novels are part of the continuing academic and cultural debate of the legacies of slavery. They reveal the benefits of intersectional analysis to historical knowledge by showing how multiply marginalised groups raise specific concerns. They focus on the interior lives of black women, their thoughts, feelings, desires, and choices in a manner that archival records would hardly provide.

## Recommendations

In prospect, the novels suggest further discussion of some important questions. What is the duty of the writers when speculating on the inside life of the enslaved people when there are no detailed historical records about it? What does fiction bring to historical studies to form fuller ideas about the multidimensional violence of slavery? What are the implications of neo-slave narratives in the modern-day struggle against racism, sexism, and other forms of intersectional oppression?

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## Original Article

### Blood and Memory: Narratives of Slave Uprising in André Brink's A Chain of Voices

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#### Abstract

*This research paper examines the depictions of blood and memory in André Brink's novel A Chain of Voices (1982). The paper re-imagines the 1825 Cape slave revolt, and how Brink constructs a counter-history through fragmented narration, polyphonic voices, and symbolic themes. While blood functions as a marker of oppression. It also serves as a metaphor of kinship and sacrifice that confirms the humanity of the rebels. Memory functions as a narrative and cultural strategy that challenges the silences of colonial historiography. It focuses on the intergenerational transmission of trauma and survival. The focus of research is on postcolonial memory and trauma that Brink depicts in the novel. It also highlights how the story of failed rebellion depicts resistance, memory, and cultural continuity and how the novel rewrites silenced histories.*

**Keywords:** apartheid, memory, postcolonial, violence, slave rebellion; Cape Colony.

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#### Introduction

In colonial history, slave uprisings have been silenced, distorted, or criminalized. The 1825 Cape Colony slave rebellion is one of the most important slave rebellions in South African history. It has been written only through the mirror of colonial authority. André Brink in *A Chain of Voices*, responds to this silence by rewriting the rebellion from the perspective of the marginalized. Brink openly criticises the racial structures of twentieth-century South Africa during the apartheid. His narrative put together the metaphors of blood and memory. It explores how slave rebellion and a bloody event turned into a cultural legacy. The novel challenges the colonial historiography and places literature in the role of counter-history.

#### Objectives

1. Analyze how blood as a metaphor is used to represent violence, kinship, and sacrifice.
2. Examine memory as a narrative technique and a cultural strategy of survival in the novel.
3. Study how Brink compares colonial historical documents to fictionalized evidences.
4. Place the novel in the context of postcolonial discussions of trauma, memory, and counter-history.

The goal of the research paper is to revive colonial voices on paper. Brink suggests that suppressed history can be restored through writing. Acts of resistance by enslaved people are often portrayed as small criminal disturbances due to the partiality of colonial historiography. Blood and memory are key themes in understanding how narratives of trauma can serve as narratives of resistance. Accordingly, this study contributes to the study of postcolonial literature, South African history, and memory politics.

#### Hypothesis

The themes of blood and memory are used to reframe the 1825 Cape slave rebellion as an act of resistance and cultural survival, ultimately challenging colonial and apartheid ideologies of erasure and forgetting.

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## Methodology

The study examines Brink's novel *A Chain of Voices* closely using postcolonial theory to analyse passages that represent blood and memory.

*A Chain of Voices* is a historical novel that takes place in early 19th-century South Africa. It is the story of a slave uprising on a Cape Dutch farm, led by a brave and clever slave named Galant, who has suffered through years of brutality and unfair treatment at the hands of the white landowners, the van der Merwe family. The revolt is swiftly put down and Galant is executed. The novel has multiple narrators who reveal various dimensions of oppression, guilt, and longing for freedom. The novel exposes the moral corruption of slavery and the quenchless human need for justice and human dignity.

In the novel blood initially appears as a symbol of violent domination. The scars and blood of the slave record the cruelty of the masters, as Galant describes, "the sjambok tore my back open until it was a river of blood" (74).

The marks of brutality on the slaves' bodies confirm that the colonial power marked its possession on the flesh, whereas the bloody execution of the rebels demonstrates how the state weaponised blood as spectacle: "One by one they dropped, blood darkening the sand, and still the crowd watched, silent, as if the spilling of blood was a sermon" (298). Here, Blood is used as a weapon of terror. The structure of *A Chain of Voices* illustrates how memory is fragmented, with several slave and master narrators telling distinct accounts of the rebellion. For example, a master calls the rebellion "senseless butchery" (145), while Galant describes it as "the only way to cleanse our memory of chains" (148). Brink depicts memory in this way: every voice is incomplete, conflicting, and influenced by trauma: however, in its diversity, it challenges the false notion of truth presented by the colonial narratives.

In the novel, memory functions as a cultural inheritance, with the slaves sharing narratives to guarantee that their struggle is not forgotten: "Even if they kill us, our children will remember. The earth remembers blood" (305). This process of storytelling fosters a connection across generations.

Finally, in Brink's novel, literature becomes counter-history: whereas colonial history transforms rebels into criminals, Brink humanizes them and, in Spivak's terms, tries to allow the subaltern to speak (even if in fractured form; Spivak 271). The title itself, *A Chain of Voices*, implies that memory cannot be silenced: the voices of the enslaved form a chain, a counter-archive. By emphasising different perspectives, Brink demolishes the colonial narrative and demonstrates how fiction can retrieve lost histories.

## Conclusion

André Brink's *A Chain of Voices* reconstructs the 1825 Cape slave uprising as an act of resistance and survival, rather than defeat, using the intertwined themes of blood and memory. Blood represents violence and sacrifice, whereas memory endures and becomes a cultural legacy. The novel offers direct testimonies and multiple narration that turns fragmented memories into a counter-history. It challenges the silences of colonial histories. For the readers under apartheid, its reconstruction had political urgency, reminding them that freedom is not only fought with weapons but also preserved through memory and narrative. Literature can reclaim dignity for the silenced and challenge historical amnesia. Brink creates a narrative that both memorializes and politicizes rebellion, making the novel a literary site of reparation: not by rewriting history in a facile corrective manner, but by insisting that the violence of history cannot erase the act of remembering, or the act of narrating.

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## Original Article

### Nature as Teacher: An Analysis of Eco-feminism in 'Fire on the Mountain' by Anita Desai

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**Abstract**

*This paper reads Anita Desai's Fire on the Mountain (1977) through an eco-feminist lens to argue that the novel represents nature not only as backdrop but as an instructive, morally charged presence that critiques patriarchal domination and offers alternative registers of knowledge and agency for women. By tracing imagery, narrative point-of-view, and the symbolic roles of landscape, flora, fauna, and seasonal cycles, the study shows how nature functions as a "teacher" that both reveals and refracts the novel's interlocking structures of gendered oppression. The analysis situates Desai's text within eco-feminist theory — particularly the critical interventions of Carolyn Merchant, Vandana Shiva, and Val Plumwood — to show how the novel stages a feminist challenge to dualisms (culture/nature, male/female) and suggests ethically reparative relations between women and the natural world.*

**Keywords:** Anita Desai, Fire on the Mountain, ecofeminism, nature as teacher, Nanda Kaul, Raka.

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**Introduction**

Anita Desai's *Fire on the Mountain* (first published 1977) is a compact novel that concentrates on interior lives, isolation, and the fragile bonds between women across generations. The central figures are Nanda Kaul — an elderly widow who has retreated to a hill home (Carignano) to preserve solitude — and Raka, her great-granddaughter, a withdrawn child who arrives to recuperate. The plot culminates in a violent rupture: offstage crimes and Raka's startling act of setting the mountain on fire, which destabilize the fragile sanctuary Nanda has created. These narrative facts are essential to any reading of the novel's moral and ecological imagination. This paper asks: how does Desai make nature pedagogical — instructing characters and readers about gender, power, and relational ethics — and how can eco-feminist theory help us read those lessons? I argue that *Fire on the Mountain* mobilizes natural imagery and dynamics to (1) critique patriarchal structures that alienate women from both social agency and embodied knowledge, and (2) model an alternative epistemology in which attentiveness to the natural world fosters forms of resistance and solidarity.

**Theoretical framework: eco-feminism and "nature as teacher"**

Eco-feminism links ecological concerns with feminist critique, arguing that domination of nature and domination of women stem from the same cultural patterns of hierarchical dualism and instrumental reason. Carolyn Merchant's influential work historicizes how the scientific revolution and Cartesian frameworks helped legitimize the control and mechanization of nature — a paradigm that parallels the social control of women. Merchant's analysis helps explain novelistic motifs that align exploitation of the environment with patriarchal control. Complementing Merchant, Vandana Shiva and other eco-feminists focus on the epistemic and ethical knowledge embodied in women's everyday practices and their relational approaches to the environment; these perspectives highlight the novel's moments when female characters display embodied, situated knowledge in relation to place and nonhuman life.

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Val Plumwood's critique of the "mastery of nature" further sharpens the argument: Plumwood shows how dualisms (reason/emotion, culture/nature) legitimize domination and devalue interdependence; in literature, then, the deconstruction of such dualisms is a key move toward envisioning co-operative human–nonhuman relations. Reading Desai with Plumwood allows us to see how the novel's depiction of landscape, seasons, and animal life problematizes mastery and points toward ethical responsiveness. Together, these theorists provide a vocabulary to analyze how *Fire on the Mountain* stages nature as both mirror and teacher: it reflects social pathologies and instructs characters (and readers) toward alternative, relational modes of being.

## Method and scope

This paper uses close reading and thematic analysis focused on language, imagery, and narrative focalization. Primary attention is paid to scenes where the hill environment intersects with character psychology: descriptions of morning and evening cycles, the garden and its plants, animal presence (birds, insects), and the climatic backdrop of the mountain. I concentrate primarily on the relations between Nanda Kaul and Raka, and on narrative moments that foreground nature's agency or pedagogical force.

## Nature as mirror: landscape, solitude, and patriarchal histories

Desai's setting — the isolated hill home Carignano — is at once refuge and classroom. The mountain's physical remoteness enables introspection but also amplifies histories of abandonment and violence. Nature in the novel often functions metaphorically: the parched earth, cicadas, and lonely terraces mirror Nanda's emotional drought and her withdrawal from public life. Critics note that *Fire on the Mountain* stages solitude as a double-edged condition — a defense against social impositions yet also a form of self-estrangement. From an eco-feminist perspective, this mirroring has political significance: the same cultural logics that isolate women — valorizing independence as a withdrawal from relational responsibility or communal care — also abstract nature into a consumable backdrop. Merchant's analysis of the "death of nature" is useful here: when culture treats nature as objectified resource, human relations reflect that commodifying stance, producing social alienations that are particularly acute for women.

## Nature as teacher: embodied knowledge and ethical attunement

Although Nanda initially seeks solitude, the narrative gradually reveals moments when the natural world instructs both her and Raka in subtle ways. Raka's solitary wanderings in the garden, her attention to small lifeforms, and her unprogrammed responsiveness to sensory stimuli suggest a kind of learning not mediated through social institutions but through embodied encounter. In key scenes, Nature's rhythms (dawn, rains, insect chorus) provide temporal and affective structure; they teach patience, attentiveness, and the acceptance of mutable limits — qualities that counter the hyper-rational instrumentalism critiqued by Plumwood. Vandana Shiva's eco-feminist emphasis on local, situated knowledge helps illuminate these scenes: Raka's and Nanda's different relations to place enact contrasting knowledges — one youthfully instinctive, the other learned and defensive. Nature functions as a pedagogue that privileges relational knowing over abstract mastery.

## The pedagogy of violence: fire, fracture, and ethical warning

The novel's climax — Raka's setting of the forest fire (and the offstage violence visited upon Ila Das) — complicates the notion of nature as purely benevolent teacher. Fire operates as both element and symbol: destructive, purgative, and a stark teacher of consequences. Raka's act can be read ambiguously: as a primal assertion of agency, as an enactment of trauma, and as a violent refusal of imposed social inscriptions. The mountain itself, which had been a site of quiet instruction, becomes a site of acute moral crisis. Eco-feminism does not sentimentalize nature; rather, it locates ethical responsibility in the interplay between human agency and natural forces. Plumwood's critique alerts us to the danger of romanticizing nature as moral savior. Desai's novel resists simplistic redemptions: the "lesson" of the mountain is often harsh — it shows interdependence's risks, the fallout of social neglect, and the ways gendered violence echoes through ecological violence. The tragic conjunction of human crime and ecological conflagration forces the reader to reckon with the costs of alienation from both human communities and natural systems.

## Gendered subjectivities and ecological ethics

Desai's women are shaped by cultural expectations: Nanda's retreat, Raka's marginalization, and Ila's activism and ultimate victimhood reflect gendered responses to social constraint. Eco-feminist theory foregrounds how environmental degradation and women's subordination are mutually reinforcing. In *Fire on the Mountain*, the land's vulnerability — its susceptibility to fire, its exposure to human neglect — parallels women's precarious social positions. The novel thus invites an ethical reframing: resisting domination requires rethinking how we relate to both bodies and landscapes. Crucially, nature instructs not only through idyllic solace but by pressing ethical questions: Who is responsible for care? How do communities fail their vulnerable members? The mountain's slow processes (regrowth, seasonal recurrence) suggest endurance and regeneration — but regeneration after violence demands accountability, not mere escape. Through this didactic function, nature operates as teacher of responsibility and relational repair.



## Conclusion

Reading *Fire on the Mountain* through eco-feminist theory reveals how Anita Desai uses the natural world as more than setting: it is a pedagogical agent that exposes social pathologies and models alternative forms of knowledge and ethical relation. The mountain instructs through reflection (mirroring inner states), embodiment (attentive sensory knowledge), and moral extremity (fire, which forces confrontation with consequences). The novel thereby stages an eco-feminist critique of domination and an appeal for ethically responsive human–nonhuman relationships. While Desai refuses an uncomplicated pastoral redemption, she nonetheless opens space for thinking about how women’s lives and ecological care might be mutually sustaining rather than mutually exploitative.

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## Original Article

### Extraction of Protease from Soil Microbe

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#### Abstract

*Proteases are essential enzymes with wide-ranging applications in fields food processing, detergents and biotechnology. This study focused on the crude extraction of protease from soil bacteria, followed by determining the enzyme activity under different conditions using the Biuret method. Protease activity was assayed by using casein as a substrate by spreading soil sample collected from the garden and then incubated at Room temperature for 24 hrs. Optimization of the enzyme activity was based on temperature stability, enzyme substrate and effect of inhibitor on enzymatic activity. The bacterial isolate isolated from garden soil showed a clear zone around the colony on casein agar plate indicating protease activity. It was observed that proteases extracted from soil microbes showed optimum activity at 55°C. An increase in substrate concentration resulted in higher enzyme activity. It was observed that in presence of 0.5% CuSO<sub>4</sub>, the enzyme activity decreased.*

**Keywords:** Protease, soil bacteria, Biuret method, Substrate concentration, Inhibitors, CuSO<sub>4</sub>, Optimum temperature

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#### Introduction:

Proteases are a group of enzymes that catalyze hydrolysis of bonds in polypeptide chains and split them into smaller polypeptides or else free amino acids. Proteases are the enzymes that perform proteolysis i.e. digestion of proteins (Arun Kumar Sharma et al.,2015). They are widely used in food processing, as a part of detergents to remove the stains and finds its immense use in textile wet processing, including desizing, bioscouring, biobleaching, and biopolishing (Iram Liaqat, 2025). Soil is an excellent source of microbes that produce protease enzyme (Dalal rupali\*,2015) Various bacterial and fungal species in soil are known for their ability to produce proteases, which play a crucial role in organic matter decomposition and nutrient cycling. Soil harbors a rich diversity of microorganisms due to its complex organic matter. Microbes in soil often produce robust and stable enzymes like protease, amylase etc to survive in variable conditions like temperature, pH, and moisture fluctuations. Soil microbes naturally produce proteases to degrade proteins in decaying plants and animals (Anmol Valsange et al., 2012). In the present study, bacteria isolated from garden soil was used as a source for isolation and extraction of protease enzyme. The present study focused on extraction of protease from the easily available source i.e. bacterial isolates isolated from garden soil and determining the for enzyme activity by using casein agar and also studying the optimum conditions such as temperature, substrate concentration and effect of inhibitors to show the maximum enzyme activity. This study can be helpful to scale up the production of proteases using s

#### Rationale of the Study:

Proteases are essential enzymes that catalyze the hydrolysis of proteins into peptides and amino acids, playing a oil microbes as well as its industrial applications using the optimal parameters.



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significant role in various biological and industrial processes. They are widely applied in sectors such as food processing, pharmaceuticals, detergents, and biotechnology. Exploring different natural sources of protease can help identify enzymes with desirable properties for specific industrial uses.

This study focuses on the extraction of protease enzymes from microbial (soil bacteria) sources. Soil bacteria are known for producing stable, high-yield extracellular proteases capable of functioning under a broad range of temperature. The present study involves optimizing the enzyme activity by determining the optimum temperature, substrate specificity and studying the effects of inhibitors.

This study aims to contribute to the development of cost-effective and sustainable enzyme sources, providing valuable insights into their potential for large-scale commercial and biotechnological use.

### **Objectives:**

The objective of this research is to extract protease enzymes from bacteria isolated from the garden soil and optimize its enzymatic activity using temperature, substrate concentration and study the effect of inhibitor concentration using (CuSO<sub>4</sub>).

### **Methodology:**

#### **1) Extraction of Protease from Bacteria isolated from garden soil.**

A) **Sample collection :-**The soil sample was collected from the botanical garden of Sonopant Dandekar Arts, V.S. Apte Commerce & M.H. Mehta Science College, Palghar. Soil samples were collected in sterile poly bag, labeled with date and site of collection and stored at room temperature till further processing.

#### **B) Isolation of protease producing bacteria**

- The soil sample collected was serially diluted till 10<sup>-5</sup>
- 0.1 ml of 10<sup>-5</sup> dilution was spread onto 1% Casein agar plate.
- Plates were incubated at Room Temperature for 24–48 hours.
- Colonies with clear zones were selected (indicating protease activity due to casein hydrolysis)
- Selected colonies were transferred in Sterile Nutrient Broth+ 1% casein for scale up of Protease producers, where Casein solution was added as an Inducer for protease production.
- Flask was incubated at room temperature for 24 hours for the appearance of the dense growth.

#### **C) Extraction of Protease from Culture**

- Centrifuge the culture broth at 10,000–12,000 rpm for 15–20 min at 4°C to remove microbial cells.
- Collect the clear supernatant, which contains extracellular protease
- Filter through a Whatman filter Paper to remove any remaining debris.
- Crude enzyme(from bacteria) was obtained. Enzyme extract was stored at 4°C to maintain enzyme stability.

**2) Study of effect of different parameters on enzyme activity and Optimization of parameters:** The Biuret method was used to estimate protein concentration and enzyme activity considering different parameters viz. Optimum temperature, substrate concentration, effect of inhibitors. The absorbance of the system was determined spectrophotometrically at 550 nm.

#### **A) Effect of Temperature:**

- 2 ml 1% Casein substrate in each of the 5 tubes.
- A 2 ml phosphate buffer was added in the above tubes .
- 1 ml of enzyme extract was added to all tubes.
- The tubes were incubated at 4°C, 28°C, 37°C, 55°C,100°C) for 30 mins.
- Centrifuge the tubes at 4°C at 10,000 rpm for 10-15 mins.
- Supernatant was carefully collected.
- 4 ml Biuret reagent was added in each tube.
- The tubes were incubated for 30 mins at room temperature.
- Take the O.D in colorimeter at 530 nm.

#### **B) Effect Of Substrate**

- Casein (substrate) 0.5,1.0,1.5, 2.0 ml was added in 5 tubes.
- The working substrate concentration used is 1 % casein prepared in a phosphate buffer.
- 1 ml of enzyme extract was added to all tubes.
- A 2 ml phosphate buffer in the above tubes was added in all tubes.
- The tubes were incubated at 55°C for 30 mins.
- The tubes were centrifuged at 4°C at 10,000 rpm for 10-15 mins.
- Supernatant was carefully collected.
- 4 ml Biuret reagent was added in each tube.
- The tubes were incubated for 30 mins at room temperature.

#### **C) Effect Of Inhibitors**

- 2 ml 1% Casein substrate in 5 tubes.

- A 2 ml phosphate buffer was added in the above tubes .
- 1 ml of enzyme extract was added to all tubes.
- Inhibitor (1% CuSO<sub>4</sub>) in the following volume 0.2,0.4,0.6 ml was added in respective tubes.
- The tubes were incubated at 55°C for 30 mins.
- The tubes were centrifuged at 4°C at 10,000 rpm for 10-15 mins.
- Supernatant was carefully collected.
- 4 ml Biuret reagent was added in each tube.
- The tubes were incubated for 30 mins at room temperature.

### Observations:



**Fig. 1. Zone of Clearance around Bacterial colony indicating protease activity**  
Colony Characteristics:



**Fig. 2. Crude enzyme extract**

Size	Shape	Edge	Elevation	Opacity	Texture	Color	Gram Staining	Morphology
Big	Irregular	Smooth	Flat	Opaque	Rough	White	Gram Positive	Cocci

### A. Effect of Temperature:

Temperature (°C)	O.D at 530 nm
BLANK	0.00
4	0.03
28	0.05
37	0.08
55	0.09
100	0.02

### B. Substrate Concentration

1% Casein (Substrate) (ml)	O.D at 530 nm
BLANK	0.00
0.5	0.04
1	0.05
1.5	0.07
2	0.10

### C. Effect of Inhibitor

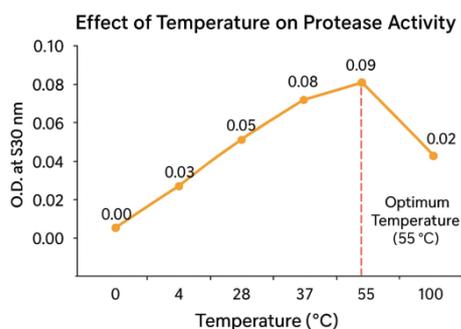
1% CuSO <sub>4</sub> (Inhibitor) (ml)	O.D at 530 nm
BLANK	0.00
0.2	0.08
0.4	0.06
0.6	0.04
0.8	0.03

### Results:

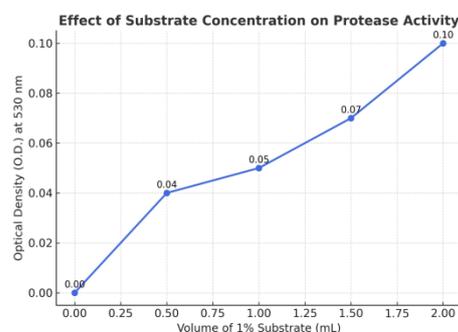
In the present study it was observed that microbial proteases exhibited higher catalytic efficiency at 55°C. This is consistent with research conducted by Dr Sankareswaran Muruganantham et al in 2014 , who reported that microbial proteases, particularly from *Bacillus species*, have higher enzymatic activity.

Studies on bacterial proteases by Akcan & Uyar (2011) also found that higher substrate concentrations enhance enzyme activity until saturation is reached. These results were found to coincide with the present study results where it was observed that protease activity is directly proportional to substrate concentration.

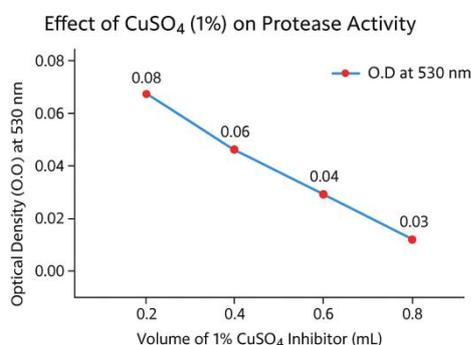
It was found in the present study, as the concentration of the inhibitor increased there was a decrease in the enzyme activity. Similar results were obtained by Thirumalai Maruthiah in 2014 where the metal ions decreased and inhibited the activity of microbial proteases.



**GRAPH 1**



**GRAPH 2**



**GRAPH 3**

### Conclusion:

The Protease enzyme was extracted from bacteria isolated from garden soil by chemical and biophysical methods. The enzyme extracted was then processed for determining the optimum conditions where it will prove beneficial to maintain the stability of the extracted enzyme from soil bacteria.

The optimum temperature determined was 55 °C, wherein it can be proved that it is a thermostable enzyme and can be used in the food and textile industry.

It was always found that as the concentration of Casein that is substrate increases the enzyme activity also increases.

From the study above, it can be said the protease extracted from soil bacteria is thermostable. As the volume of substrate increases the protease activity also increases. The Protease activity in presence in 1% CuSO<sub>4</sub> solution showed the peak activity at 0.2 ml. Enzyme activity decreased with the increased volume of CuSO<sub>4</sub>. For inhibitors, it was observed that as the concentration of the inhibitor goes on increasing the activity of protease also decreases in the present study.

### Recommendations:

With grateful recommendations and constant encouragement from Dr. Kiran Save, Principal and Dr. Shilpa Gharat, coordinator, Department of Biotechnology, Sonopant Dandekar Arts, V.S. Apte Commerce & M.H. Mehta Science College, Palghar we at Department of Biotechnology, Sonopant Dandekar Arts, V.S. Apte Commerce & M.H. Mehta Science College, Palghar, are able to carry on the research in this field of Biotechnology under varied topics.

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# Journal of Research and Development

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2. Arun Kumar Sharma<sup>1</sup>, Vinay Sharma<sup>1,\*</sup>, Jyoti Saxena<sup>2</sup>, Bindu Yadav<sup>1</sup>, Afroz Alam<sup>1</sup>, Anand Prakash <sup>1</sup> International Journal of Scientific Research in Environmental Sciences, 3(9), pp. 0334-0340, 2015 Isolation and Screening of Extracellular Protease Enzyme from Bacterial and Fungal Isolates of Soil
3. Dalal Rupali\* ISSN: 2319-7706 Volume 4 Number 8 (2015) pp. 597-606 Screening and Isolation of Protease Producing Bacteria from Soil Collected from Different Areas of Burhanpur Region (MP) India.
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## Original Article

### Climate Change in Beed district: A Geographical Analysis

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#### Abstract:

*This research paper is Studying climate change in the Beed district helps to understand what causes the changes, Prepares us for any natural hazard or extreme changes that can be predicted and helps to identify both man-made and natural causes for climate change also helps to understand how climate change has an impact on human health and the environment.*

**Keywords:** Beed district, Climate Change

#### Introduction: -

This research paper throws light on Climate of the Beed district; Physiographic, geology, drainage, climate soil and natural vegetation have been included in this research paper. To a certain extent, historical background also play a very important role in changing the face of a district and for future oriented plans for the various kind of development in the Beed district under study may be implemented. In view of this, it is most essential to give an account of each background in order to make clear overall picture of the district to interpret various aspects of the Beed district. No area on the planet has remained unaffected by climate change. The climate of the planet has changed tremendously over the last few decades, mostly due to pollution, greenhouse gases and depletion of the ozone layer that protects the earth. Global warming is one of the main factors of climate change, leading to excessive flooding, forest fires and rise in global temperatures. some main features that work like early warning signs such as heat waves, periods of unusually warm weather, sea level rising, coastal flooding, ocean warming, and melting of glaciers.

#### Climate Of Beed District: -

The term climate is a geographical term connoting a spatial distribution of the average atmospheric conditions near the surface of the earth. Average conditions of wind, temperature, pressure rainfall is known as climate. Climate is the principal aspect of the physical environment influencing the economic activities of man. It almost determines the land use and crop patterns of the particular region. Unquestionably, it has a considerable influence on the health of the people. As a matter of fact, climate has a great bearing upon the flora and fauna of a region, which in turn affects the soil condition of a particular region. Apart from this, it influences transportation and communication system and also the settlement pattern. The climate of this district is on the whole; dry, except, in the south west monsoon season. The climatic condition of the Beed district is divided into four seasons. The cold season from December to February is followed by the hot season from March to May. The period from June to September is the South west monsoon season i.e. rainy season while October and November constitute the post monsoon season in the region under study.

#### Temperature: -

Among the various elements of climate, the temperature is the most important, as it has the greatest impact upon the



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agriculture activity over the Earth. The temperature varies from place to place due to physical constraints as well as geographical location in terms of Latitudes. Beed district belongs to the tropical area which receives the maximum amount of temperature throughout the year.

The only meteorological observation in the district which is at Beed began functioning recently. The description of the temperature and other meteorological conditions in the district which follows is based on the records at the metrological observatories in the neighboring districts and the major records for Beed.

### **Physiography:**

Physiographic is one of the dominate parameter of physical environment and its impact on patterns and density of agriculture is immense. The study of the influence of environment upon the nature and the distribution of crop and livestock is of prime importance in agricultural geography. Beed is situated in the Deccan black basalt stone, ranges of Balaghat that constitutes main rang from Ahmednagar in the west, to the border of district Beed in the East.[fig 2.3]

### **Geology**

The Beed district is occupied by Basalt formations belonging to Deccan traps of Cretaceous –Eocene age. The basalt formations belong to the type called “Plateau Basalts” and uniform in composition corresponding to that of Dolerite or Basalt with an average specific gravity of 2.9. They are dark grey to dark greenish grey in color. [fig 2.4]

### **Drainage:**

Water is an essential for the development of agriculture. Adequate water supply is necessary for the choosing crops. Hence, it is essential to study drainage pattern of the district in detail. Most of the river are flowing through the Beed district are seasonal. They are having water in rainy season, and some time in winter season. Most of the rivers become dry in summer season; hence, they are not useful for irrigation. Due to the seasonal nature of the rivers, the agricultural sector is greatly affected. The district is drained by Godavari River and its tributaries. The Godavari together with its tributaries the Lindi, the Amrita, the Sindphana, the Saraswati, the Gomati and the Wan, while there are other tributories, the like Manjra, the Bendsura etc. [fig 2.5]

### **Soils:**

Soil constitutes the physical basis of an agricultural enterprise and plays a very important role in the agricultural economy of a region. Differences in soil texture, drainage and fertility are of major importance in explaining contrasts in agriculture from one region of to another. Unlike climate, soils should not be regarded as a part of the natural endowment of an area. In fact, it is agriculture that modifies soils, except certain virgin soils which can retain their original characteristics. On the whole, soils constitute the physical base, for any agricultural enterprise. Farming is a business and good soil is part of the farmer's stock in trades. [fig 2.7]

### **Natural Vegetation:**

Vegetation of some sort of the other is the natural covering of the land surface of the earth. Even the scaled deserts have their vegetation, though it may be scanty and in conspicuous. Fertility and ameliorate the extremes of climate forest play a significant role in the prevention and control of soil erosion by water and wind. These forests have thorny shrubs with barren and rocks patches scattered all over the region. On the whole, the forests in the district are of an inferior type. Apta, khair, babhul, bor, bel, hiwar, kawath, sisam, these trees belongs to dry, thorny forests are found all over the region. Dhawda, chandan, palas, pimpal, wad, chinch, nimb, mango, these trees of dry deciduous types forest are also found in study area woods obtained from the forest is mostly used for making agricultural implements etc.. Dry deciduous forest is found in the entire study region. (Fig. 2.8)

The forests of the Beed district can be classified into the following three groups. A) Scrub forest B) Tree forest C) Grasses.

#### **A)Scrub forests:-**

The pressure of the increasing population and the ever -increasing demand for land for tillage, the forest areas have receded to distance hilly tracts with poor and shallow soil.

Actually, majority of the forest blocks in this district carry scrub by growth of bharati (*Gymnosporia montma*) Dhawai (*Wood fordia floribunda*) dhal, ghela, ghaneri, Karonda, mador Rui,Nirgudi, paristak, tarwad, tarota, Chindh and thick grass due to which most of these blocks have been declared as remains of kurans and are sold either on cutting or grazing terms.

#### **B)Tree forests :-**

The types of forest occurs only in cool sheltered pockets having northern and eastern aspects, these forests are of mixed - miscellaneous type and consists mostly of salia, moina, temru, Kandal, Khari, Bahawa, Palas, bhilwa, Lokhandi, Ghat-bor, apta, bhutkes, with scattered dhavad, Awala and Chandan at some places.

#### **C)Grasses :-**

The main grasses found in the various forest blocks of the district are boni, kusali, panaya, rosha, sheda, kunda, gondal, chirka and moruel.

### **Conclusion:**

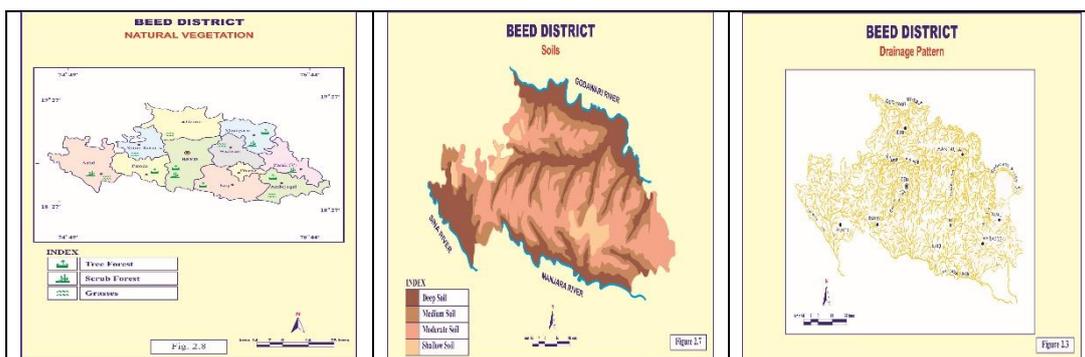
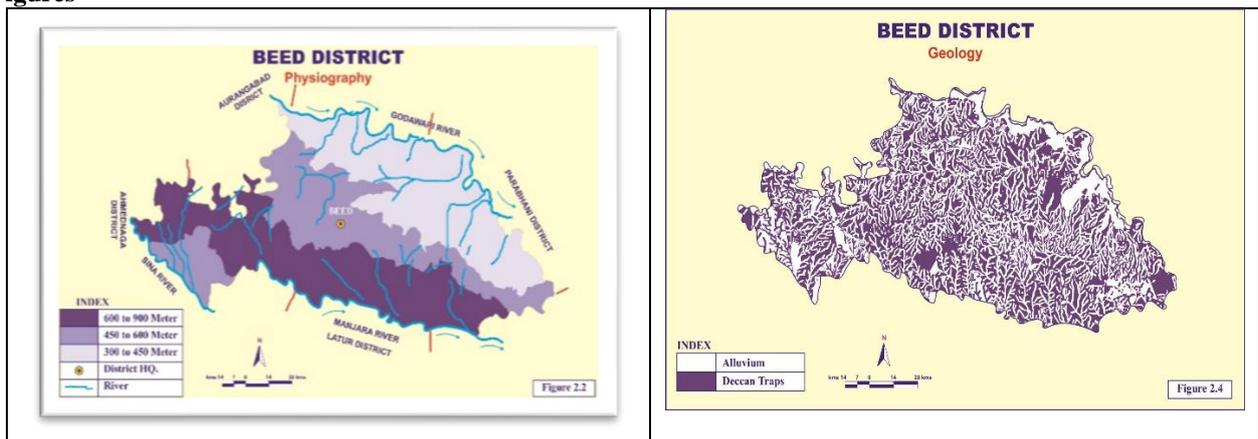
In the physiographic lowland region is found at the northern part of the district, it is part of the Godavari valley the northern lawland has a general elecation from 550 metres in the west to a little under 400 metres in the east, interspread

with a number of residual hills of summits over 600 meters. Gonaba hill, the chitora hill and Naryanagad hilly region in lawland region are not suitable for agricultural activities due to unfavourable physical condition. The Traps have been distinguished into the vesicular and non-vesicular types. The nonvascular types are hard, compact and medium to fine grained in texture. Sometimes they break with conchoidal fracture. The vesicular types are soft and tend to break with more ease. Drainage is one of the most important components of physical environment which affects agriculture directly and indirectly. All the streams of the district drain into one of the three principal rivers of the Godavari, the Manjara and the Sina which flow along the northern, southern and the south-eastern boundaries of the Beed district Godavari river has changed agricultural structure of north Georai and Manjalgon tahsil. River Lendi, Amrita, Sindphana, Saraswati, Lendi Gunwati and Wan the tributaries of Godavari which have played an important role in the agricultural development of the study region of Beed district.

The climate of this district is dry, except, in the south-west monsoon season. May is the hottest month with the mean daily maximum temperature may be as high as 46°C with the advance of south-west monsoon into the dist. By about the second week of June the temperature falls appreciably and weather is pleasant throughout the south-west monsoon withdrawn and the day temperature increase slightly and a secondary maximum is reached on 6<sup>th</sup> October up to 32°C, thereafter, the temperature begins to decrease gradually. Temperature is quite favorable for the growth of various crops in the study region. Crops growth is determined to a considerable extent by the amount of nutrients out the district. Deep black soils covers about 12.76 percent portion soils in the soils. The main factor that has influenced the development of soils in Beed district is the undulating and hilly topography. The soils of varying are to be found through covers 65 percent area, coarse and shallow soils covers 22.74 percent portion of the district. Medium deep soil is found in every tahsils particularly on the banks of various streams medium and deep black. Soils are found in Georai, Ambejogai and Manjalgaon tahsils medium and deep black soils are favorable for cotton sugarcane and other crops. The ph. Value of medium soils varies from 8.2 to 8.7 and total soluble salts from 0.2 to 0.3 percent. The contents of calcium carbonate and those of organic matter vary widely from 3 to 20 percent and from 0.48 to 2.16 percent in the medium black soil in the study region.

Deep black soils are found in the river valleys of Manjara, sina, bendsura, Godavari, Chausala, Rena, Kaij, Amrita, Wan, Saraswati etc. There is heavy concentration of agricultural activities in medium and deep black soils Natural vegetation prevents soil erosion; regulate the flow of rivers and reduce the floods, check the spread of deserts and to soil. the forest of beed of district is not economically important. The Beed district has limited area under forest Every taluka has forest cover except Georai but the proportion of cover varies from one taluka to another taluka.

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## Original Article

### Impact of Environmental Toxic Elements on Ovarian Structure And Function: A Histological and Molecular Study

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**Abstract: -**

Ovarian cancer is one of the major causes of mortality in mammalian women. Several environmental toxicants like Cd, Hg, Pd, caused major carcinomas in female reproductive organs. This study focused on global view of ovarian cancer caused by environmental toxic elements and also covers epidemiology, types and probable outcome of such kinds of ovarian cancer.

**KeyWords:** primordial germ cells (PGC), infertility, Ovarian cancer, neoplasms, Bis-phenol, dysgerminoma, teratoma

**Introduction: -**

The story of gametogenesis and sex-specific gonadal formation starts with the origin of pluripotent primordial germ cells (PGC) in the extraembryonic tissue followed by their migration towards the gonadal ridge. Infertility is trying to get pregnant with frequent, unprotected sex for at least a year with no success. Infertility results from female factors about one-third of the time and both female and male factors about one-third of the time. The cause is either unknown or a combination of male and female factors in the remaining cases. According to literature, infertility corresponds to the failure to achieve a clinical pregnancy after 12 months (woman < 35 years) or after 6 months (women > 35 years) of regular unprotected sexual intercourse. It affects 8-12% of reproductive-aged couples worldwide, a percentage that may even increase up to 25% for couples living in western countries [31-9]. The terms infertility and subfertility can be used interchangeably. Although subfertility more generally addresses any form or grade of reduced fertility, infertility may be classified as primary (difficulties to conceive at all) or secondary (difficulties to conceive the desired number of children [31]). In the female, infertility should be differentiated from impairment of fecundity, which includes either frank infertility or difficulty of carrying a pregnancy to term (recurrent implantation failure) [9,3]. While infertility may be limited to a period of time, sterility corresponds to a permanent state of infertility [28]. Often (25-50% of cases), female infertility is related to an ovulation [31]. However, different conditions affecting the single individual, the couple or the environment are claimed to be responsible or contribute to some extent to the establishment of a full-blown condition of infertility. Cancer is a disease in which some of the body cells grow uncontrollably and spread to other parts of the body. It starts all most anywhere in the human body, which is made up of trillions of cells. Normally, human cells grow in multiply to form new cells as the body needs them. When cells grow old or become damaged, they die, and new cells take their place. Ovarian cancer is a group of diseases that originates in the ovaries, or in the related areas of the fallopian tubes and the peritoneum. During the early stages of ovarian cancer symptoms may be present but are of 10 vague and ill-defined. Symptoms may include pelvic or abdominal discomfort, increased abdominal size or bloating, decreased appetite, feeling full after eating a small amount of food, or urinary symptoms. Ovarian carcinoma comprises a heterogeneous group of neoplasms that represents the seventh most lethal malignancy affecting women worldwide (and eighteenth most common carcinoma overall)



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and is a major cause of gynecological carcinoma -related death in the western world .previously. It has been suggested that the origin of most ovarian carcinoma is from the ovarian surface epithelium or postovulatory inclusion cysts formed after follicular rupture and repair [16,12]. There are many hypotheses on the occurrence of ovarian carcinoma among woman.According to the "incessant ovulation" hypothesis, a wound is created during every ovulation, Which results in increased cell proliferation to repair the epithelial cells.Serous carcinomas (52%) Mucinous carcinoma (6%) Endometrioid carcinoma (10%) Clear cell carcinoma (6%) The maximum frequency (approximately 85%) of ovarian carcinoma is found within the epithelial cells [15]. Serous tubal intraepithelial carcinoma is a relatively recent finding in understanding the development of ovarian carcinoma and it represents the precursor lesion in high-grade serous ovarian carcinoma [10],other disease-related forms of infertility are represented by hypogonadotropic hypogonadism, disorders of ciliary function and cystic fibrosis, Infertility is also frequently associated to reproductive tract infections [1]. Different endocrine pathologies, such as hypothalamic, pituitary, thyroid, adrenal, and ovarian disorders, may impair fertility as well [16]. It has been recognized that environmental pollution can affect the quality of health of the female reproductive system. Some toxicants such as lead, cadmium,mercury are among the group of highly emitted contaminations and their adverse effect of living organisms has been widely studied in present decades.Lifestyle and quality of the ambient environment are these toxicants which can mainly contribute to the heavy metals exposure in female reproductive systems.The present study is carried out to the effect of environmental toxicants in mammalian ovarian cancer.Air pollution has been nowadays clearly put in relation with some forms of cancer and with cardiovascular and respiratory disease as well. Air pollutants could also act as endocrine disruptors, being direct or indirect causes of infertility in female population, although further studies are needed to better clarify this possibleconnection [5]. Environmental chemicals present in water and food could also affect female reproduction. Biphenyl, primarily used in the production of polycarbonate plastics, and phthalate plasticizers, for example, may affect ovarian functions and pregnancy, leading to infertility [21]. Pesticides may also exert a pivotal role in compromising female infertility. For example, mancozeb and linden, two endocrine disruptors widely used in agriculture, are able to dramatically jeopardize the production of fertilizable oocytes [22-19] This may result in the increased likelihood of DNA damage and carcinoma mutation [8,27], approximately 75% of women present with the disease are diagnosed in advanced stages [26]. On the basis of histology, ovarian carcinoma is classified into three main categories based on the ovarian tissues that cause carcinoma epithelial ovarian tumor (which covers the ovary and its subtypes that include serous mucinous,endometrioid and clear cell),germ cell tumor (cells that become ova and its subtypes including dysgerminoma immature teratoma and yolk sec tumor), and sex cord -stromal cell tumor (which produces hormones with subtypes of malignant granulose cell tumor and Sertoli - Leydig cell tumor) [17].Environmental toxicants (ETs) have been proven to exert deter mental effects on ovaries causing various reproductive problems. One class of such compounds are the EDCs or endocrine disruptors. Most EDCs are manmade chemicals.They are found in routinely and frequently used materials such as agrochemicals, personal care products, plastics, metals and additives or contaminants in certain food. EDCs can also be found in drinking water, food, air and diet (Azzizet al. 2009; wee and Aris 2019). They can interfere with the endorine system of body and affect various hormone-related functions. According to the Environmental protection Agency (EPA), an EDC is defined as 'an exogenous agent that interferes with biosynthesis, secretion, transports, metabolism, binding action, or elimination of natural blood-borne hones present in the body. Which are responsible for homeostasis, reproduction, and developmental process'(Diamenti-Kandarakis et.2009). EDCs can, not only affect the reproductive system in adulthood, but also form a basis for adult reproductive problems upon exposure during the fetal or developmental phase. Their disruptive action on the endocrine system is often termed as 'The fetal basis of adult disease can occur much later in life after the early exposure in the development life.

## Discussion:-

The signs of toxicity of cadmium, lead, and mercury in reproductive organs appear to be strikingly similar when each is administered individually. The effects of cadmium on the structure and function of ovaries were first reported in 1959 KAR A,B. A significant study was published, a couple of years later, to describe the effect of a subcutaneous injection of cadmium salts on the ovaries of adult rats in persistent estrus [20].In another study, exposed rats had a significantly higher ovarian weight and a higher number of antral and atretic follicles, compared with controls [14]. The effects of cadmium on ovarian follicles were related to changes in gonadotropin hormones and decreases in follicular stimulating hormone (FSH) and luteinizing hormone (LH). A significant formation of oxidative stress in ovarian of Cd-exposed rats was evident from increased levels of the lipid peroxidation product, malondialdehyde (MDA) in combination with decreased levels of an antioxidant enzyme, catalase [23].Cadmium also affects the maturation of follicles, degradation of the corpus luteum and the arrangement of follicles and corpus luteum and increases the number of atresia follicles [29]. In an analysis of ovary morphology,visualized by the expression of the granulosa-cell-specific factor (AMH), there were no differences in the follicle number in each stage (primordial, primary, secondary, and antral follicles) in cadmium-exposed groups [33]. The number of TUNEL-positive cells in the ovaries of cadmium-exposed groups did not differ from controls as did the levels of SOD and MDA in the ovaries [13]. An age-specific effect of cadmium in women was evident from a study using anti-Mullerian hormone (AMH) that is secreted by granulosa cells of antral

follicles as an indicator of ovarian function [13]. An inverse association between cadmium and AMH was seen only in women aged between 30 and 35 years. Therefore, it is concluded that environmental exposure to cadmium may alter the AMH level and ovarian function depending on age [13]. Lead exposure affects female reproduction mainly by impairing menstruation, reducing fertility potential, delaying conception time and altering hormonal production and circulation, affecting pregnancy and its outcome [11]. Reported effects of lead include infertility, miscarriage, early membrane rupture, preeclampsia, pregnancy hypertension, and preterm birth [31]. A review of studies from China described the possible links between low-level lead exposure and adverse effects on the reproductive system. Effects manifested mainly as high prevalence rates of menstrual disturbance, spontaneous abortion, and threatened abortion in exposed females [32]. Lead exposure is associated with hormonal imbalance causing reproductive impairment, and the accumulation of lead affects many endocrine glands [7]. It affects the hypothalamic-pituitary axis, causing blunted thyroid-stimulating hormone, growth hormone, and follicle-stimulating hormone FSH luteinizing hormone LH responses to thyrotropin-releasing hormone, growth hormone-releasing hormone and gonadotropin-releasing hormone stimulation. High blood lead levels were associated with a delay in the onset of puberty, after adjustment for possible confounders. Blood lead levels ( $\geq 5$   $\mu\text{g/dL}$ ) were associated with lower levels of maturation at 9 years of age, and slower progression of pubic hair and breast development [6]. Gender differences in the effects of prenatal and postnatal lead exposure on pubertal development have been noted [18]. Accumulating evidence suggests that chronic exposure to low levels of environmental lead may have the following effects in females: menstruation cycles, offspring development, the intellectual ability, offspring weight, and hormonal production [6]. In females, mercury can accumulate in ovaries and can cause changes in reproductive behavior, infertility and ovarian failure [4,2]. Studies using experimental animals have shown that increased doses of mercury inflate the potential number of reproductive disorders (i.e., infertility, stillbirth, congenital malformations, and spontaneous abortion) [24].

## Conclusion:-

Despite the undeniable progresses, protocols for in vitro growth of ovarian follicles from fresh or cryopreserved ovarian tissue fragments have not been optimized thus far. In ovaries, the most significant changes are decreased follicular growth, increased number of atretic follicles, degeneration of the corpus luteum, and prolonged and/or irregular cycle. In testes, the most significant changes include disorganization of seminiferous tubules; alterations in spermatogenic cell arrangement; alterations in the basal membrane structure; abnormalities of the testicular stroma; decreased spermatozoa count, motility, and viability; and altered spermatozoa morphology. These are signs of adverse effects of cadmium, lead, and mercury on the architecture of reproductive organs, which are both dose- and time- dependent. In general, toxic effects of various substances in reproductive organs occur at low concentrations. Because toxic mechanisms of each individual metal have been established, future research should be aimed to elucidate molecular mechanism(s) of action of these metals in combinations to mimic human co-exposure situations. In addition, toxicity preventive strategies and the synergistic or antagonistic interactions during the simultaneous presence of more than one of these three metals should be examined in future research.

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## Original Article

### Phytochemical analysis of traditional medicinal herb- *Boerhavia diffusa*

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#### Abstract:

This study aimed to identify and understand phytochemicals presents in the wild edible *Boerhavia diffusa* and their medicinal as well as edible uses. Phytochemicals are plant based bioactive compounds produced by plants for their protection. In this study, we have collected the leaves of *Boerhavia diffusa* and tested for different phytochemical tests. It is essential to protect and conserve the wild medicinal plant and the traditional knowledge of the tribal people about the human health.

**Keywords:** Phytochemicals, wild, medicinal herb, *Boerhavia diffusa*.

#### Introduction:

*Boerhavia diffusa* Linn. also known as Spreading Hogweed is a perennial plant. Its habitat is dry wastelands where other vegetation is usually scarce [1] *Boerhavia diffusa* L is also known as Punarnava is very popular wild edible as well as medicinal plant from Maharashtra. Phytochemicals are plant based bioactive compounds produced by plants for their protection. They can be derived from various sources such as whole grains, fruits, vegetables, nuts and herbs and more than a thousand phytomolecules have been discovered to date [2]. Dense forest containing number of medicinal plants. The tribal people generally used various parts of plants for different diseases. The nutritional studies on *B.diffusa* reveals that Punarnava (*B. Diffusa*) is acting as supplementary foods for many tribal people. *Boerhavia diffusa* L, belonging to the family Nyctaginaceae. The roots are reputed to be diuretic and laxative and are given for the treatment of anasarca, ascites and jaundice.[3] It is a species of flowering plant in the four o'clock family which is commonly known as Punarnava, red spiderling, spreading hogweed or tarvine. It is taken in herbal medicine for pain relief and other uses. The medicinal plants and herbal plants has assumed greater importance in recent days, due to tremendous potential they offer in formulating new drugs, against many disease and illness that affect the human kind [4]. The introduction of better tapping techniques is one way of avoiding damage, but the use of cultivated sources can also reduce the pressure on the natural forest, and by improving the accessibility of the trees to the collector can increase the efficiency of collection [5]. The plants protect from disease and damage of phytochemicals which contributes to the plants flavour, aroma and colour. Generally, the plant chemicals that defend plant cells from environmental hazards (stress, pollination, drought, UV exposure and pathogenic attack) are called phytochemicals[6] Shingade *et al* (1995) analyzed unconventional leafy vegetables found in the forest of Konkan region of Maharashtra. They are found to be a rich source of crude protein.



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## Materials and methods:

### Study Area

Study area is situated between the latitude 20°40' - 20°45' N latitudes and between 79°9' - 79°29' E longitudes and is spread over the area of 61485.92 hectares of land which falls in villages.

(Data Source: Village and boundaries provided by Land Records Department. GoM)

### Collection of Sample:

The selected wild edible *Boerhavia diffusa* in the present study were shade dried, powdered and subjected to various qualitative tests as per the procedures mentioned in the standard reference books, for the identification of phytochemical such as, Alkaloids Flavonoids Glycosides Saponins Proteins Carbohydrates etc[7]

### Preparation of Sample:

The dried samples were grind into the fine powder which passed through 0.4 mm mesh screen.

### Storage:

The prepared samples were kept in tight borosilicate glass container and store at room temperature for further subsequent analysis.

**Table 1: List of the other wild edible plants from the study area**

Sr.no.	Botnical Name	Family	Vernacular Name	Parts Used
1	Hibiscus sabdariffa L	Malvaceae	Ambadi bhaji	Leaves
2	<i>Colocasia esculenta</i>	Araceae	Dhopa	Leaves
3	Boerhavia Erecta	Nyetaginaceae	Punarnava	Leaves
4	<i>Cassia tora L</i>	Caesalpineace	Tarota	Leaves
5	<i>Amaranthus tricolor L</i>	Amaranthaceae	Lal Bhaji	Leaves

**Table 2: List of some vernacular names of *Boerhavia diffusa***

Sr.No.	Language	Common name
1	English	Boerhavia diffusa
2	Hindi	Snathikari
3	Bengali	Punarnava
4	Marathi	Punarnava
5	Tamil	Mukaratte
6	Gujrathi	Dholia saturdo
7	Kannada	Kommegidi

### Priliminary Phytochemical Analysis of *Boerhaavia diffusa* L.[8]

Phytoconstituents	Test	Observations	Inference
Alkaloids	Dragendroff's	Orange coloured PPT produced	+
Proteins	Biuret test	Violet or purple colour produced	+
Carbohydrates	Molisch's test	Red or dull Violet colour produced	+
Carbohydrates	Fehling's test	Yellow or red coloured PPT produced	+
Phenols	hloride test	Deep blue or black colour produced	+
Glycosides	Killiani test	Two layer reddish brown produced,in upper layer turns bluish green colour produced.	+
Saponins	Foam test	Persistant foam produced	+

In the present investigation the qualitative analysis of the leaves samples of *Boerhaavia diffusa* showed the presence of phytochemical constituents such as alkaloids, phenolic compounds, saponins, tannins and steroids. In leaves most of the constituents were found to be better extracted in water than methanol.

From the results it has been observed that leaves of the sample contain the required phytoconstituents and hence can be used for therapeutic purposes.

### Results and Discussion :

The present investigation and updated reviews on phytochemical study of *Boerhavia diffusa* revealed the presence of phytochemicals in leaves are alkaloids, Phenols, saponins. Some studies identified that phytochemical screening using water methanol and petroleum ether from the extracts of the leaves samples revealed the presence of major bioactive compounds including carbohydrate, protein alkaloids, flavonoids, polyphenols, saponins and glycosides which may retain a wide range of pharmacological action. The information based upon the folk knowledge of the tribal and rural people of the study area.



## Conclusion:

From the above study and some updated review it is concluded that the *Boerhavia diffusa* which is locally known as punarnava is rich in phytochemical constituents which is helpful in medicinal as well as edible uses. Due to unavailability of proper storage facilities in the town, the harvest is bound to sell their edible products in fresh conditions. The effort should therefore be made to improve the collection and post-harvest handling of leaves.

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## Original Article

### ‘Me-Dam Me Phi’ A Socio-Religious Festival of the Tai Ahom Community in Assam

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#### Abstract

Assam is the land of various ethnic groups situated in the North-Eastern part of India. Tai-Ahom are one of the major ethnic groups in Assam who ruled for approximately 600 years in the Brahmaputra Valley of Assam. The Tai-Ahom people in Assam observe many festivals in Assam with their own traditional beliefs and practices. “ME-Dam-Me-Phi” is one of the socio-religious festivals of Tai-Ahom community in Assam. This present paper explores the historical origins, ritual structure, socio-religious significance, and contemporary relevance of Me-Dam-Me-Phi among the Tai-Ahom people in Assam. It also examines how this ancient tradition continues to reinforce ethnic identity, cultural continuity, and social cohesion among the Tai Ahoms while adapting to modern realities.

**Keywords:** Assam, Brahmaputra Valley, Tai-Ahom, Me-Dam-Me-Phi, Socio-religious festivals

#### Introduction

Assam is one of the states of North East India, surrounded by Nagaland, Manipur in the East, West Bengal in the West, Bhutan and Arunachal Pradesh in the North, Mizoram, Tripura, Bangladesh and Meghalaya in the South. Assam is divided into two main valleys based on the two major rivers, the Brahmaputra and the Barak i.e. Brahmaputra Valley and the Suma or Barak Valley. The Brahmaputra Valley is a vast region situated between hill ranges of the eastern and north-eastern Himalayan Mountain Range, with leisure tourism, nature tourism, eco-tourism and rural tourism. On the other hand, the Barak Valley is situated in the southern region of the Indian state of Assam.

Assam has been the meeting ground of various ethnic groups from time immemorial. Tai-Ahom or Ahom are one of the major ethnic groups of Assam. The Ahom were originally a Tai-Yai or Shan group of people (Gogoi, 2007) who entered the Brahmaputra Valley of Assam, crossing the Patkai Hills in 1228 A.D. under the leadership of *Su-Ka-Pha* and ruled for more than 600 years in this valley. The Ahom had their own culture, language, religion and customary laws. In this regard, historian P. Gogoi in his book “Tai Ahom Religion and Custom” (1976), mentions that the Ahom had their own religion and culture. Initially, they followed their own language, religious beliefs, and rituals, but with the expansion of the boundary of the Ahom kingdom and for political expediency, they assimilated with the local people and adopted Assamese language and Hindu religion. In spite of that, the priest clans and some other sections of the Ahom have been maintaining their traditions and customs. Ancestor worship and birth, death, and marriage rituals of the Ahom are still in practice by a section of people in different districts of Assam (Hatibaruah, 2024). Ancestor worship is the main characteristic of Tai-Ahom culture. It is also one of the socio-cultural and religious customs of the Chinese people as well. Ahom practice a variety of rites and rituals pertaining to ancestor worship (Gogoi, 1998). The traditional Tai Ahom religion encompasses a variety of rituals that reflect their deep connection with nature, ancestors, and deities. These rituals are integral to the community’s spiritual life and cultural identity.



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The Me-Dam-Me-Phi is one of the most important ancestor worship rituals of the Tai-Ahom community in Assam, where they perform to honor and appease the spirits of the ancestors. In Assam, every year, January 31 is observed as a state holiday on the occasion of 'Me-Dam-Me-Phi'.

Therefore, the present paper explores the historical origins, ritual structure, socio-religious significance, and contemporary relevance of Me-Dam-Me-Phi among the Tai-Ahom people in Assam. It also examines how this ancient tradition continues to reinforce ethnic identity, cultural continuity, and social cohesion among the Tai Ahoms while adapting to modern realities.

## Objectives of The Study

The main objectives of the paper are as follows-

- a. To know about the ritual of Me-Dam-Me-Phi and its historical origins.
- b. To explore its significance in contemporary society to create ethnic identity and unity among the Tai-Ahom community in Assam.

## Methodology

The present study used both primary and secondary sources of data. The primary data is collected through observations and interviews of selected persons called *Puruhits* (Ahom priests) who performed the rituals of Me-Dam-Me-Phi festivals. So, I have been using participatory observation method and unstructured interview methods to collect primary data. The purposive random sampling method is used to select the respondents for the study. Secondary data are collected from *Buranji's* (Chronicles), Ahom history books, History of Assam, research articles, articles (published & unpublished), journals, etc. Both descriptive and analytical methods of research are followed to achieve the objectives of the study.

## Rationale Of The Study

The present study mainly focused on the Me-Dam-Me-Phi as a socio-religious festival of Tai-Ahom in Assam. It is observed that Tai-Ahom established their kingdom in a large part of the Brahmaputra Valley within a period of two hundred years by winning against the existing ethnic groups in the Valley. In the last seven centuries, they also passed through a process of social and cultural transformation with the local people. They gradually adopted Hindu religious beliefs and practices. Hinduisation of the Ahom was the logical process towards the sophistication of the rudimentary formation of the Ahom state (Buragohain, R, 2007). Through this process Tai-Ahom community lost their own language, religious beliefs and cultural identity. But, Tai-Ahom priestly classes, mainly Deodhais, Mohons and Bailungs followed the ancestral tribal gods and goddesses and worshipped in Tai-Ahom traditional manner. The festival of Me-Dam-me-phi is deeply associated with Tai-Ahom traditions. It is a symbol of unity, harmony and integration among the Tai-Ahom community in Assam. In contemporary society, the Me-Dam-Me-Phi is one of the powerful instruments to create cultural identity and unity among the Tai-Ahom community in Assam to preserve their heritage, strengthening social bonds and asserting their distinct identity.

## Discussion

### 1. Historical Background of Me-Dam-Me-Phi in Assam

Historically, this festival was observed during times of adversity, such as natural calamities, severe illnesses, or ominous occurrences. It was also celebrated during significant events like before battles to seek blessings for victory, after defeats to find solace, and after victories to express gratitude.

Tai-Ahom religion is based on certain fundamental beliefs in supernatural powers. They had the conception of "omnipotent being" that is Pha-Tu-Ching (Pha-Heaven; Tu-a-being; and Ching- highest) (Gogoi, 2007). The Tai Ahoms believe in an Omnipotent God or God Almighty (Pha Tu Ching Phrong Hum). They also believe in a hierarchy of gods that owe their origin to the Great God. They worship not only the various gods with elaborate ceremony but even their dead ancestors are also worshipped with great devotion. The Tai-Ahoms venerate their ancestors, believing that the spirits of the deceased can protect and guide the living. Rituals and ceremonies are performed to honour and appease the ancestors.

The Tai-Ahom have a distinct culture, religion, and traditions deeply rooted in their respect for nature. After the establishment of the Ahom Kingdom in the 13th century, ancestor worship became part of the state religion and royal ritual practice. The Ahom kings institutionalized 'Me-Dam-Me-Phi' as a formal ceremony performed for the welfare of the kingdom and its people. It is also written in history that *Shu-Ka-Pha*, the first Swargadeo (heavenly king) of the Tai Ahoms observed this sacred ritual of 'Me-Dam-Me-Phi' and sought the blessings of his forefathers in the new place. After the death of Shu-Ka-Pha, he was buried in Charaideo and Me-Dam-Me-Phi was observed by his son *Suteupha* who became the King after him.

According to the belief of the Tai-Ahom, after the death of a person, the soul becomes the "Phi" i.e. deity. This "Phi" should be remembered by the following living beings. To remember the forefathers is the means active relationship among the past, present and future generations. (Duarah, 2004). The Tai Ahoms believe that after death, people attain divine status. So, the Tai-Ahom perform 'Me-Dam-Me-Phi' annually in honour of their ancestors seeking blessings from their forefathers in the 'Me-Dam-Me-Phi' festival.

## 2.Me-Dam-Me-Phi

The first and foremost ritual of the Tai-Ahom is 'Me-Dam-Me-Phi'. The Me-Dam-Me-Phi is one of the most important ancestor worship rituals, performed to honour and appease the spirits of the ancestors. It involves offering food, drinks, and prayers to the ancestors, seeking their blessings for the well-being of the living (Gogoi, 2023). It is a socio-religious festival among the Ahoms. 'Me-Dam-Me-Phi' is a word of Tai Ahom language. Literally, 'Me' means worship or offering, 'Dam' means the dead person or forefather and 'Phi' means God or deities. So, the meaning of the 'Me-Dam-Me-Phi' is the function of worshipping the forefather and deities.

The Tai-Ahom religious belief that the soul of a living person is the result of the combination of two different spirits. They are 'Pu' and 'Fu' (Duarah, 2004). After the death of a living being or human being, the 'sensible soul' comes out from the body and part 'Fu' mixed with the supreme soul "Fura" and the part 'Pu' stays in this world as 'pulin' 'puthao' etc., who guard their grand sons and great grand sons from different dangers and give blessing for prosperity. For receiving the blessing, the grandsons should hold the religious rituals like 'Me-Dam-Me-Phi'.

Me-dam-me-phi involves offering food, drinks, and prayers to the ancestors, seeking their blessings for the well-being of the living. Community feasts and gatherings are common during this ritual.

## 3.Rituals And Observances

'Me-Dam-Me-Phi' is performed by the Tai Ahom community in Assam with two types of worship systems i.e. homely and socially. During the Ahom rule, it was performed with kingly manner on behalf of the people of the state. The homely or family, in order to worship the dead, establish a pillar on the opposite side of the *Barghar* (kitchen) which is called '*Damkhuta*' (imagined as the forefather) where they worship the dead with various offerings like- *luk lao* or *Haaz* (Rice bear), *mah-prasad*, rice with various items of meat and fish. In the society worship, mainly four deities are worshipped- 'Lengdong', 'Jasingpha', 'Khaokhum', and 'Jansaihung' 'Me-Dam-Me-Phi' performed in a public place. In earlier days, buffaloes, white oxen and pigs were sacrificed, but nowadays, pigs, cocks and eggs are sacrificed. (Duarah, 2004). For performing the 'Me-Dam-Me-Phi', the Tai Ahom priests called *Mohan*, *Bailung*, *Deodhai* etc. An octagonal-sized eight-pillar house is constructed for this festival, known as *Ho-phi*. A banana seedling is planted in each corner and a *Pang* (altar) is erected there. Each *Pang* (altar) is dedicated by a 'phi'. 'Pang' is made of bamboo. On this *Pang*, many kinds of sacrifices were placed. The *Pang* is placed for the deities namely- *Khao-Kham*, *Aai Laeng-Din*, *Ya-sing-pha*, *Jan-chai-hang*, *Laengdon*, *Chit-lam-cham*, *Mut-Kam Tai-Kum*, *Dam Chau Phi* or *Chau Phi Dam* (grandparents thirteen generations ago), *Ra-Khin*, *Ba-Khin* (these are gods and goddesses of the Ahoms) who are offered prayers (Gogoi, 2011). The things required for this festival are-- agoli kol pat (upper half of fresh banana leaf), flowers, tamul (areca nut), eggs, *luk lao* (rice beer), pig, etc (Chetia, 2019). At the time of offering these things, the priest sings the Tai mantras and throws the flowers. At the end of the rituals, the people gathered there have a feast together. On the day of 'Me-Dam-Me-Phi' festival, the people of the Tai Ahom community wear ethnic dresses to revive their ancient tradition and participate in communal rituals while paying homage to their ancestors.

## 4.Socio-religious significance

Socially, 'Me-Dam-Me-Phi' is a unifying festival through which Tai-Ahom community participate in collective worship and feasting. It also strengthens kinship ties, reinforces respect for elders, and promotes social harmony among the Tai-Ahom community as well as people of Assam. The festival symbolizes the unification of people and helps transcend differences to foster a cohesive and prosperous society.

Tai Ahoms believe that after death, people attain divine status. In this regard, it is believed that Lengdon, along with eight lakhs of deities, come down to earth and accepts the offerings during Mae-dam Me-phi. The blessings of their forefathers and gods bring individual and social well-being (Chetia, 2019). Therefore, Tai-Ahom people believed that Me-Dam-Me-Phi functions as a ritual of gratitude, remembrance and spiritual continuity. The ancestors are believed to bless the living generation; failure to observe the ritual correctly is believed in some traditions to bring calamity or social disharmony.

## 5.Significance in the contemporary Society

In the age of modernisation and globalization, Me-Dam-Me-Phi plays a vital role in the cultural revival and identity assertion of the Ahom people in Assam through their ethnic roots and historical legacy. It is a process that offers younger generations a means to reconnect with their ancestry, language, and traditional values. The widespread participation of youth in organizing and performing rituals, songs, and dances reflects the transmission of Tai Ahom cultural knowledge across generations. Honouring ancestors reinforces social cohesion among the Tai Ahom community. 'Me-Dam-me-Phi' creates inter-community harmony and shared cultural consciousness among the people of Assam. Today, 'Me-Dam-me-Phi' is observed in various public places according to Ahom rites and participants from various ethnic, linguistic, and religious backgrounds participate in it. The government of Assam declared 'Me-Dam-Me-Phi' as a state-level event and declared it a public holiday. So, in contemporary society, 'Me-Dam-Me-Phi' strengthens Assamese identity while promoting unity, harmony, and mutual respect. It also attracts various scholars, tourists interested in Assam's heritage, traditional rituals and ethnic diversity and develop cultural tourism in Assam. So, in contemporary Assam, Me-Dam-Me-Phi is not only a ritual of the Tai-Ahom community but also a festival to promote harmony, cohesion and understanding among diverse communities in Assam.



## Conclusion:

'Me-Dam-Me-Phi' is a vital platform for preserving and promoting the unique cultural heritage of the Tai-Ahom people. This ancestor worship festival is still performed according to the Tai-Ahom religious rites. 'Me-Dam-Me-Phi' reflects the Tai-Ahom's reverence for ancestral ties, their rich history, and their unique cultural practices. Annually on 31<sup>st</sup> January, Me-Dam-Me-Phi is celebrated centrally at Charaideo, Assam, as it is the historical burial site of the Ahom kings. It is a vibrant display of cultural identity that strengthens community bonds.

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## Original Article

# Museums of Maharashtra: Preserving the Cultural Memory of Indian History

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**Abstract:**

*Museums play a vital role in preserving, interpreting, and transmitting the cultural and historical heritage of society. In Maharashtra, these institutions act as dynamic spaces that connect the past with the present, allowing communities to explore their evolution through artistic, archaeological, industrial, and tribal narratives. This paper examines major museums across Maharashtra, including the Chhatrapati Shivaji Maharaj Vastu Sangrahalaya, Raja Dinkar Kelkar Museum, Dr. Bhau Daji Lad Museum, Mahatma Phule Museum, Tribal Cultural Museum, Nagpur Central Museum, Maratha History Museum, Aga Khan Palace Museum, and the Town Hall Museum. Each represents a unique facet of the state's cultural and historical identity. The study analyses how these museums contribute to shaping public understanding of heritage, identity, and memory while highlighting their educational, research, and conservation roles. It also reflects on the need for digital preservation and community participation to sustain Maharashtra's living cultural legacy.*

**Keywords:**

*Museums of Maharashtra, Cultural Memory, Heritage Preservation, Indian History, Archaeology, Art and Culture, Tribal Traditions, Museum Studies, Regional Identity, Cultural Heritage*

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**Introduction:**

Museums are vital institutions for the preservation, interpretation, and transmission of a society's cultural and historical heritage. In India, they function not merely as repositories of antiquities but as dynamic spaces that connect the present with the past enabling communities to understand their evolution through material, artistic, and intellectual expressions. Maharashtra, one of India's most historically rich states, possesses a remarkable range of museums that reflect its diverse cultural landscape from ancient art and archaeology to industrial progress, tribal traditions, and the freedom struggle. Each museum embodies a distinct layer of the region's civilizational memory, offering insights into how identity, creativity, and historical consciousness have developed over time. So the study of these museums contributes to understanding the processes through which heritage is curated, remembered, and reinterpreted in modern India. Museums in India perform a critically important role in the preservation, interpretation and dissemination of the nation's cultural and historical heritage. They serve as repositories for artefacts, inscriptions, art works and antiquities that would otherwise risk deterioration or loss, thereby safeguarding material evidence of India's past from the Indus Valley and Buddhist periods, through medieval kingdoms to colonial and post-colonial eras. In doing so, museums help construct a collective memory linking individuals and communities to their roots and providing a tangible sense of continuity. Moreover, museums function as educational spaces, enabling scholars, students and the public to engage with primary historical sources in curated form, facilitating research, pedagogy and public awareness. Beyond pure preservation and display, they act as sites of interpretation museums frame narratives about identity, polity, culture and change, often



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reflecting the complex intersections of colonial legacies, nationalism, regional pride and global heritage. For instance, as Madhuparna Roychowdhury argues in *displaying India's Heritage: Archaeology and the Museum Movement in Colonial India*, museum-making in India during the colonial period was deeply connected to the “culture of history” and helped negotiate modern notions of territory, nationhood and heritage.<sup>1</sup>

## Objectives:

1. To explore the historical and cultural significance of major museums in Maharashtra within the larger framework of Indian heritage.
2. To analyse how these institutions preserve and interpret regional identity, artistic creativity, and social memory.
3. It further seeks to document the typology and thematic focus of different museums archaeological, art, industrial, tribal, and memorial while examining their role in shaping public understanding of history.
4. The study also aims to investigate the connection between museum collections, colonial legacies, and post-independence cultural policies in Maharashtra, thereby revealing how museums reflect changing cultural narratives.
5. Additionally, it evaluates the educational and research importance of museums as key instruments for cultural transmission and heritage awareness, and emphasises the urgent need for conservation, digital documentation, and active community participation to sustain the living cultural memory embodied in these museums.

## Types of Museums and how they differ in India:

Museums in India can be broadly classified according to the nature of their collections, institutional focus or theme, and scope of outreach. The first major category is the archaeological Museum, which focuses on material remains discovered through excavations and ancient sites. These include objects such as pottery, coins, inscriptions, and sculptures that help interpret and preserve India's archaeological past. The defining feature of such museums is that their collections are excavated or unearthed and directly connected to historical or prehistoric cultures rather than artistic or scientific objects. The next type is the art or craft museum (Fine Arts Museum), which displays objects of aesthetic and craft value such as paintings, sculptures, textiles, and decorative arts. Unlike archaeological museums, these museums emphasize artistic expression and craftsmanship rather than ancient relics. Their focus is on form, style, and creativity, not on the chronological or cultural evolution of society.<sup>2</sup>

Natural History and Science & Technology Museums represent another important category. These institutions collect and exhibit specimens of the natural world such as animals, plants, fossils, and minerals or highlight industrial, technological, and scientific progress. They are distinct from art or archaeology museums because their emphasis lies in the natural and scientific domains rather than human-made cultural artefacts. History or Heritage Museums (including defence, personal, and thematic museums) are devoted to narrating significant historical events, national movements, and the lives of great personalities. These museums preserve documents, photographs, and belongings of famous figures, as well as thematic exhibits like railways or wars. Their uniqueness lies in storytelling and memorialization focusing on socio-cultural memory and heritage rather than the aesthetic or archaeological value of the objects.

Another category is the Multipurpose or General Museum, which maintains collections across several disciplines, including art, archaeology, ethnography, and natural history. These museums are broader in scope than specialized institutions, offering visitors an overview of multiple aspects of heritage under one roof. Examples include regional or state museums that combine local crafts, fossils, coins, and cultural artefacts. Lastly, Ethnographic, Anthropological, or Tribal Museums focus on the life, traditions, and cultural expressions of human communities particularly tribal and folk groups. They document everyday objects, ornaments, tools, and ritual items, highlighting the living traditions of India's diverse communities. These museums differ from archaeological institutions because they centre on living cultures and on-going traditions rather than excavated antiquities.<sup>3</sup>

## Important Museums in Maharashtra-

1. **The Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (formerly the Prince of Wales Museum)** in Mumbai stands as one of Maharashtra's premier cultural institutions. Its grand Indo-Saracen building houses a vast collection spanning Indian art, archaeology, and natural history from ancient stone sculptures and inscriptions to decorative arts and paintings. It serves not simply as a repository of objects but as a living memory of India's long civilisation, colonial encounter, and modern heritage. The building's architectural grandeur and its collections emphasize the continuity of Maharashtra's cultural identity from early times through to the present.<sup>4</sup>
2. **The Raja Dinkar Kelkar Museum** in Pune is distinctive for its extraordinary collection of everyday objects, folk arts, musical instruments, weapons and domestic artefacts drawn from the 18th to 19th centuries, collected by Dr. D. G. Kelkar. Unlike a conventional fine-art or archaeological museum, it preserves the intimate cultural memory of Maharashtra's domestic, craft and lived traditions offering insights into the lives, tastes, aesthetics and material culture of communities rather than simply elite art.
3. **The Dr. Bhau Daji Lad Museum** in Mumbai (formerly the Victoria & Albert Museum of Bombay) is one of Maharashtra's oldest museums and plays a key role in preserving the industrial and urban history of the region. Its collections of maps, photographs, clay models, textiles and early industrial craft articulate the transformation of

Mumbai from a regional port city into a cosmopolitan metropolis. In doing so, the museum connects the local history of Maharashtra with broader processes of modernity, urbanisation and cultural change.<sup>5</sup>

**4. The Mahatma Phule Museum** (earlier known as the Poona Industrial Museum, established in 1890) is located in Ghole Road, Shivajinagar, Pune. It presents a wide-ranging collection that spans natural history (taxidermy animals, botanical and geological specimens), applied science and industry (models of hydro-electric works, machinery, irrigation), arms & armour of the Maratha and Mughal periods, handicrafts and cottage industry, as well as archaeological and art items. The museum's educational orientation and its multi-disciplinary galleries make it a key location for understanding how technological, cultural and historical narratives interlink in Maharashtra.

**5. Tribal Cultural Museum** Situated within the campus of the Tribal Research & Training Institute, Pune (28 Queen's Garden, Koregaon Park area), the Tribal Cultural Museum was set up in 1965 and specialises in the documentation and display of tribal life, art, crafts, musical instruments, domestic implements, costumes and other artefacts from Maharashtra's tribal communities. The museum is significant because it provides a tangible link to the lifestyles, traditions and material culture of 47 tribes of Maharashtra thus preserving a cultural memory often marginalised in mainstream institutions.

**6. Nagpur Central Museum (Ajab Bangla), Nagpur,** Often called "Ajab Bangla", this museum in Nagpur (established 1863) is one of the oldest in the Central India region. It houses archaeological artefacts, fossils (including dinosaur remains), stuffed specimens of birds and mammals, coins, sculptures, paintings of the Bombay School of Art and objects from the history of the region. The museum's role is pivotal in linking the geological, natural-history and cultural heritage of the Vidarbha region with Maharashtra's broader historical narrative.

**7. Maratha History Museum, Shivneri / Sinhagad Region** is located in the precincts of Deccan College, Yerwada, Pune (established in 1939), is a specialised repository of the Maratha period's material and manuscript heritage. The museum's collections feature arms and armour reflective of the late-18th to early-19th century Maratha military tradition, along with archival manuscripts in Marathi, Sanskrit, Persian, Arabic and English: these include astrological treatises, diaries, poetry, the Marathi *bakhars* (historical narratives), translations of Sanskrit texts into Persian/Arabic, and official correspondence. In addition, the museum houses more than 4,500 coins, copper plates, miniature paintings, ivory objects, metal and horn-work, and other artefacts which chronicle the political, cultural and administrative aspects of the Maratha realm. As such, it stands not just as a weapons-gallery but as a cultural archive where one may trace the Maratha polity's evolution through documents and artefacts.<sup>6</sup>

**8. Aga Khan Palace Museum, Pune,** apart from being a historic monument of the freedom movement (it was a detention place of Mahatma Gandhi during the Quit India Movement), functions partly as a museum containing Gandhi and Kasturba Gandhi's belongings, photographs, correspondence and exhibits related to the Indian independence struggle. This museum component holds immense symbolic value as the site of memory for both the nation's freedom and Maharashtra's role in it.<sup>7</sup>

**9. The Town Hall Museum in Kolhapur** (established around 1945-46) is the collections of ancient sculptures, inscriptions, coins, arms & armour, and local craft artefacts of southern Maharashtra. The museum plays an important role in documenting Kolhapur's regional cultural and historical layers from Satavahana and Shilahara periods through Maratha times thus preserving the localized heritage distinct from metropolitan centres.<sup>8</sup>

## Cultural Memory of museums in Indian History:

Maharashtra is home to several significant museums that collectively preserve the region's rich cultural memory and reflect India's broader historical evolution. The Chhatrapati Shivaji Maharaj Vastu Sangrahalaya in Mumbai stands as a major centre of art, archaeology, and natural history, symbolising India's civilizational continuity and the fusion of Indian and colonial artistic traditions. The Raja Dinkar Kelkar Museum in Pune presents an extraordinary collection of everyday objects and folk art, offering a vivid picture of the domestic and cultural life of common Maharashtra people during the 18th and 19th centuries. The Dr. Bhau Daji Lad Museum, also in Mumbai, captures the transformation of the city from a colonial port to a modern industrial metropolis through its displays of models, crafts, and urban artefacts. The Mahatma Phule Museum, Pune, established in 1890, combines exhibits of natural history, industry, and culture, highlighting the scientific and educational spirit that defined Pune during the colonial era. The Tribal Cultural Museum, Pune, preserves and documents the life, art, and traditions of Maharashtra's 47 tribal communities, safeguarding the state's indigenous cultural heritage. The Nagpur Central Museum is one of India's oldest museums and displays archaeological artefacts, fossils, and ethnographic materials that connect the Vidarbha region to the wider story of Indian civilisation. The Maratha History Museum at Deccan College, Pune, focuses on the political and cultural legacy of the Maratha Empire through manuscripts, coins, and arms, serving as a key archive of regional power and governance. The Aga Khan Palace Museum, Pune, commemorates Mahatma Gandhi and India's freedom struggle, preserving objects and memories from the Quit India Movement. Lastly, the Town Hall Museum, Kolhapur, showcases sculptures, coins, and artefacts from ancient dynasties like the Satavahanas to the Marathas, emphasising the continuity of art and culture in southern Maharashtra. Together, these museums form a living archive of Maharashtra's historical, artistic, and social evolution linking regional identity with India's broader narrative of civilisation, reform, and nationhood.



## Conclusion:

Maharashtra's museums show how important they are in keeping and explaining India's rich culture, history, and art. Every museum from the famous Chhatrapati Shivaji Maharaj Vastu Sangrahalaya in Mumbai to the Town Hall Museum in Kolhapur represents a special part of Maharashtra's long and varied past. Together, these museums protect old objects and traditions while telling stories about people's identity, creativity, and growth over time. They help connect the past with the present and encourage people to learn about and appreciate their heritage. These museums also show how Maharashtra's local history adds to India's larger story of unity in diversity. As places for learning and remembering, they continue to play an important role in keeping culture alive, spreading knowledge, and inspiring future generations to protect and value their shared heritage.

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## Original Article

### Parametric Optimization of Fluidized Bed Dryer by Taguchi Method: Drying Kinetics of Ragi

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#### Abstract

*This experimental study emphasizes on the assessment of the physicochemical properties of a long-term cereal Ragi (Eleusine coracana), using standard analytical methods. The main objective is to estimate their moisture content. The drying properties of these materials studied using a fluid bed dryer to estimate and evaluate parameters by Taguchi L9 (3x3) method. In addition, the fluid bed dryer is a proven and tested dryer to estimate the moisture rate in grains. In this regard an investigative model is necessary to gain insights into the factors influence on fluid bed dryer. This experimental investigation attentive on the influence of operating factors such as drying medium (air) air velocity, temperature, and solid holdup. Taguchi design technique with L9 (3x3) array settings was used. For the least number of experimental cycles with the required process factors, the L9 orthogonal array method was prepared the SN Ratio and Analysis of Variance (ANOVA) analysis tools. Significant control factors for moisture ratio and, necessary for designers and users of fluid bed dryers, have been identified. ANOVA was performed at a 95% confidence level and a 5% significance level. F values ( $F > P$ ) indicate the significance level of the control factors. The solid holdup parameter with the largest percentage contribution (76.66 %), followed by the factor air velocity (21.20%), are significant parameters, while the factor temperature (2.08 %) is insignificant for Moisture ratio (MR)*

**Keywords:** Drying Kinetics, SN ratio, Fluidized Bed Dryer, Moisture Content, ANOVA

#### Introduction

The drying of food grains is a crucial process in the food industry, as it significantly impacts their shelf- life, processing quality, and nutritional retention. Conventional drying methods such as tray drying and advanced drying techniques like fluidized bed drying are commonly used for moisture removal. However, the efficiency of these methods in preserving the nutritional content of food grains varies. Understanding the drying kinetics of different grains under varying conditions helps in optimizing the drying process. This study aims to compare the drying behavior and nutritional retention of Ragi under tray and fluidized bed drying conditions, providing insights into the best drying methodology for these grains. Previous studies have explored different drying methods for grains and their impact on nutritional quality. Tray dryers are widely used due to their simplicity and cost-effectiveness, but they have limitations in drying efficiency and uniformity [1]. Fluidized bed drying, on the other hand, offers faster moisture removal and better control over drying conditions. Research by [2] highlighted that higher temperatures in drying [3] processes lead to significant nutrient degradation, particularly protein and vitamin content. Studies on drying kinetics by [4] suggest that Page's model provides a more accurate representation of drying behavior than Newton's model for various grains.



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[5] Emphasized that heat and mass transfer mechanisms in different drying technologies affect final product quality. Studies by [6] indicate that fluidized bed drying enhances heat transfer rates, leading to shorter drying times compared to traditional methods. Research by [7] confirmed that optimizing drying parameters improves energy efficiency and minimizes nutrient loss. Studied the energy and exergy efficiency of drying methods and found that fluidized bed drying consumes less energy per unit of moisture removal than tray drying [8]. However, limited studies have focused on comparing these drying methods specifically for wheat and Ragi. Therefore, this research expands on previous findings by analyzing both drying kinetics and nutritional retention of these grains under different drying conditions. Despite extensive research on drying kinetics, few studies directly compare the effectiveness of tray dryers and fluidized bed dryers for wheat and Ragi. Moreover, the impact of these drying methods on key nutritional parameters such as protein, fat, and fiber has not been thoroughly examined. This study aims to bridge this gap by conducting an in-depth comparative analysis of drying kinetics and nutritional retention for the Ragi grains.

## Materials and Methodology

In view of experimental investigation, experiments conducted on drying of Ragi millets with sophisticated fluid bed dryer techniques. Using the data, the factors optimization conditions examined.

### 2.1 Raw Materials and sample preparation

Ragi grains were sourced from the local market in Hyderabad. The initial moisture content, density, particle size, and other physio-chemical properties were determined using standard methods. The particle size, density, minimum fluidization velocity and Bed void age at minimum fluidization of selected Food grains obtained from various sources and shown in below table.

Name of Food Grain	Particle Size (mm)	Density (kg/m <sup>3</sup> )	Minimum fluidization velocity $U_{mf}$ (m/s)	Bed Void age at minimum fluidization velocity ( $\epsilon_{mf}$ )
Ragi	1.48	1140	0.89	0.42

### 2.2 Design of Experiments: Taguchi L<sub>9</sub> (3x3) array, Drying Kinetics Study in Fluidized Bed

Fluidized bed drying was performed [9] under varying conditions of air velocity (1.75 m/s, 1.80 m/s, 1.85 m/s) and drying temperatures (50°C, 60°C, 70°C). The moisture loss was monitored over time to study the drying kinetics. The drying of Ragi are conducted in fluidized bed dryer at various drying conditions of drying medium (air) air velocity, temperature, and solid holdup. During the drying, the kinetics data were analyzed and found the effect of temperature, velocity and solid holdup on drying kinetics in a fluidized bed dryer. For the discussion of obtained results, the temperature for drying of 50° C, 60° C, 70° C, the air velocities of 1.75m/s, 1.80m/s,1.85m/s and solid holdups of 0.100 kg, 0.150 kg, 0.200 kg considered. The operating conditions for effect of temperature, effect of velocity, effect of solid holdups for Ragi given in the table 1.

Table: 1. Operating Factors and control levels of food grains Ragi

S No	factors	Level 1	Level 2	Level 3
1	Solid holdups(kg)	0.1	0.15	0.2
2	Velocity(m/s)	1.75	1.8	1.85
3	Temperature(°C)	50	60	70

## 2 Results and Discussions

The operating conditions for effect of temperature, effect of velocity, effect of solid holdups for Ragi are given in the table 2. Taguchi L<sub>9</sub> (3x3) orthogonal codes, operating factors, control levels and Response.

Table: 2. Taguchi L<sub>9</sub> (3x3) orthogonal codes, operating factors, control levels and Response.

Expts No	Taguchi L <sub>9</sub> (3x3) orthogonal code values			Levels			Response
	Factor A Solid Hold Kg	Factor B Velocity m/s	Factor C Temp °C	Level 1 Factor A Solid Hold Kg	Level 2 Factor B Velocity m/s	Level 3 Factor C Temp °C	Moisture Ratio MR
1	1	1	1	0.1	1.75	50	1
2	1	2	2	0.1	1.8	60	0.58
3	1	3	3	0.1	1.85	70	0.55

4	2	1	2	0.15	1.75	60	0.52
5	2	2	3	0.15	1.8	70	0.36
6	2	3	1	0.15	1.85	50	0.29
7	3	1	3	0.2	1.75	70	0.25
8	3	2	1	0.2	1.8	50	0.14
9	3	3	2	0.2	1.85	60	0.04

#### 1.4. Analysis of the findings

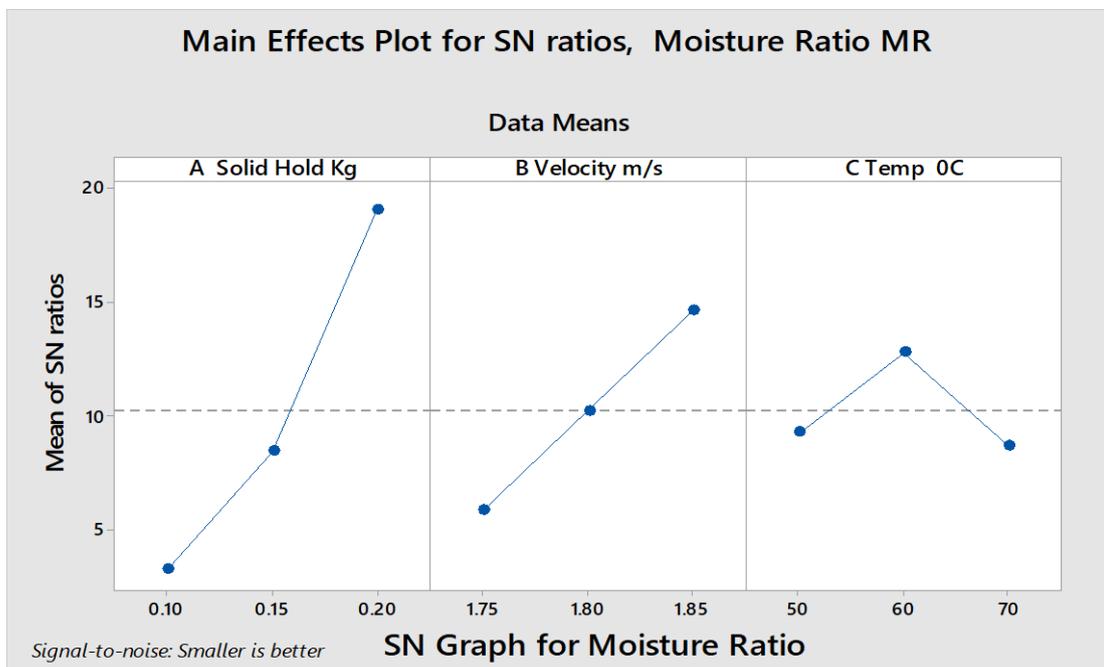
Analysis of the results obtained using the Taguchi-designed L9 (3x3) cluster design was performed at a 95% confidence level using MINITAB R18 software.

#### 1.5. Signal to noise ratio (S/N) analysis

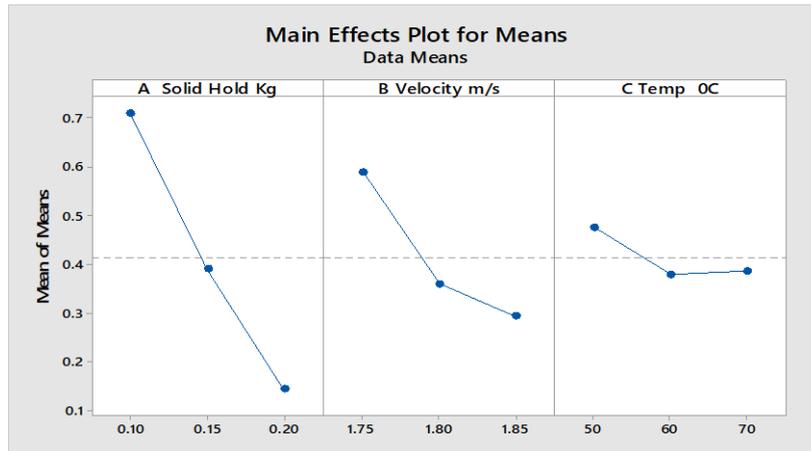
The basic planning method in the Taguchi test converts an independent parameter into a signal-to-noise ratio, which is treated as quality properties index, the lowest variability and optimal designs are achieved using the S /N ratio [10]. Advantages of S / N ratio includes increasing the influence of premium factors, reducing interactive performance, improve quality by processing mean and variation simultaneously. The higher the S/N ratio, the more stable the quality. Based on the response variable, the higher the S/N ratio, the more suitable the value is for Moisture rate analysis. The experimental results and signal-to-noise ratios are listed in Table 3. The response table of signal-to-noise ratios for control factors such as drying medium (air) air velocity, temperature, and solid holdup generated using the Taguchi method and is listed in Table 1. The optimal factors A<sub>3</sub>, B<sub>3</sub>, and C<sub>2</sub> for fluidized bed dryer Moisture ratio were determined from Table 3 and Figure 2

**Table: 3.** Response Table for Signal to Noise Ratios  
Smaller is better

Level	A Solid Hold Kg	B Velocity m/s	C Temp °C
1	3.308	5.907	9.276
2	8.435	10.228	12.790
3	19.026	14.635	8.703
Delta	15.718	8.727	4.087
Rank	1	2	3



**Figure.1.** SN Graph for Moisture ratio



**Figure.2.** Main Effective plot for means of MR (Moisture Ratio)

**Table: 4.** Response Table for Means

Level	A Solid Hold up Kg	B Air Velocity m/s	C Temp 0C
1	0.7100	0.5900	0.4767
2	0.3900	0.3600	0.3800
3	0.1433	0.2933	0.3867
Delta	0.5667	0.2967	0.0967
Rank	1	2	3

**Table: 5.** Taguchi L<sub>9</sub> (3x3) orthogonal array, control parameters, SN ratio of MR and Mean

A Solid Hold Kg	B Velocity m/s	C Temp 0C	Moisture Ratio(MR)	SN Ratio of MR	MEAN
0.1	1.75	50	1	0	1
0.1	1.8	60	0.58	4.7314	0.58
0.1	1.85	70	0.55	5.1927	0.55
0.15	1.75	60	0.52	5.6799	0.52
0.15	1.8	70	0.36	8.8739	0.36
0.15	1.85	50	0.29	10.752	0.29
0.2	1.75	70	0.25	12.0412	0.25
0.2	1.8	50	0.14	17.0774	0.14
0.2	1.85	60	0.04	27.9588	0.04
Average			0.4144444	10.2564	

The figure 1, shows the S/N graph for finding the optimal parameters using the corresponding table 3 and table 4. According to Figure 1 and figure 2, for the S/N ratios, the improved combination of optimal parameters determined for factor A, Solid Hold up, level 3, 0.20 Kg, (S/N = 19.026), factor B Air Velocity, level 3, 1.85 m/s (S/N = 14.635), and factor C Temperature, level 2, 60<sup>0</sup> C (S/N = 12.790). The analysis of the S/N ratio showed the way to choose the optimal factor level based on the minimum variation around the target and also on the average value closest to the target. [11] The average S/N ratio 10.2564 of moisture ratio (MR) obtained from Table 5 and the graph of the S/N ratio for the smaller is better given in Figure 2. In the present study “the smaller the better” standard characteristics applied. For “smaller the better” quality feature, the S/N ratio (K) is expressed by the equation (1)

$$K = -10 \log_{10} (1/MSRD) \quad (1)$$

$$MSRD = \alpha^2 + (m_{avg} - m_0) \quad (2)$$

Where  $\alpha^2$  is the variance, the  $m_{avg}$  is the data mean, and  $m_0$  is the target value, which in this case is zero. The evaluation of the experimental data carried out using the Minitab-R18 program. The graphical value of the S/N ratio is used to determine the optimal factor level [12]. The corresponding effect of this factor is estimated for ANOVA. The data required for ANOVA are given by the equation 3.

$$P_s = \sum_{y=1}^N (ky - \bar{K})^2 \quad (3)$$

Where  $P_s$  is the summation of squares,  $N$  is number of findings and  $\bar{K}$  is the overall mean of S/N Ratio.

$$PP_j = \sum_{y=i}^J (K_{ji} - \bar{K})^2 \quad (4)$$

Where  $PP_j$  is sum of square deviation of  $j^{\text{th}}$  factor,  $i$  is level of  $i^{\text{th}}$  factor.

$$PP_j = \frac{PP_j}{f_j} \quad (5)$$

Where  $U_j, f_j$  are variance and degrees of freedom respectively of  $j^{\text{th}}$  parameter.

$$F_j = U_j / U_e \quad (6)$$

$$F_j = \frac{U_j}{U_e} \quad (6)$$

Where  $F_j$  is the F-statistic of the  $j^{\text{th}}$  factor and  $U_e$  is the variance of error. If the degrees of freedom of the error become zero, it is not possible to calculate the F-statistic and the ANOVA analysis of variance. In this case, it is possible to predict and verify improvements in observed values using a combination of factor levels. As shown in equation (7).

$$K_{pred} = \bar{K} + (\bar{K}_i - \bar{K}) + (\bar{B}_j - \bar{K}) + (\bar{C}_y - \bar{K}) \quad (7)$$

Where  $K_{pred}$  is the predicted signal-to-noise ratio of the response,  $\bar{K}$  is the sum of the experimental means,  $(\bar{A}_i)$ ,  $(\bar{B}_j)$  and  $(\bar{C}_y)$  are the mean responses for factors A, B and C, at levels  $i, j$  and  $y$ , respectively ( $i, j, y = 1, 2, 3$ ). Non-significant factors and interactions are generally omitted from Equation 7.

## 2. Variance Evaluation

It shows the influence of the dependent variables and also determines the percentage contribution of these dependent variables to the response variable. ANOVA analysis was performed [13] in this study with a 95% confidence level and a significance level of 5%. The F-values ( $F > P$ ) indicate the significance of the control factors. Table 6 gives the percentage contribution of the parameters to the response variables (MR) using ANOVA. The ANOVA table therefore shows the significance of each parameter. Based on the ANOVA for moisture ratio (Table 6), the f-value concluded that moisture ratio mainly influenced by the factor –A (Solid holdup). The choice of experimental parametric factors and their corresponding levels, analysis of variance (ANOVA), controls the experimental results to determine the effect of each parameter against the objective function. General Linear Model: Moisture Ratio (MR) versus A Solid ... Temp °C shown in table 6.

## 3. Identification of Response Variables

The performance factors (Solid holdup, air velocity, and temperature) significantly influence the response. The variable is identified by the percentage contribution of each parameter. Factor A – Solid holdup parameters with a higher percentage contribution of 76.66%, followed by factor B – Air velocity with 21.20%, are significant parameters for the moisture ratio is most prominent effective property of a moisture ratio for fluidized bed dryer, it plays main role in the quality of the drying of Ragi grains. The applications of fluidized bed dryers have been applied in industrial applications as well as other applications like Agro industry, food processing industry, etc.

**Table: 6.** Analysis of Variance for Transformed Response

Source	DF	Seq SS	Contribution	Adj SS	Adj MS	F-Value	P-Value
A Solid Hold Kg	2	0.341474	76.66%	0.341474	0.170737	1131.66*	0.001
B Air Velocity m/s	2	0.094440	21.20%	0.094440	0.047220	312.98*	0.003
C Temp °C	2	0.009245	2.08%	0.009245	0.004623	30.64	0.032
Error	2	0.000302	0.07%	0.000302	0.000151		
Total	8	0.445460	100.00%				

\*significance at 95% confidence Level

## 4. Conclusions

Analysis of the experiment conducted using the Taguchi L9 (3x3) orthogonal method. A study of the signal-to-noise ratio with respect to the moisture ratio, which is generally considered "the smaller the better", shows that important parameters play a significant role in the design of a successful fluid bed dryer. The discussion concerns the optimization of moisture ratio parameters. The construction of an efficient fluidized bed dryer technique was investigated for different factors, such as solid holdup at 0.20 kg, with a 76.66% significant contribution, Air Velocity

at 1.85 m/s with 21.20% contribution and the temperature at 60<sup>0</sup> C with 2.08% contribution is insignificant. The significance of the parameters determined at the 95% confidence level using ANOVA. This effective property of a moisture ratio for fluidized bed dryer, it plays main role in the quality of the drying of Ragi grains. The applications of fluidized bed dryers have been applied in industrial applications as well as other applications like Agro industry, food processing industry, etc. This modeling process can be further improved by using non-traditional optimization methods such as neural networks and genetic algorithms.

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## Original Article

# Rituals and Festivals as a Cultural Markers in Monica Ali's Novel Brick Lane

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### Abstract-

*Festival and rituals plays vital role in the human being's life. Festivals usually perform as a part of celebration for so many reasons like worship of God, nature, seasons and ancestors etc. They help us to preserve and protect our culture. Monica Ali in her novel Brick Lane portrays the life of Nazneen and her efforts to preserve and protect culture in foreign by celebrating festivals. In Brick Lane, festivals and rituals are used as a symbol of cultural continuity, cultural marker and identity cohesion. Present paper through lights on how various festivals and rituals influences the life of immigrant lady. Novel not only highlights the value of festival in the life of human being but also focuses on how festival and rituals helps to maintain unity in group of the society. Monica Ali portrayed emigrant's food habits, religious celebration, customs and everyday practices which gradually becomes the process of cultural adaptation and formation of hybrid identity. Theories of great theorist like Homi K. Bhabha and Stuart Hall are applied to the novel to understand the role of festival and rituals in human life.*

**Keywords:** Rituals, Festivals, Cultural Identity, Diaspora, Multiculturalism, Monica Ali.

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### Introduction

Monica Ali is a British novelist and short story writer of Bangladeshi descent. She was born in Bangladesh and at the age of three her family shifted and settled in England. This early experience of migration and cross cultural identity became the prominent themes of her some literary works. She is the receiver of the Granta's Best of Young British Novelists of the year 2003. Brick Lane (2003) is the debut novel of Monica Ali. It was short listed for Booker Prize. Nazneen- a Bangladeshi immigrant woman is the protagonist of the novel who is living in London East End. Nazneen presents the tension of culturally trapped person between the choices of traditions and modernity. Novel begins in rural area of Bangladesh where Nazneen born as premature baby. Her mother Rupban took so many efforts for the survival of this baby. Nazneen's mother told her, that it was Nazneen's fate so that she survived in this critical situation. Further she said, always believe in destiny and accept everything happily without any complain. At the age of 18 her father fixed her marriage to much older educated man who was living in London. So she shifted to London to explore completely new world. Monica Ali's novel *Brick Lane* mainly divided into main three parts, consisting 20 chapters. Nazneen is presenting her life in London and with the letters of Nazneen's sister Hasina we are getting information about Bangladesh. Structure of the novel is chronological which presents the gradual growth of Nazneen from immature wife to independent women.

### Rationale of the Study

Monica Ali's *Brick Lane* is one of the noteworthy novel that portrays the identity crisis, problem of migrated people, cultural displacement and cultural clashes of South Asian people. This novel is received appreciation from both critics and readers. The study of rituals and festivals as cultural markers in this text is important because it reveals how cultural practices act as living symbols of belonging and negotiation within multicultural societies.



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Many researchers studied novel *Brick Lane* through the lenses of various themes like feminism and immigration but very less studies have examined how rituals and festivals plays vital role in cultural identity. The rationale behind this study lies in its attempt to connect the dots between literary analysis and cultural study. By exploring various rituals like prayer, food preparation, marriage customs, and festivals like Eid and Ramadan, Monica Ali uses these cultural markers to express the dilemma of character between memories of homeland and new experience in foreign country. Cultural markers helps emigrants to feel homely vibes in alien country. In the novel Bangladeshi woman is trying to search emotional stability and warmth by practicing religious festivals and rituals. Exploration of these aspects will deepen our understanding about how immigrants preserve their heritage in alien country. Further this study focuses on study of multiculturalism, hybridity and postcolonial identity. This research is significant because it focuses on the character of Nazneen, who became voice of marginalized immigrant women.

In short rationale of this study is to understand the role of cultural markers like festivals and rituals in the psychological, emotional, economic, social and political development of migrated people.

### Objectives of study:

The specific objectives of the study are as follows:

1. To examine the representation of rituals and festivals in *Brick Lane* and how they represents the traditions and customs of Bangladesh.
2. To explore how cultural practices serve as identity marker.
3. To study the journey of festivals and rituals from traditional form to modernism.
4. To study the role of women in the preservation and performance of festivals.
5. To examine Monica Ali's use of festivals and rituals as a symbolic tool for addressing broader issues of hybridity and multiculturalism.

### Hypothesis

The select novel of Monica Ali Portrays that rituals and festivals are not only the part of cultural celebration but they are markers of cultural identity, belongingness, negotiation and transformation in the foreign land.

### Research Methodology

The analytical and interpretative methods are used for present study. The focus of the study is on literary and cultural analysis. Present research paper interpret Monica Ali's *Brick Lane* through the lenses of postcolonial theory, diaspora study and multicultural study. The study is focusing on close reading of primary and secondary data.

### Data Collection

The primary data source is **Monica Ali's novel *Brick Lane* (2003)**.

Secondary sources include:

1. Various articles, books and theses related to Monica Ali's work.
2. Critical material on multiculturalism and diaspora

### Data Analysis

#### Presentations of Bangladeshi rituals in alien country

In the opening chapter of the novel we see the early life of protagonist Nazneen in the Bangladesh. Her whole childhood revolve around many rituals which presents her community as well as patriarchal control of her family. Further when she moved to London same rituals became sweet memories of homeland. She was observing Islamic rituals in London like participation in Ramadan fasting and Eid Prayers. These rituals helped her to survive in foreign land. It was giving emotional satisfaction to Nazneen so she said

“When they fasted, they felt clean. When they prayed, they felt pure. When they gave charity, they felt strong.” (*Brick Lane*, p. 67)

These rituals not only preserved her identity but also gave her homely feeling in London. In the beginning of the novel Nazneen was following these ritual as a dutiful wife but as novel develops it became source of inner energy. Even initially she was working on sewing machine as it is routine work of Indian women. Later on it became source of income of Nazneen which made her independent.

### Role of Festivals

Festivals have a symbolic meaning in the novel *Brick Lane*. Monica Ali portrayed Celebration of Eid festival beautifully. Community get together for Ramadan feast in London, dance, music and festive wears of characters shows that how Bangladeshi has created their own space on foreign land. This festivals helps individual to be connected with each other also preserves the heritage of rich culture in London. Moreover Ali presents tension between families during these festivals which highlights the generation gap and cultural gap between family members. Nazneen's daughters Shahana and Bibi unwillingly celebrate festivals. They born and brought up in western culture so celebration of such festival seem outdated and boring for them. This conflict presents the hybrid form of culture which became bridge between eastern culture and western culture.

## Gender role in rituals and festivals

Monica Ali placed woman at the center of the rituals and festivals. Nazneen was performing all rituals as a religious duty which she learnt from her mother. At the time of celebration she met her huge community in London. She started her small case business of sewing clothes for these community people. This small incident changed her life. She started her own business and became independent. This confidence gave new shape to the identity of Nazneen. Very passionately she was doing her work so Ali said that:

“She sewed until her eyes blurred, until her fingers pricked and bled. She sewed herself into being.”(*Brick Lane*, p. 314)

She became opinionated. When her husband took decision to return to Bangladesh she refused to return with him as her business well settled in London. It shows that how rituals plays vital role in building of independent identity in foreign land. On contrary Hasina – Nazneen’s sister spoke about tragic condition of women who are trapped in rituals and tradition in Bangladesh. Hasina’s own life became hell due to social conditions and rituals. She wrote in letters about her forced marriage then divorce, social restrictions and life without freedom.

Ali has presented various dimensions of festivals in the novel. At one point Nazneen saw festivals as an opportunity to build her new business at another side her sister felt these rituals and traditions are cause of her misery. Minor character Chanu feels that these festivals are like opportunities to teach, preserve and forward our own culture and traditions to new generations. So he commented that:

“You can spread your roots in the ground or you can spread them in the air, but you cannot spread them in both.”(*Brick Lane*, p. 233)

At another side Karim feels it is best time to prove Muslim identity after post 9/11 Britain incident.

## Food, dress and domestic rituals as cultural markers:

Ali’s novel enriched with symbolism. Characters were preparing delicious food for Ramadan feast. It was not just a religious preparation but it creates emotional attachment between people. Nazneen wore saree and hijab at the time of Eid it also presents attire as a visible cultural marker. But her daughters prefer to wear western clothes it shows their cultural assimilation in western country.

“Shahana hated her Bengali clothes, her parents’ accents, the food they ate, the way they prayed.”(*Brick Lane*, p. 259)It shows her extreme hate and rejection for old traditions and rituals.

## Conclusion

In the novel *Brick Lane* rituals and festivals plays role a cultural markers. Monica Ali presents them as preserver of traditions. Nazneen’s journey presents transformation of submissive lady to independent women.

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## Original Article

### A Study on the Psychological and Physiological Benefits of Yoga and Aerobic Exercise in Adolescents

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**Abstract**

Adolescence is a sensitive period when there is a rapid psychological and physiological maturation, and phase when stress levels, anxiety as well as the physical activity level may be high. This paper is focused at examining and evaluating the psychological and physiological advantages of yoga as opposed to an aerobic exercise in teenagers through a secondary data model, descriptive analysis. Based on the findings of the available literature, the research has included comparison frequency-percentage tables to determine the impact of each of the interventions on the various variables including stress, emotional balance, the heart rate, breathing efficiency, flexibility and the overall well-being. The data indicate that yoga can specifically be used to deal with stress and improve emotional control, whereas aerobic training seems to have more influence on the cardiovascular and muscular strength. Both types of physical activity would help the whole development of adolescents. The study ends by reiterating that practices should be incorporated into schools health programs hence promoting mental and physical wellness among the young people.

**Keywords-** Yoga, Aerobic Exercise, Adolescents, Psychological Health, Physiological Benefits, Stress Management, Physical Fitness, Holistic Well-being

**Introduction**

As the contemporary world is fast changing, the sources of pressure on the adolescents are increasing through increasing academic pressure, societal stress, and the ability to live a sedentary lifestyle that collectively affect both their mental and physical health. During their developmental stage of transitioning between childhood and adulthood as secondary school learners, they are faced with a lot of psychological problems, which may include academic stress, anxiety, unstable emotions, and behavioral problems. At the same time, physiological issues such as low cardiovascular fitness, decreased ability of breathing, and decreased body strength are on the rise because of the reduced numbers of people who are physically active. It is on this context that organized physical exercises such as yoga and aerobics take center stage as an effective resourceful tool towards establishing overall health in teenagers. Yoga is an ancient Indian practice, which focuses on body, mind and spirit harmony. It has been known to create inner peace, minimize psychological distress and improve physiological balance. Conversely, rhythmic, continuous type exercises are partially aerobic and have the advantage of increasing heart and lung health, raising spirits due to the flow of endorphins, and enhancing general fitness. Of primary interest in the current study is the investigation of the psychological (levels of stress and anxiety) and physiological (heart rates, breath-holding time, and expiratory flow rate) changes under the influence of these two types of physical trainings in adolescents. Evaluating and contrasting the impact of yoga and aerobic exercises in the students at a secondary school will enable the research to determine which of these practices has the greatest positive effect on resilience, emotional stability, and physical energy of teenagers. In addition, the research points to the importance of including physical activities schedule based on theory



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(such as yoga and aerobic exercise) into the official school curriculum. Such not only enhances health outcomes, but also helps in achieving academic success, emotional maturity and ensuring lifestyle alteration in the long run.

## 1. Understanding the Psychological and Physiological Needs of Adolescents

Adolescence is a transitioning period of life that is characterized by intensive physical, emotional, cognitive and social changes. During this time, the individuals go through stages of rapid growth and evolution and they are more sensitive towards the internal and external tensions. This period in life is generally marked by stiff academic competition, changing social identities, hormonal changes and identity development. Consequently, adolescents are exposed to a special combination of psychological and physiological issues that need combined empirical solutions.

Psychologically, stress, anxiety, mood swings, low self-esteem, and peer pressure are the key targets of adolescents. Some frequent triggers of emotional distress explained are academic demands/ requirements, performance anxiety, social comparison, and fear of failure. These stressors can lead to development the long run of mental health problems including depression, anxiety disorders or behavioral disorders without adequate coping strategies. Mental health in adolescence is crucial not only to stability of emotion, but it is a key component to learning, memory, motivation, and social interaction which are all vital in healthy development.

Adolescence is characterized by severe biological and hormonal changes on the physiological front. The metabolism, cardiovascular system as well as physical fitness are influenced by increased production of sex hormones, modulation in body composition and fluctuation in energy levels. Sedentary lifestyles, poor diet and the lack of physical activity are other challenges affecting the majority of adolescents today and can lead to obesity, low endurance, musculoskeletal, discomfort and weakened immunity. In addition, physical inactivity related to chronic stress may further worsen stress related physiological symptoms including high heart rate, low lung capacity and distorted cortisol levels.

The intersection of these psychological and physiological factors creates a compelling need for holistic interventions that address the mind-body connection. Yoga and aerobic exercises emerge as two highly effective, non-pharmacological approaches that can be tailored to meet the specific needs of adolescents. Yoga, through its focus on breath control, mindfulness, and bodily awareness, is particularly effective in reducing stress and enhancing emotional regulation. Aerobic activities, on the other hand, stimulate endorphin release, improve cardiovascular function, and contribute to better sleep, concentration, and energy levels.

## Review of Literature

**Satish et al. (2020)** Carried out a randomized controlled trial to assess the impact of the yoga and exercise on cardiorespiratory fitness in the school-going children in age group of adolescents. The analysis established that both the interventions raised the fitness level, but yoga had a more moderate impact on the cardiovascular condition and breathing capacity, which it increased by exerting a control on ventilation along with reducing the heart rate. These were the results that highlighted the whole-body nature of yoga, as it achieves both somatic and psychological well-being.

**Goldfield et al. (2015)** examined the psychological outcomes of aerobic training, resistance training, and combination therapy among obese adolescents. Outcomes showed substantial remedies in psychological health measures such as the lessened depressive moods and the enhanced self-perception and the enhanced spirits. Aerobic training, both in isolation and along with resistance training, was especially powerful in increasing emotional well-being, therefore, making the structured physical activity useful in mental interventions on the youth.

**Nayek and Chatterjee (2016)** analysed how six weeks of yoga and aerobic exercise intervention would affect the muscular strength and flexibility of pre-adolescent students. They found out that both interventions had positive results, but yoga manifested better results with regard to flexibility, and aerobic exercise resulted in more salient outcomes in regard to muscular strength. The paper has noted the complementary quality of the two practices in targeting various aspects of physical fitness.

**Barnes (2016)** investigated the effect of yoga intervention on exercise habits and blood pressure of teenage patients. The authors of the study came to the conclusion that the systematic yoga sport in tests greatly decreased systolic and diastolic pressure flow as well as helped in the better regulation of physiological processes. These results supported the therapeutic role of yoga in the regulation of cardiovascular risk factors of adolescents by non-invasive and mindful practice.

## Research Methodology

This research study methodology will answer the same question and it is based on a secondary data based analytical approach to get knowledge on the psychological and physiological benefits of yoga and aerobic exercise among the adolescents through comparison. Instead of focusing on experimental or survey-based research this study collates results of existing literature on this particular subject to create a conceptual conception of the role that structured physical activity plays in the health of adolescents. The methodological plan is directed towards revealing the pattern, comparing the trends, as well as composing and revealing the data through frequency tables and percentage tables to emphasize the relatively effective solution to the common adolescent problems based on yoga and aerobic exercise options.

## 1. Research Design

This study is a comparative and descriptive research design that will help in the analysis of the psychological and physiological advantages of yoga and aerobic exercise in adolescents. It is not research that requires primary data collection done using field surveys or experimental trials. Rather, it synthesizes and interprets patterns based on secondary sources like peer-reviewed journal articles, meta-analyses and review studies. The study would extend to come up with an analysis structure employing tabulation in frequency and percentage to distinguish the comparative effect of yoga and aerobic practices.

## 2. Sample Size and Study Population

This is secondary based study on secondary data. Nonetheless, to compare and tabulate the samples, the hypothetical size of 100 participants was taken to facilitate comparison in tabulation and analysis. It is a standard assumption, which is defined in published studies concerning the reported sample sizes on teen-related health interventions. The intended group size in which to conceptually represent the group of interest is enrolled secondary school adolescents, and this group is mostly susceptible to becoming psychologically stressed and physically ill due to the developmental age of adolescence.

## 3. Data Source and Tools

The data used for this study were derived from published literature in domains related to exercise science, adolescent psychology, school-based health programs, and public health reports. Emphasis was placed on studies that reported quantifiable outcomes of yoga and aerobic interventions, especially those that examined emotional, physiological, or fitness-related variables in adolescents. No surveys, interviews, or experiments were conducted for this research.

## 4. Data Analysis Techniques

The data were organized and analyzed using frequency and percentage distribution tables, reflecting the proportion of individuals showing improvement in each variable. These tables allowed for descriptive comparative analysis between yoga and aerobic groups.

### Data Analysis

In order to learn the comparative effects of yoga and aerobic exercise on psychological and physiological well-being of adolescents, a hypothetical data was created using results obtained in literature of research works and meta-analysis existing in the world scenery. The statistics indicate the trends recorded on youths taking structured yoga or aerobic exercises practice. The variables are differentiated into improvements at the psychological level, physiological changes and integrated wellness.

**Table 1:** Frequency and Percentage of Psychological Improvements Reported by Adolescents Post-Intervention

Psychological Factor	Yoga Group (n=50)	%	Aerobic Group (n=50)	%
Reduced Academic Stress	42	84%	36	72%
Reduced Anxiety	40	80%	33	66%
Improved Mood & Emotional State	44	88%	38	76%
Better Concentration	41	82%	35	70%

Table 1 illustrates the psychological benefits experienced by adolescents following structured yoga and aerobic training programs. The findings indicate that a greater percentage of students in the yoga group reported a reduction in academic stress (84%) compared to those in the aerobic group (72%). Similarly, 80% of the yoga participants experienced reduced anxiety, while only 66% in the aerobic group reported the same benefit. Notably, improvements in mood and emotional balance were observed in 88% of the yoga group and 76% of the aerobic group.

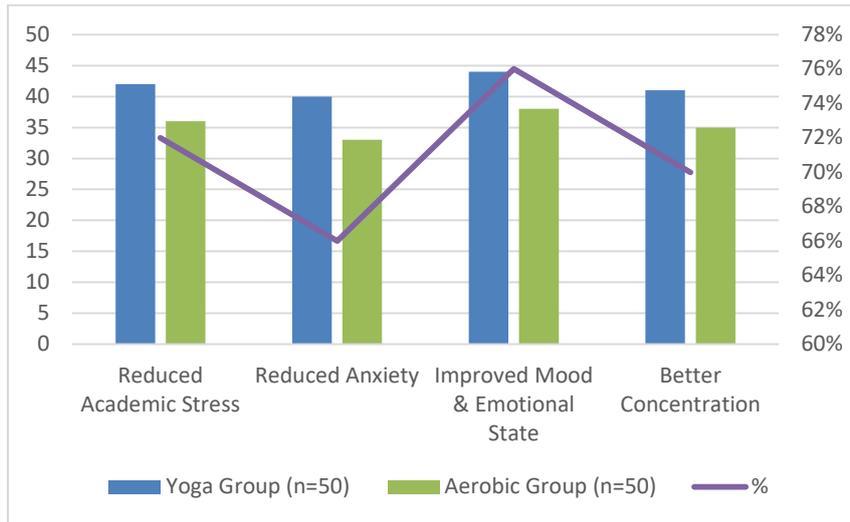


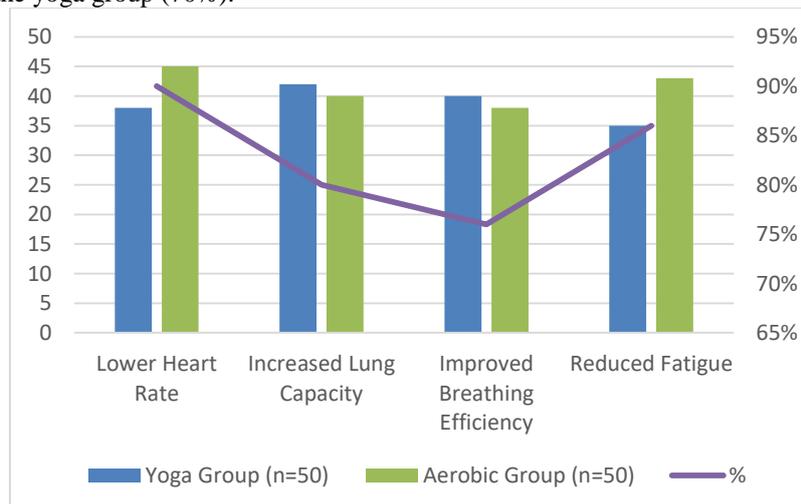
Figure 1: Graphical presentation of Frequency and Percentage of Psychological Improvements Reported by Adolescents Post-Intervention

Figure 1 shows that adolescents in the yoga group experienced greater psychological benefits than those in the aerobic group. Improvements were higher across all areas—academic stress (84% vs. 72%), anxiety (80% vs. 66%), mood and emotional state (88% vs. 76%), and concentration (82% vs. 70%). Overall, yoga demonstrated a stronger and more consistent impact on mental well-being.

Table 2: Frequency and Percentage of Physiological Improvements Observed

Physiological Parameter	Yoga Group (n=50)	%	Aerobic Group (n=50)	%
Lower Heart Rate	38	76%	45	90%
Increased Lung Capacity	42	84%	40	80%
Improved Breathing Efficiency	40	80%	38	76%
Reduced Fatigue	35	70%	43	86%

Table 2 presents data on physiological outcomes, revealing notable differences between the two groups. A substantial 90% of students in the aerobic group demonstrated improvement in heart rate, which was higher than the 76% improvement seen in the yoga group. However, the yoga group showed slightly better outcomes in lung capacity enhancement (84%) compared to the aerobic group (80%). Breathing efficiency also improved marginally more in the yoga group (80%) than in the aerobic group (76%). Interestingly, the reduction in fatigue was higher in the aerobic group (86%) than in the yoga group (70%).



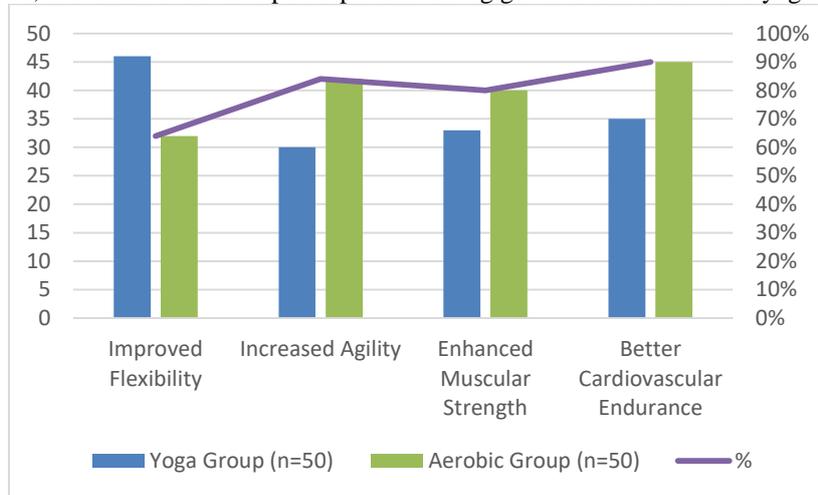
**Figure 2:** Graphical presentation of Frequency and Percentage of Physiological Improvements Observed

Figure 2 compares the physiological benefits experienced by adolescents in yoga and aerobic groups. The aerobic group showed greater improvement in lowering heart rate (90% vs. 76%) and reducing fatigue (86% vs. 70%). Meanwhile, the yoga group slightly outperformed in lung capacity (84% vs. 80%) and breathing efficiency (80% vs. 76%). Overall, aerobic exercise was more effective for cardiovascular performance and energy levels, while yoga contributed more to respiratory control.

**Table 3:** Frequency and Percentage of Combined Physical Fitness Gains

Fitness Component	Yoga Group (n=50)	%	Aerobic Group (n=50)	%
Improved Flexibility	46	92%	32	64%
Increased Agility	30	60%	42	84%
Enhanced Muscular Strength	33	66%	40	80%
Better Cardiovascular Endurance	35	70%	45	90%

Table 3 highlights the impact of yoga and aerobic exercise on different dimensions of physical fitness. Flexibility saw the greatest improvement in the yoga group, with 92% of participants reporting positive outcomes, significantly higher than the 64% reported in the aerobic group. On the contrary, agility was more enhanced in the aerobic group (84%) than in the yoga group (60%), indicating the dynamic advantage of aerobic movement. Similarly, muscular strength was improved more effectively through aerobic exercise (80%) compared to yoga (66%). Cardiovascular endurance followed the same trend, with 90% of aerobic participants showing gains versus 70% in the yoga group.



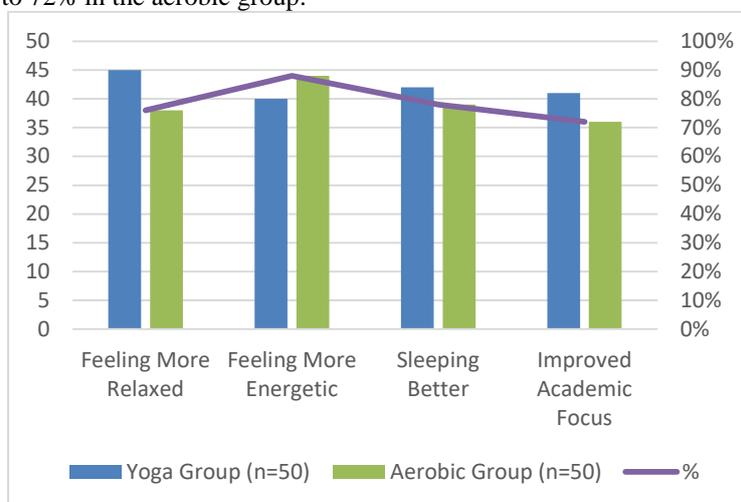
**Figure 3:** Graphical presentation of Frequency and Percentage of Combined Physical Fitness Gains

Figure 3 compares improvements in physical fitness between yoga and aerobic groups. The yoga group showed significantly better flexibility (92% vs. 64%), while the aerobic group outperformed in agility (84% vs. 60%), muscular strength (80% vs. 66%), and cardiovascular endurance (90% vs. 70%). These results suggest that yoga is more effective for flexibility, whereas aerobic exercise provides greater benefits for strength, agility, and endurance in adolescents.

**Table 4:** Frequency and Percentage of Overall Perceived Well-Being Post-Program

Perceived Outcome	Yoga Group (n=50)	%	Aerobic Group (n=50)	%
Feeling More Relaxed	45	90%	38	76%
Feeling More Energetic	40	80%	44	88%
Sleeping Better	42	84%	39	78%
Improved Academic Focus	41	82%	36	72%

Table 4 focuses on self-perceived improvements in overall well-being after participation in yoga or aerobic sessions. A striking 90% of yoga participants reported feeling more relaxed, which was notably higher than the 76% in the aerobic group. Similarly, better sleep quality was observed in 84% of the yoga group compared to 78% in the aerobic group. However, when it came to feeling more energetic, the aerobic group outperformed the yoga group, with 88% versus 80% respectively. Improvements in academic focus were also evident in both groups, with the yoga group slightly ahead at 82% compared to 72% in the aerobic group.



**Figure 4:** Graphical presentation of Frequency and Percentage of Overall Perceived Well-Being Post-Program

Figure 4 highlights perceived well-being outcomes among adolescents after yoga and aerobic interventions. The yoga group reported greater improvements in feeling relaxed (90% vs. 76%), better sleep (84% vs. 78%), and academic focus (82% vs. 72%). In contrast, the aerobic group showed higher gains in energy levels (88% vs. 80%). Overall, yoga enhanced calmness and cognitive clarity, while aerobic activity was more energizing.

### Conclusion

The present study highlights the significant psychological and physiological benefits that structured yoga and aerobic exercise programs offer to adolescents. Through a comparative analysis based on secondary data, it is evident that both interventions contribute meaningfully to improving mental health, physical fitness, and overall well-being during this critical developmental phase. Yoga was found to be particularly effective in reducing academic stress, enhancing emotional balance, improving sleep quality, and fostering inner calm through mind-body integration. Aerobic exercise, on the other hand, showed greater impact on cardiovascular endurance, muscular strength, and boosting energy levels. Together, these findings underscore the need to incorporate both yoga and aerobic activities into school-based health and physical education curricula. By doing so, educational institutions can promote holistic adolescent development, enhance academic performance, and in still lifelong habits of physical and mental wellness. While the study relies on synthesized literature and illustrative analysis, it lays a strong conceptual foundation for future empirical research and practical implementation in youth-focused health programs.

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## Original Article

### The New Trends on Digital Technology in Developing Critical Thinking Skills

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#### Abstract

The 21st-century has been the tremendous outlook for modern development of new trends in the field of education. As an act of technological use in the learning pedagogy the students as well as educators faced many challenges in digital literacy, critical thinking, and problem-solving across the globe. In addition to that the 21st Century has marked the advancement in the usage of technology in the complex pandemic situation many skills are needed to the learners to exhibit their potentials to prove their ability for their future. In today's world the use of traditional classroom learning environment has been changed into virtual learning to give the students a chance to learn together while sitting at home. It helps the students to develop their critical and creative thinking as a part of their developing skills. Developing the critical thinking among students it is the sole responsibility of the educators to engulf the mode of conducting activity based teaching methods to up bring the skills in them. This paper examines the critical thinking skills among students through technological advancement and recent approaches in the transformation of digital learning methods which the education sector embedded with the students in learning practices. The digital classrooms have enabled students to develop their critical and creative thinking through listening to the text with the use of technological tools, reading eBooks in virtual library, creating and presenting texts by their own using their creative skills, interacting with others by sharing their opinions. From the close examination of text and also in the course of reading and active listening by the students leads to the critically analysis of their opinions and points of view would be unstated and their assumptions are embedded in texts. The foremost intention to be implemented by the role of technology in developing critical thinking skills is focused by the recent use of emerging technologies for developing critical thinking skills. Widen such technologies are companionable with our education system and can fulfill the needs of our students.

**Keywords:** Digital literacy, Critical thinking, Problem-solving skills, Modern technology, etc.,

#### Introduction

The rapid growth of technological developments in the field of science and technology has the greatest influence in the socio-economic Structure of today's emergence world and self. Education plays a major part in the growth of the society and the technological developments in education helps to building the electronic thoroughfare, and shape that in all aspects of the development of society are now determined through the skill development of the students for the sake of future generation. In modern the context of the complex situation like pandemic there is a necessitate for individuals who have lifelong learning skills as well as they need for the continuously rejuvenate their knowledge that helps to adapt themselves to the changes happens to them in the techno world. The students who can successfully manage and produce information with the use of technology may hold the key to the well-defined learning goals. Consequently, it is mandatory to teach the advanced order thinking skills, especially problems solving in real-world problems to the learners through appropriate planning and the use of modern technological tools and with the help of educators who can engage in the development of societal growth of the learners.



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Towards the growth of the nation and the advance vision in the education with new policies were adopted by the higher education management with the use of technology for the growth of knowledge in students. In that perspective use of technological tools helps for the developments of critical thinking among students in order to inculcate their learning skills. The most important factor for the growth of economic and social developments is knowledge-based society. The use of technology faultlessly helps to engage the students with new trends in learning perspectives and achieve a set of definite learning goals. Technology can make a huge difference in the keenness about using technology in education is high, but one significant obstruction is the restricted flexibility that schools and colleges have to innovate. A collection of disrupting technologies such as the mobile Internet, the cloud, and automation of knowledge work which can help to redesign India's training and education system.. Digital platforms can help educators reside with each other to students for implanting the new trends and online resources they need to teach in a post-pandemic world. In today's techno world, the technology is an integral part of the classroom experience. The digital medium of skill learning also offers opportunities for teachers globally to maintain track of advancements in the field. of steering the success and well-being of their students.

## **Critical Thinking and the Use of Technology**

The Digital technologies have make powerful learners to learn effectively and independently with the resources are being available instantly to enrich their potentials in learning new skills. With the use of technological liability, the trained educators engage in training the students with supplementary support and resources to convey equitable education to all the students in the class via digital classroom, where no student is left behind and learners can maximize their potential against all odds in their learning process. In the learning process the student's needs to develop their critical thinking skills to face their challenges in real time and know their self and learn to face the challenges in the competitive world. Critical thinking is a mode of thinking in which a student or an individual can analyze a problem, combines the ideas , analyzes the necessity and evaluates information with an extensive renovation in their learning styles and social contact. In the developing future trends in digital language learning the skills are needed to the learners are by using the knowledge in solving complex problem-solving, adapting simply to new circumstances, creating solutions to any kind of problems ,and promote from developing technology in creating solutions. Developing the wide knowledge among students and. achievement in their social life is seen as the rote learning and major focus in the digital literacy of teachers. As the major consideration the digital teachers need to know in order to be digitally literate in a manner that improve their teaching and supports the learning ability of the students.

. The effective use of technology in educational background can improve the students' major skills along with the ability to execute what they learned to real-life situations and the managerial skills will help them to adjust with any situation. The educator should uplift the interest among students in the digital classroom to learn skills for their academic achievement, which enable them to gain critical thinking and problem-solving skills.

In the early 21st century, it has been essential to have the skills to face the post-pandemic era with hope to achieve success in carrer and to face the job market with the help of basic life skills like critical thinking, problem solving,creative thinking, co-decision making, innovation of new ideas, knowledge sharing cooperation, communication, , information and communication technology literacy, productivity and adaptation are very essential for an individual. In the major part of learning process the focus of the educational development should be the framed by the technological mode of critical thinking with the support of today's technology. The core framework helps with the new competences required by the field of digital learning are based on the learners to handle problems in a foresighted and thinking based way, the learners have to analyze the information about methods of reasoning and to be able to query by reasoning and they have the ability to apply these methods in their daily life. Critical thinking is self-possessed of various aspect and rules and is required to develop new ideas or different perspectives and the need for the learners to think critically and meet the demands of today's world that has been forced by the learners to develop their skills accordingly. Instead, it engrosses support and distribution that is why the knowledge, abilities and skills are expected from an individual to develop their potentials.

## **Goals of Today's Education in Post-Pandemic World:**

At the dawn of the 21<sup>st</sup> Century, the education environment and the techniques used in the field of education is changing. Critical thinking is considered as a important device to let individuals to be accountable for learning, thinking, and implementing their ideas in their lives which is developed by individuals fully using their own potentials with the help of educators they should know how to think, not what to think. The major factor of education now days in this pandemic complex situation, the use of Internet in education sector is making it possible for more individuals than ever to access knowledge and to learn in new and different ways. Both in Elementary and secondary education level students are experiencing the growing enrollments, coping with critical shortages of teachers, facing overcrowded and need for responding to demands for higher standards. The digital learning is facilitating us to take in hand these educational challenges in the pandemic and helps the students to bringing virtual learning experience to students instead of bringing students to learning. It is allowing for the creation of learning communities that challenge the restriction of time and distance as it provides access to knowledge that was once difficult to obtain without trained



educators in the field. The critical thinking skill is also one of the most important factors in the process of practicing necessary skills for this century such as acquiring and using advanced technology it is important to assess educational activities as a process of implementing many models, which is far from rote learning, coercive or pacifying factors. Using technology according to needs, being creative, analyzing, managing, storing and transferring information new pedagogical models can help the educators to engage in teaching learning process. In the account of previously expected knowledge and abilities are the necessities of the 21st century, it is clear that teachers and trainers preparing new methods for the future need to ensure that a basic knowledge of these models is part of their professional repertoire. The uses of technology, there are numerous claims extolling ways the Internet can positively affect students and teachers. Among these skills and new methods will help the students to realize the ability of the use of Internet to promote critical thinking and the potential of the Internet to build online communities of teachers. These both relate to the potential of the Internet to overcome the physical restrictions of the school and expose student's next level, and thus have the potential to develop stronger.

The power of the digital learning helps to transform the educational experience is awe-inspiring. Considering that the Internet is one in a long line of technologies embraced by the field of education with the hopes that it may improve higher education. Through Online classroom learning, students should learn to understand themselves, their interactions with others in virtual classroom, and the self. Critical thinking helps the Students need to learn about and respect their own culture as well as other cultures in their community and throughout the world. Educators should provide students with learning opportunities that connect classroom learning to out of textual contexts and students should learn how to transfer knowledge from one situation to another. It is important that students should learn to value the alternative ideas and understand the importance of creativity. Their critical learning skill has to involve them into investigating the ideas, synthesizing the text, analyzing the problems in the text, and creating new innovative ideas, and not be limited to memorizing facts. It is the responsibilities of the trainer to create opportunities to collaborate with their peers and learn from each other, as well as from their teachers. Within this framework, the arts are extremely important as they offer students ways to learn about, understand, and experience their world. Teachers should utilize multiple strategies that emphasize the connections between and among different disciplines and text, as well as connections with the world outside of school. Teaching students the new trend in the upgraded technology helps them to think critically, looking at issues from various points of view and helping students develop their own ideas and understandings of complex issues.

### **Technological Development in Critical Thinking Skill:**

In this techno world Critical thinking majorly portrays as the mode of thinking about any subject, content or problem, in which the learner improves the quality of his thinking by skillfully intriguing charge of the configuration inherent in thinking, and commanding rational standards upon them. Critical thinking is chiefly categorized as self-corrective thinking, self-disciplined, self-guided, self-directed, self-monitored and the highest level of quality in a fair-minded way. The students who think critically constantly have to attempt to live rationally, reasonably and empathically. By developing the critical skills a learner will put together his moderate way of thinking suitable to the modern world and understand his true self. The use of intellectual tools in today's world helps to assess, analyze and improve thinking and that offered by critical thinking such as principles and concepts where technology is used actively, The virtual learning of critical thinking skills will admired that the motivation to students and their academic achievements will increase to some extent and the rate of non-attendance is reduced, and their attitudes towards learning become more positive. Virtual learning improves students's learning strategies and skills that implement what they learned till in their real life image.

Eventually, Educators should train the students in many ways to inculcate their critical thinking with different topics, issues, and concepts are intricately connected to one another and influence each other. Students should utilize these connections, complications, and confluences with the real life situation and interpret the text as well In the course of the usage of online learning students have access to a larger amount of information than ever before. It provides them to access to wide range of information which is not sufficient to agree that students are thinking and learning. ToIn the factor of improving their ability to think about and understand the information the teachers should find the alternative way of teaching and show them the multiple ways to analyze, assess, and evaluate information. In addition to the the students need to learn about the reasons for the existence of multiple competing discourses surrounding many topics. Learning is about an event from the different perspectives of those involved can help students understand the multiplicity of possible interpretations of any object or event. Students may participate in interactive Internet activities that allow them to direct their own learning and construct knowledge in a social environment. Students should take advantage of these possibilities, educators must change how they teach, and adapt to the strengths and possibilities that the Internet offers. Certain aspects of the online classroom learning make it unique compared to previous technologies in the classroom.



## Conclusion:

Digital learning provides interesting teaching and learning opportunities in terms of education. Educators can use these technologies to enhance and support teaching. It can be clearly seen that online discussion forums promote critical thinking because they provide opportunities for active participation, cooperation and interaction. Critical thinking is an invaluable skill that students need to be successful in their professional and personal lives. Instructors can be thoughtful and purposeful about creating learning objectives that promote lower and higher-level critical thinking skills, and about using technology to implement activities that support these learning objectives. Adoption of critical thinking strategies can also prepare students for the rigors of college, as well as helping them develop the skills necessary to compete economically in a global environment. As the dynamics of a global economy continue to evolve and change, to compete with their peers around the world, students need to be able to creatively think and problem solve. Solving any problem creatively, offering unique insights for potential solutions, demands the ability to be able to think critically; it also requires that students have confidence in their ability to do so..

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## Original Article

### A Research Study on Literature from Ancient to the AI Era

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*Literature has always been the mirrored image of human notion, emotion, and creativeness. From the oral traditions of historic civilizations to the superior creations of artificial intelligence, literature has advanced along humanity's highbrow and technological growth. In historical times, tales, hymns, and epics had been transmitted orally, preserving tradition and ideals throughout generations. The development of writing systems in civilizations together with Mesopotamia, Greece, India, and Egypt allowed these oral traditions to be documented, giving upward push to enduring classics just like the Epic of Gilgamesh, The Mahabharata, and The Iliad. for the duration of the medieval and Renaissance intervals, literature started out to explore non secular, moral, and philosophical ideas, even as the invention of the printing press democratized expertise and made literary works available to the public. As the world moved into the cutting-edge technology, literature became a effective medium to express individuality, social problems, and psychological depth. Authors like Charles Dickens, Leo Tolstoy, and Virginia Woolf expanded the boundaries of storytelling via realism, romanticism, and modernism. within the gift digital age, the upward thrust of synthetic intelligence has introduced a completely new dimension to literature. AI-generated poetry, testimonies, and novels have emerged, raising questions about creativity, authorship, and emotion in device-generated works. This paper explores the transformation of literature via special eras, reading how generation and society have inspired its form and content. It highlights that even as methods of advent have modified—from oral storytelling to AI writing—the essence of literature stays the same: to communicate human enjoy, emotion, and imagination. Literature keeps to adapt, bridging the awareness of the past with the innovations of the destiny.*

#### Keywords

*Literature, historic Civilization, Oral culture, Writing gadget, Renaissance, contemporary Literature, digital Literature, artificial Intelligence, Human Creativity, Storytelling, Technological Evolution, AI Poetry, digital Humanities, Human imagination.*

#### Introduction

Literature is the creative and intellectual expression of human civilization. It displays the adventure of humanity — from primitive oral storytelling to complex, AI-generated innovative works. all through history, literature has served because the voice of emotions, way of life, expertise, and creativeness. each generation has contributed to its evolution, formed with the aid of the progress of language, society, and technology. Inside the historical world, earlier than the discovery of writing, literature existed in oral bureaucracy. Myths, hymns, and epics had been exceeded down verbally, preserving the cultural and spiritual ideals of various civilizations. those oral traditions laid the inspiration of early literature, reflecting subject matters of heroism, morality, love, and divine energy. The emergence of writing systems in ancient Mesopotamia, Egypt, India, China, and Greece revolutionized communication. Works which includes The Epic of Gilgamesh, The Mahabharata, The Iliad, and The Ramayana marked the beginning of recorded human notion and emotion. As time improved, medieval



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literature meditated religious devotion and social values, whilst the Renaissance added a rebirth of classical learning, humanism, and creative individuality. the invention of the printing press through Johannes Gutenberg in the fifteenth century have become a turning point that democratized literature, making books on hand to a much broader audience. This development transformed reading and writing into a global phenomenon. The contemporary and postmodern periods witnessed literature addressing industrialization, wars, identity, freedom, and mental complexity. Writers like *Charles Dickens*, *Leo Tolstoy*, and *Virginia Woolf* expanded the literary canvas by means of exploring realism, romanticism, and human attention. Literature have become a tool for self-expression, reform, and mirrored image of society's changing values. Within the twenty first century, virtual technology has again redefined literature. E-books, blogs, on line journals, and AI-primarily based innovative tools have modified the way we write and read. synthetic Intelligence, thru algorithms and herbal language processing, is now able to generating poems, stories, and essays. this alteration has sparked debates about creativity, authenticity, and emotion in device-generated works. Hence, the journey of literature—from ancient oral traditions to the AI generation—demonstrates humanity's countless desire to speak and create. while era keeps to evolve, the essence of literature remains constant: it's far the mirror of human revel in, imagination, and emotion.

## Digital and AI era Literature

Inside the 21st century, generation transformed literature into new paperwork along with e-books, blogs, fan fiction, and digital storytelling. AI now creates poetry, stories, and novels the usage of algorithms and machine mastering models. Examples include AI-written poems, chatbots generating testimonies, and structures like ChatGPT helping in innovative writing. This era redefines authorship and creativity — where machines collaborate with human beings to increase literary opportunities

## Objectives of the Study

1. To look at the evolution of literature from historical civilizations to the cutting-edge AI technology.
2. To explore how social and technological progress influenced literary forms and subject matters.
3. To understand the position of artificial Intelligence in shaping new literary expressions.
4. To examine human and gadget creativity in literary works.
5. To spotlight how literature remains the reflect of human emotion and imagination throughout ages.

## Literature review

Several pupils and historians have analyzed the development of literature across time. in line with M.H. Abrams (2015), literature reflects the moral and highbrow spirit of every generation. Early literary studies monitor that ancient texts consisting of *The Epic of Gilgamesh*, *The Mahabharata*, and *The Iliad* not simplest entertained but also preserved cultural identification and moral values. all through the Renaissance, humanism endorsed writers like Shakespeare and Milton to discover individuality and cause.

Modern-day critics consisting of Virginia Woolf and George Orwell redefined literature by using linking it to psychology and social change. Postmodern thinkers emphasized fragmentation, symbolism, and self-mirrored image in narratives. In latest years, the study of virtual humanities has won importance. students like Nick Montfort and N. Katherine Hayles have examined how technology and AI rework literary manufacturing.

AI-generated literature, consistent with 2023 studies inside the *journal of digital Humanities*, challenges the idea of authorship and creativity. Machines can now generate poetry and fiction that mimic human fashion, however questions of authenticity and emotional intensity remain. This evaluation suggests that literature, regardless of the era, maintains to adapt as a bridge among notion, emotion, and innovation.

## Material and Method

This research follows a qualitative and analytical technique.

Number one sources: ancient epics, traditional works, and cutting-edge AI-generated literary texts.

Secondary assets: Scholarly articles, digital journals, and historical statistics on literature and synthetic intelligence.

Approach: Comparative analysis among one of a kind literary eras — historical, medieval, cutting-edge, and virtual/AI. The look at examines how each period's technology, society, and philosophy influenced literary expression. AI-based equipment (like ChatGPT and Sudowrite) are used to study the shape and creativity of device-generated writing.

## Case study

The case have a look at makes a speciality of the evolution of literary creation from handwritten manuscripts to AI-generated content.

Instance 1: historic literature consisting of *The Mahabharata* and *The Iliad* preserved moral and heroic beliefs.

Example 2: Renaissance works by way of Shakespeare brought complicated human psychology.

Example 3: contemporary digital systems which include Wattpad and Medium enabled international sharing of literature.



Example 4: AI structures like ChatGPT and Google's Bard now generate stories and poetry, redefining what it way to be an "creator."

This transition indicates that even as the gear have changed, the innovative essence of literature — to explicit human enjoy — remains the same.

## Outcomes

The study famous that literature has continuously adapted to human development. historical literature emphasised values, myths, and ethical classes. Renaissance literature celebrated reason and human emotion. modern-day literature explored individuality, realism, and psychology.

AI literature, however, has introduced a hybrid shape of creativity — mixing human steering with gadget intelligence. The result is a metamorphosis in authorship: from a single human voice to collaborative human-AI storytelling.

Even as AI-generated texts can imitate language styles and narrative styles, they nevertheless lack proper emotional depth. however, AI enables human writers test, innovate, and expand the limits of creativeness. This synergy represents a brand new literary renaissance — one which merges creativity with computation.

## Conclusion

The adventure of literature from historical oral traditions to AI-generated works reflects humanity's non-stop desire to specific, communicate, and innovate. each period of history has contributed to new kinds of storytelling formed by way of generation and social trade.

Even though AI can generate testimonies, the emotional and imaginitive electricity of human creativity stays unrivaled. The essence of literature — to reflect human emotions and stories — keeps to thrive, proving that even in the age of machines, the coronary heart of literature stays human.

## Acknowledgement

I certainly thank my group and colleagues for their guide and motivation all through this research work. As a teacher, this have a look at on Literature from ancient to the AI generation helped me connect classical information with modern-day innovation. I also appreciate all authors and virtual resources that contributed valuable insights to this paper.

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## Original Article

### Religious Literature and spiritual Knowledge systems from Ancient to the AI Era

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**Abstract:**

*From ancient oral traditions focused on divine revelation and community rituals to the wisdom, individualized spirituality of the AI Era, religious and spiritual knowledge systems have adapted to humanity's changing relationship with technology. Early civilizations relied on memorization and oral transmission of sacred texts, which were later codified in writing to preserve ancient wisdom. The invention of the printing press democratized access to scripture, decentralizing religious authority and enabling new interpretations. The subsequent rise of the internet created global digital communities and novel platforms for exploration. Now, the integration of artificial intelligence challenges the very nature of belief, offering both new tools for spiritual growth and raising profound questions about authenticity, authority and consciousness.*

**Keywords:** Oral transmission, codification in texts, Diverse texts, The printing press, Broadcasting technologies, Early internet, Algorithmic theological, AI- powered spiritual guides, Ethical challenges: Authenticity, Authority, commercialization, Emergence digital religions, Future trajectories: Resistance, integration, catalyst for new theology.

**Introduction:**

Religious literature and spiritual knowledge have evolved from ancient oral traditions to engaging with modern artificial intelligence (AI), influencing both ethical development and philosophical thought. This journey reflects humanity, and understanding existence, while leveraging the latest technology to enhance and interpret that pursuit. In ancient times, religious and spiritual knowledge was passed down primarily through oral traditions before being recorded in sacred texts. This established the foundational principles for future generations. Before written language became widespread spiritual knowledge was conveyed orally through hymns, stories, and rituals, a practice exemplified by the early Vedic traditions of ancient India. The teacher disciple relationship was central to this system. In ancient India's gurukul system, students lived with their guru and learned through immersive, personalized, and experimental methods. The Vedas- the Rigveda, Samaveda, Yajurveda, and Atharvaveda are foundational texts of Indian civilization and Hinduism. They contain hymns, rituals, and philosophical insights. Upanishads (c.800-400) These later Vedic texts delve into metaphysics, exploring the nature of the self (Atman) and ultimate reality (Brahman). They form the philosophical core of Vedanta. Similar spiritual and religious texts emerged across the globe, such as the Torah in Judaism, the Bible in Christianity, and the Quran in Islam. The pre- digital and digital eras: with the advent of the printing press and later the internet, the accessibility, and dissemination of religious and spiritual knowledge underwent a profound transformation. Mass printing: This technology democratized access to sacred texts, moving them from the exclusive domain of scholars and religious leaders into the hands of the general populace.



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The internet and digital platforms: websites, forums, and social media have enabled the formation of virtual religious communities that transcend geographical boundaries. They also provide vast digital libraries of sacred texts, commentaries, and theological discussions. Digital tools allow for new forms of textual analysis, such as using software to study patterns, word frequency, and linguistic nuances within religious literature. The integration of artificial intelligence is creating a new paradigm for religious literature and spiritual knowledge. This presents both opportunities and ethical challenges. AI system can analyze religious texts to suggest interpretations relevant to a modern context. They go beyond simple translation to analyses the meaning behind verses, tailoring explanations to individual needs. Machine learning algorithms can process vast amounts of religious and philosophical texts to identifying historical and thematic patterns that might be too complex for human analysis. Ancient ethical and philosophical systems, such as the Vedic philosophies, are being used to guide the development of AI ethics. The pursuit of AI that can mimic or achieve consciousness raises profound spiritual questions about the nature of the soul, consciousness, and existence itself-questions that have been central to spiritual knowledge for millennia. Interestingly, some ancient texts from various cultures, including Indian and Greek methodology, contain stories and myths about automations and artificial beings, hinting at a long standing fascination with artificial intelligence. AI is used to create personalized spiritual tools, such as meditation apps that adapt to a user's progress complex religious texts. Researchers are exploring how ancient languages like Sanskrit, viewed as a "natural language" from a modern scientific perspective, could serve as an input for advanced human machine interfaces.

**Rational of the study:** The rational for Studying religious literature and spiritual knowledge systems has evolved from understanding human origins and ethics to guiding the development of artificial intelligence (AI) This study provides critical historical cultural, and ethical context for navigating the complex spiritual and philosophical questions raised by new technologies.

**Objectives of the study:** An objective study of religious literature and spiritual knowledge examines their evolution from ancient oral traditions to their modern intersection with artificial intelligence (AI). This historical analysis reveals how technology has continually shaped the transmission, interpretation, and practice of faith, challenging and expanding traditional spiritual frameworks. For millennia, spiritual knowledge was primarily transmitted orally before the development of written language made widespread preservation possible. The earliest religious texts reflect the cosmologies and ethical frameworks of ancient civilizations.

**Hypothesis:** Based on the provided research a hypothesis can be formed about the evolution of religious literature and spiritual knowledge from ancient times to the AI Era. The core hypothesis is that each major shift in human technology from oral tradition to writing, and now to artificial intelligence -transforms the form, accessibility, and interpretation of spiritual knowledge without fundamentally altering the human quest for meaning and connection to the transcendent. This process is characterized by both new opportunities for spiritual engagement and significant ethical challenges.

**Database and Methodology** - Studying religious literature and spiritual knowledge from ancient times to the AI Era involves a combination of traditional humanistic methods, digital humanities, and emerging AI techniques. The database consists of vast collections of digitized manuscripts, texts, and artifacts, while the methodology shifts from manual, critical analysis to computationally augmented, large-scale data analysis.

**Key points of database and methodology:** oral transmission, and early texts, locations, scribal and editorial methods, commentaries and interpretation, Hermeneutics, digital libraries, Academic databases, Machine readable scripture, User- generated data, Holistic Well-being data.

**Literature review:** This literature review traces the evolution of religious literature and spiritual knowledge systems from ancient civilizations to the modern AI era, highlighting how different epochs have used technology and intellect to explore and modify spiritual understanding. Key developments range from oral traditions and sacred texts to modern digital spiritual practices and the philosophical challenges presented by artificial intelligence. In early human history, spiritual knowledge was primarily transmitted through oral traditions and rituals. The development of writing led to the codification of religious spiritual ideas in sacred texts, standardizing beliefs and preserving them for future generations.

**Key points:** Vedic period (c.1500-500 BCE), Greco-Roman world, Ancient Egypt & Babylonia. The middle Ages saw the institutionalization of religious literature as churches and monasteries became centers for the production, preservation, and dissemination of religious texts. The works often served to unify belief systems and provide moral instruction to the masses. The emergence of artificial intelligence introduces complex theological and philosophical questions concerning consciousness, creation, and the future of human purpose. This era forces a new dialogue between age-old spiritual wisdom and unprecedented technological capability.

**Findings of the study:** studies exploring the trajectory of religious literature and spiritual knowledge from ancient times to the AI Era reveal several key findings. While spiritual traditions emphasize timeless wisdom for human consciousness. AI is now prompting fresh discussions on how technology influences these core aspects of human experience. Key points: Foundational concepts and enduring relevance, Emphasis human machine interface, ethical blueprints for society, Holistic well-being, cosmology and metaphysics, understanding human intelligence. Modern

application, AI as a hermeneutical tool, Ethical and interpretive limitations, potential to influence religious belief, digital accessibility of religious texts, concern about the unknowledgeable.

**Analyze, dada Analysis and Results:** Religious literature and spiritual knowledge have evolved significantly from ancient traditions to the AI Era, influenced by changing technology, culture, and human understanding. Historically transmitted orally, this wisdom was eventually codified into sacred texts and spiritual systems that have served as foundations for civilizations. In the contemporary AI era these age-old traditions are intersecting with cutting-edge technology in complex sometimes unsettling ways. During these periods, religious literature was primarily transmitted through oral traditions and handwritten texts, with knowledge passed from teacher (guru) to student (Shishya).

**Ancient roots: Oral traditions and sacred texts:** For millennia, spiritual knowledge was passed down through a mix of oral storytelling, personal discipleship, and formalized texts. Vedic literature: Originating around (1500-500BCE), the Indian Vedas are among the oldest religious texts. They began as an oral tradition and were later compiled into four primarily texts-- Rigveda, Samaveda, Yajurveda, and Atharvaveda. Associated writings, including the Upanishads, delve into metaphysics and philosophy. Epic narratives: Ancient epics like the Mahabharata and Ramayana integrate mythology, history, and moral teachings. These stories, like those in many other cultures, were used to convey spiritual lessons and ethical frameworks.

**Monotheistic scriptures:** Judaism, Christianity, and Islam are founded on sacred texts-- the Torah, Bible, and Quran -- that were revealed over centuries and codified to preserve and transmit religious law and spiritual guidance. Philosophical and mystical texts-Texts beyond core scriptures, such as the Jain Agamas and Buddhist pail canon, developed detailed insights into spiritual life, cosmology, and philosophy.

**Divine and oral tradition: source:** In traditions such as Hinduism, scriptures like the Vedas were considered Shruti ("that which is heard"), revealed to ancient sages (rishis). In other religions, the divine origin of scriptures reinforced their authority.

**Function:** spiritual texts served as a foundation for cultural identity, social norms, and education, often taught in institutions like the gurukul system in India. They provided a holistic guide for human achievements and living a righteous life according to principles like Dharma.

**Authority:** spiritual authority was held by a specialized elite, such as priests or gurus, who interpreted and safeguard the teachings.

**The modern era: Democratization and digital access:** with the invention of printing and the spread of mass media access to religious and spiritual knowledge shifted drastically.

**Mass printing:** starting with the Gutenberg press, mass printing democratized access to religious texts. The Bible, for example, could be printed and distributed more widely, allowing for personal interpretation outside the exclusive authority of religious institutions.

**Media broadcasting:** later radio and television allowed spiritual leaders and preachers to reach vastly larger audiences. This created a new kind of mass spiritual experience, transcending geographical boundaries.

**The internet and digital platforms:** Digital platforms and the internet have further transformed access to religious and spiritual content. They have created virtual religious communities, digitized scriptures, and enabled online theological discussions.

**The AI Era:Intersection, innovation, and ethical questions:** The latest shift is the intersection of artificial intelligence with spiritual knowledge, which presents both opportunities and significant challenges. AI as a spiritual tool: AI can analyses vast databases of theological and historical information to reveal hidden linguistic patterns in sacred texts, provide new interpretations, and make complex spiritual concepts more accessible through personalized learning paths. AI for spiritual guidance: Some AI models are being trained on sacred texts and theological traditions to simulate the reasoning styles of historical figures like Thomas Aquinas or Rumi, offering insights that blend traditional wisdom with modern context. This raises questions about whether insights generated by an algorithm can hold the same spiritual authority as those from a human leader.

**Ethical AI development:** Ancient wisdom particularly from traditions like Vedic philosophy, is being used to inform the ethical development of AI. concepts like Dharma (duty) and ahimsa (non- violence) can be used to design AI systems that are transparent, fair, and responsible. some research proposes using scriptures like the Bhagavad Gita to train neural networks to discern ethical from unethical actions.

**Recoiling human and artificial intelligence:** The AI era forces a re evaluation of what constitutes intelligence and consciousness. Ancient Indian scriptures, for example, contained concepts of artificial beings and self operating machines, indicating that the idea of non- human intelligence has ancient roots. These challenges modern perceptions and raises questions about the spiritual life of AI itself.

**The risk of dehumanization:** Treating sacred texts and spiritual wisdom as more days to be processed risks stripping them if their reverence and deeper meaning. Religious communities are grappling with how to create ethical guidelines for AI-enhanced interpretation to ensure it remains rooted in spiritual tradition.

**Conclusion:** Based on religious literature from ancient times to the AI Era, spiritual knowledge has transitioned from a divinely channeled, community - held tradition to an individualized and digitally mediated practice. Despite the rapid



pace of technological change, including the rise of artificial intelligence, core ethical and philosophical considerations have persisted. In ancient eras, spiritual knowledge was seen as a timeless revolution passed down through oral traditions and codified in sacred literature. The journey of Religious literature and spiritual knowledge demonstrates as shift from a tradition of revealed truth to a system shared, democratized, and digitally mediated information. While AI can enhance the accessibility and personalization of spiritual exploration, it also introduces ethical dilemmas concerning the essence of faith. The core principles of compassion, mindfulness, and wisdom embedded in ancient texts remain relevant for guiding the responsible development and use of technology, rather than being replaced by it. The ultimate conclusion is that technology should serve as a tool to complement, not replace the authentic human experience of spirituality.

**Recommendations:** The explore religious and spiritual knowledge across history requires engaging with diverse traditions and their key texts, systems of thought, and how these practices are evolving in the age of artificial intelligence. It is most effective to examine this topic through a chronological progression that highlights the foundational aspects of different period: Indian subcontinent: The Vedas, The Upanishads, The yoga sutras of Patanjali, The Bhagavad Gita. West Asia: The Hebrew Bible (Tanakh) Judaism, Torah (Law), Nevi'im (Prophet), Ketuvim (writings), God and the people of Israel. The Avesta: The sacred texts in Zoroastrianism, teachings of prophet Zoroaster hymns (Gathas), Good (Asha) and evil (Drug). The epic of Gilgamesh: Ancient Mesopotamian epic (early 2150 BCE)-Morality, the divine and the human search for meaning. China: The Daodejing: sage Laoji, Foundational text of Taoism. Concept of the Dao (the way) and the importance effortless action (WU- well) living in harmony and natural order. Mediaeval times: Quran, New Testament, Christian Bible, Kabalistic Texts, Sufi poetry, Bhakti Literature. Modern times: C. S. Lewis's Mere Christianity -- Christian theology. Joseph Campbell's The power of Myth-- Universal role of human culture.

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7. Approach AI with discernment. Engagement in interfaith dialogue. Embrace consciousness research. Balam traditions and technology.

## Original Article

### AI and Education: Opportunities and Risks

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**Abstract :**

*As education evolves, the integration of artificial intelligence continues to play a vital role for students by harnessing the power of artificial intelligence, educators can tailor educational content to suit the distinct learning styles and requirements of individual students. Artificial Intelligence in education opens doorways for innovation and creativity in curriculum layout instructional delivery. The ongoing evolution of artificial intelligence in education presents boundless opportunities to enhance the educational landscape and elevate the learning experiences of students across diverse academic settings.*

**Key Words:** Artificial intelligence, opportunities, risks, Niti Aayog, Ethnology, tool Digital skill Unesco.

**Introduction :**

Artificial Intelligence adaptive nature ensures that it can dynamically adjust the content and pace of learning materials enabling students to engage with educational resources in a manner that aligns with their unique preferences. Furthermore, Artificial Intelligences role as a virtual tutor continues to revolutionize the landscape of personalized learning.

**Meaning and Definition of Artificial Intelligence :**

Artificial Intelligence is the ability of Machines to perform tasks that normally require human intelligence like learning making decisions and solving problems.

**According to Niti Aayog :**

AI refers to the ability of Machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making.

**According to Johan MC Carthy :**

Artificial Intelligence a term coined by emeritus stand ford professor was defined by him as the science and engineering of making Intelligence Machines. Meaning and Definition of Education : Education is not an acronym but a process of acquiring knowledge, skill moral and values that develops an individuals mind and character to be a civilized and contributing member of society.

**Etymological Roots :**

Educare – From Latin meaning “to bring up” or “to nourish”

Educere – From Latin meaning to “draw out” or to “lead out” signifying the development of inherent potential.

**According to Unesco, Education** is the process by which societies deliberately transmit accumulated information knowledge, attitudes, values, skill and behaviors across generations involving communication designed to bring about learning.

**According to Gandhiji said :**

By education, I mean all around drawing out of the best in child and Man – body mind spirit literally is not the end of education, not even the beginning.



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## **Rational of the study :**

The study aims to explore the various areas in which Artificial Intelligence will enable of the implementation a personalized learning approach and to design the mode of delivery of knowledge to match the diverse needs of the learners however, the study does not cover the various tools, software, coding and machine learning functions that are required to implement the personalized learning approach to suit the needs of diverse class of learners.

## **Objectives of the study :**

1. To study the role of Artificial Intelligence in developing a personalized approach to cater to the diverse needs of the students.
2. To study the opportunities and risks of integrating Artificial Intelligence in education.

## **Methodology :**

The study aims to explore the various areas in which Artificial Intelligence will cater to various diverse needs of the students and provide a base for implementing the personalized learning approach. Relevant research articles and reports were discovered for this review using the databases of Google scholar, Research Gate and other research Journals etc.

## **Opportunities of Artificial Intelligence in Education :**

### **a) Digital Skill in Education :**

Social well being is component of sustainable development is reliant on education. Artificial Intelligence has developed to disseminate information and is a major impetus behind innovations in education.

### **b) Influence of Artificial Intelligence on students performance and Assessment :**

Artificial Intelligence can assist in bridging the gaps in learning and teaching needs implications of Artificial Intelligence on Education include personalized learning.

### **c) Access to Quality Education :**

Artificial Intelligence can provide access to quality education for students in remote or underserved areas allowing them to benefit from education resources and opportunities that may not have otherwise had access to (liuet a1, 2001)

### **d) Enhanced Collaboration and Communication :**

Artificial intelligence can facilitate collaborative learning by providing tools and platforms for students to work together on projects and share ideas.

### **e) Worldwide knowledge :**

Students may now work with colleagues from other nations and cultures while taking part in online course etc.

### **f) Improved classroom management :**

Artificial Intelligence can help manage routine administrative tasks, such as attendance tracking and scheduling allowing teachers to focus more on instruction and student support.

### **g) Efficient Assessment and Grading :**

Artificial Intelligence can automatic the process of grading assignments and assessments, saving teachers valuable time and providing more accurate and consistent feedback to students.

### **h) Student behavior Monitoring :**

Artificial Intelligence effect on pupil performance is obvious through its capability to offer real – time tracking of students studying sports.

### **i) Ethical Considerations of Implementing Artificial Intelligence in Education :**

A midst the improvements and ability of Artificial Intelligence in training, it is important to deal with the ethical considerations related to its implementation.

## **Risks of Artificial Intelligence in Education**

### **a) Security Risks :**

The large amount of students data collected are vulnerable to hacking and other cyber threats if not managed with strict security measures.

### **b) High Implementation Costs :**

The initial and ongoing costs of AI tools and infrastructure can be prohibitive for many schools especially in underprivileged areas.



### c) **Accessibility Gaps :**

High costs and poor internet access in certain regions can create or widen the “Digital Divide” limiting access to AI – Powered tools for all students

### **Reduced Human Interaction :**

Over reliance on AI can decrease meaningful teacher – student and student – peer interaction, which is essential for developing social and emotional skill.

### **Dependence on Technology :**

Excessive reliance on AI tools can hinder the development of essential critical thinking and Problem solving skill as students may become accustomed to technology driven solutions.

### d) **Ethical Dilemma :**

The increasing role of AI in education raises ethical questions about the long term impact on Teaching jobs, the devaluation of human expertise and the overall future of traditional learning methods.

### e) **Need for Digital literacy :**

Students need to develop strong digital literacy skills to effectively and responsibly use AI tools.

### f) **Job Displacement :**

Automation through AI is expected to replace human workers in various sector, leading to job losses and requiring workers to adapt by acquiring new skill for emerging roles.

### ❖ **Analysis of Data Analysis :**

#### **Overall Impact :**

#### 1) **Increased Efficiency :**

AI Streamlines educational processes making them more efficient for both students and teachers.

#### 2) **Greater Equality :**

By Providing personalized support and accessibility tools. AI helps bridge opportunity gaps and create a more equitable educational system.

#### 3) **Future – Ready skills :**

AI integration in education helps develop critical thinking Problem – solving and creativity skill essential for the future work force.

#### **Conclusion :**

Artificial Intelligence Plays important role in education and ability of Machines to perform in AI and Plays in education as well as, thus AI and education Parallely perform.

Summary, the goal of AI is to provide software that can reason on “Input” and Explain on “Output”.

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## Original Article

### Chetan Bhagat's Novels and their Film Adaptation

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#### Abstract:

The relation of both, film and literature has been almost as old as humanity. Five of Chetan Bhagat's novels have been adapted into Bollywood films like *Hello in 2008* (based on *One Night @ the Call Centre*), *3 Idiots in 2009* (based on *Five Point Someone*), *Kai Po Che! in 2013* (based on *The 3 Mistakes of My Life*); *2 States in 2014* (based on his novel of the same name) and *Half Girlfriend in 2017* (based on his novel of the same name). In these films characters are guided by personal, interpersonal, social and cultural norms of verbal behavior. They greet and respond to greetings, they agree and tactfully disagree, they observe quantity, quality, relation and manner maxims or violate them, and they are direct or indirect in performing speech acts for a particular reason.

**Keywords:** Chetan Bhagat, Novels, films, characters, Adaptations of films, interpersonal relationships

#### Introduction:

Film and literature are the artistic expressions of human mind. Man thinks of different ways of communicating human experiences to broaden the enlightenment scenario. At the very outset, nobody takes an interest and favour towards the connection of filming and writing (literature). Adaptation of literary genres for filming is not a new / recent phenomenon but an old one. Adaptations of films have various sources for e.g. theatre, novel, music and painting. All these sources get techniques of stage, lighting, movements and gestures, structures, characterization, theme, point of view, rhythm, repetition, colour & counter-point respectively. Adaptation of films (literature/text) has been an old phenomenon for the Indian film Industry.

#### Main Points:

Chetan Bhagat is an Indian author and columnist. He was included in *Time* magazine's list of World's 100 Most Influential People in 2010. Bhagat graduated in mechanical engineering at IIT Delhi and completed a PGP at IIM Ahmedabad. He started his career as an investment banker but left it after a few years to pursue writing. He has written ten novels and three non-fiction books. His first novel, *Five Point Someone*, was published in 2004. Chetan Bhagat is one of the few new age writers of India. His books have been a huge influence on today's youth. For the people who are too lazy to grab a book and read for hours together these books have been adapted into movies. This trend is being followed for ages in Hollywood, in recent times, the adoption of books into movies has rapidly increased. Here are the Chetan Bhagat books which have been made into a film

One night at call centre – *hello* (2008)

Five points someone – *3 idiots* (2009)

The three mistakes of my life – *Kai Po Che* (2013)

2 States – *2 States* (2014)

Half girlfriend – *Half Girlfriend* (2017)

Five of Chetan Bhagat's novels have been adapted into Bollywood films like *Hello in 2008* (based on *One Night @ the Call Centre*), *3 Idiots in 2009* (based on *Five Point Someone*),

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*Kai Po Che!* in 2013 (based on *The 3 Mistakes of My Life*); *2 States* in 2014 (based on his novel of the same name) and *Half Girlfriend* in 2017 (based on his novel of the same name). Bhagat has also written the scripts for Bollywood films like *Kick* in 2014 and adapted his stories for the movies *Kai Po Che!* and *Half Girlfriend*. Bhagat won the Filmfare Award for Best Screenplay for *Kai Po Che!* at the 59th Filmfare Awards Event in 2014. He is also often found in controversies at twitter. His latest novel *400 Days* which is based on a missing child and forbidden love was released on 8 October 2021.

**Original Book:** Five Point Someone

Film - 3 Idiots (2009)

**Storyline:** Two friends are searching for their long-lost companion. They revisit their college days and recall the memories of their friend who inspired them to think differently, even as the rest of the world called them “idiots”.

**Original Book:** The 3 mistakes of my life

**Film -Kai po Che! (2013)**

**Storyline:** Three friends growing up in India at the turn of the millennium set out to open a training academy to produce the country’s next cricket stars.

Original Book: **2 States**

**Film – 2 States (2014)**

Storyline: A story about a romantic journey of a culturally opposite couple – Krish Malhotra and Ananya Swaminathan. They meet at the IIM-Ahmedabad College and during the program they fall in love.

**Themes:**

**Novels and Films**

As mentioned above, the meeting point of literature and film is their art of story-telling, or narration. The fusion of story and cinema, thus, places film in the continuing tradition of narrative forms such as epic, folk tale, myth and the novel. There are many types of films like documentaries, news films, educational films, etc. But movies generally connote a story film. Films continue that tradition of the narrative.

**Similarities between Novels and Films**

Novels are narratives. So, also are most of the films. Novels and films have narrative in common: the recounting of a sequence of events. Both of them tell stories about characters or what may be called the recounting of a sequence of events where the characters are active participants. However, sometimes certain characters are found to be quite passive. Films can easily be used to reinforce narrative information from a text currently being read in educational institutions as part of the curriculum. That is the reason why films have now become the central conveyors of narrative in our culture. Commenting on this aspect of films John Harington explains, while other art forms have taken centuries to develop, the span of a single lifetime has witnessed the birth and maturity of film.” Some critics find this similarity between the narrative form of the novel and the narrative form of the film significant, and describe, for example, Joseph Conrad and Henry James as ‘cinematic’. Films also have the same literary features that are found in a literary or print text, e.g. symbolism and characterization.

**Differences between Novels and Films**

The major difference between novels and films is that the author uses words but the film-maker uses pictures or images (not literary images). In a novel (book) a scene is described, in a film a scene is depicted. Though the differences look quite simple externally, they are, in fact, quite complicated. A writer uses different literary techniques such as narration, description, dialogues, interior monologues, figurative languages in the form of images, metaphors, etc. In a film, the film-maker uses mainly two modes: pictures and sound. These two modes also undergo through highly complex technical processes. For pictures depend upon ways of shooting (proper camera movement), lighting, colours, contrasts, mise-en-scene (setting, props, costume, make-up), actors and acting, and also proper editing. Sound, on the other hand, heavily depend upon verbal language, music (background music including songs and dances), environmental sounds as well as special sound effects. One very important difference to be noted is that visual images stimulate our perceptions directly, while written words can do this indirectly. Reading about a scene requires a kind of mental translation but viewing a picture of a scene does not. Film is a more direct sensory experience than reading. Besides verbal language, there is also colour, movement, and sound.

**Conclusion:**

Chetan Bhagat’s characters represent real people in real time. Like normal human beings they observe and violate the norms of conversation encapsulated in the form of politeness principle, cooperative principle, and speech act theory. These characters are guided by personal, interpersonal, social and cultural norms of verbal behavior. They greet and respond to greetings, they agree and tactfully disagree, they observe quantity, quality, relation and manner maxims or violate them, and they are direct or indirect in performing speech acts for a particular reason. However, the general reason is to establish and strengthen interpersonal relationships.



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## Original Article

### Phytochemical analysis of *Amorphophallus paeoniifolius*

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#### Abstract:

This study focused on analyzing phytochemicals presents in the wild edible *Amorphophallus paeoniifolius* and their medicinal uses. Phytochemicals are plant based bioactive compounds produced by plants for their protection. In this study, we have collected the tuberos of *Amorphophallus paeoniifolius*. It is essential to protect and conserve the wild medicinal plant and the traditional knowledge of the tribal people about the human health.

**Keywords:** Phytochemicals, wild, medicinal herb, *Amorphophallus paeoniifolius*.

#### Introduction:

India is a country rich in indigenous herbal resources which grow on varied topography and under changing agro climatic conditions permitting the growth of almost 20,000 plant species. The land is a rich repository of edible plants, about 1000 species are consumed as food plants, chiefly by 53 million natives or tribal communities under 227 ethnic group occupying about 18.74% of the total area under varied geographical and climatic zones of over 5,000 forested villages<sup>1</sup>. *Amorphophallus paeoniifolius* also known as elephant foot yam is a perennial plant. An ancient Indian literature contains a remarkable broad knowledge of medicinal plants and considers a plant or parts of plants to be potential source of medicinal substance<sup>2</sup>. Wide range of dietary phytochemicals is found in fruits and vegetables. The primary constituents include the common sugars, amino acid, proteins, purines and pyrimidines of nucleic acids, chlorophyll's etc. Secondary constituents are the remaining plant chemicals like alkaloids, terpenoids, flavonoids, lignins, plant steroids, curcumines, saponins, phenols, flavonoids and glycosides<sup>3</sup>. The nutritional studies on *Amorphophallus paeoniifolius* reveals that it acting as supplementary foods for many tribal people. *Amorphophallus paeoniifolius*, belonging to the family Amaryllidaceae. It is taken in herbal medicine for pain relief and other uses. The plants protect from disease and damage of phytochemicals which contributes to the plants flavor, aroma and colour. Generally, the plant chemicals that defend plant cells from environmental hazards (stress, pollination, drought, UV exposure and pathogenic attack) are called phytochemicals<sup>4</sup>. The medicinal plant sector has traditionally occupied an important position in the socio cultural, spiritual and medicinal area of rural and tribal families.<sup>5</sup> *Amorphophallus paeoniifolius* tuber is stomachic tonic, restorative, and carminative, useful in dysentery. The fresh corms act as an acrid stimulant, expectorant and used in acute rheumatism. The corms are used as vegetable. Due to human activities such as deforestation, rapid industrialization, urbanization, commercial forestry, pilgrimage, tourism, removal of biomass, encroachment and moreover inexhaustible greed, hundreds of our important plants are at the brink of extinction and total annihilation. *Amorphophallus paeoniifolius* inhibits the biosynthesis of cholesterol and triglycerides and therefore can be used for prevention of hyperlipidemia.<sup>6</sup>



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**Tubers of *Amorphophallus paeoniifolius***

## Materials and methods:

### Study Area

Study area is situated between the latitude 20°40' - 20°45' N latitudes and between 79°9' - 79°29' E longitudes and is spread over the area of 61485.92 hectares of land which falls in villages.

(Data Source: Village and boundaries provided by Land Records Department. GoM)

### Preparation of Sample:

The selected wild edible tuberos of *Amorphophallus paeoniifolius* in the present study were shade dried, powdered and subjected to various qualitative tests. The dried samples were grind into the fine powder which passed through 0.4 mm mesh screen.<sup>7</sup>

### Storage:

The prepared samples were kept in tight borosilicate glass container and store at room temperature for further subsequent analysis.

**Table 1: List of some vernacular names of *Amorphophallus paeoniifolius* [8]**

Sr.No.	Language	Common name
1	English	Elephant foot
2	Hindi	Jimikand
3	Tamil	Ekarunaikilangu
4	Marathi	Suran
5	Telgu	Kanda
6	Malyalam	Chena
7	Kannada	Kommegidi

**Table 2: Preliminary Phytochemical Analysis of *Amorphophallus paeoniifolius***

Phytoconstituents	Test	Observations	Inference
Alkaloids	Dragendroff's	Orange coloured PPT produced	+
Proteins	Biuret test	Violet or purple colour produced	+
Phenols	Ferric chloride test	Deep blue or black colour produced	+
Glycosides	Baljet test	Yellow to orange colour produced	+
Saponins	Foam test	Persistent foam produced	+

## Results and Discussion :

The present investigation and updated reviews on phytochemical study of *Amorphophallus paeoniifolius* revealed the presence of phytochemicals in tuberos are alkaloids, phenols, saponins, glycosides. Tubers are edible, cooked as vegetable. The extractive value was observed to be in water approx.. 1%, in methanol 3% and petroleum ether approx..2 %. Highest extractive value was observed in methanol. Alcoholic extraction was observed to be approx.15%.



## Conclusion:

From the above study and some updated review it is concluded that the *Amorphophallus paeoniifolius* which is locally known as suran is rich in phytochemical constituents which is helpful in medicinal as well as edible uses.

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## Original Article

### Religious Literature and spiritual Knowledge systems from Ancient to the AI Era

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*An objective study of religious literature and spiritual knowledge from antiquity to the AI Era requires a methodological framework that synthesized historical analysis textual criticism, and technology - focused inquiry. This approach aims to understand the evolution of belief systems, practices and traditions without personal bias, using academic tools to internet sacred texts and modern phenomena. Trace the development of spiritual concepts, rituals, and knowledge systems across historical periods, noting continuities and transformations. Understand how religious texts and spiritual practices were shaped by their specific cultural, political and social environment, evaluate the profound impact of successive technical revolution from the printing press to the internet. Explore the challenges and opportunities presented by the AI's integration into spiritual practices, addressing issues of authenticity, authority and belief formation. Maintain neutrality, historical analysis, Textual criticism, primary source analysis, Ethnographic studies.*

**Key points:** oral transmission, codification in texts, Broadcasting technologies, The printing press, Early internet, Algorithmic theology, AI- powered spiritual guides, Ethical challenges, Authenticity, Authority, commercialization, Emergence digital religions

#### Introduction :

Religious literature and spiritual knowledge systems from ancient times to the AI Era: Introduction: Religious literature and spiritual knowledge systems have evolved from ancient oral traditions to interacting with artificial intelligence (AI) in the present day. Throughout history, the dissemination, interpretation, and application of spiritual knowledge have been influenced by prevailing technologies and cultural shifts. In ancient times, Religious and spiritual knowledge was passed down through oral tradition for centuries before being recorded. Key points of ancient oral tradition and scripture: Vedic traditions, Gurukul system, scriptural preservation, philosophical inquiry, Upanishads, Greco- Roman philosophy. The mediaeval period saw the rise of large, structured religious institutions that consolidated spiritual knowledge and practice. The invention of the printing press in the 15th century radically altered how religious literature was distributed. Key points of growth of organized religion and mass dissemination of mediaeval period: centralization, Democratization of knowledge. Industrialization and digital transformation in the modern era: The rise of Industrialization and mass media contributed to reshape how spiritual knowledge was shared. Key points: Broadcast media, Digital platforms, Academic study. In the AI Era as a tool for analysis and interpretation of AI is emerging as powerful intersection of philosophy and spirituality. Key points: AI for textual analysis, personalized spiritual guidance, AI ethics and ancient wisdom, technical metaphors, future implications.



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## **Rational of the study:**

The rational for Studying religious literature has evolved from understanding human origins and ethics to guiding the development of artificial intelligence AI.

This study provides critical historical cultural, and ethical context for navigating the complex spiritual and philosophical questions raised by new technologies.

## **Objective study:**

An objective study of religious literature and spiritual knowledge from antiquity to the AI Era requires a methodological framework that synthesizes historical analysis textual criticism, and technology - focused inquiry. This approach aims to understand the evolution of belief systems, practices and traditions without personal bias, using academic tools to internet sacred texts and modern phenomena. Trace the development of spiritual concepts, rituals and knowledge systems across historical periods, noting continuities and transformations. Understand how religious texts and spiritual practices were shaped by their specific cultural, political and social environments. Evaluate the profound impact of successive technological revolutions from the ...

## **Hypothesis:**

Biased on the provided research a hypothesis can be formed about the evolution of religious literature and spiritual knowledge from ancient times to the AI Era. The core hypothesis is that each major shift in human technology from Oral traditions and transformation The form, accessibility, and interpretation of spritual knowledge without fundamentally altering the human quest for meaning and connection to the transcendent. This process is characterized by both new opportunities for spritual engagement and significant ethical challenges.

## **Database and Methodology:**

A vast multi -layered database and complex methodology trace the history of religious literature and spiritual knowledge systems from ancient times to the AI Era. The development has massages from oral traditions and physical manuscripts to large scale digitization efforts and AI driven analysis. The foundation of the religious and spiritual database comprises a diverse range of materials that evolved over millennia through oral and written transmission. Today scholars and the public can access religious and spiritual knowledge through large scale digital initiatives. Historically, the methodology for studying religious literature has relied on rigorous, Tex based and human centered methods. With the rise of AI, new methodologies are e...

## **Literature review:**

The literature review traces the evolution of religious and spiritual knowledge systems from the Oral traditions and sacred texts of ancient times to their modern intersection through digital technology and artificial intelligence AI, throughout history, each technological shift has disrupted how spiritual knowledge is transmitted and understood, posing new questions about authenticity, authority and access. In ancient civilizations religious literature and spiritual knowledge were primarily disseminated through oral traditions and meticulously preserved sacred texts. The invention of the printing press in 15 the century created a communication revolution, democratizing access to religious texts and shattering the monopoly of institutional...

## **Findings of the study:**

An overview of findings on religious literature and spiritual knowledge systems from ancient times to the AI Era reveals a story of enduring human inquiry that adapts to new knowledge and existential challenges. Research shows that while technology changes how people access and practice spirituality, the core questions about meaning, consciousness, and ethical persist. In ancient civilizations, religious literature was central to preserving culture, defining social order, and sharing knowledge. With the Renaissance and enlightenment, the focus shifted towards human centered observation and empirical approaches, leading to new perspectives on religious and spiritual ideas. The advent of artificial intelligence presents a new set of opportunities and analysis for religious and spiritual knowledge systems.

## **Analyze and Results:**

Over millennia, religious literature and spiritual knowledge systems have evolved from Oral traditions to digitally mediated and AI, enhanced experiences. The Analysis reveals a consistent human drive to understand existence and morality, with each era transforming how that quest is articulated, transmitted, and accessed. Analysis of key historical periods.

**Ancient times: Oral tradition and codification:** Ancient societies relied on oral transmission of sacred stories, prayers, and philosophical ideas, which were later codified into written texts to standardize them across time and place.

**Mythology and cosmology:** Religious literature focused on establishing creation myths, divine geologies, and cosmological frameworks. Example, include Sumerian hymns c(2600B.C.E.), Egyptian pyramid Texts (c.2400B.C.E.), and the Indian Vedas (c.1500--1200B.C.E.) Early ethics and law: Texts like the Torah (7th--6th centuries B.C.E.) and the Indian Dharma sutras defined ethical conduct, rituals and laws for the community, influencing social and cultural norms.

**Philosophical introspection:** The Axial age (900--200B.C.E.) saw a shift towards philosophical inquiry, with texts like the works of Greek philosophers exploring the nature of reality, the self, and spiritual liberation.

**Middle Ages: Theological centrality:** The church and monastic institutions became the primary custodians of spiritual knowledge in mediaeval Europe. Religious themes permitted literature aiming to teach Christian dogma and morality through allegories, saints, lives, and plus. Preservation and control: Monasteries served as centers of learning, with monks painstakingly copying and preserving religious and classical texts. This process centralized knowledge within the clergy and established a hierarchy of interpretation. Broadened access through vernacular languages: The Bhakti and Sufi movements in India and the later renaissance period diversified excretal expression. Writing and translation in regional languages made spiritual concepts accessible to a wider audience outside of ecclesiastically authority.

**Artistic expression:** Religious narratives inspired epic literature, dramatic works, and highly ornate manuscripts. Text like Dante's The divine comedy explored complex theological and moral concepts through imaginative storytelling.

**The modern era: The age of reason and secular critique:**

The Enlightenment introduced a period of intense scrutiny of religious claims, with philosophers questioning the super natural authority of sacred texts. Literature began to reflect this tension, exploring the conflict between faith and science.

**Democratization of knowledge:** The printing press enabled the mass production of religious texts, such as the Bible, giving individuals direct access to scripture and fostering new interpretations. The internet and digital archives have further democratized access, making texts from diverse traditions available globally.

**Psychological and social focus:** In modern literature, religious often served as a lens to explore identity, community, and personal values. Authors moved beyond strictly biblical or mythological themes to address contemporary social issues through a religious or spiritual perspective.

**The post secular turn:** A resurgence of religious inquiry in the 21st century has seen new literature exploring the complexities of faith in a globalized, technologically advanced world. Novelists now often explore how faith endures or adapts in a supposedly secular age.

**The AI Era: Alas a spiritual tool:** Emerging technologies like AI are being used to create new averages for spiritual engagement, including AI powered chats bots trained on religious texts (**Eig Gita GT and ,Quran GTP**) and personalized meditation apps. These tools offer accessibility and convenience for users seeking guidance.

**Ethical and theological debates:** The integration of AI into spiritual practices raises profound questions, concerns include the authenticity of AI mediated experiences, potential Algorithmic bias in interpreting texts, and the commercialization of spirituality. Critics argue that AI lacks consciousness, empathy, and genuine spiritual wisdom, which are central to authentic religious experience.

**Text analysis and scholarship:** AI's natural language processing capabilities allow scholars to analyses ancient texts with unprecedented speed and depth. This can reveal new linguistic patterns and interpretation, potentially revolutionizing religious and theological studies.

**New forms of worship and community:** AI is shaping digital religions communities through virtual platforms and interactive tools. Some futurist thinkers even speculate on the emergence of AI centric religions, with itself treated as a source of divine intelligence.

**Conclusion:** The journey of religious and spiritual knowledge reflects a continuous negotiation between tradition and technology. While ancient and mediaeval methods emphasized community, authority, and meticulous human led transmission, the modern and AI eras have progressively democratized institutionalized the and spiritual path. The most significant

result of this evolution is a fundamental reevaluation of what constitutes an "authentic" spiritual experience. In the AI era, this includes grappling with whether technologically mediated encounter ereds can provide genuine spiritual meaning or simply reflect human desires back to us. The future will depend on how religious communities navigate the tension between embracing AI's powerful analytical and personalized tools and preserving the irreplaceable human and communal elements of death.

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## Original Article

### Fostering Inclusive Growth Under Pradhan Mantri Formalisation Of Micro Food Processing Enterprises Scheme: A Conceptual Study

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*The PM FME scheme is a pivotal one for the development of micro food processing businesses in India, involving much-needed capital assistance and encouraging formalization of individual micro food processing enterprises with a view to increasing their competitiveness. Based on loan sanction data, this research gives an overview of the scheme's efficacy and scope for future expansion. This paper examines secondary data on loans approved under the scheme.*

**Keywords:** Scheme, SHGs, Entrepreneurs, Credit linked scheme.

#### Introduction

From the era of importing food grains to the era of largest exporter of agricultural products India has seen peaks and valleys, as we know food is the essential component to survive, as this is materialized from agriculture and this agriculture has been widely in practice in India. As per India Brand Equity Foundation 55% of India's population is dependent on agriculture). Year on Year India exports 15% of agricultural commodities to other countries and has seen 18% contribution in exporting of agricultural products as of 2025 though the country holds the larger position in exporting of agricultural commodities, the country lacked in exporting processed food and concentrated more on domestic markets and resulted in minimizing profits and that ruined the food processing industry. Adaption to the busy work culture the generation now tends to have fast foods than the traditional ones and this has led to unhealthy practices and also decline of micro food processing enterprises, Understanding the significance of food processing industry and its demand in the global market the Prime Minister of India launched a 5 year Scheme "Pradhan Mantri Formalization of Micro Food Processing Enterprises" (PMFME) in 2020, Resulted in sustaining of those traditional food processing industries and rebounded towards healthy food practices. This decade is quite benefiting to the food processing industry as on the other hand the population of the country has gradually increased and this increase in population has made huge demand for the food consumption.

About Pradhan Mantri Formalization of Micro Food Processing Enterprises (PMFME) PMFME central sponsored scheme, the expenditure sharing in 60:40 ratio with the central and state, 90:10 ratio between central and North eastern states and Himalayan states, 100% to the Union territories. launched with an objective of promoting micro food processing enterprises through not only credit linked capital subsidies but also provides training in business up gradation like packing, branding, labelling and technical assistance to farmer producer organisations, under ODOP (One District One Product) approach and aims to uplift the self-help groups, rural entrepreneurs, individuals, cooperatives, startups and micro food processing



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enterprises such as pickle, jaggery, dairy products, meat products, and to various diverse food products. The ODOP recognizes the products across the country and certain products have achieved geographical indication and promotes such kind of products under the scheme. The program has outlaid rupees 10,300 crores (2020 - 2025) for 5 years to the development of micro food processing enterprises across the states and union territories in India. Post implementation of the scheme the food processing exports has seen 26% increase (as of 2023, from 14% in 2013), as this food processing industry covers agricultural products around 66% of these units are located in rural areas and creates rural entrepreneurs, though PMFME comprise of unorganized sector but it has 25 lakh units which provides 74% of employment opportunities and also increases the worth of the product for Example: 1 kg Mango is sold at rupees 20 to 30 whereas, 1 kg Pickle is sold at 200 to 300 rupees. It means the processed food can be sold at higher cost than selling it as a raw material.

### Financial aid to Organisations:

- Existing individual micro food processing units desirous of upgrading their units can avail **credit-linked capital subsidy at 35 percentage** of the eligible project cost with a maximum ceiling of Rs.10 lakh per unit.
- Support would be provided through **credit linked grants at 35% for development of common infrastructure** including common processing facility, lab, warehouse and others, Through Farmer Producer Organisations, Self Help Groups, cooperatives or state owned agencies or private enterprises.
- A **seed capital of Rs. 40,000-** per Self Help Group member would be provided for working capital and purchase of small tools.

### Review of Literature

*Miss Aditi Chopra and Prof. Rajendra Mishra (2023), Role Of Food Processing Industry In Food And Nutritional Security In India:* The Study Shows A strong relationship between loan applications, sanctions, and disbursements, but delays and rejections slow progress. Overall, it focuses on formalizing micro enterprises, improving productivity, and fostering sustainable development.

#### Objectives

- To create awareness among micro food processing entrepreneurs.
- To understand the concept of PMFME in inclusive growth.

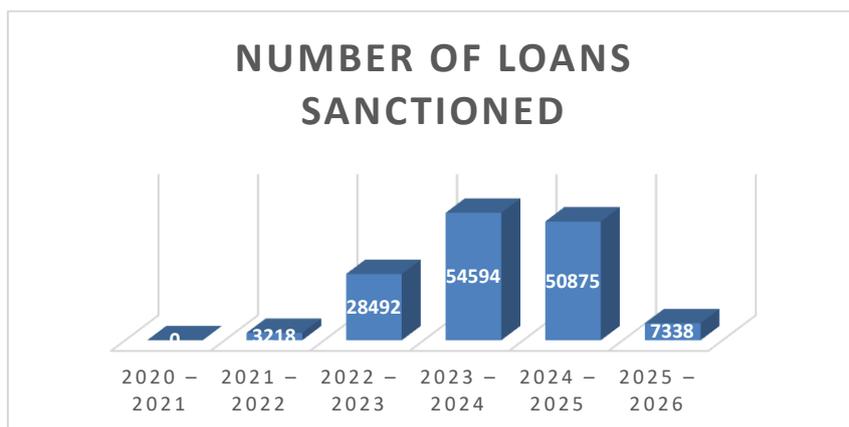
### Research methodology

The study is conducted through the secondary source of data from PMFME website and its magazines. A descriptive study is carried having the data of loans granted for Entrepreneurs from 2021 -2025, and analyzed based on the published data from the PIB website.

#### Data analysis and Interpretation

### Total number of loans granted year wise through PMFME (as on 30 June 2025)

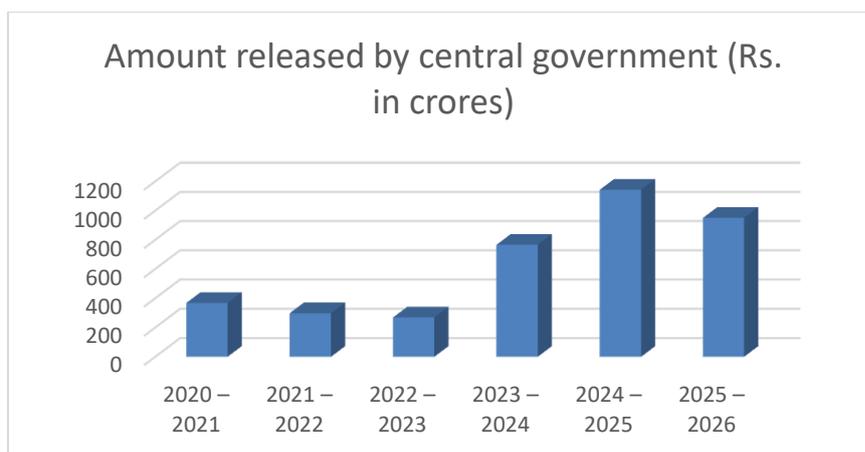
Year	Number of loans sanctioned
2020 – 2021	0
2021 – 2022	3218
2022 – 2023	28492
2023 – 2024	54594
2024 – 2025	50875
2025 – 2026	7338
Total	144517



The data shows that the number of loans sanctioned under the PMFME scheme started with zero loans in FY 2020–21 and slowly set in from FY 2021–22 with 3,218 loans. From FY 2021–22 to FY 2022–23, there was a huge increase of approximately 785.3%, reflecting a speedy uptake of the scheme. This increase persisted from FY 2022–23 to FY 2023–24 with a further hike of 91.6%, being the highest year of sanction of loans at 54,594. But from FY 2023–24 to FY 2024–25, there was a deceleration of 6.8%, reflecting some settling down after the phase of high growth.. By the end of first quarter 30<sup>th</sup> June 2025, 7338 loans were sanctioned under PMFME scheme, this data shows that the scheme has benefitted the farmers, Cooperatives, SHG’s, Individuals and various food processing industries.

**Total amount released by Central government under PMFME scheme.**

Year	Amount released by central government (Rs. in crores)
2020 – 2021	367.6
2021 – 2022	297.44
2022 – 2023	268.52
2023 – 2024	765.3
2024 – 2025	1142.6
2025 – 2026	949.63
Total	3791.1



The figures show a fluctuating pattern in the disbursement of the Centre Share between FY 2020-21 and FY 2025-26. Firstly, the figure dropped from Rs. 367.6 crore in FY 2020-21 to Rs. 297.44 crore during FY 2021-22, indicating a fall of around 19.1%. It again dropped to Rs. 268.52 crore during FY 2022-23, indicating another 9.7% fall



from the last year. Nevertheless, from FY 2022-23 to FY 2023-24, there has been a huge increase to Rs. 765.3 crore, which is an increase of approximately 185%. This trend was followed in FY 2024-25 as well, where the figure sharply increased to Rs. 1142.6 crore, which is an increase of almost 49.3% over FY 2023-24. In FY 2025-26, the figure dropped slightly to Rs. 949.63 crore, representing a fall of approximately 16.9% from the earlier year. Overall, the pattern depicts early declines, after which there has been considerable expansion.

## Conclusion

The PMFME scheme has been a key contributor to revitalizing and institutionalizing micro food processing units, providing economic development and job creation in rural India. During its tenure, it has greatly accelerated loan release and investments, with export of processed foods registering a considerable increase. The plan was able to induce conventional food processing units to switch to modern practices, establishing a viable market for varied products through the ODOP approach. While trends of varying financial disbursements were noted, the general trend remained one of wide growth and support. Not only did it improve the value addition of agriculture produce but also bolster rural entrepreneurship. By filling gaps in infrastructure, skill development, and access to credit, PMFME has emerged as a cornerstone of India's food processing revolution. With sustained attention, it holds the promise of long-term gains for domestic consumption and international trade.

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## Original Article

### Sujata Parashar's The Temple Bar Woman: Representation and Resistance of Woman

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*Sujata Parashar is a famous name in Indian writing in English. She is an award winning Indian novelist, poet, short story writer and psychological trainer. As a social activist and trainer, Sujata has more than a decade of experience in the development sector working for the cause of underprivileged children, adolescents and woman. She has credited five novels, short story collection and non-fiction books. Her fictions are woman centered. Romance, thrill, suspense are the core part of the novel. Her novels are like a Bollywood movie The Temple Bar Woman is the best example of Bollywood movies. The present novel is a picture of a girl who is victim of this unjust system. It is the story of a girl that shows daring in all the odds that come her way to achieve her aim. She is the representative to other girls. She is a simple girl but due to the social system she enters in politics to take revenge of her enemy. She is the perfect example of resistance. Radha is the main character of this novel. She is a simple school teacher who is the daughter of Headmaster of school. Her father, a single parent dots on her but is too protective of her. She cajols him to let her go to a village fair with her best friend. At the fair, a man who is Vikram Singh, the son of political leader, misbehaves with her and instead of ignoring it, responds back strongly. Vikram Singh, kidnaps her, brutally gang rapes and throws her into a brothel. Brothel is the place of prostitute and red light area. There she meets the Rakshit Singh emerging businessman and leading politician. He is unknown about her past life. He attracts towards Radha. With the help of Rakshit Singh and Habiba Bi, who is owner of Brothel. She decides to take revenge. She enters in the politics. After that she becomes politician and achieves her aim. She takes revenge. She changes from simple village girl and school teacher to supremely confident politician. Tit for tat is saying proved, reaction to action takes place. Radha becomes role model for the next upcoming generation. She is the representative to other woman's She proves that women could takes resistance against unjust system. She fights for her rights. She fights for her self respect. She stands as a role model of rise, revolt and raise her voice.*

**Key Words:** Temple, Bar, Brothel, revenge, Resistance, Representative.

#### Introduction:

Indian writing in English and which a special reference to women's writing is concerned. Woman plays a considerable role and position in our society. They plays very important role from their birth to till the end of life. Even after, playing all her roles in an proficient manner in the modern society; she is considered feeble because men are still well thought out as the strongest gender of the society. She has to take care of herself and family members in performing various roles of daughter, sister, wife, daughter-in-law, grand-daughter, mother-in-law, grand-mother etc. In spite of her family responsibility she is able to come out and do job for bright future of own, family, and country. Indian writing in English and which a special reference to women's Indian writing in English is concerned; it can be observed that it is a state of total maturity of woman's writing in Indian scenario. Woman have their own world of suffering, subjugation, suppression, depression physical and mental level torture. But as on today, we can see a changed panorama. Women have their own power to rise, revolt and revenge. She can speaks writes, protests and takes revenge.



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She has been given this power only because of education. In ancient time her life was limited to cooking and bearing children. Now her role is changed from modernity. She is aware of her fundamental rights of human rights. Changing for someone or trying to change someone is not acceptable to the woman. Strong women know how to take a stand for themselves and say yes or no accordingly. Women focus on personal development and career, striving for financial independence and equal opportunities. It is good to see women getting empowered the world is ready to take in this new change and adapt with increasing awareness that women are getting independent.

Sujata Parashar is best selling novelist, short story writer, poet and activist. She is an award winning Indian female writer. Also she is a psychological trainer. As a social activist and trainer, Sujata has more than a decade of experience in the development sector working for the cause of underprivileged children and women. She is a former founder member of Empowering minds a Delhi based NGO focussing on education and mental health issues of women and children. She is the recipient of Karam Veer Chakra award for two times. She is the representative of postmodern period. The main purpose of this paper is to learn how to deal with wrongdoers. Radha's characters have been sketched as a valiant and fearless lady who stands up to fight her criminals. Not to surrender to situation instead of it face the critical situation and come over the problems. Seek justice, take justice and become an exceptional example before the upcoming generation. Scope of this paper is limited to this novel only. Analytical, interpretative, evaluative approach will be preferred to judge the novel. Here an honest example is made to show the writer is successful to relate to the present situation of woman. Radha hatched a plan to take revenge against her criminals. The owner of the brothel also joined her to fight against their common enemy. So both woman characters are the representative to other woman. Both stands as a representative and resistance.

Now let's see how the writer Sujata Parashar is successful to depict a story of courage shown by a gang rape survivor who lived only to avenge her honour and disrespect. The novel is centred on the victims of sexual assault and molestation. The present novel is an apt example to show the intension of female character like Radhika Chaudhari. She is representative and model to other women. She enters in politics with purpose to take revenge. Politicians are very powerful. No one can hurt them. No one can oppose them. Common people don't have courage to oppose political leaders, but Radha shows courage and become a political leader and takes revenge. The present novel is an apt example of show the intension of female character Radhika. She enters in politics with intentionally to take revenge. Politicians are very powerful. No one can hurt them. They have the power of money. So no one can oppose them. Common people don't have courage to oppose politicians, but Radha shows courage and becomes a political leader. She is a female character but she wreaks her vengeance. Radha or Radhika Kumari Chaudhari is a simple school teacher has a lead sheltered your life till the age of 21 or 22. She is a daughter of headmaster of school. Her father, a single parent dotes on her but is too protective of her. She cajoles him too let her go to a village fair with her best friend. At the fair a man, Vikram Singh, a son of powerful politician, misbehaves with her and instead of ignoring it, she responds strongly. Vikram Singh kidnaps her, brutally gang rapes and throws her into a brothel called The Temple Bar. This is the turning point of her life. It is a prostitute area which is under control of Habiba Bi and her agent. She is very popular in that area. Many elite class people, rich people and political leaders used to visit this area. Bharat Singh is regular customer of Habiba Bi. She has illegal son from Bharat Singh but Arif Khan is denied his right as Singh. It is spark of quarrel among both sides. Habiba Bi is helpless in this situation. She does not want to cross her limitation. Power can spoil the character of man and position can harm the common man and woman of society. Radhika is not ready to accept that now she is prostitute woman. Habiba Bi and her maid servant Jhumki tries to convince her. Then she decides to forget her past experience and start a new life but in different way. She tells to Habiba Bi her dream to teach a lesson to Vikram Singh. Radhika knows that, Habiba Bi is the main Source and medium to reach at him. Because she is a popular local sex worker which a huge network of land lords, rich politicians, businessman and many more. Rakshit Singh is also a regular customer of Habiba Bi. One day he visits the temple bar. He is introduced with Radhika, who was not ready to please him. He was a businessman and upcoming politician. After various meetings with Radhika. He does not harm her. Then Rakshit thinks that, appoint her as a caretaker of his daughter Neer. Because Radhika is simple, clever and honest woman. So he decides to appoint her caretaker of his daughter. Time goes Radhika and Rakshit becomes intimate friend. Close relationship develops between them. After a few days, she becomes advisor of Rakshit Singh. As a family member she attends many meetings and parties of Rakshit Singh. Now let's see the first decision and encounter of Radhika, "Besides she herself did not have any proof against Vikram and without it, none would believe or accept his felonies. Still she knew that if Habiba agreed to help her, thing would become easier. For one she needed a place from where she could execute her plan without having to look for help elsewhere or reveal her real identity, and Temple Bar was just right place" (TWB.109) This is beginning of revenge process in which she appeals to Rakshit Singh as well as Habiba Bi. Whose strong support can make her revenge easy? Once just glance at the following conversation, "please think about it Habiba Bi; we are both victims of his atrocities and if we work together, we can expose him in front of very people, who you think highly of him. Radha repeated her request, gathering all her courage. Besides, I am not going anywhere from this city, till I avenge myself. Even, if you don't help me. I will find a way to destroy him" (TBW.125) above request is enough to judge and evaluate the revenge that is the main aspect of this story. When Rakshit Singh proposes to Radhika for marriage. Let's see her reaction of Radhika on

this proposal, “why does he want to marry me? She asked herself. Why did he have to spoil our friendship? I can never marry, does not he realize that I can never feel anything for any man after what that bastard and his friend did to me” (TBW.190) In the course of time a care taker turns into a life partner but the last part of novel reveals the real revenge. She becomes an advisor, from advisor to MLA and part chief. She takes the revenge when she dishonour Vikram Pratap Singh and his father Bharat Singh. In this way she destroys the political career of Vikram Pratap Singh. The following conversation proves that really the present novel is a tale of revenge by Sujata Parashar. Its an epilogue of this novel, “yes there is! A lot that you don’t know! And today you will have to hear it out, Rakshit Singh, said Radhika raising her voice. I am not what you think. I am and I did not come here to live with you to take away anything. I come here to avenge my dishonor.” (TBW.207) Taking into consideration of above statement it true that the main purpose of Radhika is to take revenge and not to achieve the political post and position. Her firmness and efforts make her successful in her mission. The main goal of her life is to punish for her insults. Really it was or it is the mentality of men to look a woman from the sensual point of view. She wants to give justice to all the women in the world. Radhika clears in the following words, “That what I am doing. Look Rakshit I don’t want to be Chief Minister. I never wanted to be one. You are better suited for that role. But now I have this opportunity. I want use it to my advantage. I want to punish that rascal and friends in public. You have to help me! Please! She said finally breaking down. (TBW.210) However, Rakshit Singh, an upcoming politician get intrigued by her plight, asks her to be his daughter’s governess. Radhika aka Rani after the tragedy turns out to become a stronger than ever woman whose life’s motive is only to take revenge from Vikram who has destroyed her life. Luckily, she gets a second chance through Rakshit Singh to avenge but not all rape survivors are as lucky as her. How she takes her revenge? How Habiba and her son help her to take her revenge is worthknowing. In the last part of tale Rakshit Singh becomes the CM. Bharat Singh accepted Arif Khan as his son and Habiba Bi as his wife. Vikram Pratap Singh is given custody for life imprisonment. The end of the story is quite a Bollywood style that the female lead finally gets justice.

## Conclusion

The present novel The Temple Bar Woman is of danger, deceit and daring. It is the story of a school teacher girl that shows her daring in all aspects of life and ultimately beats all the hurdles that come in her way to achieve her aim. It is a powerful thriller story about a woman who was abducted for a flimsy reason, raped and then left to die. The novel is about how she wreaks her vengeance. She is the representative of 21<sup>st</sup> century. She is an action taking woman. She complete her mission only because she believes in herself. A decision can change your life and a changed life is role model for the upcoming generation. She finds her own path to punishes her culprits. The above explanation proves that Sujata Parashar’s The Temple Bar Woman is a story of a woman who is representative to upcoming generation. Reaction to action takes place and she becomes the role model for woman’s who are suffering. Radhika is a model of rise, revolt and raise her voice. Radha realizes what has happened to her and turns into a plotting and scheming woman who will do anything to exact revenge from her perpetrators. Nothing in today’s world works without consent and women are at all afraid to speak up. To underestimate the power of woman is very dangerous. They are not a suffering puppet in the hands of man. She can speaks, writes, protests and takes revenge. Now her role is changed from modernity from suffering tit for tat. She is aware of her fundamental rights. She is now independent. They are people with dreams and desires, and will do anything to achieve them.

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## Original Article

### East-West Encounters and Cultural Hybridity in R.K. Narayan's The Guide: A Comparative Study

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#### Abstract

This research paper explores the dynamic forces of East-West happenstances and the rise of cultural hybridity in R.K. Narayan's *The Guide*. Positioning the novel inside the postcolonial outlines, the study draws upon Homi Bhabha's "third space", Edward Said's discourse on Orientalism and postcolonial feminist viewpoints to understand the existed realisms, performative individualities and cooperation of tradition and modernity in Malgudi. The study discovers how characters such as Raju, Rosie and Marco are vehicles for investigating the anxious yet multiplicative space between East and West, subsequent in the hybrid identities. Comprehensive indications from the text demonstrates how Narayan attacks binaries, eventually depicting hybridity as a lived, uncertain and rehabilitative power determining postcolonial Indian prejudice and culture.

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#### Introduction

The mid-century Indian fictional landscape, particularly in the result of British colonial removal, was drenched with worries about the collision and harmonization of indigenous traditions with Western modernity. R.K. Narayan's fiction, highly set in the imaginary town of Malgudi, continuously discovers and complicates these tensions. *The Guide*, Narayan's Sahitya Akademi-winning novel, serves as a benchmark in Indian English fiction for its deep engagement with themes of cultural transition, spiritual uncertainty and the uncertain journey toward selfhood. Its characters repeatedly negotiate the liminal line between the East and the West, demonstrating a generous of hybridity that is, to use Bhabha's term, interstitial, a "third space" where identity is always in progression, never correctly fixed. The drama of tradition and modernity, of rural and urban attitude and of Indian and Occidental value systems, is not just the background of the tale but is intertwined into its structure through the transformation of characters and the development of Malgudi itself. In undertaking so, Narayan's novel transfers outside simple resentments to craft a sophisticated analysis of the postcolonial condition, a critique understood not through forceful bold, but through gentle satire, uncertainty and the normality of everyday life. This paper takes on a comparative analysis of East-West encounters and cultural hybridity in *The Guide*, portrayal on postcolonial theory and close textual study to validate how Narayan's work both symbolizes and analyses the multifaceted inheritance of colonial modernity.

#### Theoretical Foundations: Hybridity, Ambivalence, and the Liminal Space

To fully understand Narayan's technique, it is essential to anchor the conversation in the hypothetical interferences that have formed postcolonial literary criticism. Homi Bhabha's idea of hybridity fights binary logic, suggesting that "the construction of identity is always ambivalent, always split" (Bhabha 56). According to Bhabha, the space of cultural encounter, the so-called "third space", is where hybrid individualities arise, caught between mimicry and struggle, tradition and modernity, colonizer and colonized.

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Edward Said's analysis of Orientalism (Said 5) and Spivak's examination of subaltern speech additionally illumines how language, art and story arbitrate power in postcolonial societies. In *The Guide*, these theories help explain both the misunderstanding (cultural ambivalence) and invention (cultural synthesis) that arise from East-West contact. Rather than seeing hybridity as a simple synthesis, Bhabha and his successors propose it is an upsetting, creative tension, "almost the same, but not quite", that both undermines and remakes prejudice.

### **Malgudi: The Microcosm of India's Cultural Negotiation**

Narayan's original choice of Malgudi as the locus of his stories is a piece of fight to both exoticizing and essentializing India. Malgudi, neither solely rural nor urban, neither exclusively traditional nor modern, develops to be an unsolidified, a hybrid space. The railway, a literal symbol of modernity and Western movement, shares through the heart of Malgudi, defining worlds that, though head-to-head, are often in fight or discussion.

Raju's journey, symbolic of the town's own everchanging identity, changes from the railway station's multicultural bustle through the sacred grounds of villages, finally ending by the river's banks, a subtle recreation of spiritual and cultural verges. The character's individual development is thus inseparably bound to the developing ambient of Malgudi, making the town a "character" in its own right and a central point for the larger postcolonial dilemma of fitting and change.

### **Raju: Performance, Identity, and the Postcolonial Subject**

Raju's transformation from railway guide to spiritual leader recapitulates the very ambiguities of cultural identity in a postcolonial context. At first, Raju is the consummate mimic, accommodating himself to the desires of tourists and outsiders. When he remarks, "I have to be all things to all people" (Narayan 13), his shape-shifting points to a fundamental insecurity and indeterminacy that, Bhabha would argue, is the "slippage" of colonial subjectivity.

As Raju assumes the mantle of a guru, his performance is at first entirely calculated—he adopts customs, speech, and gestures expected by the villagers. "It was the happiest day in his life. It was a role which he could play with imagination and zest" (Narayan 180). He becomes, as Bhabha puts it, "almost the same, but not quite", his sainthood is mimicry that soon dissolves into something real as he internalizes the role forced upon him. "He felt the weight of his responsibility growing every minute... It was no longer acting, it was real" (Narayan 217). This movement from imitation to internalization dramatizes the emergence of a hybrid identity, Raju, neither entirely a trickster nor a saint, performs countless selves, each colored by external expectation and internal confusion.

In the end, whether Raju's sacrifice is sincere sacrifice or final act that remains vague, evidence to the fundamentally unsettled nature of postcolonial hybridity. Narayan's denial to tell Raju's final fate is a tale to a sign that upholds this vagueness, highlighting the trouble of arriving at secure meanings in a world of everchanging cultural currents.

### **Rosie/Nalini: Tradition, Gender, and Agency in the Hybrid Space**

Rosie, or Nalini as she is later called, is perhaps the novel's most explicit representation of hybridity at the intersection of East and West, tradition and modernity, and gender and performance. She is, by education, a "post graduate woman" (Narayan 39), but by social convention, she is also a devadasi—a hereditary temple dancer, a status both esteemed in classical terms and marginalized in modern, caste-driven India.

Marco, her scholarly husband, although seemingly modern, is "blind" to the validity of her artistic life and her emotional needs, regarding her art dismissively as "street acrobatics" (Narayan 55). Rosie's desire to dance, to recapture and redefine her caste-based art as a legitimate and respected practice, is itself a kind of negotiation between past and present. When she chooses to leave Marco and pursue a career in dance, she becomes a figure of agency, albeit within the constraints of male protection and commercial exploitation (first by Raju, then by larger society).

The procedure by which Rosie changes into Nalini, a much-admired artist, is an act of cultural amalgamation, her art is authenticated and commodified by the urban, multicultural class of Malgudi, even as it continues to horrify the fundamentalists. As the text observes: "The same Rosie who was shunned as a devadasi by those who swore by their traditional norms is reborn Nalini, the respected classical dancer, because of the emergence of an affluent and cosmopolitan class of people in Malgudi" (Narayan 173).

Rosie's story thus exemplifies the potentials and dangers of hybridity, even as she attains a degree of independence, she remains susceptible to male assumption and social prejudice. Her journey is not wholly emancipatory; rather, it is anxious with the same uncertainties and contradictions that mark Raju's own development.

### **Marco: The Western Gaze and the Problem of Alienation**

Marco, the archaeologist husband, assists as the representative of Western rationalism and scholarly disinterest. Fixated with "cultural history," Marco is illogically cut off from the warmth and energy of the very philosophy he studies. His marriage to Rosie is obvious by abandonment and emotional distantness; he cannot stand the "disturbance" of his wife's requirements or the messiness of existing custom.

Marco's disappointment to comprehend or escalate Rosie is not only a individual fault but also a symbol for the letdown of the colonial attitude to involve genuinely with the colonized society. His research is valued, but his

incapability to exchange with the people round him leaves him disaffected, a plain difference to Raju's extreme accommodation and imitation. The difference thus creates the hybrid path that both Raju and Rosie eventually follow, neither purely traditional nor completely modern, but somewhat unsettled in between.

### **The Ritual, Faith, and Modernity: Cultural Negotiations in Practice**

If Raju, Rosie, and Marco represent personal avatars of cultural hybridity, then the larger rituals, customs, and sociocultural exchanges in *The Guide* exemplify hybridity writ large. The fact that Raju eventually undergoes is at once a parody and an affirmation of age-old Hindu practices—brought about by a hapless trickster but maintained sincerely in the face of collective conviction. “Velan gave a very clear account of what the saviour was expected to do—stand in knee-deep water, look to the skies, and utter the prayer line for two weeks completely fasting during the period—and lo, the rains would come down, provided the man who performed it was a pure soul, was a great soul” (Narayan 109).

Despite his initial fraudulence, Raju's ordeal becomes a “ritual” performed on behalf of a community desperate for salvation. In the vagueness of Raju's reasons, uncertain between selfishness and self-annihilation, the novel fights didacticism, instead posing the question; Can genuineness arise from performance? Can truth rise from untruth? These unsettled dilemmas spot the “third space” where meanings are persistently depending and individualities constantly divided.

### **Tradition versus Modernity: Family, Gender, and Social Change**

The tension between old values and new modes of existence is a persistent motif. Raju's mother, a figure of orthodoxy, is shocked when Rosie arrives “alone” at her house, a break from the strict conventions of female chastity and public conduct, “Girls today! How courageous you are! In our day we wouldn't go to the street corner without an escort. And I have been to the market only once in my life, when Raju's father was alive” (Narayan 141).

This moment sharply delineates the generational and gendered divides at play, a divide traversed, though never fully resolved, by the novel's protagonists. Rosie's agency as a public artist is made possible not by the full collapse of tradition, but by its reinterpretation, a hybrid mode in which old forms (dance, religious devotion) are adapted to new contexts (stage performance, urban audience). Malgudi's development, observed in the acceptance of Rosie/Nalini, is symbolic of Indian society's own excruciating but eventually generative cooperation with modernism.

Raju's ancestral fight, caught between a traditional mother and a liberal lover, further produces how the crash between East and West is often experienced most strongly within the home. Eventually, as tradition gives way, it does so unwillingly and unequally, “In the struggle between tradition and modernity, tradition wins though in a reluctant manner. Raju's penance and his ultimate sacrifice are real no matter how painfully flawed his motives may have been earlier or how ineffectual their outcome” (Paranjape 182).

### **The Function of the Railway: Symbolism of Contact and Division**

Through the novel, the railway is an obstinate metaphor for the infiltration of Western culture into the heart of Indian society. Its onset brings chances, external influence and significantly disturbance. As one critic notes, “It is the railway which brings the outside world, with its modernity and hybridity to Malgudi. It bifurcates the world of Malgudi both literally and metaphorically” (Narasimhaiah 132).

The railway's presence underscores the porous borders of identity in Narayan's world; it brings tourists (Marco), facilitates Raju's commercial career, and exposes Malgudi to cultural transformation. Yet, the significances are not consistently positive, the same railway that presents cosmopolitanism also spreads misperception and experiential disturbance, leading finally to Raju's fall.

### **Hybridity in Language and Literary Form**

Narayan's text style itself is an exercise in hybridity. His usage of English is marked by local rhythms, idiomatic expression, and semantic invention, battling the enticements of both British artificiality and nationalist purism. The episodic structure of *The Guide*, the fluctuation between past and present and the dual chronicle voices (Raju as first-person confessor to Velan and as third-person subject) all aid to undermine the authority of any single viewpoint, reflecting the unpredictability of postcolonial individuality itself.

### **Comparative Dimensions: Tradition and Modernity in Indian and Western Contexts**

When placed alongside other novels of Indian English literature from the period—such as Mulk Raj Anand's works on class struggle or Raja Rao's metaphysical novels, Narayan's *The Guide* stands out for its everyday subtlety and refusal to force resolution from contradiction. Instead of dramatic ideological confrontations, Narayan's hybrids negotiate the world by means of adaptation, irony, and ongoing performance.

This approach is significant when contrasted, for instance, with the more strident oppositionality of Chinua Achebe's or Ngugi wa Thiong'o's anti-colonial works. Narayan's protagonists are not agitators but improvisers; their resistance is quiet, their victories ambiguous, yet their capacity for self-renewal and synthesis is immense.

### **Conclusion: The Power and Ambivalence of Hybridity**



In *The Guide*, Narayan collects an indirect and uncertain representation of a society in the throes of change. The novel neither worships tradition nor uncritically holds modernity, but seeks fertile ground in the hybrid and the unsettled. Through the performative alteration of Raju, the artistic self-assertion of Rosie and the isolated intellect of Marco, the novel constructs a world in which cooperation rather than transparency is the key to survival.

What emerges from *The Guide* is a testimony to the ordinary, flawed, sometimes comic attempts of ordinary individuals to make sense of a world no longer susceptible to single codes of meaning. In doing so, Narayan offers not only an analysis but a vision, an image in which cultural hybridity, for all its pressures, is not a mark of misunderstanding but an opportunity for regeneration, development and reimagination in postcolonial India.

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## Original Article

# Contingency Planning and Disaster Recovery of the 2025 European Hospital Ransomware Incident

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### Abstract-

*This paper presents a comprehensive real-time case study of a large-scale ransomware incident that targeted a European hospital group in early 2025. Attackers encrypted critical patient records and demanded millions in ransom, threatening operational continuity and patient safety (Case Study: The 2025 European Hospital Ransomware Incident, 2025). Instead of complying with the ransom demand, the hospital leveraged immutable, air-gapped backups to restore operations. Recovery was achieved within 72 hours, significantly faster than the weeks typically expected in ransomware recovery scenarios. Drawing upon established cybersecurity frameworks, disaster recovery strategies, healthcare compliance policies, and resilience engineering principles, this paper meticulously analyzes the attack's background, the organizational response, and critical lessons learned. It highlights the central and indispensable role of immutable, air-gapped backups in modern contingency planning, illustrating how secure, regularly tested backup strategies can fundamentally mitigate ransomware risks. Furthermore, recommendations emphasize the necessity of layered defenses, zero-trust architectures, proactive EU policy reforms, and continuous staff awareness training to fortify healthcare cybersecurity posture against evolving threats.*

**Keywords-**Cybersecurity, Ransomware, Immutable Backups, Contingency Planning, Disaster Management, Healthcare Resilience, GDPR.

### Introduction: Ransomware Hitting Healthcare Hard

The issue of ransomware has turned out to be very big, one of the worst forms of cybercrime. It is a genuine concern for such essential things as hospitals worldwide. Hospitals are caught between a rock and a hard place since they are computerized in everything and they have computer machines to carry out tests and various types of systems that cannot be left without. Once these systems are compromised, it is not only a headache, but it can even put the patients at risk, their private information can be revealed and this proves to be very expensive. One of the larger European hospital groups was attacked in 2025 by a very bad ransomware attack. It was an indicator of the effectiveness (or lack of it) of existing defenses. The leaders of the hospital faced a large decision to make ; either to pay up (which is a risky option) or to attempt to repair the situation on their own. The hospital had a choice not to pay. They employed their backup strategy that kept a copy of all this away safe. These backups were not alterable or tamperable so the hospital was in a position to restore all the systems to normalcy within 72 hours. Since they had things fixed in a considerably short period of time, they had fewer downtimes, could save patients, and was not fined by the government due to the loss of data. This narrative takes a close glimpse at the way the hospital had organised this sort of calamity and the manner in which they handled it. It entails the technical details, the collaboration among the people, the legal aspect, and what they ought to do



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It demonstrates the need to be prepared, good back up, and rules that can be employed to cope with such attacks. The experience of this hospital can be used to assist other significant locations that may fall victim to the same.

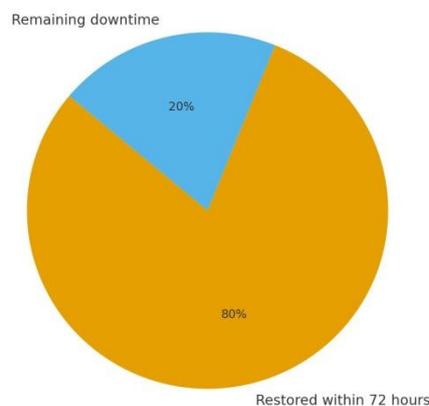
### Background: Cyber Threats In Healthcare

Ransomware is a large target to hospitals. Healthcare data is valuable in the black market and hospitals must continue operating round the clock. People might get seriously injured, in case things come to a standstill. In 2024, a report estimated that 35% of the cyberattacks on hospitals in Europe were caused by ransomware. It also claimed that hospitals incurred over half a million dollars daily when they are out of business due to these attacks. This is why hospitals should not just attempt to prevent the occurrence of attacks. We have experienced some ugly instances. In 2021, the Irish Health Service was left weeks disorganized by an attack. These cases demonstrate that it is not necessarily ordinary security. Such backups cannot be modified or destroyed. They are even more secure when kept apart out of your main network. By so doing, even in case hackers access your system, you would have a clean copy of your data to get you back on your feet. This concept coincides with the suggestions of such organizations as ISO and NIST, i.e., prepare to avoid attacks, yet prepare to be back on your feet within a short time. The regulations regarding data security are also available, particularly in Europe. Hospitals can easily get into deep trouble in case they fail to safeguard the patient information. Hospitals in Europe need to invest in backup plans and secure systems, therefore, there is a good reason to spend money on it. They are already in a lot of problems, and then they need to use outdated systems and fear to make a mistake. Patients in hospitals that have contingency plans recover quicker, are more assured and overcome crises more easily. Preparation can benefit all people, and not only the computers.

### Case Study: The 2025 European Hospital Ransomware Incident

#### 3.1 Timeline of Events

System Restoration Status after Ransomware Incident (72 hours)



The European Hospital Ransomware Incident of 2025 was developed with a sense of critical urgency, demonstrating the powerful opportunities of cyber attackers and the need to be organized and act in unison:

At the beginning of January 2025 : Hackers duped an individual at the office to open a bogus email. This provided them with the network of the hospital and stole passwords. It demonstrates that human beings can be a vulnerability in security and hospitals should educate the staff to be cautious.

Day 1: Ransomware was employed to encrypt patient records and disconnect essential software by the hackers (Case Study: The 2025 European Hospital Ransomware Incident, 2025).

Day 2: The cyber-attack team of the hospital went into action. They attempted to find out what occurred, shut down the infected segments of the network, and informed the government and information security individuals. They were aware of the reality that things were bad and the extent to which they were closed down (Case Study: The 2025 European Hospital Ransomware Incident, 2025).

Day 3: The hospital authorities discussed the matter with specialists and made a decision not to make the payment of the €5 million. They were sure that their backups were secure, and specialists state that it is not worth paying hackers at all.

Day 4: The hospital had begun recovering all operations. They applied contingency plan and concentrated on the most significant systems to the patient care such as the emergency room and surgical schedules.

Day 5: Approximately 80 percent of the hospital system was up again in some three days. This rapid recovery resulted in less interruption of patients and demonstrated the importance of good backups.

### 3.2. Technical Cause and Attack Vectors

The combination of the technical vulnerability, advanced attacker techniques, and gaps in the existing security measures could be identified as the reasons behind the successful implementation of the ransomware attack:

**Phishing and Credential Theft:** The hackers duped somebody to provide them with password on the basis of a false email.

**Lateral Movement and Privilege Escalation:** The hackers accessed other systems after the theft of the passwords. The latter would be more difficult to achieve in case the hospital had employed multi-factor authentication to access key accounts.

**Insufficient Network Segmentation:** The network of the hospital was not established in the best way. The ransomware would be easily transmitted across various hospital sections. Had they been more discrete in the network, the attack would not have been of such an extent.

**Exploitation of Known Vulnerabilities:** The hackers are likely to have exploited known security holes in the systems that were not repaired.

### 3.3. Global and Organizational Impact

The ramifications of the ransomware incident were potentially devastating, but the hospital's proactive preparedness significantly mitigated the overall impact:

**Clinical Operations and Patient Safety:** The hospital was not really interested in halting any of the crucial surgeries and fortunately they did not have to. Some other doctor visits had to be rescheduled, however, the most important thing was to make sure that everyone was safe. The ER did not close down even at the time when things were out of control. Having everything restored to normal as soon as possible meant that patients were not bothered as much as possible.

**Data Integrity and Privacy:** The best thing was that nobody could access any information about a patient. This is why the hospital was not fined and patients still have their trust in them.

**Financial Implications:** It was a good thing that the hospital did not have to pay out a ransom of €5 million. Admittedly, they needed to pay to get the issues, the attack created, fixed, but at least, they were not paying it to the bad guys.

**Reputational and Legal Standing:** The hospital was candid on what had transpired and got on top of the situation. This assisted them to avoid legal problems and maintained the trust of the community on them. The individuals who monitor hospitals in EU were happy with the manner in which things were managed, which further instilled confidence.

**Operational Downtime:** This is good because the hospital was able to be on its feet within 72 hours of the ransomware attack. Typically, these items require weeks or months to repair! Their recovery process was so quick that they did not need to close down long, saved money and got back to serve people as quickly as possible. services.

#### **Contingency Planning and Response Analysis: The Strategic Advantage of Immutable Backups**

This advanced, highly developed, and strictly tested contingency planning framework was a direct credit to the extraordinary resilience of the European hospital in the event of this sophisticated ransomware attack. The fundamental component of this winning strategy was strategic implementation and use of immutable, air-gapped backups.

**Strategic Investment in Immutable Backups:** Here they actually became intelligent. In one of its backup systems, this hospital wasted a lot of money, arranging it in such a manner that once the data was typed in, no one could do anything with that data, no alterations, no encryption and no deletion, at least temporarily. Write once, read many policy was highly convenient, and secures data. It obviously was the progressive thing to do. They were careful with their data, and they were therefore able to recover fast. That was clever.

**Air-Gapped Isolation for Maximum Security:** These backups were not simply lying in the network. They kept them in full seclusion. In other words, they were not even on the internet or that they were segregated. This ensured that the ransomware did not deliver itself and corrupt the backups hence had a good one to revert to, in case of the failure of something. The hospital would be completed in case it failed.

**Rigorous and Regular Testing and Verification:** They also did not simply install the backups and declare it over with. The hospital regularly drilled its backup systems and recovery plans. They even had been mock ransomware attacks to test whether the backups were working. Exposing issues identified any issues and reminded people about their duties. That is most important.

**Effective Incident Response Team and Cross-Departmental Coordination:** The cyber incident team was immediately triggered as soon as the attack occurred. They involved IT security staff, network technicians, the PR staff, doctors, nurses, compliance officers, and lawyers. There was a common language. They could identify problems immediately, prevent their further development, and cooperate with internal and external specialists. This simplified the process of recovery a bit.

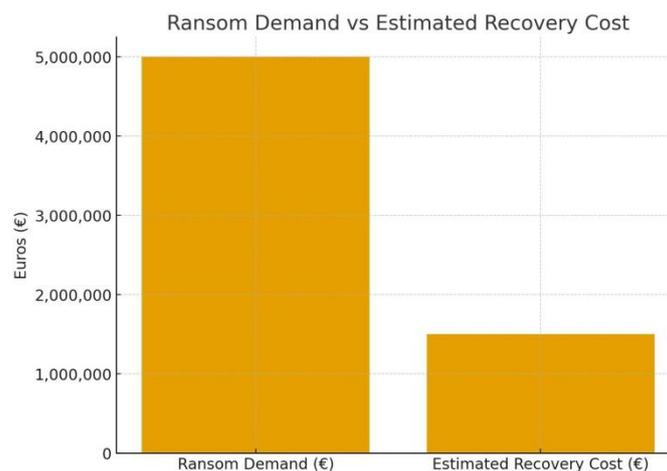
**Alignment with Leading Cybersecurity Standards:** Hospital preparations included cybersecurity organization protocols as well, and following these guidelines in the backup and recovery strategies will allow people to continue working despite a computer attack. They key is to stay current.

**Public Communication and Trust:**

The hospital was not secretive regarding the cyberattack. It is better to inform the patients and the staff what was going on rather than attempting to keep it a secret which would destroy their name since they informed everyone what had done.

*Regulatory Compliance and Cyber Insurance:* The hospital failed to pay the ransom as it is expected of them to do. Rules on insurance and privacy assisted. And insurance policies kept them out of lawsuits. Security, the law, and money are all inseparable.

**Disaster Management: Phase of strategy and implementation**



The disaster management plan of the European hospital is modeled after a multi-level and highly advanced multi-phase crisis management model, which is highly cyber resilient.

- **Preparedness:**The hospital made advance investment of some basic nature prior to any incident. They made safe backup systems, trained the employees a lot (how to detect phishing activities) and bought cyber insurances. What is more important, the hospital was also a part of the exercises in healthcare cyber incidents throughout Europe. This helped them to master their plans and faults prior to attack. Such forward-looking saw to it that resources and guidelines were available in case of need

- **Response:** The moment the ransomware attack was detected the hospital went into play. Isolating the affected networks was the first process to ensure that the malware would not spread since the affected networks could be isolated quickly. Communication plans were also one of the methods used to inform the staff and patients on the situation and the possible effect. They also notified national cyber emergency teams (e.g. CERT-EU) as soon as possible so they could get the help of external specialists and share the information about the threat. It was also during this period that the initial work to be drafted regarding the manner in which the attack was carried out and the distance that it reached.

- **Recovery :** The purpose of this step was to normalize things through assistance of the secure backups. The priority was put on the restoration of critical systems with the patient well-being in the first line. Intensive care Unit and Emergency Room systems were brought back to their operational state first so that life saving care could not be affected. This made the impossibility of the backups to go back to malware or encrypted information and it can be a major problem when restoring a system caught by ransomware.

- **Mitigation:** After recovering the hospital successfully, it started to work on the minimization of the risks in the future. They also conducted intensive reviews after the incident to be aware of what had happened, the cause of the incident, and installed mechanisms to prevent its re-occurrence. These policies included strengthening access control to what was available on the network, dividing the network to smaller safe compartments, improving the awareness and training of all the employees of phishing, and applying the modern AI-based anomaly detection system to detect potential threats in a more advanced period of time. This journey of never-ending advancement helps the company to teach the lesson of each event and re-establish the obstacles again and again. This is a well-organized and systematic approach of disaster situation management which shows that well-organized backup plans will go a long way in

decreasing the time duration required to restore data of ransomware attacks. The hospital would be able to restore its systems within a couple of days rather than uproot the hospital within a few weeks. This not only fails to protect the essential operations but also the image and compliance to rules of the hospital.

## VI. Relating this Incident to Others: Enhancing Resilience to Ransomware.

Aspect Summary	Comparison
<b>Recovery Time</b>	The European hospital in 2025 spent days to restore with backups of immutable records, which was unlike the 2021 Irish and 2017 WannaCry attacks, which took weeks.
Implication on Patients	The 2025 attack did not lead to significant inconvenience when compared to the previous attacks that caused colossal disruption in terms of delays and cancellations.
<b>Backup Systems</b>	The immutable backups were considered to be able to restore them within the shortest time possible since it would be safe; the previous attacks had weak or none at all.
<b>Response Strategy</b>	2025 case showed that there was a well-organized response compared to the disorganized responses during the older cases.
<b>Organizational Readiness</b>	The shift of view has been an apparent change of perspective on implementing cybersecurity as an element of strategy in the 2025 event, which was more primitive in the previous approaches to this one.
<b>Key Points</b>	Ask the Question Availability of a good backup system, strategic planning, are major contributors in ensuring that the scope of the impact of ransomware in an organization is minimized.

### Lessons Learned and Recommendations for Future Resilience

The European Hospital Ransomware Incident 2025 can be a lesson to priceless, practical lessons taken out by organizations in whichever fields but especially those that are involved in the critical infrastructure. These lessons may be used as a roadmap to making cybersecurity resiliency in an ever-increasing hostile digital space.

#### 7.1. Key Lessons Learned

**Do Not Rely on Ransom Payments:** This case does not in any way undermine the concept of paying the ransom as not at all a viable long-term solution in the recovery of the data. Hackers do not honor their interactions and responding to them has grave legal, ethical, and financial consequences. The recovery potential of the hospital where the non-payment was is a pointer of a better alternative.

**Unchangeable Backups are Important and Non-Negotiable:** Immutable backups are an entirely valid component of a strong cybersecurity solution in any organization that handles any of the critical information, especially in the healthcare sector. They are the last line of defense against information loss involving ransom attacks or other malicious attacks, and they will not harm the information even when there is total system compromise.

**It is necessary to periodically test the backups:** The efficiency of the backup systems has the same level of effectiveness as its last successful test of the recovery. Integrity of backups and recovery processes are of the first order and should be consistently, strenuous and realistic tested to ensure their functionality and robustness in the event of an actual incidence. Untested backups are subject to latent risk.

**Staff Training Attends to the Human Factor:** Another significant initial cyberattack is that of human error, usually through an entry-vector advanced phishing attacks ( Case Study: The 2025 European Hospital Ransomware Incident, 2025). Combined with dynamic and permanent cybersecurity education of each worker, it will help create a strong human firewall and reduce the susceptibility to attacks caused by social engineering. The psychological tension of the employees working in the fallback operations in the manual form also highlights the importance of preparedness.

**Zero-Trust Models and Robust Segmentation :** The implementation of a zero-Trust with its architecture that does not assume the presence of any trust, both inside and outside the network, and with strong network the lateral can be significantly limited by the ability of segmentation traversing of the attackers in a network and therefore the effect and propagation of a breach.

**Proactive Detection powered by AI:** Defense Not a panacea, however, a sophisticated AI-based, Machine learning and security solutions based monitoring will provide an opportunity to realize disordered activities and potential threats earlier. This will enable faster reactions, lessen the timeframe of assailants, and lessen damage in general.

**Regulatory Alignment as a Foundation of Defense:** Monitoring of international and national cybersecurity regulations and policies (e.g. GDPR, ISO/IEC 27031, NIST SP 800-34) is not merely a compliance burden, but also qualifies as a principles of successful defense, recovery planning, risk management and risk management.

## 7.2. Recommendations to Improve Healthcare.

Following the insightful lessons learnt during this event, the following recommendations can be suggested to enhance healthcare cybersecurity resilience:

**Mandate Immutable and Air-Gapped Backups:** The regulatory agencies in the EU and elsewhere in the world ought to ponder and use the policies that would compel the use of immutable and air-gapped backup plans to all the critical infrastructure, especially healthcare providers. This would create a cornerstone to organizational resilience to ransomware.

**Increased Funding and Resources for Cybersecurity Authorities:** It means that both national and international cybersecurity bodies need to receive a considerable amount of funding and resources. This would help them to offer specialized support, share robust threat intelligence, and offer expert incident response support to vulnerable healthcare organizations.

**Foster Public-Private Partnerships:** Proactively promote and support initiatives of cooperation between healthcare institutions, major cybersecurity companies, and the government. These alliances play a pivotal role in sharing important threat intelligence, distributing best practices and collaboratively creating new ways of defense.

**Standardize International Ransomware Response Protocols:** The necessity to create and popularize standardized international frameworks and playbooks with a specific focus on the ransomware response in the healthcare industry is urgent. This would guarantee the coordination, efficient and effective worldwide response to cross-border cyber threats.

**Enhance Patient Awareness Campaigns:** Carry out widespread patient education by initiating large-scale public awareness programs that will inform patients on the optimal data security practices and what medical professionals are doing to safeguard their sensitive information. This active communication can build up trust in the digital healthcare ecosystems to a great extent.

**Implement Multi-Factor Authentication Universally:** Implement MFA on all user accounts, in particular, ones with administrative privileges or with access to sensitive systems, to significantly decrease the threat of credential theft and illegal access that was a major weakness in this instance.

**Regular Vulnerability Assessments and Penetration Testing:** Regular, unbiased security audits and extensive vulnerability test and realistic penetration tests to actively determine and correct the security vulnerabilities before they can be exploited by unscrupulous individuals.

**Promote Cybersecurity as a Core Governance Function:** Make cybersecurity a strategic governance function and not a technical issue, but an active and managed role that involves executive governance and boards of directors.

### Lessons Learned And Recommendations For Future Resilience

In this case study, we go beyond reporting the incident and propose an innovative Ransomware Resilience Framework tailored for healthcare systems. Our unique contributions establish new decision-making and architectural standards necessary for organizations to achieve highly efficient recovery and minimize catastrophic operational and financial damage.

**1. Ransomware Resilience Decision Model (R2DM)-** We propose a structured model to guide executive leadership during a ransomware crisis, moving beyond purely financial or ethical considerations. This model provides a quantitative basis for the critical Pay Ransom versus Recover via Backup decision by comparing:

**Financial Liability Contrast:** Comparing the Ransom Demand (€5 million in this case) against the Actual Recovery Costs (incident response, forensics, system remediation, which averaged approximately \$2.57 million (€2.4 million) for peer organizations).

**Time-Cost Analysis:** Benchmarking the System Recovery Time (72 hours achieved) against the massive Cost of Downtime (exceeding €500,000 per day), validating that resilience investment directly minimizes financial loss.

**Intangible Impact:** Quantifying Patient Impact, Legal Risk (potential GDPR fines for data loss/inaccessibility), and Trust/Reputation Damage This model fundamentally shifts the decision-making paradigm from crisis management to strategic risk calculation, proving that a robust backup infrastructure provides the confidence needed to avoid ransom payments.

**2. Enhanced -"3-Layer Cyber Resilience Architecture** "To fortify healthcare infrastructure against multi-vector attacks, we introduce an enhanced three-layered architecture focused on preventing, detecting, and, crucially, guaranteeing recovery :Layer Focus Core Components Innovation Added

Layer 1: Prevention Attack Surface Minimization Zero Trust Architecture, Universal Multi-Factor Authentication (MFA), and Granular Network Segmentation .Standard application of best practices.

Layer 2: Detection Threat Identification Security Operations Center (SOC) monitoring, Advanced Endpoint Detection and Response (EDR).Integration of AI-based anomaly detection systems for proactive identification of lateral movement

Layer 3: Recovery Guaranteed Availability Immutable and Air-Gapped Backups, Prioritized Restoration Protocols .Blockchain-Logged Backups (for irrefutable recovery chain-of-custody) and Automated Recovery Testing processes.

**3. Backup Integrity Verification System (BIVS)**-A significant innovation is the Backup Integrity Verification System (BIVS), which addresses the most common failure point in disaster recovery: assuming backups are clean and viable without regular, automated testing .The BIVS protocol ensures backups are not corrupted, encrypted, or harboring latent malware through the following mandated steps:

Daily Hashed Snapshots: Every new backup is cryptographically hashed, and this value is compared against a pre-compromise "golden copy" hash to confirm data integrity.

Sandbox Recovery Simulation: The BIVS automatically initiates a simulated, isolated recovery—running a 5-minute boot-up test of the most critical systems (e.g., Electronic Health Records) on a quarantined sandbox server.

Automated Reporting: The system auto-generates a "Backup Health Report" daily, providing executive leadership with guaranteed, real-time proof of recoverability.

**4. Quantitative Comparison Framework:** Recovery Efficiency (RE) to allow for objective, mathematical comparison of cyber resilience across different hospital groups and incidents, we introduce the Recovery Efficiency

Recovery Efficiency (RE)=

Recovery Time (hrs)×Cost (€)Systems Restored (%)

–Data Loss (%)

This metric provides a high-level, single figure that mathematically rewards high recovery percentage, minimal data loss, rapid recovery time, and low cost. Applied to the 2025 European Hospital case:

RE = 80% - 0% /72 hours x €2,400,000 (Est. Recovery Cost)

The resulting high RE score validates the hospital's strategic performance against peer institutions, making resilience quantifiable and measurable for governance purposes.

**5. Future Vision:** AI-Driven Digital Twin Simulation Looking forward, we propose the integration of Digital Twin Cyber Environments. A digital twin of the hospital's entire IT network—from IoT devices to core servers—would be created, mirroring all configurations and security controls. This twin would be used for :

AI Attack Simulation: Running hundreds of sophisticated, AI-driven ransomware attack simulations daily to identify and exploit vulnerabilities that human penetration testers might miss .

Automated Control Validation: Automatically adjusting security controls and re-testing BIVS protocols until a 100% recovery assurance is reached. This predictive, closed-loop simulation environment moves security from reactive defense to continuous, self-improving strategic preparedness

## Conclusion

The 2025 ransomware attack on a European hospital chain is a strong and unambiguous wake-up call to the existential threat that ransomware has continued to represent to essential healthcare provision throughout the world. But this critical case study also offers strong proof that the proactive contingency planning, most evidently, in terms of the strategic implementation of the immutable, air-gapped backups, may change the face of disaster after all.

The hospital was not only able to save its precious reputation, having earned it with a lot of hard work, but also minimized its legal risks associated with all the strict data protection laws, and above all, patient safety and care did not become discontinued, because of its ability to successfully restore its vital systems in a short period of time, which is 72 hours, without having to succumb to the pressure of the attackers, who demanded a ransom of 5 million euro, which the hospital was not willing to yield. Such an incredible success story effectively justifies the overall virtue that resilience should become a top priority, as opposed to the short-term efficiency in the current digital environment which is interconnected and threatened.The successful integration of the immutable backups, frequency, and realistic drills, the implementation of the zero-trust security methodology, the incorporation of the AI-based detection tools, and the solid policy provision at both organizational and governmental levels are the key pillars of the healthcare cybersecurity



resilience of tomorrow. The valuable lessons that have been acquired throughout this incident do not confine themselves to the healthcare industry and are a priceless blueprint and an eye-opener to all critical infrastructure industries, which are becoming vulnerable to the ubiquitous risk of ransomware. The case shows that a thriving strategic investment, foresight, and unswerving dedication can help reduce ransomware, turning a possible disaster into a success story of solid cyber resilience.

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## Original Article

### International Trade and American Tariff: An Economic Analysis Special Reference to India

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**Abstract**

*International trade plays a key role in global economic growth. The use of taxes on imported goods is an important tool in international trade. The United States of America (USA) often uses tariffs to protect domestic industries and address trade imbalances. The effects of these tariffs are felt globally, including in India and developing countries. On 27 August 2025, USA tariffs on India were increased to 50% by the directive of President Donald Trump, affecting more than half of India's exports to the USA. These Indian tariffs on goods going to the USA target sectors such as textiles, gems, jewelry and leather, raising concerns about the economic impact. This research paper focuses on various aspects of international trade and USA tariffs, with a special focus on economic analysis of India.*

**Keywords:** Trade, Tariff, USA

**Introduction:**

The United State of America (USA) and India have maintained a strong and expanding trade partnership. The trade between the two countries has reached record levels in recent years. The USA has imposed a 50% tariff on India, which is affecting key exports such as textiles, gems and auto parts. India has imposed tariffs on US goods. India's tariffs on USA exports are related to the 50% tariffs imposed by the USA government on various Indian goods in 2025. These tariffs were the highest ever imposed by the USA on India. These high tariffs are having an economic impact. As a result, their \$87 billion worth of exports to the USA are at risk. This has strained relations between the two countries. This paper focuses on various aspects of international trade and American tariffs, which are of particular relevance to economic analysis for India.

**Objectives of the research paper:**

- 1) To study the various aspects of International trade
- 2) To review of American Tariff an economic analysis of India.

**Research Methodology:**

The information in the research paper is collected from secondary sources included various references book, research paper, Government report, journal, periodicals, websites and online sources etc. related international trade and American Tariff.

**International Trade**

India's major exports to the USA include pharmaceuticals, precious stones and jewelry, electrical machinery and mechanical appliances. The USA remains India's largest goods trading partner accounting for nearly 11% of India's total trade. Both nations continue trade talks to reduce

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tariffs and enhance market access for key products such as spirits, motorcycles, and industrial machinery.

## American Tariff Policy

USA tariff Implementation Dates on Indian Goods are following

Date	Event	Tariff Announcement
02/04/2025	Announcement of reciprocal tariffs	The US announced a 26% tariff on Indian goods later adjusted to 25%
05/04/2025	Baseline tariff effective	A 10 % baseline tariff on all imports including India was implemented
09/04/2025	Delay of nation specific tariffs	The 16% nation specific tariff for India was delayed for 90 days until July 9
08/07/2025	Extension of delay	The delay period for nation specific tariffs extended to August 1
30/07/2025	Announcement of 25% tariff plus penalty	The US declared to 25% tariff on Indian goods, effective August 7, with an unspecified penalty for Russian oil purchases
01/08/2025	Initial 25% tariff effective	25% tariff (10% baseline + 15% reciprocal) applied to Indian goods
07/04/2025	Executive order for 25% tariff implementation	The white house issued an executive order confirming a 25% tariff on Indian goods, effective immediately with exemptions for pharmaceuticals electronics and energy
27/08/2025	An additional 25% tariff is effective	An additional 25% tariff was implemented bringing the total to 50% for most Indian goods(except exempted sectors)
05/10/2025	Grace period for in transit goods	Goods loaded onto ships before August 7 and arriving before October 5 are subject to the earlier 25% tariff rate not the 50% rate

## India-United State of America Trade Relation

The United States and India maintain a strong and expanding trade partnership, with commerce between the two nations reaching record levels in recent years.

1. Bilateral goods trade between the two countries stood at around USD 129.2 billion in 2024.
2. The USA recorded a trade deficit of approximately USD 45.7 billion with India.
3. India's major exports to the USA include pharmaceuticals, precious stones, jewelry, electrical machinery and mechanical appliances.
4. The USA remains India's largest goods trading partner, accounting for nearly 11% of India's total trade.
5. Both nations continue trade talks to reduce tariffs and enhance market access for key products such as spirits, motorcycles and industrial machinery.

## Affected Sector by American tariffs

The following sectors in India have been affected by American tariffs.

### 1. Textile and apparel sector

The USA imposes a 50% tariff on textile and apparel, making them less competitive in the US market.

### 2. Gems and jewelry sector

The USA is imposing a 50% tariff on gems and jewelry, resulting in a 59.5% decline in exports. The gems and jewelry sector is the worst hit by this tax. Many exporters have reported a decline in turnover of up to 50%.

### 3. Leather and footwear sector

The leather and footwear sector has been affected by the USA tariffs. These are policies that are affecting the competitiveness of Indian exporters.

### 4. Marine products sector

The USA tariffs have affected the marine products sector. The significant tariffs have been imposed on exports of marine products.

### 5. Chemicals sector

The USA tariffs have affected the chemicals sector. The chemicals sector is facing a decline in exports due to the tariffs.

## 6. Automobile components

The automobile components sector accounts for over 55% of India's exports to the USA, making them vulnerable to tariff hikes.

### Impact of USA Tariffs on India

#### 1. Export decline:

India's exports to the USA have fallen by 37.5% between May and September 2025 due to USA tariffs. This has led to a significant decline in sectors such as textiles, gems and jewelry. India's exports have declined significantly due to the tariffs imposed by the USA. In particular, industries such as gems and jewelry and garments have been hit.

#### 2. GDP growth:

USA tariffs may reduce India's GDP growth by 0.3-0.5%, the estimate may be reduced from 6.5% to 6%.

#### 3. Impact on business and employment:

The Labor-intensive sectors such as textiles and gems and jewelry may lose jobs due to reduced competitiveness due to USA tariffs. Employment opportunities are also likely to be affected as some industries are hit hard.

#### 4. Economic instability:

The increased tariffs due to USA tariffs have weakened the Indian rupee. This has created economic uncertainty.

#### 5. Strain on trade relations

American tariff policy has created tension in trade relations between India and the United States.

#### 6. Stock Market Reaction to Tariff Announcement

The tariff shock has triggered a broad market correction, especially in export-linked sectors, while defensives like pharmaceuticals and IT remain resilient. The Nifty Pharma Index has gained over 3% since August, supported by tariff exemptions and stronger export orders to the US. IT Services insulated from trade exposure, these sectors continue to attract domestic and institutional investors. The Sensex and Nifty have corrected around 2.8% month-on-month. The Indian Rupee is trading near a record low of Rs. 88.78 per USD as investors' price in trade and inflation risks.

### Tariff-related measures

India has taken some measures regarding tariffs

#### 1. Increasing exports to other markets:

India is exploring new markets and trade agreements to reduce its dependence on the USA. To counter the USA tariffs, India has increased exports to other countries such as Europe, the Middle East and Africa. This has led to a 9% increase in exports in July-September.

#### 2. Bilateral trade agreements:

The Government of India is committed to a bilateral trade agreement, with a deadline of autumn 2025 for negotiations. India is in diplomatic talks with the USA to resolve this issue. Bilateral trade agreements are being discussed between the USA and India to further strengthen trade relations.

#### 3. Focus on structural reforms:

India has focused on structural reforms in its economy to counter the tariffs.

#### 4. Domestic resilience:

Prime Minister Hon'ble Narendra Modi has encouraged local manufacturing to cope with global demand shocks.

#### 5. Abandoning protectionist policies:

The emphasis is on accelerating efforts to diversify trade partners outside the USA and strengthen ties with global.

#### 7. Raising voice internationally:

India can complain about USA tariff policies at the World Trade Organization (WTO).

### Exempted Sectors

Some sectors are exempted from USA tariffs. These exemptions protect India's strategic exports, particularly its generic drug industry, which supplies nearly 50% of the USA drug market. These exempted sectors include 1. Pharmaceuticals 2. Semiconductors 3. Energy Resources 4. Critical Minerals, etc.

### Conclusion

The research paper concludes that USA tariffs have had a negative impact on India's exports. India has tried to address this challenge by focusing on other markets and entering into bilateral agreements. The Indian stock market has been experiencing volatility after the USA imposed tariffs on India. India has not yet announced any retaliatory tariffs on USA goods but reserves the right to take action through the WTO mechanism. Although India's tariffs on USA products remain unchanged until October 2025, the government is assessing reciprocal options if trade talks fail. The



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USA has imposed a 50% tariff on Indian goods, which has significantly affected various sectors. The USA - India tariff dispute is having an economic impact on trade flows, supply chains and components of the economy.

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## Original Article

### Open Source Software vs Commercial Software: A Comparative Study on Library Automation - A Need of Engineering Colleges in Pune Region Maharashtra

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#### Abstract

In today's modern techno-savvy information age, libraries require efficient and user-friendly systems to manage their vast collections and serve patrons effectively. Integrated Library Management Systems (ILMS) is computer-based to manage internal and external library resources as well as a tangible asset. It addresses this need by offering a centralized platform that automates core library functions, growth in the knowledge, and different types of libraries. To help manage the library budget utilization, library collection, and development. Software's different modules focus on simplifying library work like circulation, cataloguing, acquisition, OPAC, etc. This paper's purpose is to provide information on open-source software and commercial software information.

#### Keywords

Integrated Library Management Systems (ILMS), Open Source Software, Commercial software, freeware software, Library Automation etc.

#### 1. Introduction

Library automation is crucial for the efficient management of library resources in engineering colleges. With the increasing need for digital access and management, institutions must choose between **open-source software (OSS)** and **commercial software (CS)**. This study compares both types, analyzing their applicability, benefits, and challenges in the context of engineering colleges in Maharashtra. Library automation involves managing and automating library activities that are using computer-based. Now types of library management software are available in the market. Before the automating library systems need to find suitable library management software for the library requirements. Many types of software are available now, in that software selected as per their library requirements fulfills. Open source software OSS and commercial software both types of solutions are available. Library automation involves managing and automating library activities using computers. Open-source software provides a cost-effective solution for libraries with limited funds, allowing them to stay up-to-date with the latest technology.

#### 2. Literature Review

There is much literature available on OSS and commercial library software at national and international levels. An OSS software advantage, drawbacks and issues of Koha, MyLibrary, Infomine, LOCKSS, Libproxy, and Jake this software provide basic and general information (Bretthaur, 2002). Development of OSS applications, service and completes areas of emerging

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software mention. Library trends, supports, shifting from locally to developed system and development of vendors systems etc. maintains (Breeding, Marshall 2002).

Provide general information OSS systems and in the Evergreen software investigates issues and locations related Chinese language (Zou, Q. and Liu, G. 2009).

Discuss features in briefly OSS library management software and Digital library softwares of the Evergreen, Avanti, Koha, OpenBiblio, PhpMyLibrary, NewGenlib, DSpace, Greenstone etc (Reddy, T. R. and Kumar, K. 2013). Present information, evaluation, development and support of basic functions like OPAC, cataloguing, circulation, provide information of source code, scalability of OSS software (Boss, R. W. 2005 & 2008).

Muller is identified twenty OSS library management systems including evaluating and apply three-step criteria of software (Muller, T. 2011). Wang explains today's library system as well as describes next-generation library management systems, architecture, workflow, discovery layer and service of Alma and Kauli OLE ILMS (Wang and Dawes 2012).

Comparison in open source software and proprietary software provides a good understanding of current studies. There is an explanation for similar technological standards, different platforms, surface tables and varies research articles (Gauri, S. and Soni, R. 2016).

### 3. Objectives of the Study

- To understand the concept of open-source and commercial library management software.
- To compare OSS and CS in terms of features, cost, support, customization, and performance.
- To identify the software preference in engineering colleges of Maharashtra.
- To recommend suitable solutions based on college needs and budget.

### 4. Methodology

**Type of Study:** Comparative and Analytical

**Data Collection:**

1. Primary Data: Survey/questionnaires/interviews with librarians, IT staff.
2. Secondary Data: Literature review, software manuals, case studies.
3. Sample: Engineering college libraries in Pune, Kolhapur, Sangali, Satara cities in Maharashtra.

### 5. Library Automation

Automation is the use of automated machinery and technology to perform tasks that humans previously completed. Computer application is used in the services and various operations of libraries. One way to think of a computer system is as a high-speed, automated information transportation device (called hardware and computer software). A computer's physical parts are referred to as its hardware, and its software is a collection of instructions that the hardware is supposed to follow. A computer can only operate when the hardware and software are both compatible and configured appropriately.

According to the American Library Association (ALA), library automation is defined as "the use of computers and related technologies to carry out library operations, such as acquisitions, cataloging, circulation, and reference."

#### History of ILMS (Generations)

History of Integrated Library Management Systems ILMS library software has come a long way since the 1780s to 1930s its beginning, the cards catalog was started in the earliest phase. (Pratheepan, T. 2011) In the year 1960s libraries are taken benefits of computer technology for using Machine Readable Cataloguing MARC are started.

##### a. 1950s to 1960s

- The earliest library automation system introduced for circulation and cataloguing functions are limited
- Standalone unintegrated applications computers are used.
- No standard metadata for use
- Functions are limited in capabilities and user-friendliness

##### b. 1961s to 1970s

- Development of standard database management systems DBMS adaptations
- Metadata standards are available for the bibliographic records MARC
- Minicomputers and microcomputers are adaptations
- Bibliographic data and centralized cataloguing, distributed cards started for exchange
- Venders started to developing library management systems

##### c. 1971s - 1990s

- In 1980s personal computer rise
- Libraries have started networking LANs and WANs to connect other libraries
- Introduced features such as online public access catalogs OPAC



- GUI Interactive application and client-server-based architecture
- Possible federated searching information searching protocol through Z39.50
- RDBMS and SQL-based search systems used for back ends

## **Internet generation**

### **a. Web1.0**

- Introduction of Online Public Access Catalog (OPAC) hosted on web servers.
- Adoption of new client-server systems leveraging web technology for data storage and transaction processing, facilitated by the availability of affordable internet connectivity.
- Entry of open-source operating systems like Linux into the scene.
- Continued reliance on relational database management systems (RDBMS) for backend infrastructure, with search systems predominantly based on SQL.
- Emergence of visually rich graphical user interfaces (GUI) crafted using tools like Visual Basic and Visual C++.
- Rise of development platforms such as Java and .NET for creating web applications.

### **b. The Web 2.0 Era**

- Ordinary individuals actively contributed to the web through channels such as blogs, wikis, podcasts, and social networks, altering the expectations of library users regarding their interactions with libraries and library management systems (LMS).
- Dissatisfaction grew with the rigid and inflexible nature of traditional library management systems (LMS) and online public access catalogs (OPACs).
- Advancements like web services, increased interoperability, and the introduction of RSS/Atom feeds led to enhanced user experiences, exemplified by platforms like Amazon books and eBay.
- Open-source software has gained relevance in the market, offering alternatives to proprietary systems.
- The commercial market witnessed consolidations and mergers, reflecting significant shifts within the industry.
- Institutions sought improved integration of LMS with emerging enterprise applications to meet evolving demands.
- The internet emerged as the primary platform for software development, shifting its role from being solely an information conduit to fostering active user participation.

### **c. The Web 3.0 Era**

- Libraries incorporate linked data principles to interconnect and expose their collections, enabling more comprehensive and interconnected access to information.
- Libraries explore the potential of block chain for transparent and secure management of digital assets, including authentication, licensing, and copyright.
- Libraries experiment with VR technologies to create immersive learning experiences, virtual tours, and simulations, enriching user engagement and interaction
- Libraries integrate AR applications to overlay digital information onto physical spaces, enhancing discovery, exploration, and understanding of resources
- Libraries employ advanced analytics and user profiling techniques to deliver tailored services, content recommendations, and interactive experiences to patrons
- Libraries deploy IoT devices for real-time monitoring of library spaces, resource utilization, and environmental conditions, optimizing operations and services
- Libraries leverage AI and machine learning algorithms to improve services such as recommendation systems, personalized search, and content analysis
- Libraries prioritize data privacy and security measures, implementing robust protocols and technologies to safeguard user information and digital assets

### **d. The Web 4.0 Era**

- By using artificial general intelligence (AGI), libraries could develop very intelligent systems that can comprehend and react to intricate customer inquiries, enhancing search efficiency and suggestion systems.
- Libraries have the potential to engage in distributed knowledge networks, which facilitate the generation, exchange, and verification of information among dispersed platforms while maintaining data integrity and ownership.
- Libraries might build fully immersive learning environments, virtual libraries, and interactive educational simulations by adopting cutting-edge immersive technology like extended reality (XR).
- The potential of quantum computing to process massive volumes of data quickly, enabling extensive data analysis, encryption, and optimization of library operations, may be explored by libraries.
- Advanced data analytics methods, such as prescriptive and predictive analytics, could be used by libraries to improve decision-making, optimize resource allocation, and anticipate user demands.



- To preserve the confidentiality and integrity of user data while allowing cooperative research and resource sharing, libraries may adopt cutting-edge security techniques like homomorphic encryption and zero-knowledge proofs.
- Libraries could increase operational efficiency and free up staff members for higher-value tasks by using autonomous technologies for tasks such as robotic assistance, inventory management, and collection maintenance.

## 6. Comparative Study Table: OSS vs CS

Sr.No.	Criteria	Open Source Software (OSS)	Commercial Software (CS)
1	Cost	Free to use, no licensing fee	High licensing and annual maintenance costs
2	Customization	High Source code can be modified	Limited Vendor-dependent customization
3	Support	Community-based, sometimes inconsistent	Professional vendor support, SLA-based
4	Training	May require in-house training or online resources	Usually provided by vendor
5	Upgrades	Free, but manual or technical knowledge needed	Provided by vendor as part of AMC
6	Examples	Koha, Evergreen, NewGenLib	SLIM, Libsys, SOUL, VTLS
7	Implementation Time	Moderate depends on in-house expertise	Quick managed by vendor
8	User-Friendliness	Varies, generally improving	Generally more polished interfaces
9	Security	Depends on implementation and community updates	Vendor ensures security updates and backups
10	Scalability	High adaptable for large systems	High designed to handle large, institutional libraries

### Open Source and Commercial Library Management Software

**Richard Stallman** a pioneer of free and open source software. In order to develop a free operating system, he started the GNU Project in 1983. Several vital software libraries, such as the GNU Debugger (GDB), the GNU C Library (glibc), and the GNU Compiler Collection (GCC), have been created by the GNU Project. Numerous open source and free software projects make use of these libraries. For the free software movement, Stallman is a fervent supporter as well. For users to run, alter, and share software, he feels that it should be free. About the moral and functional advantages of free software, he has written a great deal Stallman, R. (2002).

According to [the open source way](https://opensource.com/resources/what-open-source) “Open source projects, products, or initiatives embrace and celebrate principles of open exchange, collaborative participation, rapid prototyping, transparency, meritocracy, and community-oriented development (<https://opensource.com/resources/what-open-source>).



Many software applications require libraries that are open-source software to be developed. Their code serves as a basis upon which new applications can be constructed. Along with helping to guarantee that apps are interoperable, this can save developers time and effort Morgan, E. L. (2002). People prefer using open-source software for several reasons:

1. **Freedom and Control:** Open source software licenses does not limit anyone can study, alter, and share the source code of open-source software in any way that best suits their requirements. Because of licenses are not respected also not require fees or royalties.
2. **Transparency:** Open-source software is developed in an open and transparent purpose, with the source code being freely available for inspection. This transparency fosters trust among users.
3. **Availability:** Open-source software is available freely on developer website. This type of software is developed in limited software including 24x7 support from developers as well as an online community.
4. **Cost Savings:** OSS software is available at little cost. Those can lead to significant cost savings for individuals, organizations, and businesses. There is no licensing fees and users have the freedom to deploy the software on as many systems as they like.
5. **Service and Support:** Open source software comes under an online community, it is a network to learning support. Required basic knowledge to install and run such of types software, also available online support from developers and vendors.
6. **Security:** Open source software anyone can download and make changes as per their requirements, because of the less secure code. Source code is available freely, hence changes can done as per our requirements.
7. **Long-Term Availability:** Since open-source software projects are not reliant on the financial stability or strategic choices of a single vendor, they usually have more longevity than proprietary software projects.

**Commercial Software:** the terms of a model which is software created for a business it is a usually licensed copy, and price of that is few hundred thousand dollars. The business entity frequently offers consumers the assistance, instruction, upgrades, and other services of a similar nature that they require in order to utilise the software effectively. The software's source code is typically not disseminated to the general public and may only be copied or altered in accordance with the procedures specified in such agreements. However, it may be made available to certain users of the program through special licensing or other agreements.

Propriety software advantages is provide support supports their clients without technical expertise offline as well as online. Vendors are available immediately after calling for assistance and also help to solve software-related queries. Commercial software continues to develop new versions, R&D in modules, best practices, innovation, implementation and provide to users. These types of software always lot of security because software develops in a controlled environment, and the source code is edited only development team. Availability of software easily from respected companies to libraries, some time they provide trial versions for free to test. Some commercial software are below.

Sr.No.	Name of Software	Developed by	Price	Website
1	Autolib	AutoLib Software Systems, Chennai	Rs. 80,000	<a href="http://www.autolib-india.net/">http://www.autolib-india.net/</a>
2	SOUL	INFLIBNET Center, Gujrat	Rs. 50,000/-	<a href="https://soul.inflibnet.ac.in/">https://soul.inflibnet.ac.in/</a>
3	LibSys	LibSys Software Pvt. Ltd., Gurgaon	Rs. 4,00,000/-	<a href="https://www.libsys.co.in/">https://www.libsys.co.in/</a>
4	SLIM	Algorhythms Consultants Pvt. Ltd., Pune	Rs. 1,80,000/-	<a href="https://slimkm.com/">https://slimkm.com/</a>
5	iSLIM	Algorhythms Consultants Pvt. Ltd., Pune	Rs. 1,99,500/-	<a href="https://slimkm.com/">https://slimkm.com/</a>
6	LIBMAN	Master Soft ERP Solutions Pvt. Ltd. Nagpur		<a href="https://libcloud.mastersofterp.in">https://libcloud.mastersofterp.in</a>

## 7. Key Findings (Illustrative)

- 60% of government-aided engineering colleges prefer **Koha** (OSS) due to low cost.
- Private institutions tend to adopt **SLIM or Libsys** (CS) for reliability and support.



- Customization and freedom with OSS attract technically capable colleges.
- Lack of in-house IT support leads some institutions to prefer vendor-managed CS.

## 8. Challenges in Adoption

**Open Source:** Requires skilled IT team

- Less accountability for support
- Documentation gaps

**Commercial Software:**

- High cost burden
- Vendor lock-in
- Periodic renewal and AMC costs

## 9. Conclusion

Both OSS and CS have merits and limitations. Engineering colleges in Maharashtra should base their decisions on Budget availability, Technical manpower, required features, and Scalability needs. In many cases, OSS like Koha provides a sustainable and customizable option if IT support is available, while CS suits institutions needing full support and ready-to-use features. Traditional libraries have become automated libraries through automation. Automation has become as one of libraries most important components now a days. In the information era of the future, everything will be mechanized and digitalized. In the history of Integrated library management systems, development starts 1960s , starting from machine-readable Cataloguing. The basic development in the first and second generations, The tremendous changes in library automation after the 1990s introduction of personal computer, Internet generation and Artificial intelligence in automation. Vendors introduce their commercial software LibSys, Autolib, SLIM, LIBSUTE, SOUL DELMUS, LIBRIS, SANJAY, LibMan, etc. as well as benefit of the open source software movement to use OSS are ABCD, BiblioteQ, EMILDA, Evergreen, Koha, NewGenLib, OpenBiblio, etc. use for library automation.

## 10. Recommendations

- Conduct training for library staff on OSS tools.
- Hybrid model: Use OSS with outsourced support.
- State-level consortiums can negotiate better pricing or support services.
- Encourage AICTE/UGC to fund automation in smaller institutions.

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## Original Article

### A Powerful and Fastest Business Tool: Social Media

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**Abstract:**

*In our business world, most of the business organisation interconnected with each other through workforce and many other business activities. This business activities deals with appropriate and selecting proper Social Media sites and websites from the various options available and supporting the same to acquire important value for the business organisations. This requires an overall management and understanding of the advantages and disadvantages of Social Media and adjusting these efficiency regarding in the context of organisation. Generally, most of the business organisation manage their workforce or manpower effectively with reference or according to better utility of Social Media. This research paper describes the Human Resource management through Social Media and their impact on various business tools and its business efficiency.*

**Keywords:** Business organisation, Social Media, manpower, etc.

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**Introduction:**

An important powerful business and Human Resource Management Tool is recognized as Social Media from this century. In most of the business organisation manpower or workforce which is interlinked to each other through various business activities. When a better business networked organisation helps the core or important use of social network then only we identify the inherent value of business organisation, and it can develop or grow working employees strengthen and values through identification of problems of business organisations. Having professional as well as personal experience of those work in often seen to add or contribute to Social Media. Social networks enterprises provide a mechanism for employees or workers throughout the business organisation to formally or informally step towards as functioning leaders, which influence them directly and contribute for the larger business organisation. Online retail business is another format which has high potential for growth in the near future. (Ghate, 2015) This makes business organisation to help the procedure to identify the talented leadership through Social Media but can also incalculable and develop distributed leadership skills, where as workers or employees are encouraged for their expertise value and skills they have, which can contribute or add any time, rather than the post or positions they have in Social Media business organisation. World best class leaders encourage key employees to become best employee for the business organisation on the platform of Social Media, helping customers,



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attracting talent, building the best brand, and providing a personal face to the business organisation. In addition to advantages of external activities, these important leaders of Social Media become more interconnected and personally bonded to business organisation, its goals, and mission if done accurately. Moreover these workforce or employees may come or join from everywhere in the business organisation, from managers, to line personnel, to interns, to executives, to product salesmen etc, but the work must be done correctly and be taken the attention and support accurately to protect the platform of Social Media properly for the business organisation. A well-established and brand oriented set of powerful and fastest business tool is called Social Media. In recent days larger use of Social Media is being accepted as an effective solution for internal and external innovativeness. Mostly a good governance and effective strategy when integrated with Social Media as fastest business tools, then they can impact your business organization positively very much.

**Objective:** To study the Social Media as powerful and fastest business tool.

**Hypothesis:** Social Media is a powerful and fastest business Tool.

**Analysis:-**

### **Workforce- The Multigenerational and Leveraging Tool:**

We can name as employee of Generation Y are using Social Media in the manner of very sophisticated nature. They are using as most important part or entity of their day-to-day life. Also they are using it easily and effectively for their business activity regularly. Whereas baby boomers and traditionalists are like to prefer meetings of face-to-face or phone calls, on the other hand Generation Y don't want or necessarily need face-to-face meetings and like to prefer to bring the phone for sending text on video as against to make a phone call. For relationship building of this kind of group often occurs simply through connecting the Social Media platform networking system. A proper implementation of a procedure or policy recommended for Social Media can be challenging for various diverse manpower or workforce. To understand in a best way that how a Social Media policy may affect the change of larger business organisation is through assessment of how each element or stakeholder may be affected by these change. Hence such analysis of Social Media helps to progress and identify best priority which is impacted by key highlights of every stakeholder requirements. As a powerful and fastest business tools in Social Media, age is often a part, not the only basis for the issue, its may be in a part of adaption, acceptance and readiness to change among the business organisation. However, many research has proven that the fast-developing demographic movement for Social Media and other facebook what's app tools is for every age group of people. Many traditionalists and child boomers are ready to learn quickly and uses new devices for many purpose. In fact, introducing a piece of new technology to the same population must be different rather than introducing it to those population who have developed their Social Media technology for their business activities of early years. As readily of Social Media business tools, development of both external and internal communication, it is very important to identify and clearly define its procedure and policy of Social Media for various business activities. On the other hand traditionalists and child boomers may be more opposing to accepting and initially using Social Media procedure and policy, where as Generation Y users will more positively using it and become frustrated if an business organisation does not use or fails to recognize or manage proper use of Social Media. Conceptually to proper belief, the Social Media has proven to increase the employee engagement and productivity of various business activity if it controlled accurately.

Social Media may also foster many business activities through innovation and collaboration with many other business concept and different activities. This makes result of more than 70% of the business organisations which uses the technology of Social Media have achieved best all round performance of their business activities.

### **Success of Essential Business Tools:**

Effective implementation and cultivate to proper communication an appropriate way of usage of Social Media through manpower or workforce of multigenerational nature, it is very important for various business organisations to grow effective communication plans which allow proper ongoing feedback, video and dialogues. Proper communication provide as a strategic change pillar by facilitation of transition from awareness to the real ownership and adoption of the Social Media and its integration through various business tools and guidelines. Effective communication provide the practice for external and internal guidelines required to governs the use of Social Media and its effective business tools regarding various business activities in the various organisations. A strategy of effective planned communication often initiated with a communication assessment which is focusing on three element: an effective audience and its analysis, a good communication channel and its analysis, and a culture of communication and its analysis. In general, producing such a planned communication may insist of analyzing all around current communication of Social Media procedure and policy which is adjusting new requirement and identification of necessary stakeholder groups for developing and implementation of strategy which consist of variety of many preferred communication channels of successful business tools.

## **Key Pillars of Social Media and Business Tools:**

The vision of Social Media and its business tools would be supported by many pillars that covers many projects of various business organisations. A well-integrated plan of Social Media may touching upon all sections and its population of the Indian society, if properly implementation done can hold many promises and change or transform the way of citizens those who connected with the Social Media and its business tools. It may be very critical for State and Central governments to ensure awareness of citizens its minority progress and implementation to ensure efficient and smooth functioning of Social Media and its business tools.

## **Social Media and its technology:**

Mostly, Social Media and its technology has been the largest change maker in bringing the massive transformer in both private and public sectors. For considering the appropriate timelines involvement, the implementation of Social Media would need to be done as various business tools in a agile and lean manner, and it should be secure and cost effective. Social Media and its technologies such as mobility, cloud computing and analytics could be the best appropriate which enabled the pillars and the vision for best business tools for the initiative taken by various business organisations.

## **Fastest business tools and cloud computing:**

Social Media could be considered as fastest business tools through cloud computing which enabled the users to retrieve and store information irrespective of where the data is located. The government of India plans to use Social Media for seamless integration between citizens and with various departments. Cloud computing with Social Media provide a centralized data service facility that can help in transferring of information at a very fast pace.

## **Social Media and its mobility of business tools:**

Mobility of data enables availability of information through equipments such as laptops, tablets smartphones etc. Since, it can be connected with cloud to enables sharing of information or documents with other users of Social Media. Citizens or users can communicate with Social Media for doing business activities regardless of their actual location. Bureaucrats, diplomats and many users can collect information and make decisions on the movements of Social Media for various business tools, which allows for easier and faster decisions making.

## **Social Media and its Analytics:**

Analytics of Social Media relies on large collection of data and drawing many actionable insights regarding various business tools in many small or large business organisations. The government of India across the nations are using the power of Social Media and its analytics to serve better services to the citizens or users.

## **E-Governance and Social Media:**

Social Media and E- governance is seeing a systematic growth in the online involvement with various business tools for users or citizens. Various initiatives done by the government and the progress of Social Media aim to create enabled technologically solutions and services provider to facilitate by adapting the following measures:

- 1) By encouraging research, manufacturing and development of various electronic devices makes Social Media for various business tools which makes electronic devices available in more affordable manners.
- 2) By linking basic facilities and services like incentivizing and subsidies for adoption of Social Media makes various business strong and smooth.
- 3) Introducing relevant skills and facilities to ensure that users or citizens not only uses or adopt there technologies of Social Media but also provide to contribute them through development of skill programmes.

## **Challenges of Social Media in India:**

Various challenges of Social Media are as follows:

### **1) Internet and its adoption :**

Apart from Installations of infrastructure, adoption and use of internet remains an important concern for Sound Media. People in large scale living in poor areas of our nation would find it very difficult to access internet through mobile or broadband. Low or Less literacy rate, lack of important content with regional irrelevance, inappropriate access of devices would also one of the major challenge.

### **2) Data and its speed :**

Speed of data is also another unavoidable problem which faces by citizens of users all over the country. Our country ranked nearly 15th in data speed throughout the world, in comparison of these Canada has the top ranked regarding data speed.

### **3) Inappropriate manpower:**

Appropriate skilled manpower is amongst the big challenge for all. Our country has nearly 1200 million people are in labour sector, out of these nearly 94% are working in unorganized sector. Proper skilled manpower is necessary for the effective adoption and development of new and latest technologies of Social Media for various business tools and its progress.

#### 4) Proper security:

In order to control cybercrime which is rising, the idea of sharing information to the billion citizens or users online seems to be very difficult move. Therefore, high levels of security controls and protocols would like to be taken to ensure Social Media and its business tools environment for the users or citizens.

#### **Social Media and Management of Potential Risks associated with various Business Tools:**

Many national or international companies which are using Social Media are struggling to integrate successfully it into their various daily business tools or routines. Many challenges are found frequently within the enforcement, execution and creation of Social Media procedure and policies. Many organisation or companies may not established procedure or policies to proceeds or govern Social Media business tools usage can find then important policies which is difficult to ensure due to low engagement of employee training in the implementation of Social Media technologies. With reference to these challenges, it may not surprising that more executives wanted to prefer to avoid the themes by telling that they doesn't need for adoption of Social Media and its procedures and policies to engage or manage it. Moreover ,as organisation start to realise the accurate value to be received by Social Media adoption, management of manpower or workforce risk is necessary for reducing of loss of reputational damage, employee goodwill and information damages. One the other hand business organisation and its Social Media procedure and policies are negatively oriented for directing what should not do, but a positively oriented Social Media and its business tools can perform positively if its theme of business organisation is appropriate. Clients or users have delivered successfully real value of business and its tools through formally engaging their manpower or workforce with enhancement of Social Media engagement and Policies models, Hence, when these communication are defined to workforce, some new set of examples are created. These can add the business organisation in encouraging positive messages to the nearby society regarding the qualities of services and goods as well as the workplace orientation itself being friendly collaborative creativity and opportunity for expression of latest ideas in both encouraged and welcome manner.

#### **Social Media and its various business tools presents the business organisation with two sets of unique risks:**

##### **External Risk factors:**

- 1) Inaccurate or inappropriate commentary or discussion on financial performance of business organisation.
- 2) Misrepresentation of business organisation's position on public image.
- 3) Breach of data privacy which is related to lost of personal identifiable information (PII).
- 4) Destroying desired brand issues and company's reputation.
- 5) It may increase for viral negative sentiment growth either in response of business organisation communications or simply an important discussions of market regarding services or goods of business organisation.

##### **Internal Risk factors:**

- 1) We can introduce personal information of sensitive nature into our workplace (life style issues, politics, religion, childhood etc.)
- 2) The creation of preferred items through public and thereafter "discoverable" record of public related to internal issues of employment of manpower in an organisation.
- 3) Issues sues of ownership regarding public networks/forums where executives might engage with users or customers to explore business issues.
- 4) Employees or executives deliberately or inadvertently leak privileged important information that related to the same organisation.

#### **Social Media and its business tools provide us some Opportunities:**

- 1) Employees communication and engagement can be increased through Social Media.
- 2) Social Media has the largest potential to encourage and transform performance management and talent management.
- 3) Human Resource service management and others can be improved through technology emerging of Social Media.
- 4) For leveraging the Social Media a very important opportunity is learning about Social Media.
- 5) Social Media provide transparency in the entire recruitment procedure and create good company/candidate relationship.
- 6) With the Social Media in India encourage technology will become easily affordable, accessible and adds to quality to various citizens or users services.
- 7) The Social Media or digital economy is the very important and new productivity resources that some economist regard these as the third big industrial revolution.
- 8) The important and primary advantages of public sector in India are increased the revenue, enhanced experience of citizens, improved business environment, improved security and safety, higher worker productivity, reduced the costs, und better human health and well being regarding environmental pollution.



## **Result:**

With the above discussion, observation and theoretical analysis our hypothesis " Social Media is a powerful and fastest business Tool" is accepted.

## **Conclusion:**

Social media and its business tools are changing the way of working and will transforming to do in a ways that we can imagine only. It may be difficult for Human Resource Management professionals to overcome what these business tools are assessed and used for measuring the risks and challenges that may available to a business organisation. Social media and its business tools is redefining that how a business organisation innovate and connecting the people through ideas which are not previously explored. Business organisations now utilize and have the ability of knowledge from external people or audience around the world that they couldn't reach ever before. Now, it transforming the ideas for doing business today. Additional advantages or benefits include the sources to enhance the business image, improve transactions with users, and increase engagement of employment of people.

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## Original Article

### Exploring the Basic Concepts and Techniques of Computer Graphics

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**Abstract:**

The software sector is growing faster as computer technology advances. The market is filled with software designed to perform a variety of technical tasks. When creating a print advertisement, for instance, you can employ computer graphics and picture creation tools. This program allows us to streamline the design process. Computer graphics are now often used in commercial motion movies, TV shows, and user interfaces. The process of creating images with a computer is known as computer graphics. The final result of computer graphics is an image, which can be an engineering, business, or drawing graph. It is possible to construct two- or three-dimensional study images using computer graphics. Any big image is challenging to display on a computer screen so with the use of computer graphics it simplifies this process. A variety of algorithms and methods are used to create graphics on computers. With the advancement of science and technology, nowadays computer graphics are widely used. Computer graphics can be summed up as the creation and modification of visuals on a display device, including a monitor, employing computers. It involves software methods for making, storing, altering, and representing images. Computer graphics deals with generating images and art with the aid of computers. The computer graphics enriches the data readability. This improves the quality of graphics. As a result, computer graphics applications benefit all sectors and industries. This article defines and discuss on computer graphics, application of computer graphics and types of computer graphics.

**Keywords-** Computer Graphics, Raster, Animation, Fractals

**Introduction-**

Any sketch, drawing, or unique network that visually conveys some important information is referred to be a graphic. When a collection of photographs needs to be altered or when an image is created on a computer using pixels, computer graphics are utilized. Computer Graphics can be used in digital photography, film, entertainment, electronic gadgets, and all other core technologies which are required (saigbovo, 2022). In the realm of computer science, graphics is a broad topic. UI design, rendering, geometric objects, animation, image processing, and many other fields can all benefit from computer graphics. Computer graphics is commonly shortened to CG. To implement computer graphics, a number of tools are utilized. The <graphics.h> header file in Turbo-C is the most basic tool. William Fetter of Boeing and renowned researcher Verne Hudson created it in 1960. Then we have to store this data in any format like in Excel sheet or we can use Microsoft Access to store it or we can store it in any database. Then if we want to analyze this data then we have to make calculations every time we need it.

For this we have to read this data and in case if this data is large then it is time consuming to read this data.



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Also it requires large memory to store this data. In this situation graphics is a better alternative. So, computer graphics

can help us to display, read this data in a small space and in an interactive way. With the help of computer graphics we can display the large dataset in a graphical form (saigbovo, 2022). It may be an image, a graph, a chart or a motion picture. And as we know pictorial data can be easily understood.

There are several tools available in the market to generate computer graphics. To generate such graphics, first we have to import the dataset in the tool/ software then this tool will automatically generate the graphic in the form which we want. The graphic gets modified whenever we change the values in the dataset.

## **Types of Graphics on Computers -**

### **Raster Graphics –**

Raster uses graphical pixels to create an image. It is also known as a bitmap image in which a sequence of images is into smaller pixels (Smith, 2012). In essence, a bitmap is a collection of many pixels.

### **Vector Graphics-**

Mathematical formulas are used to draw various forms, lines, objects, and other elements in vector graphics.

## **Application of Computer Graphics -**

### **1.Education and Learning -**

A vast range of concepts and basics can be taught in a way that is simple to comprehend and learn thanks to computer-generated models. Numerous teaching models that pique students' interest in the subject can be developed using computer graphics. Candidates can be trained using specific devices, such as simulators, in a method that is easier to understand and can be completed quickly. Using computer graphics to develop training modules is straightforward and highly advantageous. Trainees can learn how a system works by using models of physical structures, physiological systems, population trends, or equipment. Certain systems are created for specific training uses.

A prominent example is the flight simulator, which provides realistic training for aspiring pilots. Instead of practicing entirely in actual aircraft, pilots conduct much of their training on the ground using these simulators, gaining hands-on experience in a safe and controlled environment.

### **2.Computer Art-**

We can produce both artistic and commercial art using computer graphics, including paint and animation programs. These programs offer tools for describing object motion and creating object forms. Additionally, paintings, cartoon drawings and logo design can be completed.

### **3.Computer Aided Drawing-**

Computer-aided drawing is used in the creation of buildings, cars, and airplanes to provide minute details and create more precise, crisp designs with superior parameters.

### **4.Use in Biology-**

With the aid of computer graphics, molecular biologists can show an image of a molecule and learn more about its structure.

### **5.Computer-Generated Maps-**

Computer-generated maps which demonstrate details helpful to town planners and transportation engineers in preparing their tasks are available.

### **6.Architect-**

An interactive graphics terminal allows architects to investigate different approaches for solving issues. Without a machine, they would not have been able to test numerous alternatives.

### **7.Presentation Graphics-**

In addition to creating bar graphs, pie charts, and time plots, graphical techniques can be used to prepare reports or summarize financial, statistical, mathematical, scientific, and financial information for research papers and managerial documents. Bar charts, line graphs, pie charts, and other displays that illustrate the correlations between various parameters are examples of graphics. Summarizing is a typical usage for presentation graphics and it is used to summarize

- Financial Reports
- Statistical Reports
- Mathematical Reports
- Scientific Reports
- Economic Data for research reports
- Managerial Reports
- Consumer Information Bulletins
- And other types of reports



## **8.Computer Art-**

Industrial artists also make use of computer graphics. Television and marketing campaigns are produced using it.

## **9.Entertainment-**

These days, graphics are frequently utilized in the production of films, music videos, and shows on television. A significant portion of computer graphics are used in the film and gaming industries. Computer graphics contribute to the effective provision of these elements in the gaming business, where attention and engagement are crucial.

## **10.Visualization-**

Researchers, engineers, doctors, and entrepreneurs use graphics to visualize vast amounts of data. The demand for visualization has grown significantly in modern times, as evidenced by the numerous advances in technology. Visualization of information aids in gaining insights from data, and in order to verify and examine the actions of procedures within our environment, we require suitable visualization, that can be accomplished by using computer graphics appropriately.

## **11.Educational Software-**

The creation of educational software for computer-assisted uses graphic design.

## **12.Printing Technology-**

Designing textiles and digital printing both make use of computer graphics.

## **13.Image Processing-**

To be used in diverse contexts, various sorts of images or photographs need to be edited. One of the several uses of computer graphics is the manipulation of preexisting images onto enhanced for improved comprehension.

## **14.Machine Drawing-**

The accuracy and simplicity that diagrams provide are crucial for the safe manufacturing of machines, which is why computer graphics are used so often for the development, modification, and construction for different components of machines along with the entire machine.

## **15.Graphical User Interface-**

We as people can develop an environment where everything can be mechanized and everyone can quickly complete the needed action by using computer graphics. Graphic items, pop-up options, icons, images, and photographs help to create an interface that makes functioning easy and pleasurable. A few of the uses for computer graphics that have greatly grown in prominence and are still going to do so as advances in technology occur.

### **Interactive and Passive Graphics -**

#### **1. Non-Interactive or Passive Computer Graphics:**

In this type, the user has little influence regarding the image; they are unable to alter the generated image after it is displayed on the screen. One example of its Titles shown on T.V. Non-interactive Graphics involves only one-way communication between the computer and the user, User can see the produced image, and he cannot make any change in the image (Smith, 2012).

#### **2. Interactive Computer Graphics-**

The user has a degree of autonomy on the image in interactive computer graphics, meaning they can alter the generated image in any way. The game of ping-pong is one instance of it. Two-way communication between the individual using it and the machine itself is necessary for interactive computer graphics. A User can see the the image and make any change by sending his command with an input device (Smith, 2012).

### **Pioneer Organizations in Computer Graphics-**

- SIGGRAPH
- GDC
- Bell Telephone Laboratories
- Autodesk
- United States Armed Forces, particularly the Whirlwind computer and SAGE Project
- Boeing
- Eurographics
- IBM
- Nvidia
- Renault

- AMD
- Adobe Systems
- Pixar
- Microsoft

## Graphic Design Process:



### Step 1: Collect Information

You merely need to be aware of the precise needs and demands before you begin. The ideal method for conducting in-person client meetings or create a questionnaire or take an interview and get the data (Introduction-The Rise of Research in Graphic Design, January, 2026). Once you have gathered as much information as possible, you may ask them concerns regarding the endeavor, collect notes as needed, and—above all—find out what their aims are.

### Step 2: Research

A graphic artist ought to understand exactly what they want to look for in order to fulfill the whole target audience of their clients.

- Market trends
- Competitors
- Designs, colours and textures
- Product or service evaluation

### Step 3: Construct a Plan

Commence by making an agenda that includes all the necessary actions that will help you achieve your goal. By this I mean to consider all that you have looked into and from that point on, you can build up a plan (Al-Fatlawy, et al., August, 2023). Since your client is with you at all levels, you should always acquire their consent. If there is disappointment, cooperate to reach a consensus.

### Step 4: Construct Design Ideas and Convey

You are ready to apply your imagination as a designer by developing the design concepts on earlier plan. This is the most inventive and thrilling stage in the graphic design process.

1. Create a few drafts
2. Hold onto a small number to advance
3. Describe your reasoning for keeping the selected drafts. Evaluate with customer
4. Make changes to the final layout that already exists.

### Step 5: Production

Execution should begin as soon as the ultimate layout is complete, regardless of if it be for newspapers, the internet, or broadcast. Recognize your actions that have produced a favorable outcome for your client.

### Computer Graphics Fractals-

Fractals are extremely intricate images produced by a computer using just one algorithm. Fractals are extremely intricate images produced by a computer using just one algorithm. Iterations are used to produce them. This means one formula is repeated with slightly different values over and over again, taking into account the results from the previous iteration (Boiangiu, Morosan, & Stan, June, 2015). Fractals are used in many areas such as – Biology, Astronomy, Chemistry, Others.

### Animation -

The movement produced on a display device's screen by showing a series of static images is referred to as animation.

The process of planning, sketching, creating layouts, and preparing photographic sequences that are incorporated into multimedia and gaming goods is known as animation. In order to create the appearance of movement, animation links the manipulation and exploitation of still pictures. He/she use various computer technologies to capture the pictures and then to animate these in the desired sequence (Hushain, Gupta, & Sharma, 2023).

Animation includes all the visual changes on the screen of display devices (Singh, 2018). These are:

1. Modification in shape
2. Modification in size
3. Modification in colour
4. Modification in angle

## Application Areas of Animation -

### 1. Learning and Training-

Animation is used in school, colleges and training centers for education purpose. Animation forms the foundation of aircraft flight simulators.

### 2. Amusement-

Animation methods are now commonly used in making motion pictures, music videos and television shows, etc.

### 3. Computer Aided Design (CAD)-

CAD is one of the greatest application of computer animation. Auto design was one of the first uses of CAD. But now almost all types of designing are done by using CAD application, and without animation, all these work can't be possible (Hushain, Gupta, & Sharma, 2023).

### 4. Publicity-

Publicity is one of computer animation's important use. An animated promo's ability to draw viewers in while taking up very little place is its greatest benefit.

## Conclusion –

Over the past couple of centuries, computer graphics have undergone significant development and evolution, and their production is still expanding at an exponential rate. The emergence of novel techniques to produce specific frameworks or components, expanding appeal, advancements in both hardware and software, and general increased attention to the subject have all contributed to the substantial progress over time. There are many chances for research and development as well as effective implementation and the area it covers is extensive. There are numerous uses for computer graphics practically in every industry.

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## Original Article

### Identity Crisis, Diasporic Predicament, Displacement and Factors of Alienation in Jhumpa Lahiri's novel The Namesake

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#### Abstract

*In the present world of literature especially, in the Indian English literature the word diaspora is used in written and heard in the discourse in a larger scale. The very term, diaspora has become a universal yet very complex phenomenon in the postcolonial literary world. The postcolonial literature connects the local to the global. In course of time, we can see that in the field of communication technologies major positive changes have taken place and as a result of this the Indian diaspora has connected to the world, very easily. In the post-colonial literature, as readers we can find the major themes of the well-known post-colonial writers who have embraced the major themes of their literature to the diaspora. The themes such as- identity crisis, alienation, displacement, predicament of displacement, etc. The novel A House for Mr Biswas by VS Naipaul is the supreme example of the diaspora literature. The paper critically analyzes the characters within the broader context of immigration, the diasporic tensions they encounter, particularly the conflicts between memory, identity, and cultural displacement. The work selected for the study is the novel The Namesake by Jhumpa Lahiri.*

**Keywords:** - Diaspora, displacement, alienation, identity crisis and psychological and physical suppression, etc

#### Introduction-

The term Indian Writing in English is one of the prominent literary genre that has acquired a worldly acknowledgement and fame in the course of time. However, this paper aims at focusing on the diasporic literature of the Indian writers who are presently living in the different parts of the world and they are facing certain emotional issues and they have been getting kind of emotional problems. This is how it is consistent to take a look at what exactly the term 'diaspora' is.

#### What is Diaspora?

According to the Word Web Dictionary, the term diaspora is 'The dispersion of the Jews outside Israel; from the destruction of the temple in Jerusalem in 587-86 BC when they were exiled to Babylonia up to the present time.' The second definition of the noun diaspora is 'the body of Jews (or Jewish communities) outside Palestine or modern Israel. The dispersion or spreading of something that was originally localized (as a people or language or culture). The word diaspora as per the Oxford Advanced Learner's Dictionary now applies to the movement of people from any nation or group away from their own country. However, due to the space constraint I will not embrace the global diaspora in detailed, rather focus will be on the Indian diaspora.

#### What is an Indian Diaspora?

The Indian diaspora is a significant and complex socio-economic phenomenon in today's world. Migration, a long-standing human activity,



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often occurs when people cannot find enough resources in their homeland and move in search of better opportunities. Historically, Indians have migrated due to unfavorable conditions at home or the appeal of better prospects abroad.

### **About *The Namesake***

The novel, *The Namesake* is the debut novel by Jhumpa Lahiri which was at the outset, published in *The New Yorker* and later it published as a full length novel. *The India Today* writes about this novel that “Lahiri is good at capturing the world, in a language that is chiseled, unadorned, clear as crystal, and as if her narrative is a documentary of little lives, displaced and dour, floating in an anonymous island, far away from home, and her empathy is as transparent as her words”. Thus, her writing skills and narrative techniques helps her to outreach at the inner flaps of characters with unexpected turn in plot and human situations.

The novel *The Namesake* is suggestive story of Ashima Bhaduri, a student in a degree class in Calcutta now Kolkata who becomes Ashima Ganguli after her engagement with Ashoke Ganguli of Alipore. The novel revolves around five major characters- Ashoke, Ashima, Sonia, Gogol and, Moushumi. This Bengali family gets shifted in America Massachusetts. Ashoke works in one of the colleges in Ohio and in the meantime the couple gets a baby boy named Gogol. The name Gogol is taken from the Russian novel which is read by Ashoke. Apart from this there are certain minor characters like- Maxine Ratliff, Gearld and Lydia Ratliff, Dimitri, Graham, Ghosh, Astrid and Donald, Ashima’s grandmother and grandfather, etc. But I believe that Gogol is the major character in the novel.

The novel is a painful record of diasporic identity and the sense of alienation that Lahiri focuses in terms of this novel. The novelist, after the return of Ashima to the US expresses the psychological condition of Ashima, According to the Lahiri, the feelings of migration are distressing and painful. She feels:

....being a foreigner, Ashima is beginning to realize, is a sort of lifelong pregnancy- a perpetual wait, a constant burden, a continuous feeling out of sorts. It is an ongoing responsibility, a parenthesis in what had once been ordinary life, only to discover that the previous life has vanished, replaced by something more complicated and demanding. Like, pregnancy, being a foreigner, Ashima believes, is something that elicits the same curiosity from strangers, the same combination of pity and respect (49-50)

The confusing and bewildered mental condition is just not only related to Ashima only, it is the same condition of Gogol. His growing awareness of his tangled and confusing identity is simultaneously grown by the disconcertingly contrasted and contradictory experiences in his personal and private life. Gogol had various love affairs with American girls before he gets married. He was in love with Ruth and Maxine. However, Ashoke and Ashima warns him evry now and then that the marriages between the Bengali and Americans generally breaks. So, he marries with a Bengali girl Moushumi. But at the end Gogol meets the same end even if he marries with a Bengali girl.

In the case of Sonia the same situation takes places that leads her to displacement and marginality. However, the sense of alienation and nostalgia is less in the case of Sonia. In the novel the writer has given a record that Sonia assimilated with the American culture and adapts herself with the American culture, by and by. She lives on her own in San Francisco and works for an environmental agency and studies for LSAT. But when she hears the news of a sudden and sad death of her father due to heart attack, she comes to her mother. She stays with her mother and starts working as a paralegal in order to apply for the law school. It is not only Ashima who suffers from alienation, but Ashoke also suffers from it.

The fact of the matter is that the life experience of all the characters appeared the novel exhibit the fact that cultural assimilation is a complex one rather than a simple. Thus, the reason behind forgetting or to neglect the immigrants is not as easy as we believe, because they cannot fully comprehend the host culture and throw away the home culture. In most of the conditions the immigrants sometimes lose their original cultural values. The elements such as- foreign language acquisition, cultural disparities and marriages do some chances for the assimilation. The immigrants in most of the cases go under mental changes. In the process of assimilation, the immigrants forget their as well as the culture of the country where they reside. In trying to adopt the host culture, they lose their home culture. But the remaining will be settled in their minds. They would be engaged in assimilating the new culture and lifestyle of the land in which they are living. The first generation in the Ganguli family could find a balance between the two, but the second generation could not find one and failed to locate their identity. By and by, they could find a transnational space and culture beyond any nation. In general, the first generation suffers identity crisis and has to undergo many pressures and compromises. In context with Gogol, cultural hybridism is the other aspect which has a telling effect on his identity. He belongs to many cultures at once and identity may not be determined by national boundaries only. Identity changes, if the location gets changed.

Cultural displacement of Gogol in *The Namesake* is an internal struggle as he tries to balance his Bengali heritage and American identity. His search for belongingness is linked to his name, his relationships and his family



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expectations. Many characters in the novel faced cultural displacement as they traverse in search of identities and relationship in the context of Indian American Diaspora.

To conclude, the novel *The Namesake* explores the fundamental truth: the quest for self -identity is a universal and inherent journey. This narrative illustrates that identity is not static, it is a continuously shaped by many number of factors including cultural heritage, historical events, and personal experiences. We very distinctly find that the characters in the novel struggle a lot to emphasize the uncertainties in search for identity but also illustrate the strength and resilience needed to overcome these challenges. *The Namesake* echos the universal pursuit of journey to find identity in an intricate and dynamic world. Jhumpa Lahiri highlights that the essence of humanity lies in our power to relate, understand and support each other despite our varied cultural backgrounds. It is the essence of the novel that in this interconnected world compassionate treatment of immigrants is prime to make the world more inclusive and better place to be lived for all of us.

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