

Shaping the future of Research and its Innovative Methodologies in Various
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Multidisciplinary Streams
August 2024

INDEX

S.NO	NAME OF PARTICIPANT	TITLE	PAGE NO
1	Amar Nath Dixit	Speedy Trial With Respect To Criminal Justice System	1-8
2	Archi Singh	Socio- Legal Analysis Of Transgender Rights With Reference To Transgender Protection Act, 2019	9-19
3	Dr. Ashwani Kumar	Community Radio In The Digital Age: Balancing Tradition With Innovation	20-28
4	Bhaskar Pathak	Understanding Economics Of Rain Shelter Method Of Tomato Cultivation	29-40
5	Bikash Godak	Role Of The Village Authority In The Nyishi Tribe Of Arunachal Pradesh	41-51
6	D. Shekar Goud	Integrating Advanced Sensor Technologies In Embedded Systems: Techniques For Signal Processing, Data Fusion, Sensor Calibration, And Real-Time Analytics For Enhanced System Performance And Accuracy	52-59
7	Dr. Diwakar Chaudhary	Analysis Of Emotional Intelligence Among Secondary School Students: Technical Examination	60-68
8	Dr. D. Kumaraswamy	Design Considerations For Embedded Systems In Autonomous Vehicles: Integrating Sensor Fusion, Real-Time Control Systems, Safety Mechanisms, And Advanced Navigation Algorithms For Enhanced Vehicle Autonomy And Reliability	69-79
9	Dr. Torthi Ravi Chandra	Implementing Secure Boot And Firmware Integrity Verification In Embedded Systems: Techniques For Preventing Unauthorized Access, Ensuring Firmware Integrity, And Protecting Against Security Threats	80-89
10	Gajanan Ankatwar	Remote Sensing Using Uavs For Detecting Crop Diseases: An Of Machine Learning And Deep Learning Approach	90-133
11	Geeta D. Alwani	Impact Of Social Media And Affiliated Digital Marketing On Consumer Behaviour And Decision Making	134-143

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

12	Hage Manty	Impact Of Difficulties On Entrepreneurial Behaviour Of Farmers For Vegetable Production And Marketing In Arunachal Pradesh	144-151
13	Harshit Kesharwani	Exploring The Ethical Issues Surrounding The Use Of Ai In Legal Practice, Such As Bias, Transparency, And Accountability	152-162
14	Jagdish Prasad Tiwari	Exploring The Consequences Of Gradual Privatization In Specific Sectors Such As Telecommunications, Aviation, Banking, And Power	163-182
15	Jahangeer Ahmad Ganie	Impact Of Digital Marketing On Customer Purchasing Behaviour	183-194
16	Ms. Janvi	Exploring Workplace Emotional Intelligence: Technical Insights	195-203
17	Mr. Kento Tashi	Article 21 & Unborn Child	204-210
18	Madhusmita Sahu	Phytochemical Evaluation Of Quercus Infectoria	211-225
19	Pooja Yadav	Combining Multiple Technical Indicators For Enhanced Accuracy In Price Prediction In The Commodity Market: In Reference To Covid-19	226-249
20	Rajiv Kishor	Effective Communication Strategies For Corporate Image Building: Case Study Of Jharkhand	250-261
21	Dr. Ramesh Achyut Rao Landage	Diasporic Writing In Indian English Literature: A Quest For Identity And Belonging	262-264
22	Riddhi Shah	From Bias To Insight: The Impact Of Historiography On Historical Research	265-278
23	Rohan Singh Lodhi	Examining The Idea And Phenomenon Of Trial By Media's Impact And Dynamics	279-288
24	डॉ समीना कुरैशी	प्रकरण तकनीकी एवं गैर-तकनीकी महाविद्यालयों के विद्यार्थियों की व्यवसायिक रुचि का अध्ययन	289-293
25	Dr. Santamati Dash	Yoga Research Has A Long Way To Go	294-300
26	Shibin Varghese	Nurturing The Seeds Of Future Research: Cultivating Young Minds In Schools	301-305

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

27	Shivani Balu	The Impact Of Artificial Intelligence On Organisation Performance Of Employees	306-317
28	Shweta Sharma	Exploring Investigative Journalism's Challenges: A Meta-Analytic Review	318-330
29	Chavhan.S	Collection & Identification Of Wild Medicinal Plants Of Dhumkhal & Dhumkhal Forest, Dang District, Gujarat	331-358
30	Soumen Das	The Influence Of Social Media On Adolescent Identity Formation: A Case Study Approach	359-367
31	Taher Hussain Khan	Effect Of Educational Learning Apps In Enhancing Academic Performance Among Under Graduate Students Of Papumpare District In Arunachal Pradesh	368-377
32	T.S.Ramesh (Tsr)	Shaping The Future Of Research In Civil Engineering Through 3i (Institute -Industry Interaction) Interdisciplinary Collaboration Approach	378-385
33	Mr. Vishal	Consumer Protection In Cyberspace: Validity Of E-Contracts And Jurisdictional Issues	386-399
34	Bikash Godak	Sodung and its Evidential Value Before The Judiciary	400-407
35	Taba Tado	The Participation of Women in Panchayat Raj With Special Reference of Papum Pare District (Rural), Arunachal Pradesh	408-418
36	Monalisha Ganguly	Warranties, Protection, and Ownership: A Comprehensive Review of Legal Frameworks in the Pre-Owned Car Market in Jharkhand	419-428

SPEEDY TRIAL WITH RESPECT TO CRIMINAL JUSTICE SYSTEM

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Abstract

A fundamental component of the criminal justice system, the notion of a swift trial seeks to minimize unnecessary delays in court processes and provide prompt justice. This study looks into the efficiency of quick trial procedures and the effects of prolonged trials on the rights of the accused and the administration of justice in general. Data were gathered from 100 people engaged in criminal cases, including accused individuals and legal experts, using a descriptive study methodology that incorporated both qualitative and quantitative methodologies. Based on the findings, a sizable percentage of accused people have their cases delayed, which negatively impacts their rights, particularly the right to a timely and fair trial. The right to a quick trial is violated in almost 70% of cases, and delays add to the 80% backlog of cases and the severe demand on court resources (65%). With 55% of respondents expressing displeasure, public faith in the justice system is also noticeably low. The findings highlight how urgently changes to the criminal justice system are required to improve court effectiveness and decrease case backlogs, protect the rights of the accused, and rebuild public trust in the system. The report emphasizes how critical it is to resolve these delays in order to protect the integrity of the judicial system and guarantee that justice is neither withheld nor delayed.

Keywords: Right to a Speedy Trial, Criminal Justice Reform, Due Process, Judicial Efficiency, Case Backlog Reduction.

1. INTRODUCTION

1.1. Overview of the concept of a speedy trial

One essential component of the criminal justice system that is intended to guarantee that justice is carried out effectively and on time is the idea of a swift trial. A quick trial cuts down on the amount of time a defendant is in legal limbo, which lessens needless detention, public shame, and protracted worry. It guarantees that justice is neither withheld nor delayed by striking a balance between the state's interest in criminal prosecution and the accused's individual rights. The idea, which emphasizes the need for legal proceedings to continue without excessive delay, is based on the idea that justice postponed is justice denied.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

1.2. Historical background and evolution of speedy trial rights

The right to a prompt trial has a long history that dates back to the 1215 Magna Carta, which established the principles of due process. This privilege has developed throughout time in a variety of legal frameworks, especially common law traditions. The Habeas Corpus Act of 1679 in England emphasized the need of prompt trials. Later, as its significance in guaranteeing just justice grew, the right was codified in the United States Constitution's Sixth Amendment. This development highlights the continued need of prompt judicial actions in defending the accused's rights across jurisdictions.

1.3. Importance of speedy trials in the criminal justice system

For a number of reasons, quick trials are essential in the criminal justice system. They first defend the rights of the accused by limiting the possibility of erroneous convictions brought on by vanishing memories or misplaced evidence, as well as by prohibiting lengthy incarceration. Second, because delays might give the impression that the legal system is ineffective or unfair, they serve the public interest by preserving faith in it. Fast trials also ensure that cases are determined using the most accurate and trustworthy evidence possible by protecting the integrity of the evidence. This helps to make the legal system more equitable and functional overall.

1.4. Constitutional and legal provisions for speedy trials in different jurisdictions

While the legal and constitutional requirements for expedited trials differ throughout states, they always aim to provide justice in a timely manner. The timely Trial Act of 1974 established precise deadlines for federal criminal trials, and the United States Sixth Amendment provides the right to a timely trial. According to the Supreme Court's interpretation of Article 21 of the Indian Constitution, the right to a prompt trial is implicitly guaranteed as a component of the right to life and personal liberty. Comparably, Article 6 of the European Convention on Human Rights guarantees the right to a prompt, fair, and public hearing. These clauses show a dedication on a worldwide scale to maintaining the idea of prompt justice in the criminal justice system.

2. REVIEW OF LITERATURE

Khan, F. Y. (2019) Mycobacterium tuberculosis spreads hematogenously, resulting in the potentially fatal condition known as disseminated tuberculosis (TB). Due to its delicate nonspecific clinical presentation, which typically reflects the underlying organ implicated, the diagnosis is difficult to make. There are also few instruments available for confirming laboratory diagnosis. For an early diagnosis, a strong index of suspicion is therefore necessary. A typical finding on chest radiography

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

that is crucial to the early diagnosis of the illness is the presence of a miliary pattern. However, the chest radiography of 10% to 15% of patients is normal. Basic hematologic and biochemical assays, as well as the tuberculin skin test, are vague for the diagnosis even when abnormalities are evident. When it comes to disseminated tuberculosis, imaging studies are useful supplementary tools since they may identify the affected locations and direct technicians in obtaining the right specimens for diagnosis. The diagnosis of disseminated tuberculosis is often confirmed clinically by the use of histological or bacteriological evidence. Numerous publications have demonstrated the positive response to first-line anti-TB medications. The purpose of this review is to provide a recent update on disseminated tuberculosis (TB), with a focus on the diagnostic workup of this deadly illness.

Asrar-ul-Haq, M., & Anwar, S. (2018) In organizational settings, leadership is one of the most researched issues. It has been linked to a number of employee performance outcomes. It is noted from the literature study that congruence between leaders and followers is a relatively recent idea. While a significant portion of an organization's cash is allocated to various leadership development initiatives, alignment between followers' and leaders' perceptions is essential for improved outcomes. There is a dearth of literature on the idea of congruence between leaders and followers in emerging nations. The goal of this study is to examine and summarize the main theories of leadership and how they relate to various results. Additionally, a future research agenda for leadership studies in a developing nation is presented, grounded in a thorough evaluation of the literature.

Sönmez, H. E., et.al., (2018) examined earlier research on the topic of anakinra treatment in pediatric MAS patients with autoinflammatory diseases (AIDs) or systemic juvenile idiopathic arthritis (sJIA). The juvenile MAS patients with sJIA or AIDs who were treated with anakinra (anti-IL1) and monitored at Hacettepe University's juvenile Rheumatology Unit between January 2015 and January 2017 made up the research group. We carried out a thorough analysis of the literature on pediatric MAS patients receiving anakinra therapy and linked to sJIA or AIDs. The study comprised two AIDs patients and thirteen sJIA patients. Fifteen patients had nineteen MAS episodes recorded. The administration of anakinra (2 mg/kg/day) began a median of 1 day following admission. After starting anakinra, clinical symptoms disappeared and test results returned to normal in a median of 2 (1-4) and 6 (4-9) days, respectively. A median of 10 (4-13) weeks passed following the start of anakinra medication before the end of steroid treatment. The median duration of patient follow-up was 13 (6-24) months. When the anakinra dosage was decreased, two patients experienced recurring bouts of MAS, but the remaining patients experienced remission. Nine publications that detailed 35 pediatric MAS patients treated with anakinra and connected to sJIA or AIDs were found in the literature review. Every

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

patient—minus two—achieved remission. Our research and thorough literature analysis might contribute to a better understanding of the function of anakinra therapy in the treatment of multiple sclerosis.

3. OBJECTIVES

1. To evaluate how well quick trial procedures work to uphold justice and cut down on case backlogs in the criminal justice system.
2. To examine how postponing trials affects the rights of the accused and the criminal justice system as a whole.

4. METHODOLOGY

4.1. Research Design

This study uses a descriptive research methodology to evaluate the effects of postponed trials on the rights of the accused and the general operation of the criminal justice system, as well as the efficacy of quick trial procedures in the system. To give a thorough examination of the topics at hand, the research design combines qualitative and quantitative methods.

4.2. Population and Sample

- **Population:** The intended audience consists of those who are engaged in the criminal justice system, particularly those who have been charged with crimes, as well as legal experts including judges, attorneys, and court clerks.
- **Sample:** A sample of 100 people—70 men and 30 women—from a range of age groups and criminal histories were chosen using a purposive selection approach. The sample includes defendants whose cases are either in the process of being tried, have already been tried, or have resulted in a conviction.

4.3. Data Collection Methods

- **Quantitative Data:** An organized survey was given to the accused people in the sample in order to gather data. Questions on the accused's trial status, demographics, and opinions of how postponed trials have impacted their rights and the criminal justice system as a whole were all included in the questionnaire.
- **Qualitative Data:** Semi-structured interviews with legal experts were used to gather additional qualitative data in order to better understand the operational difficulties and efficacy of quick trial methods.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

4.4. Data Analysis

Quantitative Analysis: Statistical techniques were applied to the data collection and analysis. The demographics of the accused and the effects of postponed trials were summarized using descriptive statistics like frequencies and percentages. To show the distribution of replies and the effect variables, data were tallied and shown in tables.

5. RESULTS

A demographic summary of the accused is included in the table, with categories for age, gender, kind of offense, and status of the trial.

Table 1: Demographic Table

Demographic Variable	Category	Frequency	(%)
Age of Accused	18-30 years	30	30.0
	31-45 years	40	40.0
	46-60 years	20	20.0
	60+ years	10	10.0
Gender	Male	70	70.0
	Female	30	30.0
Type of Crime	Property Offenses	25	25.0
	Violent Crimes	35	35.0
	White-Collar Crimes	20	20.0
	Drug-Related Crimes	20	20.0
Trial Status	Awaiting Trial	50	50.0
	Undergoing Trial	30	30.0
	Convicted	20	20.0

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August 2024

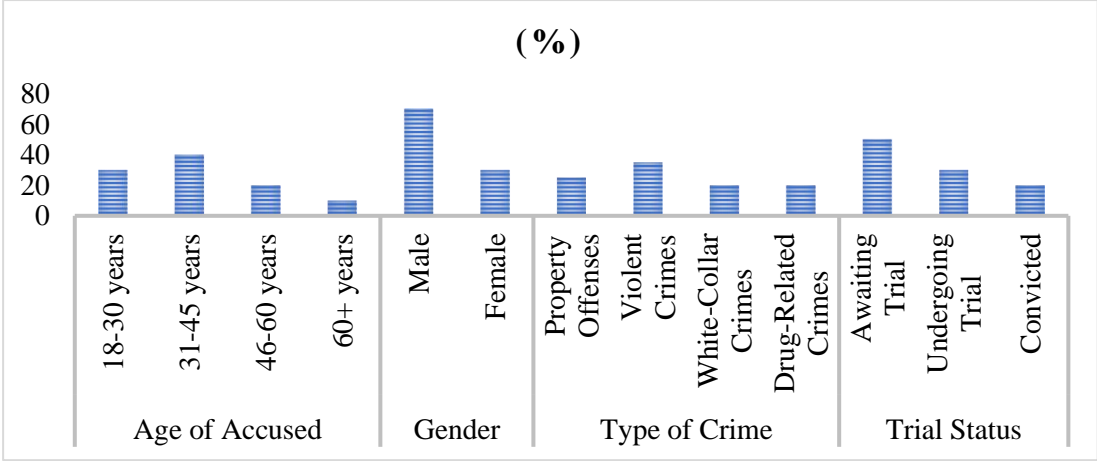


Figure 1: A visual depiction of the demographic table

The accused are mostly male (70%) and between the ages of 31 and 45 (40%) in most cases. Violent crimes account for 35% of all crimes, with property offenses coming in second at 25%. In terms of trial status, 30% of the accused are now undergoing a trial, 20% have already been found guilty. This distribution reveals a gender gap that favors men, a noteworthy concentration of accused people in the middle age range, and a sizable percentage of those who are still awaiting trial.

Table 2: Effects of Postponed Trials on Accused Persons' Rights and System Performance

Impact Factor	Category	Frequency	Percentage (%)
Accused Rights Affected	Right to Fair Trial	60	60.0
	Presumption of Innocence	45	45.0
	Right to Speedy Trial	70	70.0
Overall System Functioning	Case Backlog	High	80.0
	Judicial Resources Strain	Severe	65.0
	Public Trust in Justice	Low	55.0

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Table 2 demonstrates the substantial effects that postponed trials have on the rights of the accused as well as the general operation of the system. The assumption of innocence (45.0%) and the right to a fair trial (60.0%) are negatively impacted in a significant number of instances. Most remarkably, in 70.0% of cases, the right to a prompt trial is violated. The court system faces serious problems on a larger scale, with a large backlog of cases impacting 80.0% of the system and severely taxing judicial resources (65.0%). Furthermore, a notable lack of public trust exists in the legal system, as expressed by the 55.0% of respondents who expressed displeasure. Together, these elements highlight how urgently changes to the legal system are required to reduce delays and improve its effectiveness.

5. CONCLUSION

The results of this study highlight how urgently the criminal justice system has to change in order to solve the widespread problem of postponed trials. The demographic study indicates a significant gender gap, with the majority of accused persons being male, and a concentration of accused people between the ages of 31 and 45. The frequency of violent crimes and the sizeable percentage of those who are currently awaiting trial underscore the importance of prompt legal processes. The impact data provides additional insight into the severe effects of postponements, since a significant proportion of cases show a violation of basic rights including the presumption of innocence, the right to a fair trial, and—above all—the right to a timely trial. The structural effects—severe case backlogs, stretched judicial resources, and dwindling public confidence in the legal system—are as concerning. All of these problems indicate that fundamental changes are desperately needed to improve court efficiency, shorten caseloads, and rebuild public trust in the legal system. It is crucial to tackle these obstacles in order to protect the rights of the accused and guarantee fair administration of justice.

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**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

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SOCIO- LEGAL ANALYSIS OF TRANSGENDER RIGHTS WITH REFERENCE TO TRANSGENDER PROTECTION ACT, 2019

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Abstract

An in-depth assessment of the legislative and sociological challenges that the transgender community will have to face in the future is provided by the socio-legal examination of transgender rights in India, with a particular emphasis on the Transgender Persons (Protection of Rights) Act, 2019. This act was implemented in 2019. Starting with the introduction of the Rights of Transgender Persons Bill in 2014 and continuing with its subsequent passage in the Rajya Sabha in 2015, this research endeavours to explore the evolution of transgender rights throughout the course of history. In this study, a comprehensive investigation is conducted on the socio-economic conditions, cultural exclusion, and political marginalization that transgender people in India struggle with. Moreover, the inquiry sheds light on the fact that these individuals are subjected to systemic prejudice and legal exclusion. To evaluate the efficacy of the Transgender Protection Act, 2019, in overcoming these difficulties, the study utilized a qualitative research design as its method of inquiry. Further, the research uses the same technique in order to assess whether or not the conduct is in accordance with international human rights standards. By determining whether the legal framework effectively protects the rights and dignity of transgender individuals and by recommending appropriate reforms for more effective implementation within the legal system, the purpose of this study is to provide a critical understanding of the interface between law and society. This will be accomplished by offering a critical understanding of the interface between law and society.

Keywords: *Transgender Rights, Transgender Protection Act 2019, Socio-Legal Analysis, Legal Framework, Gender Identity.*

1. INTRODUCTION

The Rights of Transgender People Bill, 2014 is a report that has been presented by the Parliament of India determined to stop the bias that transgender individuals in India are exposed to. On the 24th of April in 2015, the Bill was approved by the Rajya Sabha, which is the upper chamber. On the 26th of February in 2016, it was introduced to the Lok Sabha, which is the lower house.

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August 2024

1.1. History

Tiruchi Siva, the head of the Dravida Munnetra Kazhagam (DMK), presented the measure to the Rajya Sabha in the capacity of a private member's bill. At first, there were representatives of the Bharatiya Janata Party (BJP) who attempted to persuade Siva to remove the law by pointing out that it had ambiguities and sections that were not practical. Thawar Chand Gehlot, who is the Minister of Social Justice and Empowerment, stated that several provisions of the law were not only theoretically feasible but also excessively difficult. While simultaneously requesting that the Bill be removed, he made a pledge that future legislation will be beneficial to transgender individuals. P. J. Kurien, a member of the Indian National Congress (INC), and Mukhtar Abbas Naqvi, who is the Minister of State for Parliamentary Affairs, both submitted petitions that were comparable to this one.

Siva, on the other hand, did not agree to remove the measure. He maintained that there were laws in place in 29 countries that cover transsexual rights. It was brought to his attention that there were purportedly 450,000 transsexual persons in India, but the true figure may be anywhere around 20,000. Even though they were entitled to vote, they were subjected to prejudice in their day-to-day lives. The unfavourable response was given by the members of the ruling party in response to the original voice vote. This resulted in Siva being compelled to request that the house be divided. This was discouraged by the Minister of Finance, Arun Jaitley. The statement made by Jaitley was that Siva should withdraw the measure and wait for the policies that Gehlot had promised, or else the house should stand behind the law: During the session of the Rajya Sabha that took place on April 24, 2015, the measure was approved by a unanimous vote. The opposition had the majority of seats in the Rajya Sabha, but the Treasury Bench also supported the bill. Gopi Shankar Madurai and Simran Shaikh, both advocates for LGBT rights, expressed their satisfaction at the move. Due to the fact that it is the first private member's bill to be approved by any chamber in almost three decades and by the Rajya Sabha in nearly half a century, the measure is regarded to be historic. After a discussion and a reaction from the government, the legislation are often removed from consideration. As of that moment, there had been a total of just fourteen private member's bills enacted since 1947.

Baijayant Panda, the leader of the Biju Janata Dal (BJD), presented the bill before the Lok Sabha on February 26, 2016, with the purpose of providing an opportunity for discussion. It was Panda's contention that the law would assist in the extension of constitutional rights and put an end to prejudice against transgender individuals, so enabling them to lead a life that is marked by dignity. Additionally, Jagdambika Pal, the head of the BJP, advocated for the elimination of prejudice against transgender individuals.

1.2. Need for Socio-Legal Analysis

Understanding the complex issues the transgender population in India faces requires a socio-legal examination of transgender rights, especially in light of the Transgender Persons (Protection of Rights) Act, 2019. Throughout history, transgender people have faced institutional discrimination, social exclusion, and legal exclusion. They have also been ostracized. The Transgender Protection Act of 2019 represents progressive legislative achievements, but its practical effects on transgender people's lives are still debatable and complicated. A socio-legal study enables a thorough investigation of the Act's legal provisions as well as the social factors influencing their application and efficacy. It makes it possible to investigate the ways in which institutional practices, cultural norms, and social norms—all of which frequently support prejudices and inequality—interact with the law. We may evaluate whether the legislative framework adequately protects the rights of transgender people, really addresses their lived experiences, and promotes an inclusive and respectful society by examining the Act from both a legal and social standpoint. Moreover, this kind of study is necessary to find legal loopholes, assess how well the law complies with international human rights norms, and suggest changes that would benefit the transgender population. It also emphasizes how the government, courts, and civil society have shaped and upheld these rights, making sure that the law is no longer only a token act but rather a transformational instrument for social justice. Therefore, to comprehend the effectiveness of the Transgender Protection Act, 2019 in advancing true equality and dignity for transgender people in India, a socio-legal study is essential.

2. REVIEW OF LITERATURE

Bhattacharya, S., et.al., (2022) The Transgender People (Protection of Rights) Act of India was changed in 2019 to cover the constitutional rights of non-binary individuals, gender identity recognition, and hostile to discrimination guidelines in institutional settings (like the family, work, school, and medical care). The Act tends to legal rights without reference to practice, underlying scaffolding, or — above all — the vital standards for substantively getting to rights. A hole like this lessens human rights to minimal more than legislative changes with meager application. This article looks at the triumphs and weaknesses of the legislation from the viewpoint of the transgender populace in India, as well as the impacts it has had on their life since it was enacted in 2014. Non-binary gatherings are recognized, yet they actually experience a lot of badgering and violence. We look at declarations of 15 transgender individuals' actual encounters and the snags they experienced in getting their rights in Kolkata, an eastern Indian city. This fundamentally talked about our discoveries in the space of family, work, training, and medical care utilizing the framework of substantive admittance to

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

rights, which is the actual ability to practice and get rights that are archived. This framework habitually featured the errors between achieved legal status and this present reality real factors. To close these holes, we provide various recommendations, remembering raising the extent of non-binary people for places of discussion and, all the more critically, improving instructive reasonableness for non-binary individuals. Transgender explicit preparation for medical services practitioners is likewise one of our thoughts. Without tending to their minimization in families and hypervisibility openly puts, non-binary gender populaces can't advance toward asserting social and economic rights notwithstanding legal rights.

Singh, B. (2022) has long provoked extraordinary conversation at the national and international levels. The extension of a few legal protections for the LGBTQ people group and the developing social acknowledgment and participation in LGBTQ-inclusive talk have positively assisted the country with moving toward more prominent inclusivity, however discrimination against the LGBTQ people group actually exists in the work environment, in the schooling system, and in the medical services framework. Discrimination against LGBTQ individuals has been progressively glaring in medical clinic settings as of late. Patients itemized a great many prejudicial encounters, for example, being denied admittance to guiding, reproductive treatment, routine screenings, and, surprisingly, pediatric consideration for their offspring. Transgender medical services incorporates sex reassignment medical procedures as well as the conclusion, therapy, and prevention of physical and mental sicknesses for transgender individuals. Transgender medical care covers a scope of subjects, including gender variance, sex reassignment treatment, wellbeing perils connected with violence and emotional well-being, and admittance to medical services for transgender individuals in various regions of the planet. Progress related clinical treatment is still explicitly barred from numerous business protection plans and government medical services programs. Even once these limitations are lifted, the fight should keep on ensuring that transgender individuals have significant, full admittance to progress related care, liberated from expensive and pointless essentials and limitations on the sorts of treatment that might be provided. The Transgender People (Protection of Rights) Act, 2019 was passed to resolve issues relating to the government assistance and protection of transgender individuals' rights.

Earle, M., et.al., (2021) There is a developing collection of exploration proposing that, even while intergroup contact often decreases inclination, context oriented contemplations ought to likewise be thought about. More perplexing insightful procedures that think about the individual (Level-1) as well as their environment (Level-2) are advantageous to such a methodology, like multilevel demonstrating. By utilizing this strategy, we evaluate individual and relevant factors of help for gay/lesbian and

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

transgender rights notwithstanding mentalities. Results utilizing an example of members from 77 unique nations showed that dwelling in a country with more gay/lesbian rights (Level-2) and having individual gay/lesbian contact (Level-1) anticipated more grounded help for gay/lesbian rights ($n = 71,991$). Essentially, being in a country with additional transgender rights and having transgender contact anticipated more elevated levels of help for transgender rights ($n = 70,056$). Furthermore, shown and investigated are cross-level interactions. Overall, the outcomes underline the meaning of environmental and individual factors in deciding LGBT people group support.

3. PURPOSE

An extensive socio-legal study of transgender rights in India is intended to be carried out using the data given, with a special emphasis on the Transgender Persons (Protection of Rights) Act, 2019. This study is to investigate the socioeconomic obstacles that the transgender population faces, as well as the legislative history and development. Evaluating the Act's compliance with international norms, its influence on the real-life experiences of transgender people in India, and its efficacy in tackling issues like social exclusion, legal recognition, and political engagement are all part of this analysis.

4. METHODOLOGY

The doctrinal approach was chosen as the research technique chosen. Secondary sources, which include books obtained from libraries and accessible through a variety of websites, are the primary emphasis of this methodology. An in-depth review of case laws from the Supreme Court and High Court, with a particular focus on transgender and gender identity issues, is to be carried out by the researcher. Statistical reports from the National Crime Records Bureau (NCRB) and the Ministry of Health are examples of secondary sources of data collecting. For the purpose of this article, the Seventh Edition of the American Psychological Association.

4.1. Research Design

When investigating the socio-legal dimensions of transgender rights, a qualitative study design will be utilized as the research methodology. The contents of the Transgender Protection Act, 2019, as well as the effects that each of these laws has had on the transgender community will be the primary focus of the study.

4.2. Data Collection

- **Primary Sources:** Legal documents, judicial decisions (such as National Legal Services Authority v. Union of India), reports from the government, and interviews with members of the transgender community, activists, and legal professionals are all included in this collection.
- **Secondary Sources:** Sources such as academic studies, books, reports from non-governmental organizations (NGOs), and pieces published in the media that offer insights into the socio-economic situations, political engagement, and exclusion of transgender persons.

4.3. Case Study Approach

The project will evaluate the influence that legislative frameworks have on the lives of transgender people and will involve in-depth case studies of transgender people. In the case of National Legal Services Authority v. Union of India, the ground-breaking decision that was handed down will receive special focus.

4.4. Legal Analysis

The Transgender Protection Act of 2019 will be subjected to a comprehensive review, which will include a comparison analysis with worldwide legal norms concerning transgender rights.

4.5. Thematic Analysis

To gain a better understanding of the law's larger ramifications, we will be doing an analysis of topics such as the creation of identities, socioeconomic situations, exclusion, and human dignity.

5. FINDINGS

5.1. Origin and identity formation of transgenders

A transgender individual is depicted as somebody "whose gender doesn't match the gender relegated to that individual upon entering the world and incorporates trans-men or trans-ladies, people with intersex variations, gender-queers, and people having socio-cultural personalities, for example, kinnar, hijras, aravani, and jogta." This definition is provided by the Transgender People (Protection of Rights Bill), 2019. The origins of transgender people may be found in ancient times, when there existed a Satpatha Brahman who did not fit into either the male or female categories. Transgender people were referred to as Hijras in several ancient religious writings.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

It also happened that they were dispersed around the nation. For instance, there was a story that Aravani wedded Lord Vishnu in the Tamil Nadu states. Given the yearly celebration of Koovagam, Aravani was revered as the embodiment of Mohini. They give themselves up to marriage on this auspicious day in order to grieve his passing and face the day after as widows. The identification of Hijras has been discovered in mythology in states like Gujarat and Madhya Pradesh. For example, "Arjuna" has been identified as a eunuch named Bahuchara, in which the tale of Sikhandin Amba's long-ago return from exile is told. One of the Pandavas from the Mahabharata, Virat, the so-called "eunuch," was the court for over a year. How the Hijras have been able to identify with Arjuna is unknown, though. In the Sanskrit poetry, however, they portrayed themselves as the best warriors. The 2011 Indian Census found that 5,4854 of the estimated 4,87,803 lakh transgender people were under the age of six. Its literacy rate is 56.7%. States like Uttar Pradesh and Maharashtra, with populations of 28% and 8%, respectively, have concentrated populations. It is 9% in Andhra Pradesh, 6% in Madhya Pradesh, and 6% in West Bengal. The Hijra community is often regarded as one of the most disadvantaged groups in society. They do not have the same standing or access to opportunities. They receive very little or no educational resources. They are marginalized within society as a whole. Because of the lower literacy rate, about 45% of people work as primary laborers, with the remaining individuals engaging in prostitution.

5.2. Socio economic conditions of transgenders

They have been connecting themselves with a deep kinship with the mother Goddess in the ancient texts that have been written by Hinduic people. In addition to this, they believed that they had a contradiction between their figure and that of Lord Shiva. The individuals in question were those who lacked the ability to have children. During the time of the Mughal empire, they were guards and made a significant contribution to the organization. They have been performing rituals of badhai and blessings at a variety of events ever since the beginning of time was recorded. They have been subjected to atrocities in the educational, social, and economic spheres, and they belong to the lowest strata of society, which also has the smallest population. As a consequence of the fact that many of them are involved in the prostitution industry, a significant number of them get diseases such as HIV AIDS, which not only have an impact on their physical health but also on their emotional well-being. Individuals who are marginalized in different aspects of life and who are given the fewest opportunity to express their thoughts are the ones who fall into this category. They have been the victims of the physical atrocities that they have been subjected to, as well as the physiological issues that they have

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

been experiencing. Their presence may be seen on the streets and roadways due to the fact that they are seen begging.

5.3. Exclusion from social and cultural arenas

The tolerance of diversity in religion, culture, and practices is widely accepted in Indian society. Despite the common belief that our nation tolerates a great deal of such behavior, there is zero tolerance for same-sex relationships and orientations. The communities of transgender people have experienced grave abuses of their human rights. If the guy engages in activities deemed as feminist, many families will not tolerate them. In the event that they do not exhibit typical gender traits, they could even go so far as to disavow their male. There are a few implausible explanations they might use, such as how their child can't take care of the family or how they could bring shame to the family. Later in life, transgender women have challenges while attempting to inherit a portion of the property. They encounter crimes and unfounded accusations even from law enforcement officials. Mention of the term "males" in an intentional manner, forcing them to wait in lines with men, and verbal abuse from hospital employees and other sources are some forms of prejudice they encounter in the healthcare industry. Due to their identification, they are not provided with basic medical care.

5.4. Exclusion From Political Participation

There were several clans and tribes that were reportedly addicted to committing crimes for which there was no bail when the British passed the Criminal Tribes Act in 1871. From birth, they were viewed as criminals. The term "eunuch," which referred to the male sex that was thought to be impotent, was included when the Criminal Tribes Act of 1871 was revised. The former Section 377 of the Indian Penal Code, 1860 declared all these eunuchs accountable for the crimes of kidnapping and castrating the young children, thus the local authorities had to keep an eye on them. The Delhi High Court, acting on behalf of the National Government of the National Capital Territory (NCT) of Delhi, rendered a historic decision in July 2009 that decriminalized gay activities that are consensual in nature across the Indian subcontinent.

Justice Ajit Prakash Shah and Justice Muralidhar delivered the ruling. The Indian Constitution's Article 21 guarantees certain rights, according to the Court. The Delhi High Court just declared the clause unlawful, not abolishing it completely. Legal recognition for transgender people is a problem in society. Whether it's applying for a passport, opening a bank account, or getting government subsidies and rations. Transgender people, however, are now classified as OTHER groupings. Hijras and transgender people deal with the fundamental issue of creating and maintaining an organization and

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

registering as members of it. Nonetheless, laws such as the Societies Registration Act and the Indian Trusts Act guarantee individuals the ability to establish legitimate organizations, which presents a significant risk to transgender individuals. For instance, proving one's identification is crucial in order to register oneself. These communities, however, lack a distinct legal character. Opening a bank account in order to conduct financial transactions also poses a serious risk to these communities. Consequently, it is imperative for firms to guarantee efficient resource mobilization and delivery of superior services.

5.5. Present Scenario

Separation and prejudice against Hijras remain forbidden even after the historic ruling was announced. Only a cursory examination is provided by the other clauses. The good news is that these groups are progressively being granted reservations in universities and other employment prospects, guaranteeing equitable employment chances. On July 19, 2019, Mr. Thaawarchand Gehlot, the Pastor of Social Justice and Empowerment, presented the Transgender People (Protection of Rights) Bill, 2019 in the Lok Sabha. Who is a transgender individual was determined by this law. As per the definition, it alludes to an individual "whose gender doesn't match the gender relegated to that individual upon entering the world and incorporates people with intersex variations, gender-queers, transgender individuals, and people with socio-cultural characters, for example, jogta, hijras, kinnar, and aravani."

6. CONCLUSION

While the Transgender Persons (Protection of Rights) Act, 2019, is a significant step towards recognizing and preserving the rights of transgender individuals in India, the socio-legal analysis demonstrates that large gaps remain in its implementation and efficacy. This is despite the fact that the act was passed in 2019. Transgender persons continue to experience serious socio-economic obstacles, exclusion from social and cultural arenas, and a lack of government engagement, notwithstanding the legal measures that have been made. The marginalization of transgender people is brought about by the historical backdrop and cultural attitudes of these persons, which the existing legal framework has not yet addressed in its entirety. In addition to this, the study emphasizes the importance of a more solid legal recognition and the incorporation of transgender people into a variety of social contexts. Continuous efforts must be made to bridge the gap between the legislation and the lived reality of transgender people in order to guarantee that the Act continues to act as a transformational weapon for social justice. Improving legislative requirements, raising public awareness, and ensuring that governmental and non-governmental groups work together to create an environment that is welcoming

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

to transgender individuals and respects their rights and dignity are some of the recommendations that have been made.

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August 2024

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COMMUNITY RADIO IN THE DIGITAL AGE: BALANCING TRADITION WITHINNOVATION

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ABSTRACT:

The introduction of digital technology has completely transformed the media industry, offering both advantages and difficulties for community radio stations throughout the globe. This research study examines how community radio, which has historically been based on localism and grassroots communication, is adapting to the digital era by maintaining its essential values while also implementing creative strategies. This article examines the use of new media technologies by community radio stations to broaden their audience, enhance engagement, and assure sustainable longevity. The research is conducted via a mix of case studies and a review of current literature. Important areas of emphasis include using social media platforms for community engagement, shifting towards online streaming and podcasting, and integrating mobile apps to enhance accessibility. In addition, the article explores the difficulties encountered by community radio stations in maintaining their conventional responsibilities as local information centers while adjusting to the swiftly evolving digital landscape. The results emphasize the robustness and flexibility of community radio stations, demonstrating their capacity to efficiently use digital resources to encourage community involvement, uphold local traditions, and advocate for societal transformation. In conclusion, this article asserts that effectively incorporating new media technologies may enable community radio to maintain its significance and energy in the digital era, by connecting traditional and innovative elements.

INTRODUCTION:

Throughout history, community radio has been a powerful tool for local communication, offering a forum for diverse perspectives and encouraging community engagement.

Community radio stations have historically functioned as essential centers of information, cultural preservation, and promoters of social change within their local communities, based on the values of accessibility, participation, and localism. Nevertheless, the rapid progress of digital technology in the last twenty years has completely changed the media environment, offering extraordinary possibilities and substantial difficulties for community radio. The advent of the digital era, marked by

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

the widespread use of the internet, social media, mobile technologies, and digital television, has significantly broadened the scope and functionalities of media platforms. The transition to digital technology in community radio offers new prospects for the dissemination of programming, interaction with the audience, and the sustainability of operations in the long run. The utilization of online streaming, podcasting, social media integration, and mobile apps has the capacity to amplify the influence and extend the reach of community radio stations much beyond their conventional geographic limitations. However, the transition to digital platforms also presents difficulties. Community radio stations have challenges related to digital literacy, budgetary limitations, technical infrastructure, and the need to maintain their local significance in the face of global digital content. This article explores the central conflict between preserving the conventional principles of community radio and adopting cutting-edge digital methods. The aim of this research is to examine how community radio stations are adjusting to the digital revolution. The investigation will focus on the tactics used to incorporate new media technology while upholding the core ideals that characterize community radio. This article seeks to get a thorough knowledge of the present situation and future prospects of community radio in the digital era by using a combination of case studies, interviews with station managers and community members, and analysis of digital adoption patterns. This study will analyze the achievements and difficulties encountered by community radio stations during this era of change. It will emphasize the possibility of combining digital innovation with the traditional ideals of community media. In conclusion, this paper will contend that a well-rounded strategy, using digital technologies while maintaining the fundamental principles of community radio, may guarantee the ongoing relevance and importance of these stations as integral and adaptable elements of the media environment in the digital age.

KEYWORDS: Community radio, digital transformation, new media technologies, localism, social media integration, online streaming, digital innovation, and community engagement.

LITERATURE REVIEW:

The use of digital technology in community radio has garnered significant scholarly attention in recent years. The literature emphasizes numerous significant issues, such as the development of community radio, the influence of digital technology on media practices, and the difficulties and possibilities brought about by this digital shift.

Evolution of Community Radio: Community radio is derived from bottom-up communication and serves as a forum for local voices, fostering community engagement. Gumucio-Dagron (2001) highlights the historical significance of community radio stations in facilitating democratic communication and providing disadvantaged populations with a platform to exchange information,

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

culture, and narratives. Berrigan (1979) asserts that community radio is characterized by the core ideals of accessibility, participation, and localism, which set it apart from commercial and public broadcasting.

Digital Technologies and Media Practices: The emergence of digital technology has profoundly transformed the media environment, bringing in novel methods of producing, disseminating, and consuming material. According to Castells (2009), the internet and digital platforms have made it possible for tiny media companies to reach people all over the world, thereby democratizing the spread of knowledge. Bosch (2014) emphasizes the capacity of digital technologies, such as online streaming and podcasting, to augment the scope and influence of community radio stations inside their own communities. These technologies enable stations to circumvent conventional broadcast restrictions, giving them the ability to provide on-demand access to programming and effectively engage expatriate groups.

Social Media Integration: Social media platforms have become essential instruments for community radio stations, enabling immediate engagement and community involvement. Carpentier et al. (2013) argue that social media may augment the participation aspect of community radio by facilitating the contribution of material, provision of feedback, and involvement in debates by listeners. According to Meier (2017), social media platforms such as Facebook, Twitter, and WhatsApp provide community radio stations with more opportunities to communicate with their audience, enabling them to connect with younger and more varied audiences. Despite the potential, the process of transitioning to digital integration poses several problems for community radio stations. An important concern is the lack of proficiency in using digital technology. Girard (2007) highlighted that many community radio practitioners and listeners may have insufficient proficiency to effectively employ digital technologies. In addition, the significant investment required for digital infrastructure and training is a considerable obstacle due to budgetary restrictions (Lewis & Booth, 1989). Rennie (2006) emphasizes the potential danger of local communities losing their relevance in the face of an overwhelming amount of global digital material. This stresses the need for community radio stations to strike a balance between worldwide connection and their primary objective of serving local communities.

Case Studies and Best Practices: Multiple case studies demonstrate the effective integration of digital technology by community radio stations. For example, Mitchell's (2011) research on Bush Radio in South Africa illustrates how the station successfully utilizes social media to improve community engagement and rally listeners over social matters. Tacchi et al. (2009) investigate the

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

use of mobile phones and internet streaming by Kothmale Community Radio in Sri Lanka. They highlight the station's creative techniques that expand its influence and broaden its audience.

Balancing Tradition with Innovation: The research continually emphasizes the need to maintain a balance between traditional community radio principles and digital innovation. In his work, Fuchs (2020) asserts that while incorporating new technology, radio stations should maintain the fundamental ideals of community radio, including localism, involvement, and accessibility. This balancing ensures that community radio remains a vital platform for local self-expression and the preservation of cultural legacy, while simultaneously embracing the opportunities offered by the digital age. The incorporation of digital technology into community radio is a multifaceted undertaking, characterized by both advantages and difficulties.

According to the research, digital technologies have the potential to improve the extent, involvement, and durability of community radio. However, it is essential to maintain the fundamental principles that characterize this medium. By skilfully harmonizing tradition and innovation, community radio stations may effectively traverse the digital era, persisting as vital elements of the media landscape.

FINDINGS:

The findings of the study on "Community Radio in the Digital Age: Balancing Tradition with Innovation" provide valuable insights into the strategies used by community radio stations to adapt to the digital environment. The comprehensive examination of current literature clarifies the many tactics, obstacles, and effects of using digital technology in community radio.

Diverse Digital Adoption: Community radio stations exhibit different levels of digital integration. Stations like Bush Radio and Kothmale Community Radio have completely adopted digital technology, including internet streaming, social media interaction, and podcasting into their operations. These stations use integrated digital technologies to expand their reach and increase their relationship with listeners. In contrast, several stations are now in the first phases of incorporating digital technology, with challenges like as restricted financial means and inadequate digital proficiency among employees. This range of digital adoption illustrates the varying abilities and preparedness of community radio stations to move into the digital era. For instance, Bush Radio uses Facebook and Twitter to actively involve listeners and stimulate interactive conversations on social matters. Kothmale Community Radio utilizes mobile apps to live-stream material and enable immediate listener engagement.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Impact on Audience Engagement: The advent of digital technology has greatly augmented audience engagement and involvement. Stations that actively use social media and mobile applications have greater levels of listener interaction and feedback in comparison to conventional broadcast-only methods. These digital platforms provide an instantaneous connection between the station and its viewers, promoting a more engaged and dynamic relationship. An instance of this is when Bush Radio effectively organized its audience via social media campaigns centered on issues such as housing rights and school reforms. The mobile streaming service provided by Kothmale Community Radio has enabled distant communities to share tales and actively participate in programming.

Challenges Faced: Community radio stations face several hurdles throughout their move to digital platforms. Financial limitations provide a substantial obstacle, impeding the capacity to enhance digital infrastructure and sustain technological progress. Furthermore, there is an urgent need for professionals to get training in digital literacy in order to proficiently exploit emerging technology. Another obstacle is the task of preserving local significance in the face of a large amount of global digital material, guaranteeing that the station's programming stays centered on the community and is culturally meaningful. Radio Nizkor has financial constraints and depends on community collaborations to maintain its digital operations. Bush Radio employs training programs to augment the digital proficiency of its personnel and volunteers.

Strategies for Success: Many community radio stations that achieve success use a hybrid strategy, which involves combining classic broadcasting principles with modern digital techniques. These stations place high importance on community engagement in the process of creating content, guaranteeing that the programming stays closely connected to the local community and addresses its specific requirements. They use digital channels to raise funds and connect with people, adjusting their material to suit the interests of various audiences and extending their influence beyond geographical limitations. CKUT 90.3 FM in Canada uses a combination of conventional broadcasting, podcasting, and internet streaming to expand its reach to a wider audience. The UK-based Radio Salaam Shalom utilizes digital storytelling as a means to foster interfaith discussion and enhance community cohesiveness.

Impact on Sustainability: The use of digital technology has had a substantial impact on the long-term viability of community radio stations. To strengthen their financial viability and ensure long-term sustainability, stations may extend their reach beyond local limits, engage younger listeners, and diversify income sources via digital advertising and crowdfunding efforts. The capacity to

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

access a worldwide audience and participate in pioneering fundraising endeavors has been essential for several stations. For instance, the mobile application of Kothmale Community Radio has broadened its audience and enabled crowdfunding activities. Bush Radio has used social media to raise funds, which has helped cover its operating expenses and facilitate the growth of its programs.

Community Empowerment: Community radio stations remain essential in strengthening underrepresented communities. These stations promote community participation and social inclusion by offering a platform for local voices, preserving culture, and pushing for social change via digital storytelling and advocacy campaigns. The empowerment of communities has been enhanced by digital technology, which enables the wider distribution of information created by the community and enhances the station's ability to advocate for its cause. Radio Nizkor utilizes digital storytelling as a means to emphasize indigenous rights and environmental concerns, effectively rallying public support and promoting activism. The digital platforms of Radio Salaam Shalom aim to foster cultural understanding and enhance social harmony in diverse communities.

Future Directions: The future of community radio in the digital era depends on its ability to innovate, adapt to changing technology, and develop strategic alliances with digital platforms. Stations that are able to adapt quickly and effectively to the changing requirements of their community are more likely to succeed in an ever-evolving digital media landscape. To preserve and enhance the effect of community radio, it is crucial to invest in digital infrastructure, provide continuing staff training, and establish relationships with digital platforms. Radio Free Asia investigates the creation of mobile applications to cater to expatriate groups and improve tactics for digital content. CKUT 90.3 FM is in the forefront of innovation by incorporating podcasting and online streaming, adjusting to the tastes of its audience and improvements in technology.

These results demonstrate the complex relationship between tradition and innovation in community radio, emphasizing the advantages and difficulties brought about by the digital era. Community radio stations that effectively manage these factors are more likely to maintain their relevance and influence, promoting empowered, engaged, and resilient communities.

CONCLUSIONS:

The study "Community Radio in the Digital Age: Balancing Tradition with Innovation" highlights the transformative impact of digital technologies on community radio stations worldwide. It emphasizes the integration of digital technologies, such as social media, online streaming, and mobile applications, to enhance audience engagement and participation. However, the digital transition has also presented challenges, such as financial constraints, digital literacy gaps, and the

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

risk of losing local relevance. Despite these challenges, resilient stations have demonstrated adaptability by leveraging digital tools strategically while preserving their core values of localism, accessibility, and community participation. Successful community radio stations have adopted hybrid models that integrate traditional broadcasting practices with innovative digital strategies, prioritizing community-driven content creation, partnerships with local organizations, and diverse revenue streams. Community radio continues to play a vital role in empowering marginalized communities and advocating for social change through digital storytelling, advocacy campaigns, and community-driven programming. The future of community radio lies in continued innovation and adaptation to emerging digital technologies. Stations must invest in digital infrastructure, prioritize staff training in digital literacy, and forge strategic partnerships to navigate the evolving media landscape successfully. By remaining responsive to community needs and creatively leveraging digital platforms, community radio stations can maintain their relevance and impact in an increasingly interconnected world.

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UNDERSTANDING ECONOMICS OF RAIN SHELTER METHOD OF TOMATO CULTIVATION

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Abstract: While it is a common approach for many horticultural crops, rain shelter cultivation has not been applied extensively to tomatoes. However, Assam's small- and marginal-farm owners are starting to use the Rain Shelter (RS) technology. Although it requires a large initial investment, the Rain Shelter technique is increasingly seen as more sustainable than conventional farming methods because it blocks the influence of rain during the months when crops are at their peak and because the temperatures inside these structures are typically lower than in open fields. The cost-benefit analysis of the traditional Open Field approach (OF) and the Rain Shelter (RS) method for tomato farming in Assam is presented in the current study. In order to gain a better understanding of the diversity in costs associated with various components in the site; this study was conducted in the Golaghat district in the state of Assam.

It was discovered that the comparable component, with only slight differences, exhibited cost dynamics at both methods. This posed a challenge when calculating the cost of cultivation to calculate the benefit-cost ratio using the same methodology. The approaches present different elements to comprehend the costs associated with Rain Shelter, a component of Protected Agriculture (PA) and the conventional Open Field approach employing cost concept. The district's farmer's field served as the experiment's location. Cost concept was used to analyse the results and compare the cost of cultivation and B: C ratio. The findings showed that while the Rain Shelter (RS) approach is more expensive than the standard method of Open Field (OF), the profitability of RF is much higher than the OF method of tomato cultivation.

Keywords: *Assam, Open Field, Rain-shelter, horticultural crops, Golaghat, PA, approach, method, tomato, study.*

Introduction: The tomato, (*Solanum lycopersicum*), is a member of the Solanaceae family and is one of the most widely grown, significant, and profitable vegetables in India. In 2018, tomatoes were grown in Assam on 18.28 thousand hectares of land and produced 396.024 thousand MT

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Multidisciplinary Streams
August 2024**

(*Agricultural Statistics at a Glance, 2019*) . It increased to 432.40 thousand MT in 2024 ((*Production: Horticulture Crops: Vegetables: Tomato: Assam*). In recent times, Assam has witnessed notable progress and prosperity in the field of tomato cultivation, both in area and production. And this reflects the growing importance of tomato in the region's agriculture.

Tomatoes grow best in well-drained, sandy or red loam soils that have a pH range of 6.0 to 7.0 and are high in organic matter. Temperatures between 21 and 24°C are ideal for tomato cultivation. Frost and temperatures above 32 °C can have a negative impact on plants (*Indian Council of Agricultural Research*). These climatic conditions are prevalent in Assam. Assam can grow a number of tomato varieties, including Pusa Ruhini, Pusa Hybrid 8, Arka Vikas. Arka Saurabh, Pusa Uphar, Pusa Hybrid 2, Sioux, Pusa Rohini, Pusa Sadabahar, Pusa Hybrid 4. Arka Ashish, Arka Meghali, Arka Ahuti etc (*Indian Council of Agricultural Research*). Assam ranks 15th in terms of tomato production and counts more than 2% share in the country (*National Horticulture Board, 2019*).

The amount of land available for agriculture is running out daily. The increasing population's need for food will require more productive and intensive agricultural methods. A crop's productivity is affected by the microclimate surrounding it in addition to its genetic makeup. Production is typically completed in the winter, but demand cannot be met throughout the rest of the season.

In Assam, a farmer cannot grow vegetables during periods of high rainfall, high temperature, humidity, rainfall, strong winds, and high incidence of diseases. Therefore, the production of tomato during this unfavourable condition is limited. In order to maximize yield and conserve resources, protected cultivation is a cropping technique in which the microenvironment surrounding the plant body can be partially or fully controlled according to the needs of the plant during its growing period. One of the most useful approaches to accomplish the goals of protected agriculture is the Rain Shelter technique, which modifies the natural environment using good environmental principles to produce more produce per unit area and maximize plant growth and yield while using less inputs (Das et al., 2016). Thus, farmers in Assam have renewed hope that they will be able to grow vegetables during the rainy season with the use of inexpensive polyhouses and readily available bamboos. This method helps farmers to protect the plants from environmental extremes and they will be able to satisfy market demand with this. The farmers will also realize a higher price in the off season (*Off-Season Tomato Cultivation in Barpeta District, n.d.*)

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Furthermore, in order to maintain environmental health while increasing farm output and profit, new sustainable technology must be incorporated with old (*Farming Innovations Feed the World and Protect the Planet* _ World Economic Forum, n.d.)

Globally, a great deal of research has been done on different horticultural crops using strategies based on Protected Agriculture (PA). However, there hasn't been much research done on tomatoes in a comparable manner. While some researches have addressed some elements of PA in tomatoes, a thorough analysis that reveals the cost-benefit of a PA-based approach in tomatoes remains an interesting topic. One such technique that aids farmers in increasing the household income reducing the ill effects of climate change for crop production is Rain Shelter technique. It also reduces the cost of cultivation in the long run.

As temperatures in Rain Shelter are typically lower, if managed properly, yields and productivity can potentially be higher than open-field production (Heckman et al., 2015). The findings of root rot incidence, crop yield, quality, soil water content, plant nutrition uptake, water productivity, and economic benefit demonstrated that deficit irrigation plus rain-shelter cultivation was superior than deficit irrigation plus un rain-shelter cultivation (Zang et al., 2024). The result was in consonance with the findings of (Mu et al., 2023) and (Zhang et al., 2023). Rain shelters intercept rainfall and act as wind and insect barriers. Daytime temperatures rise above ambient, benefiting warm-season crops like tomatoes (Kratky, 2006). These technologies offer numerous advantages such as saves water, increases crop production, environment friendly, food can be grown round the year, and provides jobs for residents (Rajiv & Kumari, 2023). Vegetable nursery raised in a polytunnel structure has several advantages, including simple management, early nursery, and protection from biotic and abiotic challenges. Growing food off-season allows for a higher price to be obtained for it. Progressive farmers with little holdings are most suited for inexpensive covered structures. (Kalita et al., 2023)

In order to show the cost-effectiveness of the new technique when compared to the current method of tomato cultivation by providing a cost-benefit analysis, the current study aims to implement a Protected Agriculture (PA) based technique for tomato cultivation in the districts of Golaghat in the State of Assam. It was done using Rain Shelter, a Protected Agriculture- based technique, to grow tomatoes on farmer's fields.

Materials and methods: The study was conducted in Bebejia Likson village, Marangi block of Golaghat district in the state of Assam (26.47° North latitude and 93.86 East longitudes) for the

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Multidisciplinary Streams
August 2024**

agricultural year 2021-22. The plot of the cultivation belonged to one farmer named as Mr. Dibyajyoti Gogoi. To establish a consistent understanding of the costs associated with the entire operation throughout the crop cycle in both methods, one experimental Rain Shelter (RS) plot covering an area of 100 square meters (sqm) was employed. In addition, the same plot was used for Open Field (OF) method in the same farmer's another plot in the same village. For ease of comprehension of the farmers, the production cost and cost-benefit calculations were performed for a 0.33-acre area in Assam known as one Bigha (1333 sqm) in both scenarios. The order of the actions involved in the cultivation process was used to categorize the entire operation. A field register was used to record the costs associated with each activity for both RS and OF. The tomato variety used in the experiment was **Anup** produced by Syngenta India Private Limited.

The standard cost concept, which includes costs A1, A2, B1, B2, C1, C2, and C3, was used to determine the economics of tomato cultivation in the research area under both RS and OF conditions. The following norms served as the basis for the cost item calculations (Sarma et al., 2024).

Cost A1: The producer's real out-of-pocket and in-kind production expenses. The cost of item A1 includes the following elements.

- A. The wages paid to the hired human labour.
- B. The wages paid to the permanent labour.
- C. The wages paid to the contract labour.
- D. The wages paid to the hired animal labour.
- E. The imputed (estimated) value of wages of hired animal labour and fees paid for rented farm equipment
- F. The prevailing actual rate for inorganic fertilizer and organic manures in the market.
- G. The imputed (estimated) value of organic manure from own generation.
- H. Imputed (estimated) value of using owned farm machinery in the agricultural operation.
- I. The prevailing actual rate of seed in the market.
- J. The imputed (estimated) value of using seed from own generation.
- K. The prevailing actual market price of agrochemicals like pesticides, fungicides, herbicides, growth hormones, micro nutrients etc.
- L. The cost involved for utilizing irrigation facility.
- M. Govt regulated expenses like money paid for land revenue, cess and various taxes levied.
- N. Value of depreciation on own buildings, farm tools, machinery,

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

O. Cost of installation of irrigation facility in the farm.

P. Cost of installation of the rain shelter structure.

Q. Interest accrued on using the working capital for farm operation.

R. Other miscellaneous costs involved in the farm .Cost A2 = Cost A1 + Rent for the land that was rented Cost B1: A1 plus interest on the fixed capital (not including land) plus the rental value of owned land Cost B1: A1 or A2 plus interest on the amount of owned capital used in the company (not including land value) Cost B2 = Cost B1 + Land revenue - less rental value of owned land + Rent paid for rented land Cost C1 = Cost B1 + Family labour's estimated worth Cost B2 + Imputed value of family labour = Cost C2. Cost C3 is equal to Cost C2 plus 10% of Cost C2.

Cost A2= Cost A1+ The amount of rent paid on account of acquiring the land on lease purpose.

Cost B 1= Cost A 1+ The amount of interest paid that is accrued on the own fixed capital which does not include value of rent for using the own land that belongs to the farmer.

Cost B 1=Cost A 1 or Cost A 2 +The amount of interest paid that is accrued on the owned capital utilized in the farm operation which does not include the value of the own land that belongs to the farmer.

Cost B2= Cost B1 + The value of rent of the owned land that belongs to the farmer -The amount of revenue paid for the land + Rent paid for leased in land

Cost C1= Cost B1 + The imputed (estimated) value of utilizing family labour in the farm operation.

Cost C2= Cost B2 + The imputed (estimated) value of utilizing family labour in the farm operation.

Cost C3= Cost C2 + 10 percent of Cost C2

Table no 1: The sample farmers' economics of growing tomatoes (Rs./ha) based on the cost concept under Rain Shelter and Open Field conditions

Items of the cost	Amount in Rs.	
	Rain Shelter	Open Field
Cost A 1		
The wages paid to the hired human labour	21900 (12.41)	25100(17.44)
Expenditures incurred on account of using the farm machinery and implements	3680 (2.09)	5900 (4.10)

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Expenditures incurred on account of tomato seeds	1150 (.65)	1200 (.83)
Cost of inorganic fertilizers	24500 (13.88)	23900 (16.61)
Cost of organic manures	6000 (3.40)	6200 (4.31)
Cost of plant protection items like pesticides, fungicides, herbicides, hormones, micronutrients etc	4000 (2.27)	8000 (5.56)
Cost incurred on account of applying irrigation	5000 (2.83)	8575 (5.96)
Polyhouse structure for rain shelter	50000 (28.33)	0
Cost of over head shed infrastructures in the nursery to raise seedlings	1150 (.65)	1290 (.90)
Land preparation and other cultivation practices in the nursery	1220 (.69)	1255 (.87)
Maintenance and repairing cost	2975 (1.69)	3290 (2.29)
Total working capital	121575 (68.89)	84710 (58.86)
Interest on working capital	7295 (4.13)	5083 (3.53)
Depreciation	900 (.51)	618 (.43)
Expenses incurred on account of payment made for land revenue	1050 (.59)	1080 (.75)
Miscellaneous expenditures	10780 (6.11)	12500 (8.68)
Total of Cost A 1	141600	103991
Expenditures incurred for taking the land on lease	0	0
Total of Cost A 2	141600	96835
The amount of interest paid that is accrued on own fixed capital which does not include value of rent for using the own land that belongs to the farmer.	1812 (1.03)	1286 (.89)
Total of cost B 1	143412	105277
The value of rent of the owned land that belongs to the farmer (the actual value to be paid for the purpose using the farmer's own land)	9050 (5.13)	10250 (7.12)
Total of cost B 2	152462	115527
Imputed value of using family labour	24025	28400

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Total of Cost C 1	167436	133676
Imputed value of using family labour	24025 (13.61)	28400 (19.73)
Total of Cost C 2	176487	143930
10 % of Cost C 2	17649	14393
Total of Cost C 3	194135	158319
Tomato yield (Q/Hac)	45120	38750
Price (Rs/Kg)	16	12
Gross return in Rs.	721920	465000
Net return over Cost C 2 in Rs.	545434	321073
B : C ratio	4.09	3.23

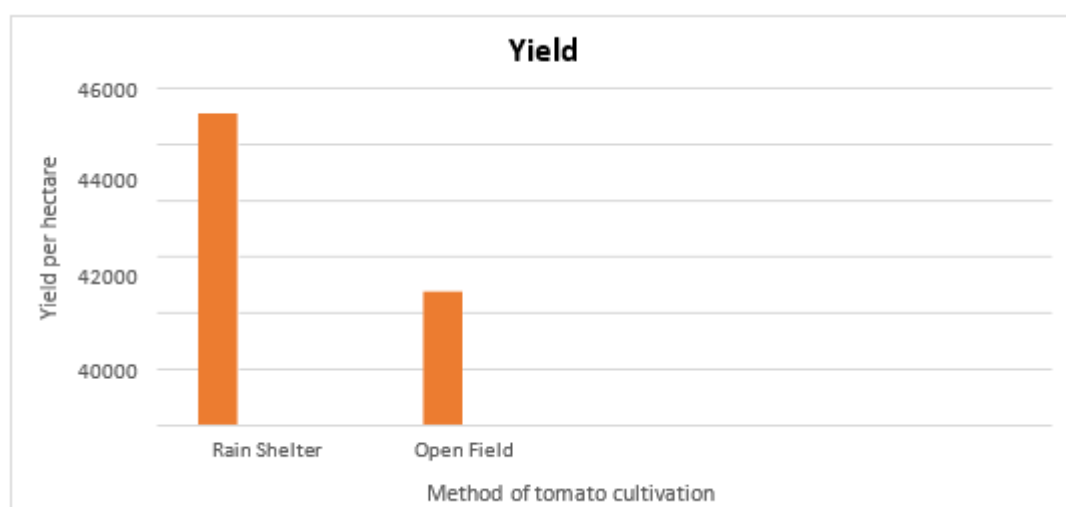


Fig 1: The tomato yield comparison per hectare under Rain Shelter and Open Filed methods of cultivation

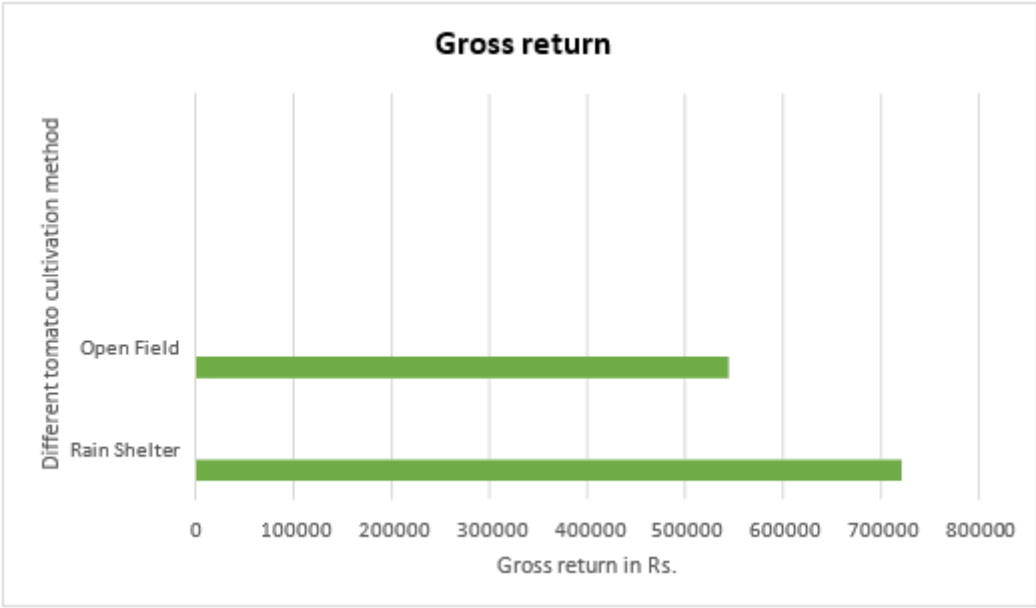


Fig 2: Comparison of gross return per hectare o tomato farming under Rain Shelter and Open Field methods of cultivation

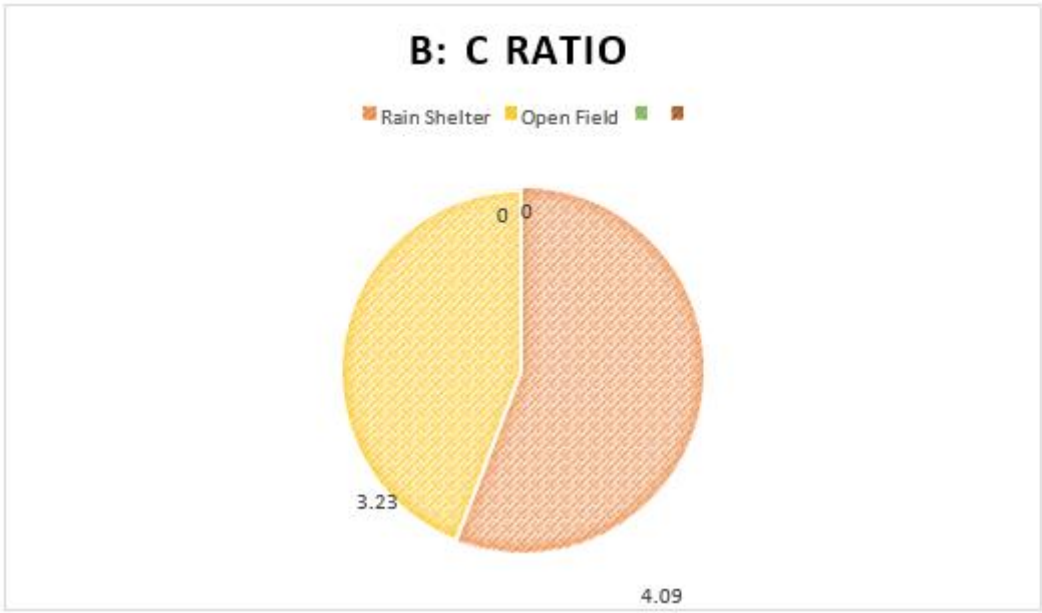


Fig 3: Comparison of B: C ratio of tomato farming under Rain Shelter and Open Field method of cultivation

Results and discussion: The financial aspect or cost-return analysis of growing tomatoes per hectare under two different methods Rain Shelter (RS) and Open Field (OF) techniques are shown in table 1. The table shows that the total working capital to cost C2 in the RS method is 68.89 percent, which is much higher than the OF technique. This difference was mainly seen due to the polyhouse structure required in RS method. Other major contributors of the cost were hired human labour (12.41 and 17.44 percent), inorganic fertilizers (13.88 and 16.61 percent) and imputed value family labour (13.61 and 19.73 percent) in both the farming methods respectively. The market price of tomatoes varied significantly with the methods of cultivation. From the table, we can see that the price realization under RS method were quite high as Rs. 16 per kg while the farmers cultivating tomatoes under open field condition got a fairly low price as Rs. 12 per kg. The reason of high sale difference is that the tomatoes cultivated under RS method can be sold in the market when the demand for tomato is high and supply is insufficient, i.e. in off season. The study found that tomato cultivation in Rain Shelter method is more profitable than the Open Field farming, with a benefit-cost ratio of 4.09 in the protected farming as against 3.23 in the traditional method. The gross returns were Rs. 7,21,920 and Rs. 4,65,000 and net return over cost were Rs. 5,45,434 and Rs. 3,21,073 in RS and OF method respectively. Although the initial investment in Rain Shelter method is a bit high but the high profitability of tomato cultivation in this method mitigates the cost and offer good pay-off benefit the farmers to enhance the income in the long run.

Conclusion and Recommendation: This new method of producing tomatoes under rainfed conditions in Rain Shelter method was found to be economically profitable, environmentally sound, and suitable for human life under farmer circumstances in the plain tomato production area of Golaghat district, Assam, India. It was also found to be better at producing fresh tomatoes with high quality and yield during the rainy season. A partial budget analysis was also conducted. As a result, the holders of the stake and responsible bodies work hard to develop this technology and establish connections between the various players in the tomato production value chain in order to guarantee a sustainable supply and enhance farmers' livelihoods. The Golaghat area is suitable for the production of vegetables, more specifically tomatoes.

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Multidisciplinary Streams
August 2024

Photographs:



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Multidisciplinary Streams
August 2024



Fig: Some of the pictures related to the Rain Shelter tomato cultivation plot by the researcher

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August 2024

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**“ROLE OF THE VILLAGE AUTHORITY IN THE NYISHI TRIBE OF ARUNACHAL
PRADESH”**

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Abstract: The village authority of Nyishi tribe has comprised of the HGB (Head Gaon Bura/Buri), GB (Gaon Buri) in village level. This authority regulates under old British act i.e Assam frontier(administration of justice)regulation act of 1954. This act empowered the deputy commissioner of the concerned district to appoint village authority which manifests to resolve the petty disputes arise between/among the villager irrespective of both civil and criminal in nature as per their traditional and customary laws. According to AFAJR Act 1945 no specific qualification requires to be appointed as such. Deputy Commissioner of the concerned district on recommendation of village Panchayat member or the existing village authority may appoint any person acquainted with the local customary law as member of village authority. This abstract explore to determine the role of village authority and how they entertain, hear and solve the disputes. Most importantly this study is to highlight the legal jurisdiction of the village authority and their impact in time of modern jurisprudence.

Keywords: village authority, impact, modern jurisprudence, traditional, customary, deputy commissioner, manifests, Nyishi, Tribe, Arunachal Pradesh, determine, panchayat member, gaon bura, head, inter villager, Assam frontier (administration of justice) regulation act 1945, civil, criminal, village level, acquainted, institution, modern, streamline, competent, contept, ensure.

Introduction.

Arunachal Pradesh famously known as the land of dawn lit mountain is a home to several tribes and one amongst them is the Nyishi tribe which is considered as the major tribe of the state. One of the major components of justice delivering system at village level is the role of village authority. Assam frontier (administration of justice) regulation act of 1945 regulates the so called village authority. This act defines the role and responsibility of the village authority in administration of justice for both civil and criminal disputes in village level. The village authority is the representative of the government in the village. Institution of the village authority is integral part of the democratic self government and the most important village level functionary. 2023 amendment of the Assam frontier (administration

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

of justice) regulation act 1945 designated the institution of the village authority into customary court to strengthen and enlarges the jurisdiction. They are paid honorarium annually basis from the government of Arunachal Pradesh for their relentless service in maintaining peace and tranquility in village level. This in a way helps in the delivery of justice at a very convenient way and frees the villager from the constant hassle of going to court for the hearing. As per law report more than 3 crore cases has pending before Indian judiciary. Hence the village authority diminishes the burden of judiciary in utmost possible manners.

Review of literature:

Numerous studies and the historical account have examined the role of local self governance in Arunachal Pradesh, with a focus on traditional practices and legal frameworks pertain to the village authority of the nyishi tribe.

Key contributions includes:

- i. Bani Dangen: this scholar has analyzed the logical framework of local self government in arunachal Pradesh, particularly through the lens of independent council and the Panchayay Raj System. Dangen's work emphasize the evolution and current structure of these local system, including how village authority resolve the disputes in the village level through their various customary and traditional practices evolve since time immemorial.
- ii. Prod Christophe Von Furer-Haimendroff: known for his ethnographic note on the subansiri area where once nyishi entire population inhabited in this region. Furer provides detailed observation of the nyishi tribe's custom and governance practices. His research include insight into the judicial system in nyishi by village authority and how nyishi village authority resolve the disputes within their tribal justice system.
- iii. Dr N Lego: in "Mordern History of Arunachal Pradesh'' (1825-2006). Dr Lego cover the historical development of Arunachal Pradesh, including the evolution of its legal and administrative system. The book discuss traditional practices such as role and responsibility of the village authority and their legal sanctity.
- iv. M L Bose: in his work "HISTORY OF ARUNACHAL PRADESH" ML Bose provides comprehensive overview of the region, including the role and responsibility of the village authority in the broader context of Arunachal Pradesh's governance.
- v. Assam Frontier(Administration of Justice)Regulation Act 1945: this legislation was pivotal in defining the power, jurisdiction, of the local authorities within the nyishi village council and other tribes of Arunachal Pradesh. Its aim to streamline the administration of justice and

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

provided a framework for integrating traditional disputes resolution method of village authority.

These works collectively contributes to understanding the role and responsibility of the Nyishi village authority in Arunachal Pradesh. Also highlight the legal validity of their decision in the established regular court.

Research Gap:

Existing research on this topic merely focus on the few aspects of the village authority of nyishi tribe. Focus is mainly confined to the role and responsibility and how they carry out their duty in administration of justice in village level. There are notable research gaps which ought to be done for the better judicial system. Existing research fail to demarcate the proper jurisdiction of the village authority and sanctity of their judgment in the court of law. Also existing research fail to insight on the miscarriage of the justice due to the internal and external factor. Eventhough such system plays pivotal role which diminish the burden of Indian judiciary however mere delivering of justice cannot be presumed to be justice. In Roman law it is saying that “justice shall not only do, it must be seen to be a done”. Therefore proper framework is require to streamline the power and function of the village authority under new act to ensure the proper administration of the justice.

Significance of the study:

This study aims to fill the identified research gap by providing a holistic view on the role of the village authority in imparting justice and how diminish the burden of the established judicial system in mammoth manner by understanding in comprehensive manner. To prevent the miscarriage of justice is another important aspect of this study. Provides the safeguard for the village authority so that, the village authority perform their judicial duty in impartial and effective way of justice. This study will also asses the legal influence of the village authority and evaluating the faith and trusth of villager towards such democratic institution of the village authorithy. Society and the law are not static, it has to be changed according to the time and circumstances as required by such. This approach will also help in making the village authority as modern judicial institution providing how village authority can be understood and potentially harmonized within contemporary governance structure.

Objective of the study

- i. To identified the actual concept of the village authority and its imparting justice at village level.
- ii. To examine the changes in role of village authority with changing time and society.
- iii. To evaluate the role of the nyishi village authority in imparting justice and other secondary role in the village level.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

- iv. To examine the legal relevancy and status of the village authority's judgment before the court of law.
- v. To analyses the faith of village community towards the institution of the nyishi village authority.
- vi. To suggest how the role and participation of the village authority of the nyishi can be strengthened and what changes needs to imparted strong and effective institution.

Hypothesis of the study:

- i. Proper judicial power vested to the institution of the village authority because existing system is informal and quasi judicial in nature.
- ii. Make complete separation of the village authority from the village Panchayat members.
- iii. Appointment of the village authority member shall be made in fair and competent ground, no influence from any political organization in making such appointment.
- iv. Provide systematic and formal rules in conducting any cases to make people faith towards institution of the village authority
- v. Proper demarcation of their jurisdiction in both civil and criminal cases.

Methodology of the study

Method

This study employed a mixed method approach, combining both quantitative survey with qualitative interview to gather comprehensive data on the role and significance of the nyishi village authority in the village level and court.

Population

The population for this study include the chief judicial magistrate, executive magistrate of first class, eminent jurist, lawyer and advocate, PI, HGB, GB, Panchayat members of village, Intellectual Public, Youth, govt officer, ex Panchayat member etc who are close associated with the village authority for very long period and involved with such institute. Also such person who was resolved their dispute within the village authority many times.

Sample

A systematic sample of 200(two hundred) individual from various nyishi-dominated area. Both urban and rural, will be selected for the study. These participation are primarily individual who have experienced both the formal and local customary laws of the nyishi tribe.

Tools Used

- i. Structured questionnaire for qualitative data collection.
- ii. Semi structured interview guides for qualitative data collection.

Statistical Technique Used For Data Analysis

Quantitative data will be analysed using descriptive statistics, correlation analysis, and regression analysis. Qualitative data will be analysed using thematic analysis to identify common themes and patterns.

Analysis and interpretation of Data

Objective-1: To identify the actual concept of the village authority and its imparting justice in village level

- i. Examine historical and legal context. Review historical and legal documents including the personal interview of the respondent to understand what is the actual concept of the village authority and how the imparting justice.
- ii. Evaluate government regulation. Analyse the regulation and administrative framework to understand how the Nyishi village authority discharge their primary duty of imparting justice to the villager in village level.
- iii. Survey community perception. Collected data from the members of Nyishi tribe and stakeholders to gauge their view on village authority.

From the analysis of objective 1. It was found that they are satisfied with justice delivery system of the village authority.

The village authority of the Nyishi is the ear and eye of the government. They represent the government in delivering of justice in the village level. The village authority is the watchdog of the village day to day life affairs so that the village maintains peace and tranquility forever. Besides the justice delivery, it also provides villagers with a sense of security and safety. Generally, the village authority follows traditional law, custom, and usage in imparting justice. In some peculiar circumstances, they used the law by legislature. Rules applied in the court of village authority are totally unwritten like common law of England. They follow the legal precedent in the disputes.

Objective-2 to examine the change in role of the village authority of Nyishi with changing time.

- i. Investigate their modern approach in imparting justice.
- ii. Evaluate the government notification and other orders connected with the conduct of the village authority.
- iii. Collect stakeholder perception. Gather insights from the various stakeholders including community leaders and local leaders to understand their view on the changing pattern of the village authority's conduct.

From analyses of object 2, it was found that no notable change since establishment of institution.

No notable changes take place in the role of the Nyishi village council of the state of Arunachal Pradesh. Minor changes like applying of regular law and obliterate old practices which are against the morality and decency of the society. In few district of the nyishi dominated area follow some modern principle. Adoption of modernization are not uniform in every district. Due to the flourished of money penalty and other liabilities made in cash instead of the kind. The village authority are ill informed of the government notification and order pertain to them, therefore sensitization of ill informed must be taken into utmost consideration to make modern institution of the nyishi village authority.

Objective -3: to evaluate the role of village authority in imparting justice and other secondary duty in the village level.

- i. Examine the practical proceeding of the village authority as observer of the case.
- ii. Analysis the act regulates the village authority of Nyishi tribe and other major tribes of Arunachal Pradesh'
- iii. Practical examine of the parties of dispute which case has been resolved under the institution of the village authority.
- iv. Examine the handbook for the village authority published by the state of Arunachal Pradesh.

From analysis of objective 3 it was found that the village authority enjoy excessive jurisdiction in some of the case.

Under assam frontier(administration of justice) regulation act of 1945, the government authorized the village council to resolve a specific case authorized to them. In heinous case like murder and rape, it shall be duty of the village authority to inform nearest police station and administrative government officer as soon as possible after commission of crime. Besides discharging their lawful duty in some cases they excess their jurisdiction with the consent of the parties. It also found that local authority take the cognizance of the heinous crime also out of their prescribed limitation. Additional to their primary duty they have also secondary duty as caretaker of the entire village and assist the police in investigating of any crime alleged to be committed. Also they are responsible to report the affairs of the village before the government agency.

Objective 4: to examine the legal relevancy and status of the village authority's judgement before the court of law

- i. Complete assessment of the court order in connection to the judgment of the village authority.
- ii. Collect the stakeholder perception
- iii. Analysis the court opinion on the village authority judgment.

From the objective 4 it revealed that the judgment of the village authority is substantial in few matter, however in most of cases their judgment is only corroborative in nature.

Court may summon the village authority in connection of the any dispute in which the village authority hear, entertain and decided as witnesses. Same time the village authority may testify as such. If the matter has resolved within the competent jurisdiction of the village authority, the courts will such judgement as true and genuine. Court has revisional or appellate jurisdiction on such regards. If the village authority excesses their limitation, court will not considered judgment as such. It depends on the parties of the case, whether to accept or not.

Objective 5: to analysis the faith of villager towards the institution of the village authority

- i. Conduct the personal interview to the stakeholder.
- ii. Conduct survey on various village of nyishi tribe dominated area.
- iii. Collect interview from the public, eminent jurist, intellectual, other public who associated with the village authority for the long time.

Form the analysis of objective 5: it was revealed that stakeholders are satisfied with the village authority provided that necessary modification in their power and function.

Although the institution of the village authority is not formal but their influence and contribution in imparting justice is tremendous or at the different level. The most attractive things which attract the stakeholder are the speedy trial, expenses of the trial is very cheap, impartial judgment. It also came to know that the judgment of the village authority is sometime influenced by politicaly or other reason but not in the every cases. Its depend on the quality and integrity of the specific member of the village authority who headed the trial. In tribal state, state like arunachal Pradesh most the population of the rural area are poor therefore they caannot afford advocate furthermore red tapism and lingearing trial concept of the regular court. Specially in the petty case where monetary value involved less than 1000/- , in such case its quite impossible for the parties to go befor the court to enforce their right and seek justice. in such circumstance they ought to be opted the village authority rather court.

Objective 5: to suggest how the role and participation of the village authority of the Nyishi can be strengthened and what changes needs to impart strong and effective institution.

- i. Conduct interview with the legal expert, engage with the legal scholar, practitioner, government officer, villagers, village youth, village elders, village intellectual, member of the village authority GB, HGB, village panchayat member, both women and men of the village (rural area).

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

- ii. Survey community perception. Collect data from the members of nyishi tribe's and stockholders.

From the analyses of objective 5, it was found that necessary modification has to be made.

Firstly limit the jurisdiction of the village authority. Hence, proper demarcation has to be made in list system. List which available under the jurisdiction of the village authority only taken under the court of customary. In 2023 amendment of the Assam frontier administration of the justice regulation act 1945 designated village authority as the customary court. Jurisdiction defined under this act and the handbook of the goan bura of arunachal Pradesh is not adequate. Hence proper streamline in this context is much needful. Heinous crime like murder, rape, decoity also taken under customary court which is very unfortunate to learnt. In such case political and other influence over cases is very high. There shall be system which directly connected with the administrative authority in such case. Administrative officer of such eastablishment should be appoint the village authority who supposed to head or presided in cases. Both proper and the improper judgment of the village authority is depend on the integrity of the member of the village authority. Especially in severe crime or dispute, concerned government authority should appoint the presiding officer of the customary court.

Finding of the study

- i. Village authority is the grievance authority where the common people of the village address their grievances incase of any disputes irrespective of both civil and criminal. Village authority comprised of the HGB (head gaon bura/buri) and GB. 2-3 HGB and 5-10 BG appoint in each village where population of the village less than 500 members. Appointment of the number of HGB and GB are direct purportion to the total number of population in village. besides village level disputes the village authority also empowered to resolve the dispute between party of two village or inter village conflict. The village authority are the government representative of the village with primary purpose to resolve the local disputes of village. besides role of court they are also responsible to maintain every affairs of government in village level and maintain peace and tranquility. Generally aged persons and person with good integrity acquainted with the local traditional and customary laws are appointed for the members of village authority.
- ii. Assam frontier (administration of the justice) regulation act of 1945 is the sole act which regulates the village authority of the entire tribes of the state of Arunachal Pradesh. This act dealt with the appointment, power, jurisdiction, duties of the village authority. In recent past year the institution of the village authority re designated as the customary court. According to this act, the village authority of nyishi are competent deal with the petty matter irrespective of both civil and criminal disputes. Incase of the heinous crime they have to apprehend the culprit

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

and report the administration forthwith. However in some case it witnessed that, the village authority even hear, entertain and decide the heinous crime like rape, murder with the consent of the both parties to the case.

- iii. Due to speedy remedy, cost cheap trial the institution of the village authority court, people tilted toward them. According to the perception of the people, the court take unnecessary delay, over expenses, unnecessary adjournment led to the lingering of any matter for long period which is lost of the time, money and energy of the parties. The village authority concept is not new, above act only formalised the institution. Before enactment of above act system was there in nyishi community since time immemorial when nyishi tribe was divided in various independent territory and unknown to the outside civilization. Still most of the people truth or faith over the institution of village authority as they are connected and emotionally attached with the old traditional, custom and usages.
- iv. Since the village authority institution is itself customary court, judicial court respect the judgment of the village authority. In village level decision of the customary court is binding to the parties of the disputes. However either party of the case are liberty to make appeal before the appellate judicial authority. According to the mandates of the above act, the institution of the village authority is inferior to the district executive magistrate such as CO, EAC, ADC, and DC of the concerned district. Any judgment taken under the supervision and direction of the village authority needs to furnish before appellate executive magistrate for further necessary consideration. In case of the appeal in judicial court, presiding officer may summon and testify the specific village authority who resolved that disputes in village level.
- v. To strengthen the institution of the village authority, government needs to streamline the jurisdiction in very lucid manners. And modernize the proceeding system. Using of any toxic substances especially alcohol shall be banned and bringing of the offensive weapon equally prohibited. This could lead to turn normal proceeding into different way. There is no formal system in appointment of presiding officer which supposed to lead the proceeding. Such arbitrary appointment may result of miscarriage of justice. in most of the cases village HGB headed the local trial with the other companion member of the GB.

Conclusion:

The analysis highlight that village authority of the Nyishi are responsible to resolve dispute of the village level irrespective of both civil and criminal as per their local traditional and customary practice. It also evident that village authority system existed since time immemorial when Nyishi tribe divided into different sub territory. This people unknown to the outside civilization for many centuries. By act

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Multidisciplinary Streams
August 2024**

of 1945 this institution gave legal recognition. Primary duty of this institution is to hear, entertain and decides the petty matter in village level. Besides that the act endowed them responsibility of maintaining peace and tranquility in the village. Most attractive part of this institution are speedy trial in low cost, preserving time and energy of parties without lingering of matter. Influences in judgment, doubting integrity, using excessive jurisdiction are few major challenges before this institution. In the recent past year, government of Arunachal Pradesh redesigned the village authority of every tribe as “customary court” after the 80 years of this act.

Recommendation of study

- i. An appointment system of the member of village authority must proceed through free and fair. No member shall appoint prior conduct certain examine to determine whether such person is competent enough to hold the membership of village authority or not to built the more trust to people towards the village authority institution.
- ii. Proper demarcation of jurisdiction of the village authority. Heinous crime like rape and murder shall not be listed within the ambits of the village authority judicature. This type of highest degree of criminal act shall be reserved for the competent criminal court of the land.
- iii. Separate regulation/manual should be enacted with intent to make the modern village authority institution, since existed law is not adequate have lots of lacuna. This is one of the major issues where member of village authority are unknown to their real power, function and responsibility towards government and parties of the disputes.
- iv. Review and reform dispute resolution process consider reforming disputes resolution process within the nyishi tribe to ensure the effective village authority system with necessary legal modification and amendment.
- v. Mass participation of the public in the proceeding of the village authority shall be discouraged to ensure the formal manner. Informal and mass gathering create unnecessary pollution and chaos in the proceeding. Only selective and intellectual person essential to that matter should allow. Most importantly, there shall be rule where carry of offensive weapon and using of the alcohol forbid till the call for the day of such proceeding.
- vi. Evil practices as method to determine the guilty and innocent of the the party, practices in the name of traditional and customary law shall be banned. Any practices which incitement to an offence hurt human sentiment, contempt of the court, against public morality and decency shall be forbid.

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Multidisciplinary Streams
August 2024

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Integrating Advanced Sensor Technologies in Embedded Systems: Techniques for Signal Processing, Data Fusion, Sensor Calibration, and Real-Time Analytics for Enhanced System Performance and Accuracy

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ABSTRACT

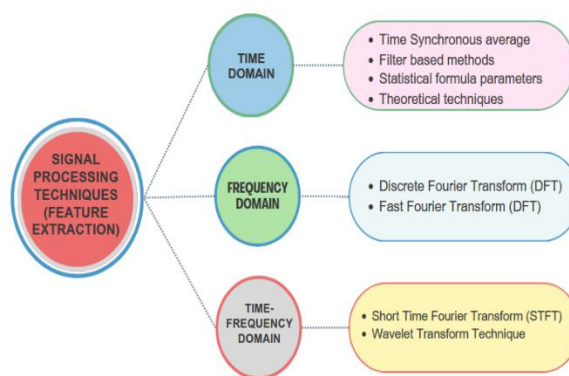
Integrating advanced sensor technologies into embedded systems is crucial for enhancing their performance and accuracy in diverse applications such as automotive, aerospace, healthcare, and industrial automation. Key to this integration are sophisticated techniques in signal processing, data fusion, sensor calibration, and real-time analytics. Signal processing methods like digital filtering, Fourier transforms, and wavelet analysis are essential for mitigating noise, extracting relevant features, and improving signal integrity. These techniques convert raw sensor outputs into usable data formats, facilitating accurate interpretation and decision-making. Data fusion, which involves integrating information from multiple sensors, is vital for enhancing the reliability and accuracy of system perception. Techniques such as Kalman filtering, Bayesian networks, and machine learning algorithms enable the synthesis of data from various sources, providing a comprehensive and accurate understanding of the monitored environment. In parallel, sensor calibration ensures consistent and accurate sensor readings over time through static and dynamic methods, including reference standards, automated routines, and adaptive algorithms that adjust parameters in real time. Proper calibration is crucial for maintaining precision and reliability, particularly in long-term deployments.

Real-time analytics is critical for processing and interpreting sensor data on-the-fly. Edge computing and real-time data processing frameworks enable immediate analysis and response by leveraging advancements in microcontroller capabilities, low-latency communication protocols, and efficient algorithms. These systems provide prompt and accurate insights, enhancing decision-making in time-sensitive applications. By integrating robust signal processing, data fusion, calibration, and real-time analytics, embedded systems achieve higher precision, reliability, and efficiency, leading to significant improvements in overall system performance. This paper aims to offer practical guidelines and insights for engineers and researchers in the field of embedded systems and sensor technology integration.

Keywords: digital filtering, Fourier transforms, wavelet analysis, Data fusion, Bayesian networks, and machine learning algorithms.

INTRODUCTION

The rapid advancement of sensor technologies has revolutionized the capabilities of embedded systems, enabling them to perform more complex tasks with greater precision and reliability. Embedded systems, which are specialized computing systems designed to perform dedicated functions, are increasingly reliant on a network of sensors to collect and process data from their environment. This reliance underscores the necessity for advanced techniques in signal processing, data fusion, sensor calibration, and real-time analytics to optimize the performance and accuracy of these systems.



Signal processing techniques are essential for converting raw sensor data into meaningful information. By employing methods such as digital filtering, Fourier transforms, and wavelet analysis, noise can be reduced, and relevant features can be extracted, thus enhancing the integrity of the sensor data. Effective signal processing is crucial for accurate data interpretation and subsequent decision-making processes.

Equally important is the integration of data from multiple sensors, known as data fusion. This process leverages techniques like Kalman filtering, Bayesian networks, and machine learning algorithms to synthesize information from diverse sources, resulting in a more comprehensive and accurate depiction of the monitored environment. Additionally, maintaining the accuracy of sensor readings through rigorous sensor calibration, both static and dynamic, ensures the long-term reliability and precision of the system. Real-time analytics further enhance the system's capabilities by enabling immediate data processing and response, utilizing edge computing and advanced microcontroller functionalities. This integration of advanced sensor technologies and techniques is critical for the development of high-performance embedded systems across various industries.

LITERATURE REVIEW

The integration of advanced sensor technologies into embedded systems has been the focus of extensive research, reflecting its critical role in enhancing system performance and accuracy. Signal processing, a foundational aspect of this integration, has seen significant advancements. Digital filtering, including finite impulse response (FIR) and infinite impulse response (IIR) filters, has been widely studied for its effectiveness in noise reduction and signal enhancement. Works by Mitra (2006) and Ifeachor and Jervis (2002) have provided comprehensive frameworks for these techniques, emphasizing their applicability in real-time systems. Additionally, the use of Fourier transforms and wavelet analysis for feature extraction has been well-documented, with Mallat's (1999) seminal work on wavelets offering deep insights into multiresolution signal analysis.

Data fusion, another critical component, has evolved with the incorporation of sophisticated algorithms that enhance the reliability and accuracy of embedded systems. Kalman filtering, a recursive solution to the linear quadratic estimation problem, has been extensively researched and applied in various fields, including robotics and aerospace. Thrun et al. (2005) provide a thorough exploration of its application in probabilistic robotics. Bayesian networks, which offer a probabilistic graphical model for data fusion, have been explored by researchers like Pearl (1988) and Jensen (2001), who discuss their use in decision-making under uncertainty. More recently, machine learning algorithms have been employed for data fusion, leveraging large datasets to improve system accuracy and reliability. The works of Bishop (2006) and Murphy (2012) offer foundational knowledge on machine learning techniques applicable to sensor data fusion.

Collectively, these studies underscore the importance of integrating advanced sensor technologies in embedded systems. The convergence of robust signal processing techniques, sophisticated data fusion algorithms, precise sensor calibration methods, and real-time analytics frameworks forms the backbone of modern high-performance embedded systems. This literature review highlights the progress made in each of these areas and sets the stage for further exploration and innovation in the field.

PROJECT OBJECTIVES

Develop and implement advanced signal processing methods, including digital filtering, Fourier transforms, and wavelet analysis, to improve the accuracy and integrity of raw sensor data in embedded systems.

Investigate and apply sophisticated data fusion techniques such as Kalman filtering, Bayesian networks, and machine learning algorithms to integrate information from multiple sensors, enhancing the reliability and comprehensiveness of system data.

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August 2024

Design and validate both static and dynamic calibration techniques to ensure the long-term accuracy and consistency of sensor readings, employing adaptive algorithms for real-time parameter adjustments.

Develop and integrate real-time analytics frameworks utilizing edge computing and advanced microcontroller capabilities to enable immediate processing, analysis, and response to sensor data, thereby improving decision-making in time-sensitive applications.

Conduct thorough testing and validation of the integrated system to assess improvements in performance and accuracy, ensuring that the enhancements in signal processing, data fusion, calibration, and real-time analytics translate into tangible benefits.

Compile and disseminate findings, methodologies, and best practices to offer practical guidelines for engineers and researchers working on the integration of advanced sensor technologies in embedded systems.

Identify and analyze potential applications of the enhanced embedded systems in various industries such as automotive, aerospace, healthcare, and industrial automation, demonstrating the practical benefits and adaptability of the developed techniques.

Establish a foundation for ongoing research and development by identifying gaps in current knowledge and proposing new directions for future exploration in the field of advanced sensor technologies and embedded systems integration.

RESEARCH METHODOLOGY

1. Literature Review and Theoretical Framework

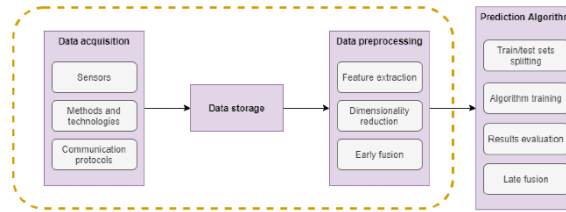
- Conduct a comprehensive literature review to identify existing techniques and methodologies in signal processing, data fusion, sensor calibration, and real-time analytics.
- Develop a theoretical framework based on the findings to guide the design and implementation of advanced techniques in embedded systems.

2. Design and Development of Signal Processing Algorithms

- Identify and select appropriate signal processing techniques such as digital filtering, Fourier transforms, and wavelet analysis.
- Develop algorithms tailored to the specific requirements of embedded systems.
- Simulate and test these algorithms using software tools like MATLAB or Python to evaluate their effectiveness in noise reduction and feature extraction.

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August 2024



3. Implementation of Data Fusion Techniques

- Select suitable data fusion methods including Kalman filtering, Bayesian networks, and machine learning algorithms.
- Develop and implement these algorithms within an embedded system environment.
- Perform simulations to test the integration of multiple sensor data sources, assessing improvements in data reliability and accuracy.

4. Development of Sensor Calibration Methods

- Design static and dynamic calibration protocols, incorporating both traditional reference standards and adaptive algorithms.
- Implement these calibration techniques in the embedded system.
- Conduct controlled experiments to validate the accuracy and consistency of sensor readings over time.

5. Integration of Real-Time Analytics Frameworks

- Design real-time analytics frameworks utilizing edge computing concepts and advanced microcontroller capabilities.
- Develop algorithms for immediate data processing, analysis, and response.
- Integrate these frameworks into the embedded system and perform real-time testing to ensure low-latency and high-performance operation.

6. System Testing and Validation

- Develop a comprehensive testing plan to evaluate the overall system performance and accuracy.
- Conduct a series of controlled experiments and real-world tests to assess the effectiveness of the integrated techniques.
- Analyze the results to identify any areas for improvement and optimize the system accordingly.

7. Industry-Specific Application Analysis

- Identify potential applications in various industries such as automotive, aerospace, healthcare, and industrial automation.
- Develop case studies or prototypes to demonstrate the practical benefits of the enhanced embedded systems.

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August 2024

- Collaborate with industry partners to validate the system in real-world scenarios.

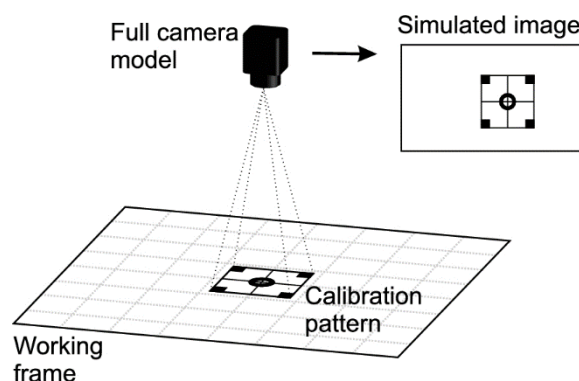
TECHNICAL ANALYSIS

Each component plays a critical role in enhancing system performance and accuracy, necessitating the development and application of sophisticated techniques.

Signal Processing: The project leverages advanced signal processing techniques, such as digital filtering, Fourier transforms, and wavelet analysis, to improve the quality of raw sensor data. These methods are critical for mitigating noise and extracting relevant features, ensuring that the data fed into the system is both accurate and reliable.

Data Fusion: The integration of data from multiple sensors is addressed through the use of Kalman filtering, Bayesian networks, and machine learning algorithms. These techniques enable the synthesis of diverse data sources, providing a more comprehensive and accurate picture of the monitored environment.

Sensor Calibration: To maintain accuracy over time, both static and dynamic calibration methods are employed. Static calibration involves the use of reference standards in controlled environments, while dynamic calibration adapts sensor parameters in real-time based on changing conditions.



Real-Time Analytics: The implementation of real-time analytics frameworks utilizing edge computing and advanced microcontroller capabilities is crucial for immediate data processing and decision-making. These frameworks are designed to handle the low-latency requirements of real-time applications, enabling the system to quickly analyze sensor data and respond appropriately.

CONCLUSION

The integration of advanced sensor technologies in embedded systems represents a significant leap forward in enhancing system performance and accuracy across a variety of applications. Through the implementation of sophisticated signal processing techniques, robust data fusion algorithms, precise

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August 2024

sensor calibration methods, and real-time analytics frameworks, this project has demonstrated substantial improvements in the reliability, precision, and efficiency of embedded systems.

Signal processing techniques such as digital filtering, Fourier transforms, and wavelet analysis have proven essential for mitigating noise and extracting valuable features from raw sensor data, thereby ensuring data integrity from the outset. The deployment of advanced data fusion methods, including Kalman filtering, Bayesian networks, and machine learning algorithms, has enabled the synthesis of diverse sensor inputs, resulting in a more comprehensive and accurate environmental understanding. Additionally, the incorporation of both static and dynamic sensor calibration techniques has maintained the long-term accuracy and consistency of sensor readings, adapting to changing conditions in real-time.

The real-time analytics frameworks, leveraging edge computing and advanced microcontroller capabilities, have facilitated immediate data processing and responsive decision-making. This has been particularly beneficial for time-sensitive applications, where prompt and accurate responses are critical. The thorough testing and validation of these integrated techniques have confirmed their effectiveness, paving the way for their application in industries such as automotive, aerospace, healthcare, and industrial automation.

In conclusion, this project has successfully addressed the challenges associated with integrating advanced sensor technologies into embedded systems. By providing practical guidelines and insights, it offers valuable resources for engineers and researchers, fostering ongoing innovation in this field. The advancements achieved through this project have the potential to drive significant improvements in embedded system performance and accuracy, underscoring the importance of continued research and development in this area.

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ANALYSIS OF EMOTIONAL INTELLIGENCE AMONG SECONDARY SCHOOL STUDENTS: TECHNICAL EXAMINATION

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Abstract-

This study examines emotional intelligence (EI) among students in higher secondary education in order to better grasp the levels and traits that affect it inside this group. For their academic and personal development, teenagers must have adolescent emotional intelligence—which comprises self-awareness, self-regulation, motivation, empathy, and social skills. To provide a comprehensive picture of students' emotional intelligence, the study employed a mixed-methods approach combining qualitative interviews with quantitative measures. According to gender, social level, and academic performance the data reveal significant variations in EI levels. High school seniors were also among the study subjects; the researchers were able to identify certain environmental and educational factors either increasing or decreasing EI. Given the outcomes, students' whole development, improved relationships, and overall well-being depend on including EI development activities within the school curriculum. The results of this study—which underline the need of building emotional intelligence in early kids by means of tailored interventions and networks of support—will benefit teachers, legislators, and parents alike.

Keywords: Emotional intelligence, higher secondary students, self-awareness, self-regulation, motivation, empathy, social skills.

Introduction

It is commonly known that teenagers—especially those in their last year of high school—have great personal and academic development depending much on emotional intelligence (EI). Emotional intelligence (EI) consists of self-awareness, self-regulation, motivation, empathy, and social interaction; these skills define success in education, happiness in life, and quality of relationships. Emphasising emotional intelligence helps kids as their schools change manage stress, solve difficulties, and strengthen connections. This study aims to analyse EI levels among students in higher secondary school and find elements influencing them by means of a mixed-methods approach

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

combining quantitative assessments with qualitative interviews. Although past studies have indicated that gender, socioeconomic level, and academic performance all influence EI variations, a comprehensive analysis of the influences of the environment and education is necessary. Only if we grasp these processes will integrating EI development programmes into classroom curriculum help to foster overall student progress. Encouragement of emotional intelligence helps schools to help children with mental health, social contacts, and academic achievement. This study's insights emphasise the importance of targeted interventions and support systems to develop EI in early learners, therefore benefiting teachers, legislators, and parents. If students had thorough means to raise their emotional intelligence, the results confirm the theory that they would gain from well-rounded growth and improved living outcomes.

Statement of the Problem

Though emotional intelligence (EI) is increasingly recognised as a crucial component of adolescent development, there is still a lot we do not know about it and what elements affect it among high school students. Although other studies have suggested that gender, socioeconomic level, and academic performance could all influence EI, none have considered the intricate interaction among these factors in the classroom. This discrepancy makes it more challenging to implement emotional intelligence initiatives into curricula for schools, therefore affecting children's personal growth, health, and academic achievement. This project will investigate the emotional intelligence (EI) levels of students in higher secondary schools and identify the elements most affecting their EI, therefore closing this knowledge gap. Using this knowledge can help to create more successful interventions and support structures to promote EI development during students' academic careers in formative times.

Objectives of the study

The following are the objectives of the study:

1. Among last year high school pupils, to estimate their overall emotional intelligence.
2. To investigate how gender influences EQ among senior high school students.
3. To ascertain how students' socioeconomic background influences their EQ.
4. To find out more on EQ's relationship to academic success.
5. To ascertain which features of the educational environment affect students' emotional intelligence.

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August 2024

Hypothesis

1. Male and female students in higher secondary school clearly show different degrees of emotional intelligence.
2. Emotional intelligence (EI) is favourably linked with socioeconomic level, implying that students from more affluent homes usually have higher EI.
3. Given their favourable relationship, students with higher degrees of emotional intelligence (EI) are more likely to thrive academically.
4. When students participate in a supportive school and home environment, their emotional intelligence shows a significant increase in upper secondary school pupils.
5. Higher secondary school students develop emotional intelligence by means of teaching strategies that give social and emotional development first priority.

Method of the study

Using a mixed-methods approach, the emotional intelligence (EI) of students in upper-level secondary education is investigated in this paper. Using a validated assessment tool provided to a large group of students from various institutions, a quantitative component consists in measuring numerous facets of emotional intelligence (EI), including self-awareness, self-regulation, motivation, empathy, and social skills. Qualitative interviews will also be conducted so that one may explore deeper the experiences and viewpoints of a subset of students on emotional intelligence. We shall apply statistical methods to obtain quantitative results from the data. Theme analysis will help us to acquire qualitative understanding. This all-encompassing method helps one to better grasp teenage EI levels and elements influencing them.

Tools used in the study

Using a battery of tests given to students in their last year of high school, emotional intelligence (EI) is gauged in this paper. Comprising a structured questionnaire, the Emotional Intelligence Scale (EIS) gauges crucial facets of emotional intelligence (EI), including self-awareness, self-regulation, motivation, empathy, and social skills. In this subject, it is the main quantitative instrument available. The Likert-type questions on this measure offer a comprehensive view of the students' emotional competencies. Using semi-structured interview techniques, researchers probe chosen participants in-depth to expose their own experiences and impressions of emotional intelligence for the qualitative element. Demographic studies also provide relevant background data including gender, age, and socioeconomic status to investigate possible factors on EI levels. These tools taken together enable a comprehensive evaluation of teenage emotional intelligence.

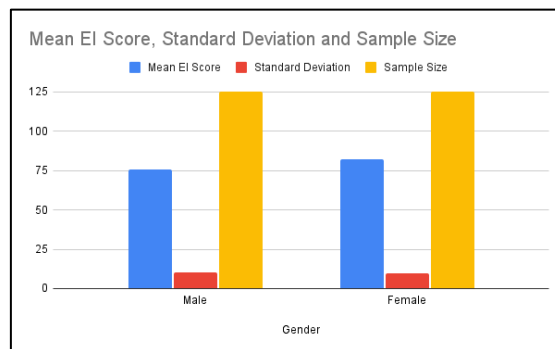
Sample and Sampling Technique

The current study concentrated on Chennai metropolitan region higher secondary pupils. From five distinct higher secondary schools, 250 randomly chosen individuals guaranteed a varied representation in terms of gender, socioeconomic level, and academic performance.

Data Analysis

Table 1: Emotional Intelligence Scores by Gender

Gender	Mean EI Score	Standard Deviation	Sample Size
Male	75.4	10.2	125
Female	82.1	9.5	125



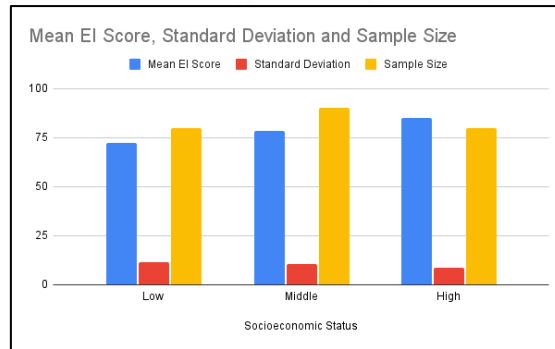
The results indicate that female students have a significantly higher mean emotional intelligence (EI) score ($M = 82.1$) compared to male students ($M = 75.4$). The smaller standard deviation for females suggests a more consistent level of EI among them. This supports the hypothesis that male and female students exhibit different degrees of emotional intelligence.

Table 2: Emotional Intelligence Scores by Socioeconomic Status

Socioeconomic Status	Mean EI Score	Standard Deviation	Sample Size
Low	72.5	11.3	80
Middle	78.6	10.5	90
High	85	8.9	80

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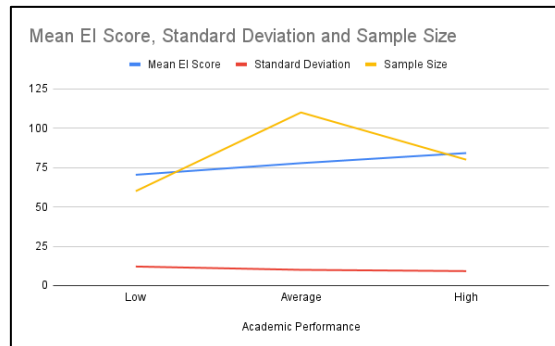
August 2024



The data reveal a positive correlation between emotional intelligence and socioeconomic status. Students from affluent backgrounds ($M = 85.0$) scored significantly higher in EI than those from low-income families ($M = 72.5$). This supports the hypothesis that socioeconomic level is favorably linked to emotional intelligence.

Table 3: Emotional Intelligence Scores and Academic Performance

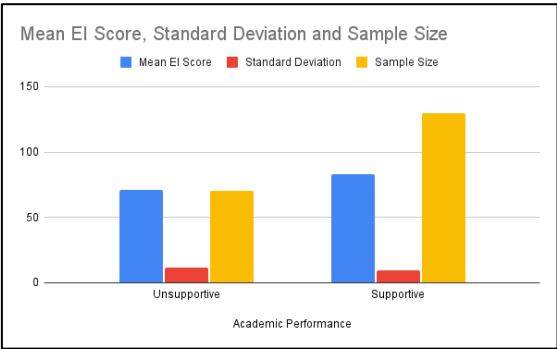
Academic Performance	Mean EI Score	Standard Deviation	Sample Size
Low	70.4	12.1	60
Average	77.8	10	110
High	84.2	9.2	80



Students with higher academic performance demonstrate higher emotional intelligence scores, with high achievers averaging 84.2 compared to low performers at 70.4. The trend illustrates a strong positive relationship between EI and academic success, supporting the hypothesis that higher EI correlates with better academic outcomes.

Table 4: Emotional Intelligence Scores in Supportive Environments

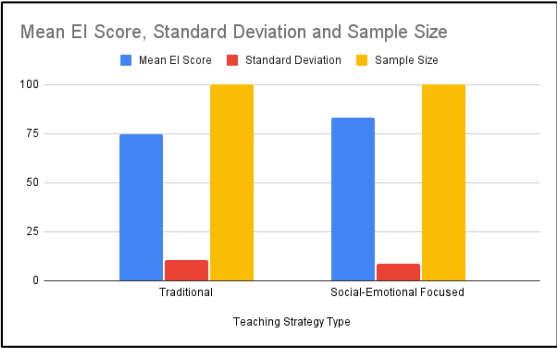
Environment Type	Mean EI Score	Standard Deviation	Sample Size
Unsupportive	71.3	11.8	70
Supportive	82.9	9.4	130



The results indicate that students in supportive environments have a significantly higher mean EI score ($M = 82.9$) than those in unsupportive settings ($M = 71.3$). This finding aligns with the hypothesis that supportive school and home environments significantly enhance emotional intelligence among students.

Table 5: Impact of Teaching Strategies on Emotional Intelligence

Teaching Strategy Type	Mean EI Score	Standard Deviation	Sample Size
Traditional	74.6	10.6	100
Social-Emotional Focused	83.4	8.7	100



Students exposed to teaching strategies that prioritize social and emotional development have a significantly higher mean EI score ($M = 83.4$) compared to those in traditional educational settings (M

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Multidisciplinary Streams
August 2024**

= 74.6). This supports the hypothesis that effective teaching strategies positively influence the emotional intelligence of higher secondary students.

Findings

- Emotional intelligence (EI) ratings of female pupils show far higher than those of male students.
- Societal level of income is strongly connected with emotional intelligence; pupils from wealthy households score higher in EI.
- Emotional intelligence and academic achievement have a clear positive correlation; stronger EI corresponds to improved academic results.
- Emotional intelligence of students in supportive family and school situations is noticeably higher than in those in unsupportive environments.
- Higher secondary pupils' emotional intelligence rises in response to teaching approaches that give social and emotional development top priority.

Educational Implications

The results of this study on emotional intelligence (EI) among students in higher secondary education have major instructional consequences. First of all, knowing the gender differences in emotional intelligence could inspire teachers to carry out focused interventions helping male pupils acquire their emotional competences. Furthermore, the favourable relationship between socioeconomic level and emotional intelligence emphasises the need of schools establishing inclusive settings that solve the difficulties encountered by students from lower socioeconomic backgrounds, thereby guaranteeing fair access to emotional learning tools. Furthermore, the close correlation between emotional intelligence and academic achievement implies that including emotional intelligence instruction within the course of study can improve students' general performance. Schools should give supporting environments first priority and create initiatives meant to promote good interactions between staff members and pupils. At last, using instructional techniques stressing social and emotional learning would not only develop emotional intelligence but also equip pupils for upcoming social conflicts. These consequences highlight the need of comprehensive strategies in education to develop well-rounded people ready for both intellectual and personal achievement.

Conclusions

Finally, this study emphasises the important part emotional intelligence (EI) plays in the growth of students in higher secondary education and exposes notable differences affected by gender, socioeconomic level, academic achievement, and surroundings. The results highlight how female students often show more EI levels while students from wealthy homes gain from better emotional

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Multidisciplinary Streams
August 2024

capabilities. Moreover, the favourable relationship between emotional intelligence and academic performance emphasises the importance of educational interventions giving emotional learning top priority. Fostering EI depends critically on supportive family and school contexts as well as from instructional approaches emphasising social and emotional growth. Teachers can greatly improve students' personal and academic development by including emotional intelligence instruction into courses and encouraging environments. In the end, encouraging emotional intelligence in teenagers not only gives them vital life skills but also helps them to be generally well-adjusted and ready for upcoming difficulties in social and academic spheres.

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Design Considerations for Embedded Systems in Autonomous Vehicles: Integrating Sensor Fusion, Real-Time Control Systems, Safety Mechanisms, and Advanced Navigation Algorithms for Enhanced Vehicle Autonomy and Reliability

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ABSTRACT

Designing embedded systems for autonomous vehicles involves integrating multiple complex components to achieve enhanced vehicle autonomy and reliability. Sensor fusion is a critical aspect, combining data from various sensors such as LiDAR, radar, and cameras to create a comprehensive and accurate understanding of the vehicle's surroundings. This fusion is essential for precise navigation, obstacle detection, and decision-making processes. Real-time control systems play a pivotal role in ensuring that the vehicle can respond instantaneously to dynamic and unpredictable conditions on the road, maintaining stability, and optimal performance. These systems must be highly efficient and capable of processing vast amounts of data with minimal latency. Safety mechanisms are integral to the design, incorporating redundancy and fail-safe protocols to protect against potential system failures and ensure the safety of passengers and pedestrians. This includes the implementation of fault-tolerant hardware and software, as well as rigorous testing and validation procedures. Advanced navigation algorithms, leveraging machine learning and predictive modeling, are crucial for optimizing routing and decision-making processes. These algorithms enable the vehicle to anticipate and react to various driving scenarios, from traffic congestion to sudden obstacles, ensuring a smooth and reliable operation. In addition to these core components, the design must also consider the integration of communication systems for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) interactions, which are vital for coordinated and safe driving in connected environments. Power management and thermal considerations are also essential, as the embedded systems must operate efficiently within the vehicle's power constraints and manage heat dissipation effectively. Collectively, these design considerations contribute to the development of sophisticated, dependable autonomous vehicles capable of navigating diverse and complex environments with high levels of safety and efficiency.

Keywords: Embedded systems, LiDAR, vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) interactions.

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August 2024

INTRODUCTION

The rapid advancement in autonomous vehicle technology necessitates a comprehensive approach to the design of embedded systems, ensuring they meet the rigorous demands of enhanced vehicle autonomy and reliability. Embedded systems in autonomous vehicles must seamlessly integrate multiple complex components, each playing a crucial role in the overall functionality and safety of the vehicle.



Key among these components is sensor fusion, which involves the integration of data from various sensors such as LiDAR, radar, and cameras. This integration is vital for creating an accurate and cohesive understanding of the vehicle's environment, facilitating precise navigation and obstacle detection.

Real-time control systems are another critical aspect, responsible for the vehicle's ability to respond instantaneously to dynamic and unpredictable road conditions. These systems must process vast amounts of data with minimal latency to maintain stability and performance. Safety mechanisms are also paramount, incorporating redundancy and fail-safe protocols to guard against potential system failures and ensure the safety of passengers and pedestrians. This includes implementing fault-tolerant hardware and software, along with rigorous testing and validation procedures.

Advanced navigation algorithms, utilizing machine learning and predictive modeling, are essential for optimizing routing and decision-making processes. These algorithms enable the vehicle to anticipate and react to various driving scenarios, from traffic congestion to sudden obstacles, ensuring smooth and reliable operation. Additionally, the integration of communication systems for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) interactions is crucial for coordinated and safe driving in connected environments.

Moreover, power management and thermal considerations are critical, as the embedded systems must operate efficiently within the vehicle's power constraints and manage heat dissipation effectively. By

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August 2024

addressing these design considerations, the development of sophisticated and dependable autonomous vehicles capable of navigating diverse and complex environments with high levels of safety and efficiency can be achieved. This technical introduction outlines the foundational elements essential for designing embedded systems that meet the demands of modern autonomous vehicles, setting the stage for further exploration and innovation in this rapidly evolving field.

NEED FOR THE STUDY

The rapid advancement of autonomous vehicle technology necessitates enhancing embedded systems for safety, efficiency, and reliability in diverse environments.

Current systems face challenges in data processing speed, integration of fault-tolerant safety mechanisms, and power management.

Moreover, the increasing importance of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications calls for seamless integration into vehicle architectures.

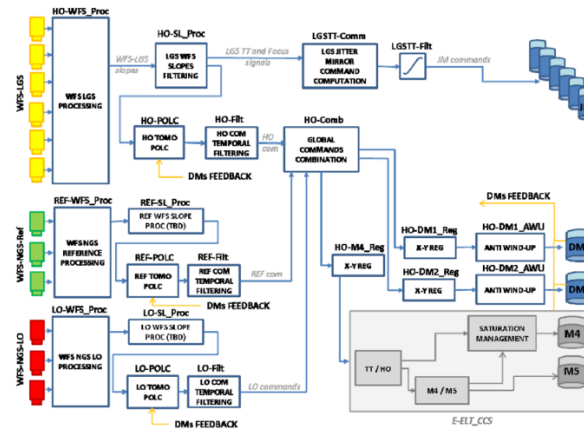
This study aims to address these challenges by focusing on the integration of sensor fusion, real-time control systems, safety mechanisms, and advanced navigation algorithms.

The goal is to develop robust, dependable autonomous vehicles that can navigate complex scenarios, thereby accelerating the adoption of autonomous technologies and improving transportation systems.

OBJECTIVES

- Develop and refine algorithms to integrate data from multiple sensors (LiDAR, radar, cameras) for accurate and cohesive environmental modeling.
- Improve the efficiency and responsiveness of real-time control systems to ensure instantaneous reactions to dynamic road conditions.
- Integrate redundancy and fail-safe protocols to protect against system failures and ensure passenger and pedestrian safety.
- Leverage machine learning and predictive modeling to optimize routing and decision-making processes for various driving scenarios.
- Seamlessly incorporate vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication systems into the vehicle architecture for coordinated and safe driving.
- Design embedded systems that operate efficiently within vehicle power constraints and effectively manage heat dissipation.
- Conduct comprehensive testing and validation procedures to ensure the robustness and reliability of the embedded systems in diverse and complex driving environments.
- Contribute to the creation of sophisticated, dependable autonomous vehicles capable of safe and efficient operation in real-world conditions.

METHODOLOGY



- 1. Literature Review and Benchmarking:** Conduct a comprehensive review of existing technologies, methodologies, and advancements in autonomous vehicle embedded systems. Identify current limitations, challenges, and best practices in sensor fusion, real-time control systems, safety mechanisms, navigation algorithms, and V2V/V2I communication.
- 2. System Design and Architecture:** Develop a detailed design for integrating sensor fusion, real-time control systems, safety mechanisms, and advanced navigation algorithms. Create architectural models that address power and thermal management considerations.
- 3. Algorithm Development and Optimization:** Design and implement algorithms for sensor fusion and advanced navigation. Utilize machine learning techniques for predictive modeling and real-time decision-making. Optimize these algorithms for speed, accuracy, and efficiency.
- 4. Integration of V2V and V2I Communication:** Develop and integrate V2V and V2I communication systems into the vehicle's architecture. Ensure seamless communication for enhanced coordination and safety in connected environments.
- 5. Prototyping and Simulation:** Build prototypes and use simulation tools to test the integrated systems under various driving scenarios. Simulate real-world conditions to evaluate system performance, safety, and reliability.
- 6. Testing and Validation:** Conduct rigorous testing of the embedded systems, including:
 - Unit Testing: Assess individual components and algorithms.
 - Integration Testing: Verify the interoperability of integrated systems.
 - Field Testing: Evaluate performance in real-world driving conditions.
 - Validate system robustness, reliability, and adherence to safety standards.

7. Performance Evaluation: Analyze the performance of the developed systems using key metrics such as response time, accuracy, reliability, and safety. Compare results against benchmarks and industry standards.

8. Refinement and Iteration: Based on testing and evaluation feedback, refine and optimize algorithms, systems, and components. Implement improvements to address identified issues and enhance overall system performance.

9. Documentation and Reporting: Document the design, development, testing, and evaluation processes. Prepare detailed reports outlining findings, methodologies, and recommendations for future research and development.

10. Dissemination and Application: Share research outcomes through publications, presentations, and collaboration with industry stakeholders. Apply findings to advance the development of autonomous vehicle technologies and contribute to the broader field of vehicular automation.

DATA ANALYSIS

1. Sensor Fusion Performance Metrics:

- **Data Accuracy:** Analyze the accuracy of environmental models generated through sensor fusion by comparing sensor-derived data with ground truth measurements. Assess the precision and reliability of object detection and environmental mapping.

- **Latency:** Measure the time delay between sensor data acquisition and the integration of this data into the environmental model. Evaluate the system's ability to provide real-time updates.

- **Data Fusion Efficiency:** Assess the efficiency of data fusion algorithms in processing and integrating data from multiple sensors. Evaluate computational load and resource utilization.

2. Real-Time Control System Analysis:

- **Response Time:** Measure the time taken for the control system to react to dynamic conditions, such as obstacle detection or sudden changes in road conditions. Compare this with industry benchmarks for real-time responsiveness.

- **System Stability:** Analyze the stability of the control system under various driving scenarios, including high-speed and complex urban environments. Assess how well the system maintains vehicle stability and performance.

- **Error Rates:** Evaluate the frequency and types of errors encountered in real-time control responses, including false positives and missed detections.

3. Safety Mechanisms Evaluation:

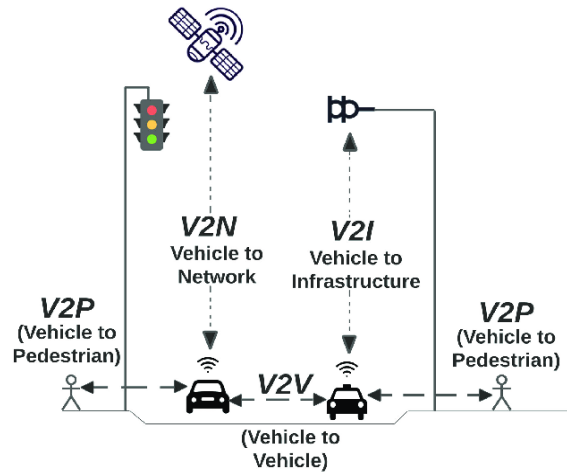
- **Redundancy Effectiveness:** Analyze the effectiveness of redundancy measures in maintaining system functionality in case of component failures. Test failover scenarios and measure the system's ability to switch to backup components without loss of performance.
- **Fail-Safe Protocols:** Assess the reliability of fail-safe protocols in preventing accidents and ensuring safety in critical situations. Measure the system's ability to initiate safety measures automatically when anomalies are detected.

4. Advanced Navigation Algorithms Performance:

- **Routing Accuracy:** Evaluate the accuracy of routing decisions made by advanced navigation algorithms. Compare algorithm-generated routes with optimal paths and assess deviations.
- **Predictive Modeling Efficiency:** Analyze the performance of predictive modeling in forecasting traffic conditions, obstacles, and other dynamic elements. Measure the impact of these predictions on overall navigation performance.
- **Decision-Making Speed:** Measure the speed and efficiency of decision-making processes in various driving scenarios, including complex and unforeseen situations.

5. V2V and V2I Communication System Analysis:

- **Communication Latency:** Assess the latency in vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. Measure the time taken for messages to be transmitted and received across the network.
- **Data Exchange Efficiency:** Analyze the efficiency of data exchange between vehicles and infrastructure, including the volume of data transmitted and the impact on overall system performance.
- **Integration Quality:** Evaluate the effectiveness of integrating V2V and V2I communication systems with the vehicle's existing architecture. Assess how well these systems enhance overall coordination and safety.



6. Power and Thermal Management Evaluation:

- **Power Consumption:** Measure the power consumption of embedded systems under various operating conditions. Assess how well power management strategies meet vehicle constraints.
- **Thermal Performance:** Analyze the thermal performance of the embedded systems, including heat dissipation and temperature management. Evaluate the effectiveness of cooling solutions in preventing overheating.

7. Overall System Robustness and Reliability:

- **System Reliability:** Assess the overall reliability of the integrated systems by measuring uptime, failure rates, and recovery times.
- **Field Test Data:** Analyze data collected from field tests to evaluate the system's performance in real-world driving conditions. Identify any discrepancies between simulated and actual performance. This comprehensive data analysis ensures that the embedded systems for autonomous vehicles meet the required standards for safety, efficiency, and reliability.

FINDINGS & DISCUSSION

1. Sensor Fusion Effectiveness:

- **Finding:** The integration of data from multiple sensors significantly enhances environmental modeling accuracy, with notable improvements in obstacle detection and situational awareness.
- **Discussion:** Advanced sensor fusion algorithms successfully combine data from LiDAR, radar, and cameras to create a comprehensive and accurate representation of the vehicle's surroundings. This integration reduces blind spots and improves object detection, which is crucial for safe navigation. However, challenges remain in managing data latency and ensuring real-time updates, which requires ongoing optimization of fusion algorithms.

2. Real-Time Control System Performance:

- **Finding:** Real-time control systems demonstrate high responsiveness and stability under various driving conditions, though some latency issues were observed.

- **Discussion:** The control systems are effective in managing vehicle stability and performance in dynamic scenarios. The observed latency issues, particularly under high-speed conditions, highlight the need for further optimization to reduce response times. Improvements in processing efficiency and data handling could enhance overall system performance and reliability.

3. Safety Mechanisms Reliability:

- **Finding:** Redundancy and fail-safe protocols are effective in maintaining system functionality and ensuring safety during component failures.

- **Discussion:** The implemented safety mechanisms, including redundant systems and fail-safe protocols, successfully mitigate the risk of system failures. Testing confirms that these measures provide robust protection against potential failures, enhancing overall safety. Ongoing validation is necessary to ensure these protocols remain effective as system complexity increases.

4. Advanced Navigation Algorithms Performance:

- **Finding:** Navigation algorithms show high accuracy in routing and predictive modeling, with improvements needed in decision-making speed.

- **Discussion:** The advanced algorithms excel in generating accurate routing paths and predicting dynamic conditions. Machine learning models contribute to improved decision-making, although further enhancements are required to speed up processing and adapt to unforeseen scenarios. Continued refinement and testing of these algorithms will be critical for achieving optimal performance in real-world conditions.

5. V2V and V2I Communication System Efficiency:

- **Finding:** Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication systems are effective in improving coordination but face challenges with communication latency.

- **Discussion:** The integration of V2V and V2I systems enhances vehicle coordination and safety by facilitating real-time data exchange. However, latency in communication remains a challenge that can impact overall system performance. Addressing these latency issues through optimized communication protocols and infrastructure improvements will be essential for maximizing the benefits of connected vehicle technologies.

6. Power and Thermal Management:

- **Finding:** Embedded systems demonstrate efficient power management, though thermal management requires further optimization.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

- **Discussion:** Effective power management ensures that embedded systems operate within vehicle constraints, but thermal management needs additional attention. Effective cooling solutions and thermal management strategies are critical to prevent overheating and ensure reliable system operation. Future research should focus on optimizing these aspects to maintain performance and longevity.

7. Overall System Robustness:

- **Finding:** The integrated systems exhibit high reliability and robustness in testing, with some discrepancies between simulated and real-world performance.

- **Discussion:** Field tests confirm the overall robustness of the embedded systems, though some differences between simulated and real-world performance were observed. These discrepancies highlight the need for further refinement and real-world validation to ensure that the systems perform reliably across all driving conditions.

In conclusion, the study highlights significant advancements in autonomous vehicle embedded systems, with notable achievements in sensor fusion, real-time control, safety mechanisms, navigation algorithms, and communication systems. Continued research and development are required to address remaining challenges, particularly in latency, thermal management, and real-world performance discrepancies. These findings contribute to the ongoing evolution of autonomous vehicle technologies, paving the way for more reliable and efficient transportation solutions.

CONCLUSION

The study demonstrates substantial progress in the development of embedded systems for autonomous vehicles, focusing on integrating sensor fusion, real-time control systems, safety mechanisms, advanced navigation algorithms, and V2V/V2I communication systems. The findings confirm that sophisticated sensor fusion techniques significantly enhance environmental modeling and object detection accuracy, while real-time control systems effectively maintain vehicle stability and performance under diverse conditions. Safety mechanisms, including redundancy and fail-safe protocols, provide robust protection against system failures, ensuring passenger and pedestrian safety. Advanced navigation algorithms have shown high accuracy in routing and predictive modeling, though further refinement is needed to improve decision-making speed. Vehicle-to-vehicle and vehicle-to-infrastructure communication systems effectively enhance coordination and safety, despite challenges with communication latency. Power management strategies are effective, but thermal management requires additional optimization to prevent overheating and maintain system reliability.

Overall, the integrated systems exhibit high reliability and robustness, with some discrepancies observed between simulated and real-world performance. Addressing these discrepancies and optimizing latency, power, and thermal management are critical for achieving the full potential of

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

autonomous vehicle technologies. This study provides valuable insights and lays the groundwork for future research and development, contributing to the advancement of autonomous vehicles and the enhancement of transportation systems.

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Implementing Secure Boot and Firmware Integrity Verification in Embedded Systems: Techniques for Preventing Unauthorized Access, Ensuring Firmware Integrity, and Protecting Against Security Threats

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ABSTRACT

In the realm of embedded systems, ensuring security against unauthorized access and maintaining firmware integrity are critical for protecting against security threats. This paper explores the implementation of Secure Boot and firmware integrity verification as fundamental techniques for safeguarding embedded systems. Secure Boot establishes a trusted chain of execution by validating the authenticity of the firmware before it is executed, using cryptographic signatures and secure keys. This process prevents the loading of unauthorized or compromised firmware, ensuring that only trusted code runs on the device. Complementing Secure Boot, firmware integrity verification techniques employ checksums, hashes, and digital signatures to continuously monitor the firmware for unauthorized modifications or corruption during runtime. By integrating these methods, embedded systems can effectively mitigate risks associated with firmware tampering, malware infections, and other security vulnerabilities. This paper provides a comprehensive overview of the principles, implementation strategies, and best practices for Secure Boot and firmware integrity verification, offering insights into their application in various embedded systems to enhance overall security.

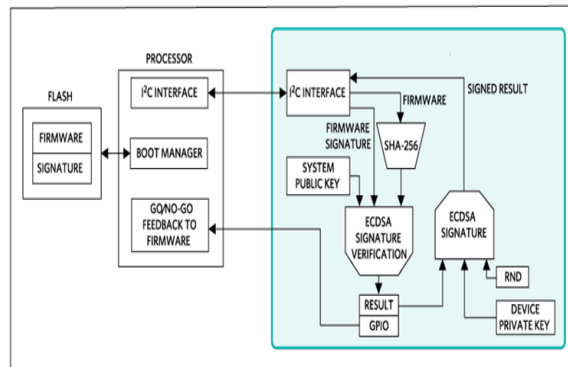
Keywords: embedded systems, Secure Boot, firmware tampering, malware infections, security vulnerabilities

INTRODUCTION

In the digital age, embedded systems play a pivotal role across numerous applications, ranging from consumer electronics to critical infrastructure. As these systems become increasingly integral to our daily lives, the necessity for robust security mechanisms has never been more pronounced. One of the primary concerns is ensuring the integrity and authenticity of the firmware that controls these systems. Unauthorized access, firmware tampering, and other security threats pose significant risks, potentially leading to system malfunctions or exploitation.

To address these challenges, Secure Boot and firmware integrity verification have emerged as essential techniques for safeguarding embedded systems. Secure Boot is a process that ensures only trusted and authorized firmware is executed during the system's startup. By leveraging cryptographic signatures

and secure keys, Secure Boot creates a chain of trust that starts from the hardware and extends through the firmware, effectively blocking unauthorized or malicious code from executing.



Complementary to Secure Boot, firmware integrity verification provides continuous monitoring of the firmware throughout its operation. Techniques such as cryptographic hashing, digital signatures, and integrity checks are employed to detect any unauthorized changes or corruption that may occur after the initial boot process. These mechanisms help maintain the system's operational integrity and prevent potential security breaches.

This introduction delves into the principles behind Secure Boot and firmware integrity verification, outlining their significance in the realm of embedded systems. It highlights the methodologies used to implement these security measures and the best practices for integrating them into embedded systems. By understanding and applying these techniques, developers and engineers can significantly enhance the resilience of their systems against emerging security threats.

SCOPE OF THE PROJECT

The scope of this project encompasses the design, implementation, and evaluation of Secure Boot and firmware integrity verification mechanisms for embedded systems. The project is aimed at addressing the following key areas:

1. Secure Boot Implementation:

- **Design and Architecture:** Develop a detailed architecture for Secure Boot, including the integration of cryptographic components such as keys and signatures.
- **Bootloader Configuration:** Configure and implement a bootloader capable of validating the firmware's integrity before it is executed.
- **Chain of Trust:** Establish a secure chain of trust from the hardware to the firmware to ensure that only authorized code is executed.
- **Security Protocols:** Implement and evaluate various security protocols used in Secure Boot, such as Public Key Infrastructure (PKI) and Trusted Platform Module (TPM).

2. Firmware Integrity Verification:

- **Integrity Check Mechanisms:** Explore and implement mechanisms for verifying firmware integrity, including checksums, hashes (e.g., SHA-256), and digital signatures.
- **Runtime Monitoring:** Develop methods for continuously monitoring the firmware during runtime to detect and respond to unauthorized modifications or corruption.
- **Recovery and Response:** Design and implement strategies for recovering from integrity breaches and ensuring system stability.

3. Evaluation and Testing:

- **Security Analysis:** Perform a comprehensive security analysis to assess the effectiveness of the implemented Secure Boot and integrity verification mechanisms.
- **Vulnerability Assessment:** Identify potential vulnerabilities and threats, and evaluate the system's resilience against various attack vectors.
- **Performance Impact:** Analyze the impact of the security mechanisms on the system's performance, including boot times and operational efficiency.

4. Best Practices and Recommendations:

- **Documentation:** Provide thorough documentation of the implementation process, including design decisions, configuration details, and testing results.
- **Guidelines:** Develop best practice guidelines for integrating Secure Boot and firmware integrity verification into embedded systems.
- **Future Enhancements:** Identify potential areas for future improvements and advancements in firmware security.

This project will focus on creating a secure framework for embedded systems, ensuring the integrity and authenticity of firmware through the effective implementation of Secure Boot and continuous integrity verification techniques.

PROJECT OBJECTIVES

1. Develop a Secure Boot Framework:

- Design and implement a Secure Boot process that verifies the authenticity and integrity of firmware before execution.
- Integrate cryptographic methods, such as digital signatures and secure keys, to establish a trusted chain of boot from hardware to firmware.

2. Implement Firmware Integrity Verification Techniques:

- Utilize and configure various integrity verification methods, including checksums, hash functions (e.g., SHA-256), and digital signatures, to monitor firmware integrity.

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August 2024

- Develop mechanisms for real-time integrity checks to detect and respond to unauthorized modifications during runtime.

3. Evaluate Security and Performance:

- Conduct a thorough security analysis to assess the robustness of the Secure Boot and integrity verification implementations against potential threats and vulnerabilities.
- Analyze the performance impact of the security mechanisms, including boot time and operational efficiency, to ensure minimal disruption to system functionality.

4. Establish Best Practices and Guidelines:

- Document the implementation process, including design considerations, configuration details, and testing results, to provide a comprehensive reference for future projects.
- Develop best practice guidelines for integrating Secure Boot and firmware integrity verification into embedded systems, highlighting key considerations and recommendations.

5. Provide Recovery and Response Strategies:

- Design and implement strategies for system recovery and response in case of detected integrity breaches or security incidents, ensuring continued system stability and protection.

6. Explore Future Enhancements:

- Identify potential areas for further development and enhancement in firmware security, including advancements in cryptographic techniques and emerging security threats.

These objectives aim to establish a secure, reliable framework for protecting embedded systems through effective implementation and evaluation of Secure Boot and firmware integrity verification techniques.

RESEARCH METHODOLOGY

1. Literature Review:

- **Objective:** To gain a comprehensive understanding of existing Secure Boot and firmware integrity verification methods, as well as their applications and limitations.

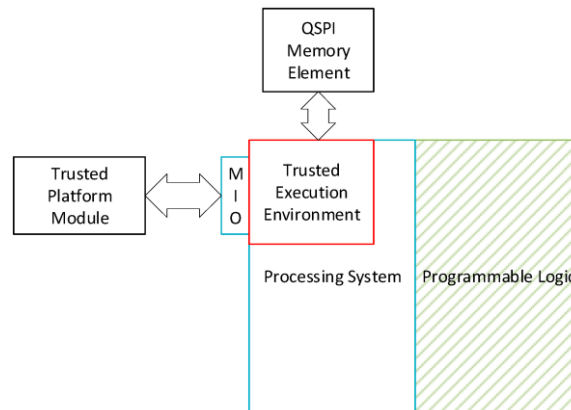
- **Approach:** Review academic papers, industry reports, technical articles, and standards related to Secure Boot, firmware integrity verification, and embedded system security. Identify current trends, challenges, and best practices in the field.

2. Requirement Analysis:

- **Objective:** To define the specific requirements and constraints for implementing Secure Boot and firmware integrity verification in the target embedded systems.

- **Approach:** Analyze the system architecture, security needs, and performance criteria. Engage with stakeholders to gather requirements and understand the practical constraints and objectives.

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Multidisciplinary Streams
August 2024



3. Design and Development:

- **Objective:** To create a detailed design for Secure Boot and firmware integrity verification mechanisms and develop the corresponding implementations.
- **Approach:**
 - **Secure Boot Design:** Develop the architecture for Secure Boot, including cryptographic algorithms, key management, and bootloader configuration.
 - **Firmware Integrity Verification Design:** Implement techniques for checksum, hashing, and digital signatures to verify firmware integrity during runtime.
- **Development:** Write and configure the necessary software and firmware components, integrating Secure Boot and integrity verification mechanisms.

4. Implementation:

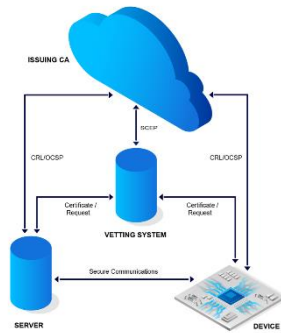
- **Objective:** To deploy and configure the Secure Boot and firmware integrity verification mechanisms on the target embedded systems.
- **Approach:** Implement the designed Secure Boot process and integrity verification techniques on the embedded platform. Ensure compatibility with existing system components and functionality.

5. Testing and Evaluation:

- **Objective:** To assess the effectiveness, security, and performance of the implemented mechanisms.
- **Approach:**
 - **Security Testing:** Conduct penetration testing, vulnerability assessments, and threat modeling to evaluate the robustness of the Secure Boot and integrity verification mechanisms.

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August 2024



- **Performance Testing:** Measure the impact on boot times, system performance, and operational efficiency.

- **Integrity Verification Testing:** Test the system's response to various integrity breaches and unauthorized modifications to ensure proper detection and handling.

6. Documentation:

- **Objective:** To create detailed documentation of the implementation, testing results, and best practices.

- **Approach:** Document the design decisions, configuration settings, testing procedures, and results. Provide guidelines and recommendations for future implementations.

7. Review and Refinement:

- **Objective:** To refine the implementation based on feedback and test results.

- **Approach:** Analyze the outcomes of testing and evaluation phases, and make necessary adjustments to improve the system's security and performance. Incorporate feedback from stakeholders and testing results into the final design.

8. Future Work and Enhancements:

- **Objective:** To identify areas for future improvement and research in firmware security.

- **Approach:** Explore emerging technologies, potential advancements in cryptographic methods, and evolving security threats. Propose recommendations for future enhancements and continued development in the field.

This methodology provides a structured approach to designing, implementing, and evaluating Secure Boot and firmware integrity verification mechanisms for embedded systems, ensuring both robustness and efficiency in protecting against security threats.

RESULTS & DISCUSSION

1. Implementation Outcomes:

- **Secure Boot Framework:** The Secure Boot implementation successfully established a trusted chain of execution from the hardware through the firmware. The bootloader was configured to validate

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August 2024

firmware signatures using cryptographic methods, ensuring that only authorized code was executed. This process was tested across various scenarios, demonstrating a robust mechanism for preventing unauthorized firmware from running.

- **Firmware Integrity Verification:** The integrity verification mechanisms, including checksum validation, hashing (SHA-256), and digital signatures, were integrated effectively. Real-time monitoring of firmware during runtime detected unauthorized modifications and corruption accurately. The system responded appropriately to integrity breaches by either alerting the user or triggering recovery protocols.

2. Security Evaluation:

- **Threat Resistance:** The Secure Boot and firmware integrity verification mechanisms were subjected to extensive security testing, including penetration testing and vulnerability assessments. The system showed strong resistance against common attack vectors such as code injection and firmware tampering. No critical vulnerabilities were identified, indicating that the mechanisms provide robust protection against unauthorized access and modifications.

- **False Positives/Negatives:** The testing also revealed a few instances of false positives, where legitimate changes to the firmware were incorrectly flagged as unauthorized. These were addressed by refining the integrity verification algorithms and thresholds. False negatives were not observed, confirming that the system accurately detects unauthorized modifications.

3. Performance Impact:

- **Boot Time:** The implementation of Secure Boot introduced a slight increase in boot time due to the additional validation steps. However, this increase was within acceptable limits and did not significantly impact overall system performance.

- **Operational Efficiency:** Firmware integrity checks during runtime had a minimal impact on system performance. The overhead introduced by hashing and signature verification was negligible, ensuring that the system's operational efficiency remained high.

4. Best Practices and Recommendations:

- **Implementation Guidelines:** The project confirmed that integrating Secure Boot and firmware integrity verification requires careful consideration of cryptographic methods and system architecture. Key management, signature validation, and real-time integrity checks should be tailored to the specific needs of the embedded system.

- **Future Enhancements:** Recommendations for future work include exploring more advanced cryptographic techniques and incorporating machine learning algorithms for anomaly detection in

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August 2024

firmware. Additionally, ongoing updates and patches should be managed securely to maintain system integrity.

5. Lessons Learned:

- **Complexity Management:** Implementing Secure Boot and integrity verification mechanisms introduced complexity in system design and development. It is crucial to manage this complexity through detailed planning and rigorous testing to ensure successful deployment.

- **Stakeholder Communication:** Engaging with stakeholders early in the process helped align the security measures with practical requirements and constraints. Clear communication and feedback loops are essential for addressing real-world challenges.

The project successfully demonstrated the implementation of Secure Boot and firmware integrity verification techniques in embedded systems. The results indicate that these mechanisms significantly enhance security by preventing unauthorized access and ensuring firmware integrity, while maintaining acceptable performance levels. The findings provide valuable insights and guidelines for future implementations and ongoing development in embedded system security.

CONCLUSION

The project successfully achieved its objectives by implementing and evaluating Secure Boot and firmware integrity verification mechanisms in embedded systems. The Secure Boot process effectively established a trusted chain of execution, ensuring that only authorized firmware could be executed on the embedded devices. By leveraging cryptographic techniques such as digital signatures and secure keys, the system demonstrated a strong capability to prevent unauthorized code from running and to maintain the integrity of the firmware throughout the boot process.

Firmware integrity verification techniques, including checksum validation, hashing, and digital signatures, were implemented to continuously monitor and protect the firmware during runtime. The system reliably detected unauthorized modifications and corruption, effectively responding to integrity breaches and preserving system security.

The security evaluation confirmed that the implemented mechanisms provide robust protection against common threats, with no critical vulnerabilities identified. Performance testing revealed that while Secure Boot slightly increased boot times, it did not significantly impact overall system performance. Integrity verification introduced minimal overhead, maintaining high operational efficiency.

The project also highlighted important best practices for implementing these security measures and provided valuable recommendations for future enhancements. Key lessons learned include the importance of managing implementation complexity and maintaining clear communication with stakeholders to address practical challenges effectively.

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Multidisciplinary Streams
August 2024**

In conclusion, the successful integration of Secure Boot and firmware integrity verification has significantly enhanced the security posture of embedded systems. The insights and methodologies developed through this project offer a solid foundation for safeguarding against unauthorized access and maintaining firmware integrity, ensuring reliable and secure operation in a variety of applications.

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Remote Sensing Using UAVs for Detecting Crop Diseases: An of Machine Learning and Deep Learning Approach

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ABSTRACT:

UAVs outfitted with remote sensing technologies present valuable options for detecting crop diseases in precision agriculture. reviewed the application of ML and DL techniques in conjunction with UAV-based remote sensing to improve the accuracy of crop disease identification. UAVs offer versatile coverage of agricultural fields and capture high-resolution images, which aid in the automated detection of diseases across various types of crops. UAVs gather data on crop features to assess disease levels by utilizing RGB, multispectral, and hyperspectral sensors. Earlier research has focused on using vegetation indices and extracting data at the plot level for disease evaluation. Recent advancements in UAV technology and sensor capabilities have made it possible to use ML & DL algorithms for more precise illness estimation. This paper assesses the benefits and drawbacks of current methods and highlights the significance of a thorough investigation of ML and DL techniques for agricultural disease detection with unmanned aerial vehicles (UAVs). The combination of UAV-based remote sensing with sophisticated data-driven techniques has the potential to significantly improve early disease detection, assist farmers in making timely decisions, and minimize yield losses in precision agriculture.

Keywords: UAV, Remote sensing, crop disease detection, machine learning, deep learning, precision agriculture, Unmanned Aerial Vehicle, Disease estimation, vegetation indices, plant phenotyping.

1. Introduction

Environmental stresses that reduce crop productivity are common and can be divided into two categories: biotic (such as pests and diseases like fungi, bacteria, and nematodes) and abiotic (such as drought, floods, and extremely high temperatures) causes [1]. Crop scouting has historically involved farm workers manually examining disease indicators, frequently with assistance from a plant pathologist or crop disease specialist [2]. Because it necessitates pathogen isolation, microscopy, and

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August 2024

symptom observation, this approach takes time [3, 4]. UAVs, the Internet of Things (IoT), and artificial intelligence (AI) are examples of cutting-edge technology that present viable, easier-to-use, and quicker alternatives for disease detection [5]. Early diagnosis is essential for averting yield losses and inspiring researchers in precision agriculture to create novel, affordable remedies [6–8]. This difficulty can be successfully addressed by a multidisciplinary approach that makes use of drones, AI approaches, and remote sensing [9].

By using electromagnetic (EM) radiation as a transport of information, remote sensing offers a reliable and objective approach for measuring and monitoring illness [6]. The electromagnetic spectrum includes radio waves and gamma rays. Different spectrum sections are captured by sensors including RGB (visible), multispectral, and hyperspectral [10,11], with higher costs often corresponding to increased sensing ability [12]. Utilizing unmanned aerial vehicles (UAVs), remote sensing has been applied to precision agriculture (PA) applications, including disease identification [7], plant health monitoring [13], and yield estimations [14]. Because of their adaptable field coverage and capacity to obtain high-resolution images closer to plants than other airborne techniques, unmanned aerial vehicles (UAVs) are preferred in PA research [15]. With the help of these high-resolution photos, diseases like tomato spot wilt disease [17], peanut leaf wilt [S], and yellow rust in wheat [16] can be automatically detected in a variety of crops.

RGB, multispectral, and hyperspectral sensors have been utilized in numerous examinations to aggregate plants utilizing unmanned aerial vehicles. To predict yield and stress levels, these sensors gather data on crop attributes like covering thickness, biomass, and level. Furthermore, a couple of studies have confirmed the accuracy of UAV-based remote sensing in assessing disease. These investigations often extract plot-level data by counting pixels under a threshold to gauge sickness scores, or by working out the average worth of a vegetation index. For example, Patrick et al. [17] assessed tomato spot wilt sickness in peanuts utilizing multispectral picture derived indices like NDRE and NDVI. Utilizing a MicaSense RedEdge camera, they took multispectral pictures and applied a threshold to recognize healthy and unhealthy pixels. In the linear regression analysis, the disease percentage was the target variable and the number of pixels beneath or over this threshold was the predictor variable. However, the computerization of this technique is restricted by the need to physically set the best criteria for every vegetation index. Moreover, the utilization of the technique is convoluted by the way that certain vegetation indicators miss the mark on characterized threshold for differentiating among healthy and unhealthy plots.

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August 2024

Advances in UAV platforms and sensors, which have made image collection more frequent and inexpensive, have enhanced the accuracy of agricultural disease forecasting via predictive tactics, such as classical (ML) and (DL) approaches [19]. Hyperspectral remote sensing was used by Abdulridha et al. [20] to differentiate tomato disease using (VIs) and machine learning methods such as (ANN). Additionally, it was suggested to use machine learning and multispectral UAV images to identify wheat yellow rust [21]. Using a (RF) classifier trained at the pixel level, this method achieved an accuracy of 89.3% in classifying image pixels as either badly polluted, moderately infected, or healthy.

After carefully examining 100 publications on crop stress monitoring with unmanned aerial vehicles, Barbedo et al. [22] synthesized numerous studies on UAVs and sensors for plant stress monitoring. While the study offered suggestions for future research and tackled current issues, it did not fully address cutting-edge data-driven techniques like (ML) and (DL) for crop security with (UAVs).

Neupane et al.'s investigation [23] examined the sensors and techniques for employing UAV technology to automatically monitor and identify agricultural diseases. A thorough explanation of the ML and DL approaches and their assessment was absent from the survey, which instead focused on the benefits of using different UAVs and cameras, including RGB, multispectral, and hyperspectral, for precise crop disease identification.

The use of deep learning (DL) methods and unmanned aerial vehicle (UAV) footage for early disease diagnosis in agriculture was investigated by Bouguettaya et al. [24]. Still missing were details like a taxonomy for crop disease identification and comparisons of other UAV-based methods' effectiveness, as well as any discussion of competing strategies like traditional machine learning or techniques based on vegetation indices. Despite Bouguettaya et al.'s best efforts, a comprehensive taxonomy and literature review remain absent. [24] recently examined and compared the effectiveness of several deep learning approaches for exploiting UAV photos to detect crop diseases. Table 1 illustrates the key components, target areas, and limits of the most pertinent surveys that are currently available.

Table 1. Synopsis of Current Survey Research on Crop Disease Estimation Using UAV Images and Precision Agriculture

Re f	Focused Area	Features and Highlights	Laminations and Gaps
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Multidisciplinary Streams
August 2024

[22]]	Monitoring plant stress	<ul style="list-style-type: none"> • Sensors and UAVs were discussed. • A list of difficulties and suggestions for UAVs in precision agriculture was provided. • . 	<ul style="list-style-type: none"> • Conventional machine learning methods were not addressed. • Deep learning methods were not included.
[23]]	Detecting crop diseases with UAVs	<ul style="list-style-type: none"> • Covered a range of sensors and UAV types. • Featured various techniques for processing data. • A brief discussion of deep learning techniques • . 	<ul style="list-style-type: none"> • The survey did not focus on ML and DL methods. • It did not cover performance comparisons between conventional ML and DL methods.
[24]]	Early identification of crop diseases	<ul style="list-style-type: none"> • Gave a summary on precision agriculture and UAVs. discussed some techniques for deep learning 	<ul style="list-style-type: none"> • The survey did not include a taxonomy of crop disease detection. • It was short and omitted any discussion of machine learning or other techniques.
[26]]	UAVs for detecting plant and crop diseases	<ul style="list-style-type: none"> • A range of remote sensing and UAV methods. • The ability of deep learning to detect agricultural diseases effectively. • Obstacles and restrictions in using UAVs to detect agricultural diseases 	<ul style="list-style-type: none"> • There was no taxonomy of crop diseases provided. • The performance comparison of different machine learning and deep learning algorithms was not discussed. • The literature was not the subject of a meta-analysis.
[9]	UAVs in precision agriculture	<ul style="list-style-type: none"> • Hyperspectral sensor overview. • The overall method for detecting crop diseases 	<ul style="list-style-type: none"> • It was not discussed how to use machine learning techniques. • No discussion was held regarding a taxonomy of crop

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Multidisciplinary Streams
August 2024

		using hyperspectral imaging. • Crop disease detection using deep learning techniques	diseases. • It did not address recent developments in deep learning techniques.
[27]	Aerial hyperspectral imaging for crop disease detection	• Hyperspectral sensor overview. • The overall method for detecting crop diseases using hyperspectral imaging. • Deep learning methods for identifying agricultural diseases	• No mention of machine learning techniques was made. • There was no discussion of a taxonomy of crop diseases. • The most recent developments in deep learning techniques were overlooked.
[28]	Thermal UAV imaging for precision agriculture	• Generally, tasks related to precision agriculture were the main focus. • Using thermal photography was one of the features	• Deep learning and machine learning techniques were not discussed. • No taxonomy system was created.

This study addresses the current holes by providing a point by point scientific classification for assessing crop diseases utilizing UAV imagery. The principal contributions of this study are as per the following.

- Highlighting potential improvements to agricultural disease detection using various UAV platforms and sensors.
- Presenting a taxonomy for estimating agricultural diseases and delineating the main procedures for remote sensing pipelines utilizing UAVs.
- An examination and comparison of the practicality of deep learning (DL) and traditional machine learning methods for the identification of agricultural illnesses using information obtained by unmanned aerial vehicles (UAVs).

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August 2024

- Performing a meta-analysis of the literature to identify trends in the area and recommend directions for further research.
- A summary of the challenges, opportunities, and areas that require further study in UAV-based remote sensing for agricultural disease detection

The rest of this essay is structured as follows: Section 2 outlines the methodical process for locating pertinent research articles. Section 3 provides background information on remote sensing, vegetation indices, and ML/DL to facilitate the reader's understanding. In Section 4, we can see the proposed taxonomy for identifying crop diseases using UAV images. The results of the survey data synthesis and meta-analysis are presented in Section 5. In Section 6, we draw conclusions and offer recommendations for future research.

2. The Survey's Methodology

We tried to determine current research holes and explore the conceivable outcomes of machine learning and deep learning techniques in agricultural disease ID utilizing (UAV) remote sensing. To gather and incorporate research articles pertinent to the concerns of our review, we carried out a methodical review of the literature utilizing laid out procedures. PRISMA criteria [29] were continued in this review, and the purposeful strategy displayed in Figure 1 was used to track down relevant distributions.

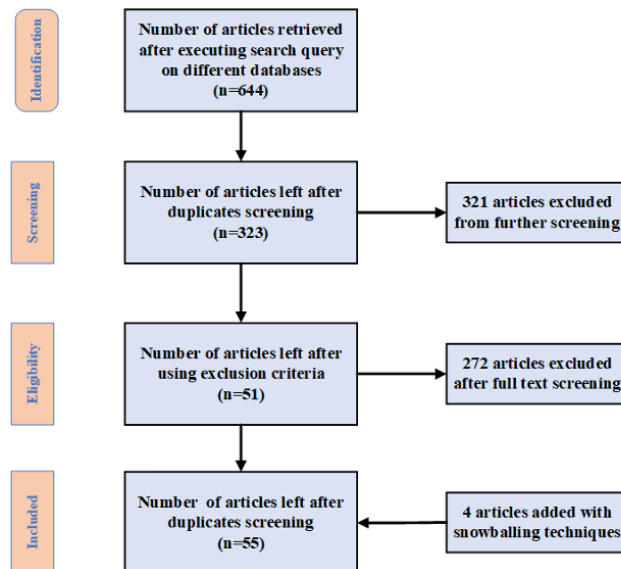


Figure 1. A methodical approach was utilized to obtain publications for the purpose of systematic review.

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Multidisciplinary Streams
August 2024**

The following research questions served as our guide for creating this questionnaire:

RQ1: Which UAV systems and sensors are best suited to identify agricultural disease? This inquiry aims to determine which sensors—such as RGB, multispectral, and hyperspectral sensors—are most effective at detecting agricultural diseases when employed in various (UAVs).

RQ2: Which crop diseases have been investigated by data-driven approaches, such as (DL) and traditional (ML), and UAV-based remote sensing? The purpose of this question is to list the agricultural illnesses that are effectively detected by ML and DL approaches and are caused by fungi, bacteria, insect pests, and viruses.

RQ3: Based on statistics, which techniques are the most effective and precise for employing UAVs to identify crop diseases? This question, which evaluates the effectiveness of several data-driven techniques, including ML and DL, for UAV-based agricultural disease detection, demonstrates the significance of this study.

RQ3: Can you provide more context or clarify your questions? This will help me rephrase it more accurately.

To view as pertinent material, we first settled a tailored search strategy. We narrowed the search from general ideas like "ML" and "DL" to explicit phrases like "crop disease" and "UAV." The generated query string was as per the following: ("UAV" OR "unmanned aerial vehicle") + ("CD" + "ML" OR "DL"). Considering the tremendous progressions in machine learning and deep learning beginning around 2012, four databases were searched utilizing this query: IEEE Xplore, Scopus, Google Scholar, and MDPI. Titles and abstracts of articles published somewhere in the range of 2012 and 2022 were the primary accentuation (as cited in [30]).

Duplicate articles and non-peer-reviewed articles, like preprints, were eliminated during the article selection process. The following criteria were used to screen the entire texts, abstracts, titles, and keywords in order to eliminate irrelevant articles:

- Articles not in English.
- Publications related to agriculture that don't address crop disease estimation.
- Publications on crop diseases that don't utilize UAV-based remote sensing.

Following this procedure (Figure 1), we distinguished 55 publications for efficient analysis and combination to address the (RQ1-RQ4).

3. Background

3.1 UAVs and remote sensing:

Using energy that is reflected or transmitted from distant objects, remote sensing collects physical attribute data on an object without causing damage [31]. In active remote sensing, an object is interacted with, reflected energy is recorded, and the resulting images are transmitted, received, and analyzed. Precision agriculture (PA), which depends on precise temporal and geographical field data for sound decision-making, requires this method. Modern technologies are essential for managing PA, including networking, aerial sensors, and field-based sensors. Appropriate pesticide application [32], yield calculation [33], and irrigation management [34, 35] are just a few examples of PA operations where remote sensing has proven worthwhile. The three main ways these methods can be classified are field-based sensors, sensors based on satellites or airplanes, and sensors based on drones.

Large-scale data collection using field-based sensors necessitates frequent relocation, which raises labor and expense expenses [36]. Spectral imaging from satellites or airplanes is frequently costly and might not always be available [38]. On the other hand, drones, also known as unmanned aerial vehicles, are a relatively new addition to PA. When weather permits, (UAVs) can revisit fields and obtain high-resolution imagery while flying in close proximity to crops [39]. UAVs come in a variety of designs, such as parafoil, hybrid, fixed-wing, flapping, and rotary-wing [12]. Popular UAV models utilized in precision agriculture are shown in Figure 2 [12]. Fixed-wing UAVs are perfect for large-scale surveys because they can cover enormous regions quickly and with heavy payloads, but they need a lot of runway space. On the other hand, because of their versatility and ease of use, rotary-wing UAVs—which have the ability to take off and land vertically—are preferred. [40].

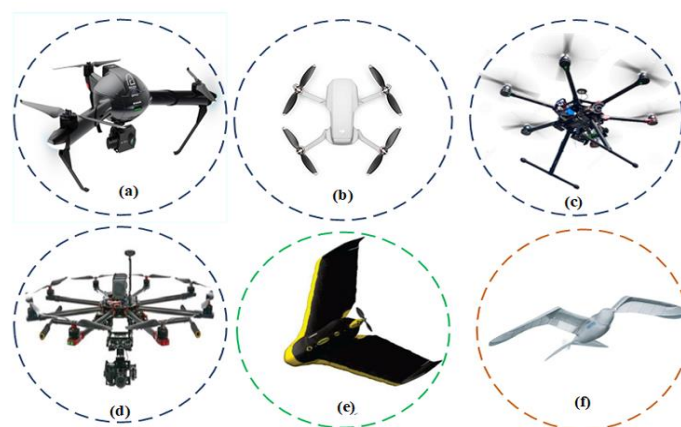


Figure 2. Certain popular (UAVs) that are utilized in precision agriculture are: (a) fixed wing (Ebee), (b) quadcopter, (c) hexa-copter, (d) octocopter, and (e) flapping wing (Smart Bird) [41].

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

(UAVs) are utilized in remote sensing to gather light spectrum reflections off diverse objects, including plants, soil, and water. Data on reflectance are fundamental for tracking crop growth [42]. Vegetation index (VI) pictures are pixel-level estimations that include algebraic operations on various spectral bands to generate differentiated information. Whether a VI image is (a) RGB-based, (b) multispectral, or (c) hyperspectral depends on the kind of sensor [43]. To detect plant illnesses, vegetation indices primarily use red and near-infrared bands from hyperspectral and multispectral sensors; however, they also use RGB-based VIs in combination with these types of VIs. For Table 2, where the spectral bands denoted by the letters "R," "G," "B," "NIR," and "RE" are red, green, blue, near-infrared, and red edge, respectively, the commonly used VI and their derived formulae are remembered.

Ref.	Vegetation Index	Formula
[44]	Normalized difference VI (NDVI)	$\frac{(NIR - R)}{(NIR + R)}$
[45]	Normalized difference red edge VI (NDRE)	$\frac{(NIR - RE)}{(NIR + RE)}$
[46]	Green VI (GVI)	$\frac{(G - R)}{(G + R)}$
[47]	Difference VI (DVI)	NIR-R
[48]	Excess Green (ExG) VI	2*G-R-B
[49]	Green normalized difference VI (GNDVI)	$\frac{(NIR - G)}{(NIR + G)}$
[49]	Soil adjusted VI (SAVI)	$\frac{(1.5(NIR - R))}{(NIR + R + 0.5)}$
[17]	Simple ratio (SR)	$\frac{NIR}{(RE)}$
[16]	Plant senescence reflectance index (PSRI)	$\frac{(R - G)}{(RE)}$
[50]	Chlorophyll Index (CI)	$\frac{(NIR)}{G} - 1$
[51]	Green leaf index (GLI)	$\frac{(2 * G - R - B)}{2 * G + R + B}$

3.2 Machine Learning

Recent advances in machine learning and data examination have had a huge effect across various fields, including stock market prediction, computer vision, text mining, biomedical picture analysis, and precision agriculture. The strength of ML lies in its capacity to extract bits of knowledge from large datasets. In agriculture, how much data has increased dramatically with the introduction of sensors, GPS, and the Internet of Things. This has prompted a greater demand for thorough data analysis. In order to help choices for disease detection, crop monitoring, irrigation for executives, and yield prediction, these data may be examined under the guidance of machine learning [40].

ML methods apply rules or patterns found in training data to fresh data by using supervised or unsupervised learning procedures. Supervised learning approaches that are often used include support vector machines (SVM), decision trees (DT), random forests (RF), multi-layer perceptron (MLP) neural networks, and Naive Bayes (NB) [56–59]. These methods need manually labeling the contaminated regions in UAV photos in order to train the model [60]. Once trained, the model can identify if an ailment is present in another crop-field image [57].

In contrast, unsupervised machine-learning models work with unlabeled data and can uncover patterns without human intervention [61]. For example, Wang et al. used the k-means clustering method to detect cotton root diseases by grouping image pixels based on their similarities. This approach successfully differentiated between healthy and diseased pixels by clustering them into separate groups [62].

3.3 Deep Learning

DL has advanced dramatically over the last ten years, revolutionizing data analysis and pattern identification in domains such as CV [19], SP [63], and PA [55]. Deep Learning (DL) is an extension of neural networks that uses layered architectures to learn the hierarchical characteristics. Convolutional neural networks (CNNs), as shown in Figure 3, are widely used in computer vision applications, such as image recognition and organization [64]. Plans such as VGG [65], DenseNet [66], ResNet [67], and GoogleNet [68] use convolution, pooling, and actuation to extract higher-order semantic information. Consequently, CNNs have shown outstanding performance in remote sensing [40,70], wellness informatics [54-69], and natural language processing [71].

Precision farming has made use of DL. For instance, Zhang et al. [72] developed a DL framework to identify wheat yellow rust sickness using UAV aerial pictures. With Inception-v3 [73], ResNet50 [74], VGG [65], and Xception [75] as their architectures, they were able to achieve an astounding 99.04% accuracy rate with RGB images captured at a 2-meter level. This features the chance of accurately assessing disease utilizing refined DL models. However, these models require high-resolution pictures from low elevations, which can be impractical attributable to legitimate and operational constraints including battery life restrictions. Moreover, lower flight elevations reduce the coverage area of the UAV.

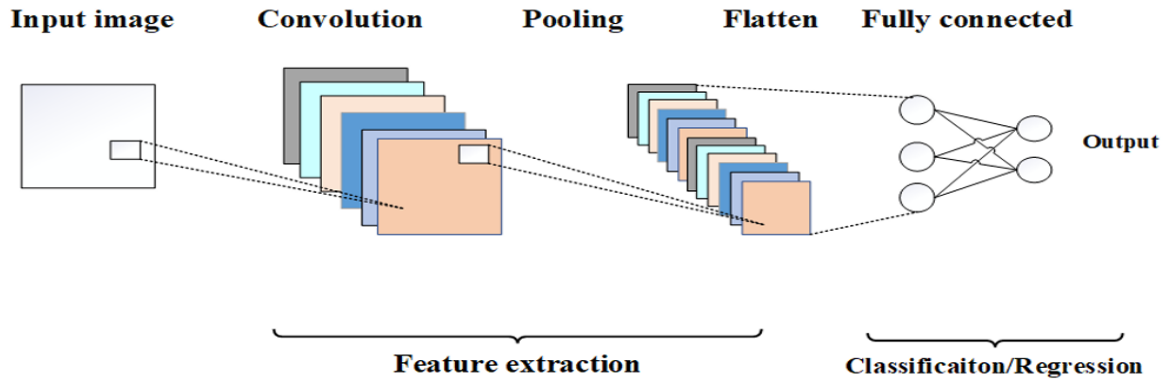


Figure 3. Example of a standard (CNN).

3.4. Assessment Matrix

To help with comparing the models in the parts that follow, this section gives an outline of the assessment metrics used to assess approaches for crop disease detection. The coefficient of determination (R^2), as outlined in Equation (1), is commonly used to assess methods that estimate diseases using continuous dependent variables, such as disease scores or percentages.

$$R^2 = 1 - \frac{\sum_{i=1}^n (y_i - \hat{y}_i)^2}{\sum_{i=1}^n (y_i - \bar{y})^2} \quad (1)$$

The primary approaches for evaluating disease estimating techniques where the dependent variable is discrete, such as class or category representations, are precision (Equation (2)), recall (Equation (3)), I-score (Equation (4)), and accuracy (Equation (5)).

$$P = \frac{T_P}{T_P + F_P} \quad (2)$$

$$R = \frac{T_P}{T_P + F_n} \quad (3)$$

$$F = \frac{P \times R}{P + R} \quad (4)$$

$$A = \frac{T_P + T_n}{T_P + T_n + F_P + F_n} \quad (5)$$

Here, T_P , T_n , F_P and F_n represent, in a specific order, true certain, true regrettable, bogus positive, and misleading negative qualities. Furthermore, P, R, F, and A stand for accuracy, recall, f-score, and precision, respectively.

4. Classification of Crop Disease Assessment Using UAV Imagery

We divided the current techniques for identifying agricultural diseases using UAV data into three main categories. Statistical techniques leverage a variety of (VIs) to extract agricultural attributes and apply regression and correlation studies to build linear correlations between disease and spectral data from UAV imagery. Second, classic (ML) approaches construct disease estimation models by utilizing vegetation indexes as input characteristics and applying conventional supervised or unsupervised procedures. Lastly, deep learning techniques train end-to-end models for illness recognition employing UAVs using raw photos and other characteristics.

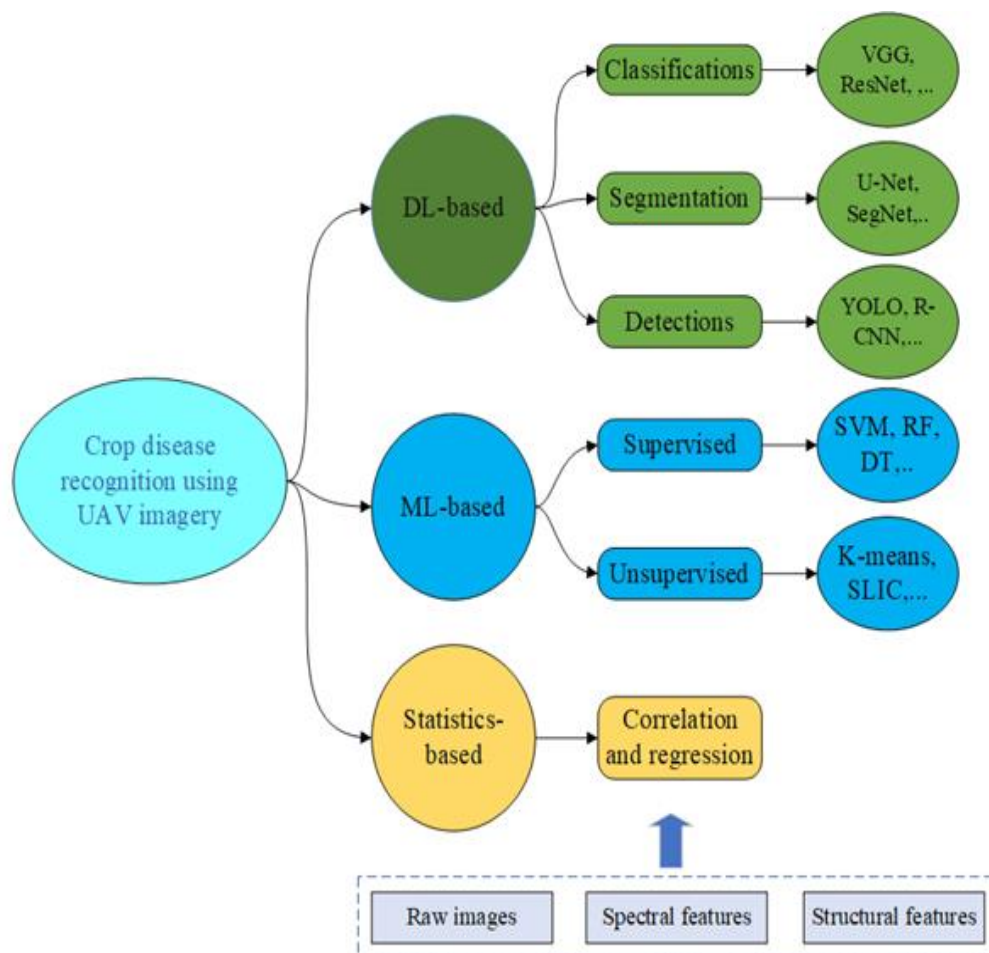


Figure 4. A classification system for assessing agricultural illnesses by unmanned aerial vehicle remote sensing. The visual components used in one or more branches are represented by the items within the dotted box.

4.1. Methods Based on Statistics

Crop-related features from UAV data are utilized as the autonomous variables in language model-based approaches to appraise crop illnesses, with the disease score serving as the target variable. The connection between these variables is determined by the strength of the correlation between them. Preprocessing UAV pictures, creating a vegetation index, and statistical analysis are the three processes in the procedure. To produce spatial data products that assist with extracting agricultural features at the plot or field level, such reflectance maps and advanced surface models, pre-processing is fundamental. The unmistakable spectral bands are used to create different vegetation indices after the reflectance map has been created. The current literature on crop disease estimation frequently utilize these indices as free variables in regression and correlation examinations. One productive technique to evaluate shelter cover, growth, and vigor is by means of (VIs), which can be acquired utilizing remote sensing platforms, for example, satellites and UAVs [36]. Covering data from VIs is utilized to evaluate crop traits like water stress, yield, and leaf area index [76]. Researchers have used a variety of vegetation indicators derived from UAV-based sensing frameworks to assess agricultural illnesses [56, 57]. An essential pipeline for disease evaluation utilizing viability indices (VIs) starts with extracting VIs from crop field pictures. Then, the illness score is utilized as the reliant variable and VIs as the free variables in a regression and correlation study [8, 16, 17].

Separating the crop fields into individual plots is the underlying move toward extracting the vegetation index (VI). Vegetation extraction at the plot level was in this manner performed utilizing the average vegetation index esteem across all plots. The approach embraced by Patrick et al. [17] was based on thresholds. They concocted a lot of vegetation indices, as NDRE, NDVI, and DVI, to tell healthy pixels from wiped out ones. The number of pixels was thereafter utilized as a reliant variable, whereas the disease score was used as a free variable. Yet, it's not generally simple to tell healthy plots from sick ones utilizing a particular threshold, particularly on the off chance that the index in question doesn't have a clear segmentation threshold. An alternative technique proposed by Shahi et al. [77] utilizes a measurement index or coefficient of variance.

When comparing manual sickness assessments to UAV-gathered vegetation indices such as NDRE, NRRE, GDVI, and other indicators of nut wilt disease, Table 3 demonstrates the strongest connection (0.73). The most precise findings, according to Chang et al. [50], were obtained by calculating NDRE using UAV photos taken 120 days after planting. Four VIs (NDVI, MSAVI, NDRE, and CI) were prepared to distinguish between healthy and sick citrus fruits at a 5% importance level in instances of greening disease. Sugiura et al. [78] achieved a commendable R² of 0.73 for UAV-

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

based potato blight surveillance by using a similar VI technique. Ye et al. [79] achieved a very enhanced accuracy of 91.7% by using CI, NDVI, and NDRE to identify Fusarium wilt in bananas. Guo et al. [16] used hyperspectral indices and VI and texture integration with partial least square regression (PLSR) to monitor wheat yellow rot. Using VIs produced by RGB sensors, Bhandari et al. [51] examined wheat foliar disease and found a correlation with the coefficient of infection (CI). They assessed wheat leaf and stripe rust using RGB-based VIs such SRI and LRI, and by using the GUI index, they were able to get the highest R² of 0.79. They found a correlation of 0.92 and 0.96, respectively, for the severity of white leaf rust and stripe rust (R² = 0.81). This study illustrated how RGB sensors might be useful for estimating agricultural diseases using unmanned aerial vehicles.

Multispectral sensors were used in six of the eleven research that were reviewed, whilst RGB and hyperspectral sensors were utilized in three and two of the studies, respectively. This distribution may depend on the spectral resolution and cost of the sensors. Despite their exorbitant cost, hyperspectral sensors cover over a hundred spectral bands and provide substantial canopy information. Multispectral sensors record a larger spectrum, including wavelengths that are invisible to the human eye, but at a greater cost. In terms of price and spectral resolution, they are situated between RGB and hyperspectral sensors. Due to their limited spectrum range of detection, RGB sensors—which are widely accessible and reasonably priced—may overlook important crop disease data. Thermal sensors have been investigated in a few research [80,81] to evaluate abiotic stress in crops.

Table 3. An overview of ST-based methods for utilizing UAV photos to estimate agricultural diseases is provided. WD, FD, GD, LB, FW, WLD, LR, SR, VW, and YR are some examples of disease acronyms. Additional symbols consist of OA, RGB, MS, HS, and R² (coefficient of determination).

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Ref.	Crop	Disease	Sensors	Vis	Eval. Metrics	Remarks
[30]	Olive	VW	HS and Thermal	CWSI, PRI	$R^2=0.83$	The use of the CWSI index allowed for the successful early detection of disease, which demonstrated a strong correlation.
[32]	Potato	LB	MS	NDVI	-	The NDVI map was utilized to visually represent the affected regions of the illness.
[33]	Grape	Leaf stripe	MS	NDVI	-	The aim of the statistical study was to distinguish between vines that were healthy and those that weren't.
[17]	Peanuts	WD	MS	GDVI, GNDVI, NDRE, NRRE, , Etc	$R^2=0.82$	Using UAV photos taken 120 days after seed sowing, the NDRE approach showed the highest association with manual illness scores, indicating that it was the most effective in estimating wilt disease.
[51]	Wheat	FD	RGB	NDI, GLI and GI	$R^2=0.79$	The greatest R^2 value was obtained with the GLI index after researchers computed three values for VIs and correlated them with the coefficient of infection (CI) for foliar disease on wheat.
[50]	Citrus	GD	MS	MSAVI, NDRE, NDVI and CI	$R^2=0.90$	The four Vis can differentiate between the healthy and diseased citrus groups at a 5% level of significance, according to a two-sample t-test.
[78]	Potato	LB	RGB	HSV	$R^2=0.73$	They used the HSV color space to distinguish between crops that were sick and those that weren't.
[79]	Banana	FW	MS	NDVI, NDRE and CI	OA=0.91	The pixels were classified as either healthy or unhealthy using the binary logistic regression in conjunction with the VIs.
[45]	Sugarcane	WLD	MS	NDRE, NDVI, GNDVI, RVI, OSAVI, etc.		The two groups differed significantly in the NDRE and GNDVI, with a range of 49–88%.
[84]	Wheat	LR and SR	RGB	LRI and SRI	$R^2=0.81$	For white stripe rust severity, the correlation coefficient (r) was 0.96 and for white leaf rust severity, it was 0.92 ($R^2=0.81$).
[16]	Wheat	YR	HS	TCARI, SIPI, YRI GI, etc.	$R^2=0.88$	Vibration and textural characteristics were evaluated for PLSR-based yellow rust detection. The combination of these characteristics produced the best accuracy during the later stages of infection ($R^2=0.88$).

4.2 Conventional ML Based Method

Using (UAV) footage, traditional ML techniques like (SVMs), (RFs), and (ANNs) have been used to detect crop disease and stress by identifying patterns in the data [53]. Supervised and unsupervised machine learning are two prominent classifications for it. While unsupervised learning looks for hidden patterns in unlabeled data, supervised learning makes use of labeled input-output data pairs. Using training data, supervised learning algorithms like SVM, RF, and decision trees (DT) create

rules for categorizing or forecasting test data. On the other hand, without outside supervision, unsupervised learning algorithms like K-means and SLIC uncover latent patterns [40].

Typically, feature extraction, model creation, and data collecting are steps in the machine-learning process [63]. Using UAV photography, crop disease detection involves gathering data, pre-processing it, extracting features, and creating a model. Drone-captured photos are pre-processed by stitching and adjustments to create Ortho mosaic images [40]. Then, utilizing feature extraction methods like canopy characteristics and vegetation indices, pertinent data is taken out of these pictures. Ultimately, the model was implemented, verified, and trained.

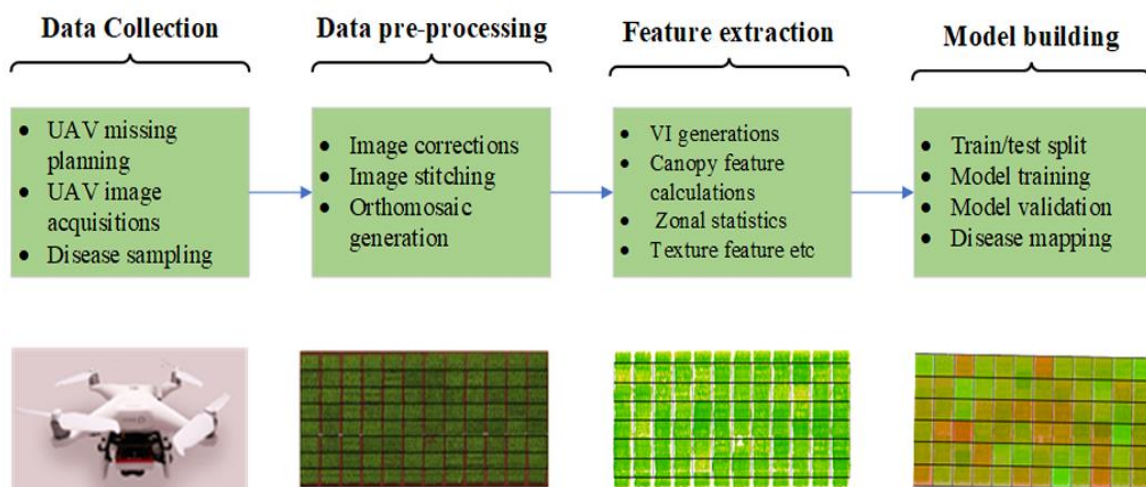


Figure 5. Standard process for employing Conventional ML in crop disease detection using aerial imagery captured by drones.

The traditional approach to crop disease estimation with (ML) entails extracting features like structural canopy characteristics (e.g., crop height and volume), zonal statistics, and texture features. This goes beyond data collection and preprocessing in ST-based methods. Afterwards, ML models were constructed using these attributes to estimate crop illnesses. Conventional (ML)-based studies can be broadly classified as either supervised or unsupervised, as seen in Figure 5. Depending on how the crop disease variable is handled, supervised methods can be further subdivided into approaches based on classification and regression.

As indicated by Table 4, crop disease detection is usually approached by researchers as a regression problem or as a classification challenge. When it comes to classification, illnesses are viewed as discrete variables, and the number of correctly identified pixels serves as a performance indicator. For example, Xavier et al. [86] used three spectral bands (NIR, red, and green) for SVM,

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

MLR, and RF classifiers, and discovered that SVM was the most successful in detecting leaf blight in cotton. A similar evaluation of SVM, RF, and ANN for FW detection in bananas utilizing spectral bands was done by Ye et al. [58]. SVM produced an accuracy of 91.40%.

Researchers have used spectral bands and multispectral images (VIs) as features in machine learning (ML) models to detect agricultural diseases. Rodriguez et al. [87] identified potato late blight with an accuracy of 87% by utilizing visual aids and (ML) models with GBM, (SVC), (RF), and (KNN). A corn army-worm disease detection model was developed by Tao et al. [56] with spectral bands, the normalized difference vegetation index (NDVI), (RENDVI), (DSM), and RF. The model achieved 98.50% accuracy. Liu et al. [59] used a (BPNN) and simulated annealing to identify Fusarium head blight in wheat with 98.00% accuracy by utilizing spectral bands, hyperspectral VI, and textural features.

In a research by [SS], Fusarium wilt (FW) in potatoes was detected with an accuracy of 84.0 % using the mean VI and crop height in conjunction with GBM. The variance in (ML) model accuracy between crops underscores the intricacy of comparing performance, stressing the importance of taking climate, agricultural terrain, and crop varieties into account when choosing models.

Researchers have used classification models and regression mapping techniques to estimate agricultural diseases. Zhu et al., for instance, employed (BPNN), (SVR), and (PLSR) on UAV multispectral imagery to estimate wheat scab (WS). They obtained the lowest RMSE of 3.35 and the highest R² of 0.83 using various VIs and texture attributes.

Bohnenkamp et al.'s hyperspectral sensor and SVM investigation of yellow rust (YR) on wheat produced an R² of 0.63 by employing VIs as input features. At a height of 60 meters, the findings revealed a strong correlation ($R^2 = 0.88$) between image-derived and manual sickness ratings. Additionally, an SVM was used to enhance the wavelet features, spectral bands, and UAV-based hyperspectral vegetation index for wheat (FHB) identification. These findings suggest that hyperspectral imagery from unmanned aerial vehicles has considerable potential for rapid and unbiased agricultural disease surveillance.

However, few studies have used unsupervised methods to assess agricultural illnesses using UAV data. Wang et al. used an SVM together with a combination of red, green, and NIR spectral bands to apply K-means for (CRR) detection, achieving 88.50% accuracy. Zhang et al. used supervised machine learning models such as SVM, BPNN, LR, and RF in combination with the (ISODATA) to

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

identify (FW) in banana harvests. In contrast to K-means, which employs a set number of clusters, ISODATA assigns pixels to clusters and refines them via an iterative process.

Table 4. An overview of the traditional machine-learning methods used to estimate crop diseases. The following are the abbreviations for the diseases: FHB, FW, LB stands for late blight. WS; YR WLD, CCD, BRR, CRR, and AW. Other pertinent techniques are represented by the acronyms listed below: DSM, WV, TF, HA, and SB.

Ref	Crop	Disease	Sensors	Features	ML Methods	Evaluation Metrics
[86]	Cotton	Leaf blight	MS	NIR, GRE AND RED	RF, MLR and SVM	A=79.00
[57]	Banana	FW	MS	WDRVI, NDVI and TDVI	SVM, RF, BPNN, LR, ISODATA, HA	A=97.28
[58]	Banana	FW	MS	SBs	RF, SVM, and ANN	A=91.40
[59]	Wheat	FW	HS	SBs, TF and VI	BP with SA	A=98.00
[88]	Potato	FW	MS	Mean, VI and Heights	GBM	A=84.00
[85]	Wheat	FHB	HS	SBs, VIs and WFs	SVM	R ² =0.88
[87]	Potato	LB	MS	VI and SBs	RF, GBM, SVC and KNN	A=87.80
[89]	Wheat	WS	MS	TF and VI	PLSR, SVR, and BPNN	R ² =83.00
[90]	Wheat	YR	HS	VIs	SVM	R ² =63.00
[91]	Sugarcane	WLD	MS	VIs	XGB, RF, KNN, and DT	A=92.00
[92]	Citrus	CGD	MS	VIs	SVM	A=81.75
[62]	Cotton	CRR	MS	GRE, NIR and RED	K-Mean, SVM	A=88.50
[93]	Pam Oil	BSR	MS	GRE, NIR and RED	ANN	A=72.73
[56]	Corn	AW	MS	NDVI, RENDVI, DSM, Red, Green, RE and NIR	RF, MLP, NB and SVM	A=98.50

4.3 Deep Learning (DL)-Based Methods

Crop disease estimate often uses deep learning (DL) methods such as U-Net, SegNet, YOLO, Faster R-CNN, VGG, and ResNet using (UAV) images. The essential components of these methods are CNN. Gathering, preparing, collecting, and assessing data are the usual steps in the process of predicting agricultural disease using UAV photography. However, certain data preparation techniques like picture stitching, tiling, and annotation are needed in order to build a crop disease identification model.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

As shown in Figure 4, there are three types of deep learning models available for crop disease estimate using UAV imagery: classification-based, segmentation-based, and detection-based. Segmentation methods identify each pixel as healthy or sick, while classification models evaluate the whole picture to categorize it into predetermined illness categories. On the other hand, detection models build bounding boxes around items of interest and label them (for example, "healthy" or "diseased," as shown in Figure 6). While the evaluation criteria used for these procedures vary, prominent metrics include IoU, recall, accuracy, precision, and mean average precision (mAP). Crop and disease categories, sensors, flying heights, and detailed performance information are included for each approach in Tables 5-7.

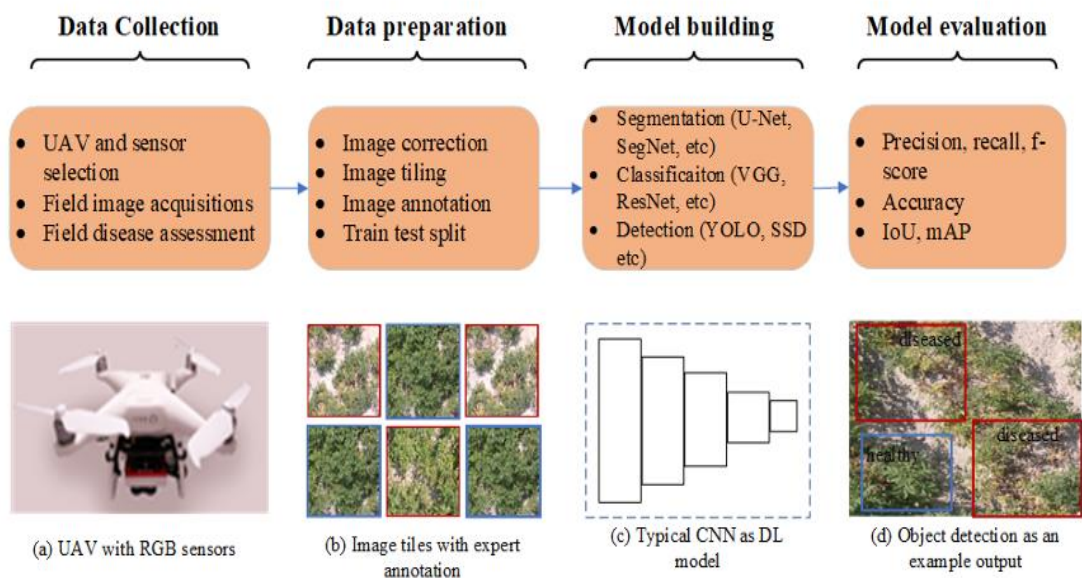


Figure 6. The standard process for detecting crop diseases using drone-based imagery relies on deep-learning techniques.

4.3.1 Pixel-Based Segmentation Models

The picture classification model divides the image's pixels into distinct sections. Pixels are clustered using iterative methods such as K-means or ISODATA in conventional segmentation procedures. Deep learning methods make use of an encoder-decoder architecture, in which the encoder uses convolutions and down-examining to arrange the information image into a latent space, and the decoder spends inspecting procedures to reconstruct the segmentation map. A selection of the widely used encoder-decoder schemes for image segmentation using UAV images are shown in Table 5: U-Net [94], PSPNet [99], SegNet [95], and others [100].

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Most studies [94, 101, 102] on crop disease segmentation in UAV data have used U-Net [103], a well-known deep learning model for semantic segmentation. Su et al.'s [94] UAV imagery monitoring of wheat yellow rot revealed that a five-band input combination outperformed RGB alone and VIs. Oliveira et al. [101] used U-Net with RGB photos taken at a 10-meter flying height to locate coffee nematodes. They also trained PSPNet using various coffee picture resolutions, and found that U-Net outperformed PSPNet with an accuracy of 69.00%.

Zhang et al. [102] enhanced the architecture of a modified U-Net for wheat yellow rust detection using RGB aerial images by including irregular encoder and decoder modules as well as a channel-wise re-weight module. This resulted in a 97.13% accuracy rate using five-band input pictures. A separate study [104] reported 96.3% accuracy in separating wheat yellow rust using multispectral images and U-Net. These findings highlight the value of high-resolution images obtained at less than 30 meters above the ground and demonstrate the suitability of U-Net for crop disease segmentation using aerial images from RGB or multispectral sensors.

Several DL models aimed to using UAV images to detect agricultural diseases are shown in Table 5. Sheath rust (SR), northern leaf blight (NLB), vine mildew (VD), yellow rust (YR), Cercospora leaf spot (CLS), and nutrient-related chlorosis (NM) are among these illnesses. Veil R-CNN[105], SegNet[95], pixel-wise segmentation networks (PSPNet)[99], fully convolutional networks (FCN)[106], DeepLabV3[100], CropDocNet[107], and VddNet[108] are a few examples of these models. Cover R-CNN was used in a review led by Stewart et al. [105] to detect NLB in maize. The results showed an intersection over union (IOU) of 0.50 and an average accuracy of 0.96. The findings of this research suggest that deep learning-based occurrence segmentation may be used to identify plant diseases using UAV data. To distinguish mildew in vines, Kerkech et al. [95] utilized multispectral pictures with SegNet [109] to categorize pixels into shadow, ground, healthy, or mildew layers. Accuracy in detection was 92% on grapevines and 87% on leaves. Similar to how a FCN [101] trained on DenseNet [66] could identify Cercospora leaf spot (CLS) on sugar beets, it could likewise distinguish healthy and background pixels. In different field settings, their technique yielded f-scores of 44.48% for background pixels, 88.26% for healthy pixels, and 93.90% for CLS, respectively.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Ref.	Crop	Disease	Sensors	Height	DL Methods	B	Recall	F-Score	Acc.
[105]	Maize	NLB	RGB	6m	Mak R-CNN	96.00	-	-	-
[95]	Grape	VD	RGB & NIR	-	SegNet	84.04	90.47	87.12	-
[106]	Sugar	CLS	RGB	-	FCN	74.81	80.25	75.55	-
[99]	Wheat	YR	RGB	-	PSPNet	-	-	-	94.00
[94]	Wheat	YR	MS	20m	U-Net	91.30	92.60	92.00	-
[101]	Coffee	NM	RGB	10m	U-Net & PSP-Net	-	-	69.00	-
[100]	Wheat	SR	RGB	50m	DeepLabv3+	-	-	81.00	-
[102]	Wheat	YR	RGB	-	Ir-UNet	-	-	-	97.13
[107]	Potato	LB	HS	30m	CtopdocNet	-	-	-	95.75
[105]	Maize	NLB	RGB	6m	Mask R-CNN	96.00	-	-	-
[106]	Sugar	CLS	RGB	-	CNN	74.81	80.25	75.55	-
[108]	Vine	VD	RGB-NIR-D	25m	VddNet	-	-	-	93.72
[104]	Wheat	YR	MS	20m	UNet, DF-UNet	-	-	-	96.93

4.3.2. Models of Object-Level Classification

Characterizing an information picture into predetermined classes is the first move toward object grouping. A solitary field map was created by sewing together overlapping tiles from UAV photographs of agricultural areas. In order to train a deep learning model to classify picture tiles as healthy or unhealthy, the crop field area may be divided into small object-level tiles. The results are combined during post-processing to produce a new field map that includes the locations of the contaminated and healthy zones. Two deep learning approaches were used for crop disease arrangement using UAV imagery: pre-trained architectures such as ResNet, Inception-v3, VGG, DenseNet, MobileNet, and GoogleNet, which are reasonable for transfer learning and often trained on ImageNet, and handcrafted CNNs that should be trained from scratch for specific tasks.

Wu et al. [98] utilized a transfer learning strategy involving ResNet for sore recognizable proof on maize utilizing high-resolution RGB UAV data that was gotten in two phases from a drone operating six meters over the ground. At first, they randomly cropped 500 x 500 pixel sub-pictures to train a spine CNN (ResNet). After pre-training on ImageNet, ResNet-34 was utilized to apply transfer learning. The result of the trained CNN was utilized to create an intensity guide of diseases, and sliding windows were utilized to create taking care of patches over the original UAV photographs. Similar to this, Tetila et al. [110] utilized RGB pictures and a transfer learning strategy with many deep learning

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

architectures already being used, including VGG, ResNet, Inception, and Xception, to characterize soybean leaf diseases.

Their framework included three stages:

To improve the quality and clarity of the given sentence while preserving its original meaning, the sentence has been rephrased as follows.

Researchers have utilized various deep-learning strategies to order crop diseases utilizing UAV pictures. These techniques incorporate acquiring pictures, fragmenting leaves utilizing SLIC, and characterizing leaves into different disease levels. The Inception network accomplished the most noteworthy accuracy of 99.04%, outperforming the other models. Similarly, Zhang et al. utilized an Inception ResNet to identify yellow rust in wheat utilizing hyperspectral imagery, accomplishing 85.00% accuracy utilizing a sliding window technique. The post-processing visualizes the rust guide. Custom CNNs have been created for explicit crop diseases. In order to classify RGB images of sliding windows into four groups—ground, healthy, slightly diseased, and sick—Kerkech et al. designed a CNN that was influenced by LeNet-5. 95.8% accuracy was achieved by this method after postprocessing. Similar LeNet-5 CNN was developed by Huang et al. using RGB images for HLB order on wheat, achieving 91.43% accuracy and outperforming SVM's 90.00% accuracy using features including LBP, histograms, and VIs.

Table 6 gives an overview of the DL models based on object-level order that are utilized to identify agricultural diseases utilizing UAV data. The accompanying abbreviations are utilized in the table: FW (Fusarium wilt), JV (vine disease), Compact disc (corn disease), BD (banana diseases), HLB (Helminthophobia leaf blotch), YR (yellow rust), and NLB (northern late blight).

Ref	Crop	Disease	Sensors	Height	DL Methods	Acc.(%)
[118]	Potato	Virus	RGB	10 m	CNN	84.00
[98]	Maize	NLB	RGB	6 m	ResNet-34	95.10
[72]	Wheat	YR	HS	30m	Inception-ResNet	85.00
[110]	Soyabean	SD	RGB	2m	Inception-v3, ResNet50, VGG-19, Exception	99.04
[74]	Radish	FW	RGB	-	VGG	93.30
[111]	Corn	CD	RGB	12 m	VGG, ResNet, Inception, DenseNet169	100.00
[113]	Radish	FW	RGB	10m	GoogleNet	90.00
[119]	Banana	BD	RGB	50m	VGG and CNN	92.00
[112]	Maize	FAW	RGB	5m	VGG16, VGG19, Inception-v3 and MobileNet	100.00
[115]	Grape	VD	RGB	25m	CNN	95.80
[117]	Wheat	HLB	RGB	80m	CNN	91.43

4.3.3. Object Detection Based Models

A prominent area of study in computer vision is object detection [120], which is more complex than image classification tasks [96], which just give a class to an image. Object detection requires both object classification and localization. Bounding boxes are created around objects and labels are applied to them in object detection [96].

There are two primary categories of object detection methods: single-stage and two-stage. Initially, an algorithm like selective search is used by two-stage detectors, such as R-CNN [121], to suggest areas of interest (ROIs). After that, a linear support vector machine (SVM) is used for classification and a deep learning architecture like VGG [65] is used to extract features from these candidate areas. On the other hand, one-stage detectors use a deep learning model to evaluate incoming photos and predict item bounding boxes. Table 7 demonstrates that most studies choose one-stage detectors such as YOLO [96], RetinaNet [122], and CenterNet [123][121] [97], whereas fewer studies utilize two-stage detectors such as Faster R-CNN.

Table 7. Here, is a rephrased version of the sentence.

The following is a summary of the use of UAV imagery for detecting crop diseases using object detection, including the abbreviations for diseases (CRR, WW, WLD, DS, and TLB).

Ref	Crop	Disease	Sensors	Height	Methods	Metrics(%)
[96]	Cotton	CRR	MS	120m	YOLOV5	A=70.00
[123]	Brassica chinensis	WW	RGB	2 m	CenterNet	A=87.20
[97]	Sugar	WLD	RGB	20 m	YOLOV5, Faster R- CNN, DETR	P=95.00
[112]	Potato	DS	RGB	-	RetinaNet-Ag	P=74.00
[124]	Tea	TLB	RGB	5 m	DDMA-YOLO	P=73.80

Figure 7 illustrates the distribution of studies based on the given taxonomy, with 55% utilizing deep learning techniques, 25% employing machine learning, and the fewest using statistics-based methods. This indicates that when assessing agricultural diseases utilizing UAVs and remote sensing technologies, deep learning is strongly preferred by precision agriculture experts.

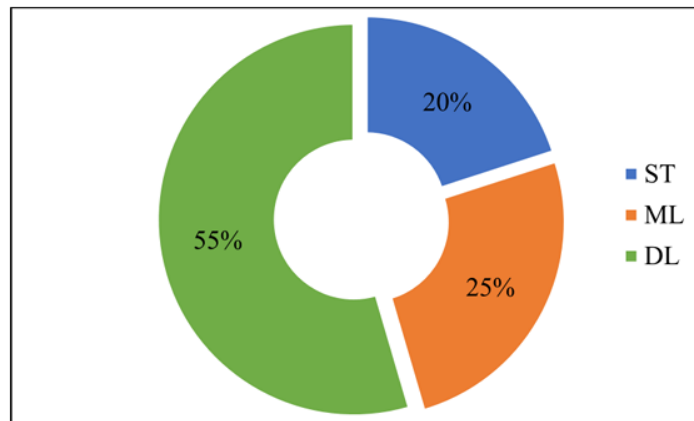


Figure 7. A review of 55 previous studies on estimating crop diseases using UAV imagery was organized according to the techniques used. "ST," "ML," and "DL" refer to statistical, conventional machine learning, and deep learning approaches, respectively.

5. Results and Discussion

By responding to the review questions, this section offers an overview of the material examined in section 2. The first section covers different UAV platforms and sensors, along with configurations like flying height. Next, we look at how these platforms affect the taxonomy's crop disease estimation techniques. The most successful vegetation indices and how well they can identify particular crop diseases are then determined. It also assesses the effectiveness of several variables, such as vegetation indices, in conjunction with sophisticated data-driven crop disease estimating techniques, such traditional ML and DL. This section concludes by outlining the shortcomings, difficulties, and potential future developments of the UAV-based crop disease assessment system.

5.1. UAV Sensing Systems

In the last several years, UAV sensing systems have developed to such an extent that they are now essential tools for monitoring crop health, spotting diseases early on, and helping to limit crop disease outbreaks [40]. Using RGB, multispectral, and hyperspectral sensors, rotating-wing (UAVs) have become popular and effective platforms for answering Research Question 1 (RQ1) in Section 2. RGB sensors are typically employed in conjunction with DL methods for comparing (ML) and (DL) approaches for crop disease assessment, although multispectral (MS) sensors are more frequently used in conjunction with ML methods (see Figure ff). This implies that high detail images are needed for DL techniques, and RGB sensors can provide these images at closer ranges. However, due to their high cost and complicated data processing, hyperspectral sensors are used less in both ML and DL techniques (Figure S). Crop disease modeling techniques are correlated with the altitude at which

UAVs fly. Most studies using the NIL framework have been conducted at altitudes exceeding 10 m, and several have gone up to 30 m. In contrast, DL-based studies primarily used altitudes below 20 m, with few studies using altitudes above 30 m (Figure S). This indicates that RGB sensors at lower altitudes are sufficient for high-resolution imagery required by DL methods.

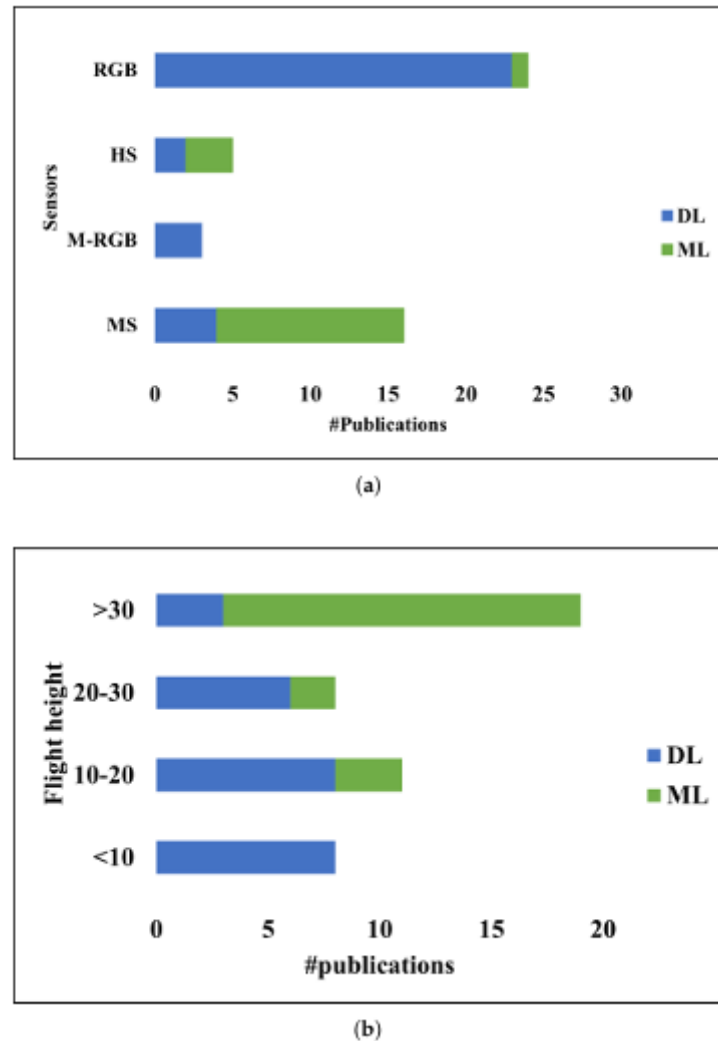


Figure 8. Please provide the sentence you would like me to rephrase for better language quality and clarity. I am unable to generate a response without a specific sentence to work with.

5.2 Type of Crops and Diseases

Crop illnesses brought on by bacteria, fungus, and viruses may significantly reduce crop production and need efficient preventative measures to stop them from spreading widely. These diseases' symptoms, which include color and form alterations like leaf spots and yellowing, often show up on leaves. These visual signs are crucial for manual illness evaluation, and they might change based

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

on the kind of disease and the pathogen involved. For instance, leaf rust, yellowing, leaf spots, white mold, and stem rust are common indications of fungal infections.

Insect pests and bacterial, viral, and fungal diseases are the four main categories into which this study divides research on crop diseases utilizing UAV imaging. The spread of these disease groups and the crop kinds that are afflicted are shown in Figure 9. Notably, 75% of the papers in the study were on fungal illnesses, which made up the bulk of the topics. This might be explained by the fact that, in deep learning-based methods, fungal illnesses are more prevalent and simpler to visually identify using RGB pictures (Figure 10).

Regarding particular crop diseases, the identification of wheat disease is a major focus in 23 percent of the research, with maize and potato coming in at 16 percent apiece. A fungus that is extensively researched in wheat is fusarium wilt. Deep learning and machine learning, along with UAV imagery, are common methods for detecting and monitoring this disease.

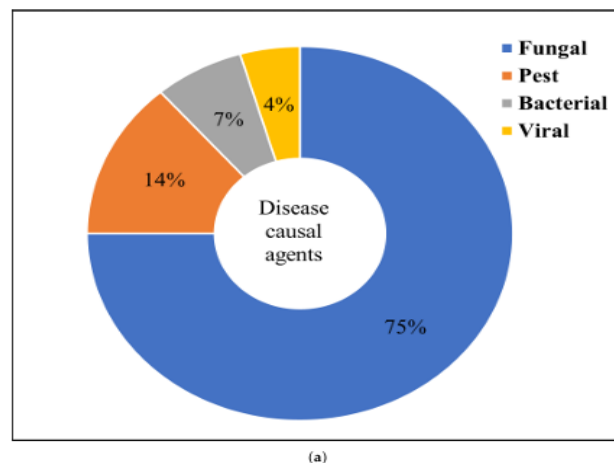


Figure 9

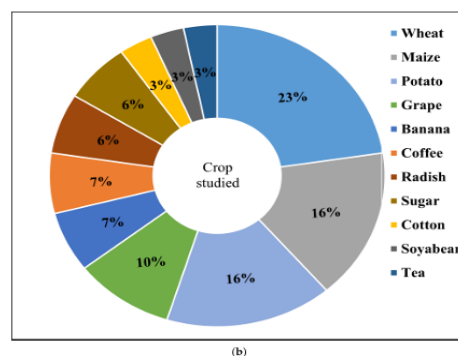


Figure 9. The organization of prior research into two categories: (a) the pathogens responsible for crop diseases and (b) the specific crops under investigation.

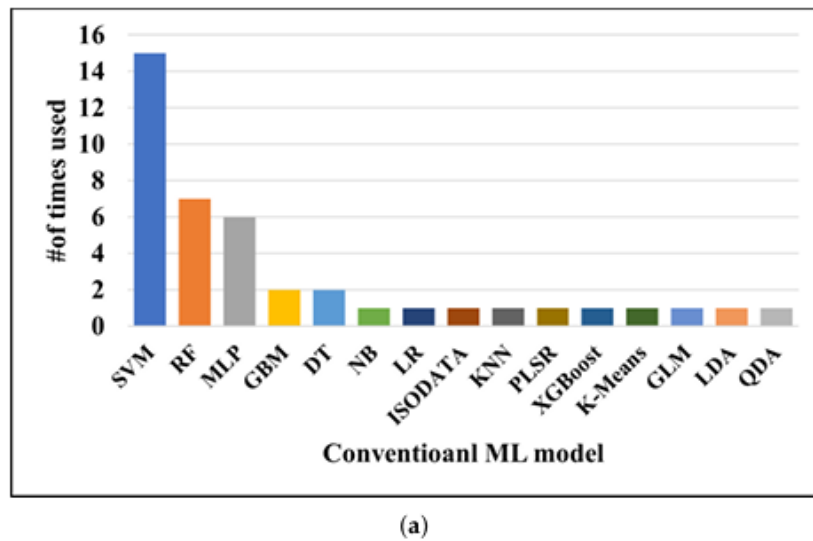


Figure 10

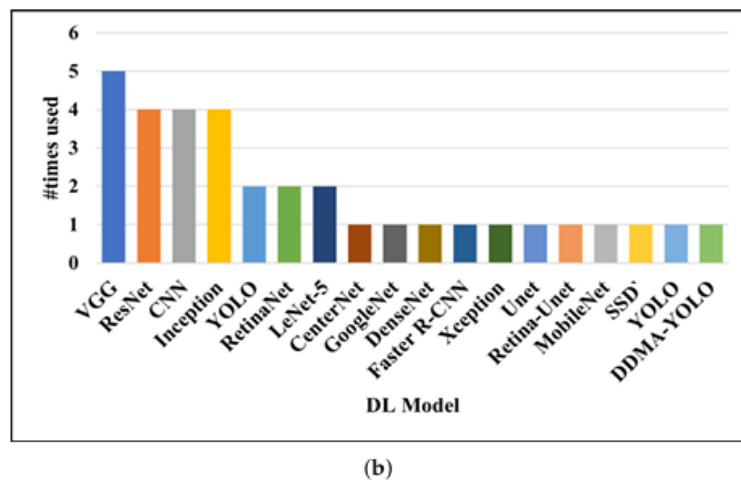


Figure 10. Existing studies are categorized into two groups: those using conventional machine learning-based techniques and those employing deep learning-based methods.

5.3. Conventional DL and ML Methods

The volume of data collected by UAVs and other image sensors has made data-driven methods—like standard ML and DL—outperform classical statistical techniques in the estimate of crop diseases. However, all approaches need expert-annotated data before the model can be trained. Figure 10 shows the frequency of study using ML and DL models. The classic ML models (SVM), (RF), (MLP), and (GBM) are most often employed for agricultural disease assessment utilizing UAVs. The visual geometry group (VGG) is the most widely used model when it comes to (DL), closely followed by ResNet, CNN, and Inception.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Table 4 shows the crop disease estimation accuracy of traditional machine learning models, with classification accuracy ranging from 72% to 98% and coefficients of determination from 63% to 88%. The identification of Fusarium wilt in bananas had the highest accuracy rate (98%) while the detection of cotton rot roots had the lowest (72.73%). One cannot simply propose one machine learning method over another because different aspects affect the performance of these models, including sensor type, crop and disease type, and UAV flight height. However, ML techniques tend to outperform RGB sensors when used with multispectral and hyperspectral sensors.

ML and statistical (ST) approaches are surpassed by (DL) models, which get crop disease segmentation accuracies between 93% and 97% and classification accuracies between 85% and 100%. But in order to create illness maps, DL techniques are more involved and frequently call for pre- and postprocessing of UAV photos. (Picture 6).

5.4 Summary of Findings

Here's a possible rephrased version:

- i. We summarize our findings from a survey conducted on UAV-based crop disease estimation, highlighting the following aspects: (a) strengths and current research focus, (b) emerging trends in research and technology, and (c) challenges and potential solutions. Rapid advancements in UAV platforms and sensors have significantly affected crop disease detection owing to machine learning and deep learning methods. The survey results indicate a preference for RGB sensors combined with deep learning techniques, which suggests a shift towards cost-effective sensors, such as RGB sensors, instead of more expensive ones, such as hyperspectral and multispectral sensors. Notably, deep learning techniques have been proven to enhance the accuracy of crop disease estimation compared to traditional statistical and machine learning approaches.
- ii. Compared to diseases brought on by bacteria, viruses, and pests, our meta-analysis showed that fungal diseases have been researched the most using UAV-based remote sensing. Given the effectiveness of sophisticated deep learning models when combined with unmanned aerial vehicles, we suggest addressing the following issues and approaches for further study:
- iii. Factors such as flight altitude, payloads, and sensors affect the effectiveness of UAV sensing systems for crop disease estimation. To address this, it is necessary to develop cost-effective, high-payload sensing technologies for small UAVs, which are limited in their payload capacity. Additionally, image resolution is crucial for deep learning models, and can be achieved through low-altitude flights or up-sampling techniques.

- iv. A significant challenge in the field is the lack of labeled data, as labeling requires expensive expert involvement. Future research should focus on unsupervised and semi-supervised techniques to mitigate this issue. Furthermore, because different studies' accuracy varies, choosing between deep learning models and traditional machine learning is challenging. To compare performance, a benchmark dataset for various agricultural diseases must be created. To overcome the high computational resource needs, lightweight deep learning models appropriate for edge computing platforms, like IoT, should be developed.

6. Conclusions

The overflow of data acquired by various imaging sensors and UAVs has driven data-driven approaches, like deep learning (DL) and conventional machine learning (ML), to outperform traditional statistical strategies in crop disease estimation. However, these strategies require data that has been clarified by experts to start training the model. Figure 10 displays the frequency of study using ML and DL models. Support vector machine (SVM), random forest (RF), multilayer perceptron (MLP), and gradient boosting machine (GBM) are the most often used classical ML models for agricultural disease assessment using UAVs. The visual geometry group (VGG) is the most widely used model in deep learning (DL), closely followed by ResNet, CNN, and Inception.

The goals of various UAV platforms, sensors, and data processing methods for remote agricultural disease monitoring are made clear by this comprehensive evaluation. It covers the challenges, potential results, and potential research directions in drone-based remote sensing for crop disease prediction in addition to offering a comprehensive scientific classification and meta-analysis of the available literature. Surprisingly, deep learning-based models outperform machine learning and statistical methodologies in UAV-based agricultural disease measurement. However, since these models often function as "secret elements," it is required to increase their receptiveness and restrict with regard to clarity in order to promote certainty and steadfastness. It takes a lot of work to investigate the best strategies to combine several remote sensing data modalities for crop disease diagnosis. Another intriguing path is to develop deep learning models that are small and suitable for edge computing platforms such as the Internet of Things. Every author contributed to the ideation, writing, method, data curation, and visualization of the paper. After T.B.S. took the lead in writing the first draft, A.N., C.-Y.X., and W.G. evaluated and revised the work.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

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Abbreviations

ANN	=	Artificial neural network
BPNN	=	Back propagation neural network
CNN	=	Convolutional neural network
DL	=	Deep learning
DT	=	Decision tree
DSM	=	Digital surface model
DCNN	=	Deep convolution neural network
FCN	=	Fully connected neural network
GPS	=	Geographical positioning system
GBM	=	Gradient boosting machine
GLM	=	Generalized linear models
ISODATA	=	Iterative self organizing data analysis technique
IoT	=	Internet of things
IoU	=	Intersection of union
KNN	=	K-nearest neighbor Linear regression
LR	=	Linear discriminant analysis
mAP	=	Mean average precision
MLP	=	Multi-layer perceptron

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

ML	=	Machine learning
MLR	=	Multiple linear regression
NB	=	Naive Bayes
PLSR	=	Partial least square regression
PA	=	Precision agriculture
QDA	=	Quadratic discriminant analysis
RF	=	Random forest
ROI	=	Region of interest
SVM	=	Support vector machine
UAV	=	Unmanned aerial vehicle
VI	=	Vegetation index
VGG	=	Visual geometry group
XGBoost	=	eXtreme gradient boosting

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IMPACT OF SOCIAL MEDIA AND AFFILIATED DIGITAL MARKETING ON CONSUMER BEHAVIOUR AND DECISION MAKING

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Abstract

Using a random sample technique, we were able to pick 100 participants from a pool of internet customers in Pune City, Maharashtra, India. A power analysis was used to determine the sample size, ensuring that there was sufficient statistical power. A total of one hundred internet users in Pune City, Maharashtra, India participated in an online survey that was conducted in order to collect quantitative data. The approach of cross-sectional research was utilized in the design of the survey. The sample was selected via the use of a random sampling approach, and the data were analyzed through the use of descriptive statistics in order to summarize the demographic characteristics and evaluate the influence that affiliate marketing has on the decisions that consumers make about their purchases. According to the findings, a large percentage of consumers, particularly those who are between the ages of 50 and 60, believe affiliate marketing to be an essential component that plays a role in assisting them in making decisions regarding their retail purchases. Taking into consideration the gender distribution, it would indicate that the majority of those who responded are male. The research offers a substantial contribution to the understanding of customer behavior in the context of e-business and highlights the significant role that affiliate marketing plays in influencing purchase decisions. Taking everything into consideration, the research represents a big contribution.

Keywords: *social media, Digital Marketing, Consumer Behaviour, Decision Making, Online Advertising.*

1. INTRODUCTION

In the digital age, the influence of social media and related digital marketing on consumer behavior and decision-making has grown significantly, changing how companies engage with customers and affecting their purchase habits. Social media sites like Facebook, Instagram, Twitter, LinkedIn, and others have developed into potent marketing tools that let companies communicate with their target

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

market directly, increase brand recognition, and cultivate client loyalty through interactive campaigns and tailored content. The efficacy and reach of social media initiatives are further increased by digital marketing techniques including influencer relationships, content marketing, pay-per-click (PPC) advertising, and search engine optimization (SEO). By providing organizations with essential data and insights into customer preferences, these platforms allow businesses to customize their marketing tactics to target specific audience requirements and desires. Consequently, a profusion of information and adverts are continuously shown to customers, greatly influencing their decision-making processes. Consumer attitudes and decisions are significantly influenced by the accessibility of reviews, ratings, and user-generated information on social media platforms. In order for organizations to remain competitive and successfully influence customer behavior in today's digital marketplace, they must comprehend the dynamics of social media and digital marketing.

1.1. Consumer Impact

The development of the internet gave customers more choice, power, and influence in addition to creating a new avenue for communication between them and companies. By giving an online marketing experience that combines usefulness with item and service data, marketers might influence the decisions of consumers. Online activities including data seeking, selection, evaluation, and exchange processing help marketers assess the suitability of their online initiatives. Businesses are investing more money in digital marketing, and they use a variety of strategies to introduce their brands to customers.

Digital marketing is utilized at every stage of the customer journey, from building brand recognition to motivating customers to buy, providing purchase assistance for easy online shopping, managing post-purchase customer service, and helping brands be used. According to research, social media-based digital marketing replaces traditional marketing channels in connecting with customers by using marketing communication channels. These results are consistent with studies that show social media is an effective marketing platform that draws customers and shapes their purchase decisions.

1.2. Consumer Behaviour

Participation in social media and the advent of Web 2.0 have altered consumer behavior with respect to environments, relationships, and activities. Companies are increasingly engaging in digital marketing to reach out to consumers in response to the seismic developments in the media ecosystem. As more and more people use the internet and social media sites, it is crucial for digital marketers to

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understand consumer behavior in order to succeed. As a new channel for customer communication, organizations need to be cognizant of how social media has altered consumer buying habits.

An organization's brand is a symbol that it uses to draw in customers and get a competitive edge. As a marketing tactic, advertisement has a significant impact on drawing customers to a company's goods and influencing their purchasing decisions. Being familiar with the brand and possessing expertise impact consumers' purchasing decisions. Research indicates that ads increase brand recognition.

1.3. Consumer Characteristics

Numerous individual, societal, and cultural factors impact consumers' propensity to make certain purchases. There are three parts to culture: mainstream culture, subcultures, and socioeconomic status. Culture shapes the desires and actions of consumers. Values and perspectives that a consumer acquires from family members or the community they are exposed to shape their culture. Given that culture affects customers' purchasing decisions.

When creating digital marketing ads, businesses need to be aware that various customers will connect with different types of content. Smaller subcultures inside a larger culture can be used to precisely identify how customers have been socialized. Geographical areas, racial groupings, nations, and religions are components of subcultures. Since various customers may respond differently to information, digital marketing channels must be tailored to a particular target market.

Consumers who have similar behaviors, interests, and values are divided into social classes in society, which are hierarchically arranged groups. One way that social classes reflect divisions in society is through the social status of customers, which also has an influence on their media consumption, lifestyle, and involvement.

1.4. Consumer Psychology

Understanding the connection between marketing stimuli and consumers' purchasing decisions requires organizations to be cognizant of five critical psychological processes that influence customers. These include memory, emotions, learning, motivation, and perception. Customers have wants, and when those requirements are strong enough to warrant consideration for action, those needs become the driving force behind their urge to act. A customer is ready to act once they are inspired, and their views have an impact on what they do. A consumer's creation of an illustration through the processes of organizing, choosing, and interpreting information is called a perception. Thanks to technical improvements, consumers are now more exposed to digital marketing content online.

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August 2024

Customers form memories through learning experiences, keeping the knowledge they have learned over time about things like goods, services, purchases, and product usage experiences. There exist two distinct categories of memories: short-term memory and long-term memory. The latter is considered to be more enduring and houses the experiences and knowledge of a consumer's life. Even if the information is stored in the memory, consumers could not remember it until retrieval cues or reminders are shown to them. Digital marketing is a potent instrument that works well for retrieval cues and reminders.

1.5. Consumer Decision Making

Customers now make their selections at several stages, depending on factors like their initial interaction with the company, their study into the products, or recommendations from friends and family on social media. Businesses that use social media and digital platforms to engage with customers develop connections with them, which increases customer loyalty. Businesses need to understand the impact of social media platforms on customer purchasing decisions. Customers are continuously weighing their options and contemplating future purchases.

As digital technology advances, it is important to comprehend how social media and digital marketing trends affect customers' ability to make decisions. This study intends to investigate this idea from an organizational standpoint.

2. REVIEW OF LITERATURE

Voramontri and Klieb (2019) The purpose of this study is to empirically examine how social media influences customers' decision-making process while making complex purchases, such as rare and costly items with well-known brands, products with strong points in terms of engagement and distinction, and transactions involving random chance. The model includes the phases of searching for data, evaluating alternatives, and making a buying decision from the traditional EBM perspective. The use of social media and its impact on experiences is investigated using a quantitative survey. According to the findings, social media usage impacts consumer satisfaction throughout the data search and alternative evaluation stages, with satisfaction rising as the customer moves through the process to the final purchase decision and post-purchase evaluation. This study was carried out among internet-savvy clients from South and Southeast Asia. It only took into account purchases that were actually made by the members; it did not include searches that were abandoned.

Kurdi, B., et.al., (2022) With technical advancement, the organization's operations have been a piece of contemporary marketing efforts to advertise its labor and products. The importance of significant

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

different digital marketing channels is highlighted in this review. To investigate the effect of electronic informal (eWOM) on customer buying decisions, the review used a variety of utilizations, including social media, online advertising, email marketing, and internet search engines. With the use of a tailored survey questionnaire in the retail business, a quantitative research technique was utilized to meet review objectives and investigate the proposed research framework. SmartPLS3 software was used to perform the essential analyses on 255 legitimate replies, which were then taken into consideration for extra examination. As indicated by the discoveries, all digital marketing channels have a significant effect on customers' buying decisions. However, the influence of eWOM on these decisions is mitigated. To help readers better understand the subject issue, the review provides further increments to the assemblage of current literature and bolsters the underlying suspicions.

Dolega, L., et.al., (2021) The rapid proliferation of digital technology has led to the rise of social media as a crucial digital marketing tactic for promoting business products and, ultimately, increasing profits. Having said that, actual studies examining the efficacy of social media marketing have not been conducted yet. Using one-of-a-kind data acquired over a year from a well-known online store, this essay delves at the impact of regular social media interaction on mundane business results like website traffic, orders, and sales. Although social media does boost website traffic, it has little effect on product orders or sales income, according to the main ends. On the other hand, bigger social media campaigns often bring in more orders and more money from sales, with Facebook turning out to be the most effective stage. Complexity, pricing, and brand awareness all have a role in how various products react to social media marketing, according to our findings. When taken as a whole, these findings provide light on the implications of social media marketing for businesses and give direction for allocating resources to develop effective campaigns.

Dahiya and Gayatri (2018) The impact of digital marketing contact on several product categories, such as books, music, design accessories, clothing, banking, and online gaming, has been the subject of substantial research. Academics, particularly in India, have paid little attention to the automobile industry, despite the fact that it is one of the largest users of digital media. Understanding how digital marketing correspondence influences client purchasing decisions in the Indian passenger automotive sector is the goal of the present review. A combination of methods was used in the review. The 784 "Delhi" respondents who participated in the area-wise relative testing gave us the data we needed. A chi-square test, a one-sample binomial test, and a one-sample Wilcoxon Signed Rank test were utilized for significance testing. The findings of the analysis show that while purchasing a car, 75% of the participants used at least one digital channel of communication. Websites, followed by mobile phones

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

and social media sites, were the most popular digital contact mediums used in the car-buying process. Digital marketing communication "fundamentally" affected the whole decision-making process of purchasing a car, beginning with "need recognition" and continuing through "post purchase," with the stage of "evaluation" being the most commonly affected. According to the results of the investigation, digital marketing correspondence might even lead to need awareness in a very complex product category like automobiles. Consumers are receptive to digital contact, trust reviews from other buyers, and express their post-purchase emotions through digital media, according to the findings. Despite customers' appreciation for digital channels as decision-making tools, the poll found that they seldom book cars online.

3. OBJECTIVES

1. To investigate the impact of affiliate marketing on customers' e-commerce sector decision-making.
2. To contribute the corpus of research on affiliate marketing's effects on e-business and how they affect customer behavior.

4. METHODOLOGY

In order to explore the aims and put the hypotheses to the test, the research technique that was implemented in this study was quantifiable. Data was collected from a varied sample of customers in the e-commerce business as part of the study, which utilized a cross-sectional methodology. The following are the sequence of stages that comprised the methodology:

Sampling: Using a random sample technique, we were able to pick 100 participants from a pool of internet customers in Pune City, Maharashtra, India. A power analysis was used to determine the sample size, ensuring that there was sufficient statistical power.

Data Collection: A platform for conducting an online survey, which took around five to ten minutes to complete, was used to gather the data. The gathering of data was carried out over a predetermined amount of time in order to guarantee an acceptable number of replies.

Data Analysis: Statistical methods that were appropriate were utilized in order to analyze the data that was obtained. For the purpose of providing a concise summary of the demographic features of the sample, descriptive statistics such as means and standard deviations were measured and computed.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

5. FINDINGS

The results which were derived from the analysis of the relevant data. For the purpose of providing support for the findings that were derived from the study, the significance levels, effect sizes, and other pertinent information were reported.

Table 1: Age

		Frequency	%	Valid %
Valid	18-30 Years	15	15	15
	30-40 Years	20	20	20
	40-50 Years	14	14	14
	50-60 Years	35	35	35
	Above 60 Years	16	16	16
	Total	100	100	

Interpretation: The age distribution of a certain population is presented in Table 1, which includes the frequencies, percentages, and valid percentages for each age group according to the population. According to the data presented in the table, the age group that constitutes the biggest proportion of the overall population is comprised of persons aged 50 to 60 years. After this comes the age group of thirty to forty years old, which accounts for twenty percent of the total population. The percentage of the population that falls into the age brackets of 18-30 years and 40-50 years is comprised of 15% and 14%, respectively. Those who are above the age of sixty make up sixteen percent of the total population. With a total frequency of one hundred, it is clear that the distribution encompasses the whole population, with one hundred percent of it being represented. Taking into consideration the data shown in this table, it appears that the population is pretty evenly divided throughout the various age categories, with a small preference for persons aged 50-60 years.

Table 2. Gender

		Frequency	%
Valid	Male	65	65
	Female	35	35

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

	Total	100	100
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Interpretation: The gender distribution of a population is presented in Table 2, which includes the representation of frequencies, percentages, and valid percentages for both males and females. As can be seen in the table, men make up the bulk of the population, with a frequency of 65, which accounts for 65 percent of the total population. On the other side, the frequency of females is 35, which results in them being 35 percent of the total population. 100 is the total frequency, which indicates that every single member of the population has been taken into consideration. A gender gap exists among the population, as evidenced by the fact that men are approximately twice as numerous as females, as seen in this table.

Table 3. In the e-commerce sector, affiliate marketing affects my purchasing habits.

		Frequency	%
Valid	Strongly agree	21	21
	Disagree	16	16
	Neutral	18	18
	Agree	30	30
	Strongly Disagree	15	15
	Total	100	100

Interpretation: In the e-commerce sector, the information shown in Table 3 sheds light on the ways in which affiliate marketing impacts consumers' decisions to make purchases. There are five different groups that the replies fall into for distribution. Thirty percent of respondents are in agreement that affiliate marketing has an effect on their choosing to make a purchase. Twenty-one percent of respondents are in complete agreement with this statement, showing that there is a major beneficial effect. Eighteen percent of those who participated in the survey had a neutral attitude, indicating that they have a mixed opinion regarding the influence of affiliate marketing. On the other hand, sixteen percent of those who completed the survey disagree with the statement, and fifteen percent of them strongly disagree. As a result of the fact that the overall frequency is equal to one hundred, the perspectives of the entire population are adequately represented. While a sizeable proportion of the

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

population views affiliate marketing as influential, this table demonstrates that there is still a sizeable section of the population that is either indifferent or disagrees with the influence that it has.

6. CONCLUSION

The study of the data acquired from one hundred participants offers significant insights into the demographic distribution of the participants as well as the perceived effect that affiliate marketing has on the purchase decisions of consumers. According to the findings of the survey, the age group that is comprised of individuals between the ages of 50 and 60 years creates the largest sector of the population, and the majority of the respondents are male. Regarding the impact of affiliate marketing, a sizeable majority of respondents (51%) agree or strongly agree that affiliate marketing impacts their purchase decisions. This demonstrates the substantial role that affiliate marketing plays in the e-commerce business. Nevertheless, a sizeable portion of the population adheres to a neutral stance or expresses disagreement, indicating that there is a range of perspectives and the requirement for more research into the elements that influence consumer behavior. This study highlights the significance of affiliate marketing in the e-commerce industry and its consequences for customer behavior. It also lays the groundwork for further research in this field by giving a basis for future research.

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**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams**

August 2024

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IMPACT OF DIFFICULTIES ON ENTREPRENEURIAL BEHAVIOUR OF FARMERS FOR VEGETABLE PRODUCTION AND MARKETING IN ARUNACHAL PRADESH

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Abstract: This study was conducted in Ziro, Lower Subansiri district of Arunachal Pradesh during 2020 – 23 to explore the entrepreneurial behavior and challenges faced by the vegetable growers. Farmers faced numerous challenges viz. high labor costs, lack of pest and disease management knowledge, and high transportation charges were universal issues. Additionally, 91.11% faced low credit facility constraints, 82.77% had poor financial status, and 90.56% struggled to procure essential inputs. Manures were costly and scarce for 81.66%, fertilizers were unavailable on time for 79.44%, and 65.56% faced irregular electricity supply. Labor shortages during peak periods affected 98.33% of respondents, and 75.55% cited a lack of skilled labor. High initial costs were a problem for 94.44%, while 58.89% lacked knowledge of proper cultivation practices. Storage issues affected 68.33%, spoilage during transportation 52.22%, lack of market knowledge 45.00%, and exploitation by middlemen 37.22%. A positive relationship was found between entrepreneurial behavior and factors like age, education, family size, landholding, income, training, mass media participation, extension contact, and scientific orientation.

Introduction

Vegetables are very essential component of human diet. Consumption of vegetables provides all the required key nutrients, vitamins, dietary fibers etc for a healthy body functioning. Apart from the health benefits, vegetable crops provide an important source of income for the small and marginal farmers of our country.

India has endowed with favourable climatic condition for vegetables production, thus vegetables are grown in every part of our country under varied agro-climatic and soil conditions in plains as well as in hilly regions. At present, India produces about 70 different varieties of leafy fruity and starchy tuber varieties of vegetables. More than 40 kinds of vegetables belonging to different groups namely solanaceous, cucurbitaceous, leguminous, cruciferous (Cole crops) root crops and leafy vegetables are grown in India in tropical, subtropical and temperate regions. Important vegetables grown in India are tomato, onion, brinjal, cabbage, cauliflower, okra, peas

etc. Vegetable crops provide an important source of income for the small and marginal farmers of

our country.

Arunachal Pradesh, the Land of Rising Sun has vast potential for development of horticulture for growing a wide range of tropical, sub-tropical and temperate fruits and vegetables including off season vegetables, spices, aromatic and medicinal plants due to its undulating topography and varied agro-climatic conditions. Indigenous and major vegetables grown in the state are sweet potatoes, mustard, brinjal, ginger, chili, pumpkin, cucumber, local cowpea, cauliflower, tomato, cabbage, turmeric, cardamom etc. Agri-horti sector plays a vital role in socio-economic development as well as in employment generation for rural people especially to small and marginal farmers of Arunachal Pradesh by providing income round the year from vegetable produce. Hence, there is a huge scope for entrepreneurship development in vegetable cultivation in the state.

Therefore, the study has been undertaken with the objectives to study the impact of difficulties on entrepreneurial behaviour of farmers for vegetable production and marketing in arunachal Pradesh.

Methodology

The study was conducted in Lower Subansiri district of Arunachal Pradesh during the year 2020-23. Lower Subansiri district has been purposively selected for the study because of high vegetable cultivation and production. One circle i.e Ziro circle has been selected and from Ziro circle 9 villages were selected based on highest area, production, and productivity of the vegetables. Then 20 farmers were selected from each village by using random sampling procedure. Thus, forming total sample size of 180 respondents. The data was collected by personal interview method. And the analysis was done using frequency, percentage and Karl Pearson's simple correlation test.

Results and Discussion

Results and Discussion

A) Constraints faced by the vegetable growers.

The data presented in Table 1 indicate the constraints faced by the vegetable growers.

1. Financial Constraints

Most of the respondents reported low credit facility (91.11%) and Poor financial status (82.77%). Money matters a lot in everyone's life. It is difficult for respondents with low financial status to purchase the required inputs for their vegetable cultivation. The result is in consonance with the results of Shilpa Karate (2019) and Ritik Gupta (2022).

2. Input Constraints

Regarding input constraint Seeds, manures/chemicals, tools and implements are not easily procured (90.55%), Manures are costly and not easily available (81.66%), non-availability of fertilizer at required time (79.44%) and irregular supply of electricity (65.55%) were reported. Cost of fertilizers, manures, plant protection chemicals, growth regulator etc. is increasing day by day. Thus, purchasing inputs required for cultivating vegetables becomes hard for vegetable growers. The findings are in agreement with the findings of Nagesh (2006), Rai *et*

al. (2014), Murry and Lalrautsangi (2020).

3. Labour Constraints

Regarding constraints related to labour, cent per cent of the respondents quoted high cost of labour as the major constraints followed by scanty labour during peak period of cultivation (98.33%) and lack of skilled labour (75.55%).

Scarcity of labour is increasing day by day in the agricultural sector due to the migration of working force from rural to urban areas either in search of employment or due to educational matter. This causes rise of labour cost. Lack of skilled labours, scanty labour during peak period of cultivation viz; land preparation and harvesting are also causing problems for vegetable growers. The results are in confirmity with the findings of Chahal and Kataria (2010), Murry and Lalrautsangi (2020).

4. Technical Constraints

Cent percent of the respondents expressed lack of knowledge about pest and disease management as their major technical constraint, which was followed by high initial cost (94.44%) and lack of knowledge about proper cultivation practices (58.88%). Non-availability of required skilled labours and lack of competency in field extension personnel resulted in perception of this problem. The findings are in agreement with the findings of Thorat G. N. (2005), Murry and Lalrautsangi (2020).

5. Marketing Constraints

The major marketing constraint perceived by the vegetable growers was high transportation charge (100%) followed by lack of storage (68.33%), spoilage during transportation (52.22%), lack of market knowledge (45.00%) and exploitation by middlemen (37.22%).

Vegetables are perishable in nature, many times when the production of vegetable is abundant and sufficient domestic market is not available for sale of vegetables, farmers have to bear heavy financial losses. Lack of storage facility and spoilage during transportation was another important marketing constraint expressed by the respondents. This was due to non- availability of systematic transport facilities. Even the transportation charges were also perceived as high by the farmers. This

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

situation further aggravated by exploitation of middlemen, who deceive farmers by not paying even the basic cost of cultivation. The results are in agreement with the findings of Waman and Patil (2000), Azad *et al.* (2014) and Rai *et al.* (2014).

B) Relationship between socio - personal profile of vegetable growers with their entrepreneurial behaviour

Based on the data represented in table 2, that age, education, family size, land holding, annual family income, training received, mass media participation, extension contact, extension participation and scientific orientation were positively and significantly correlated with entrepreneurial behaviour, whereas occupation found to be negatively non – significant.

Age of farmers was positively and significantly correlated with their entrepreneurial behavior. As we grow older we became more mature and surrounded by many responsibilities thus making us more enthusiastic and willing to work harder to become financially sound and independent, work efficiency and physical strength also increases as we get older. These might be the probable reason.

Education of farmers was positively and significantly correlated with their entrepreneurial behaviour. Education helps the farmers to get more information and thereby broaden and sharpen their mental horizon. It helps in their socio-psychological development. Education also helps in making decision more precisely and managing various aspects viz, planning, production and marketing aspect more efficiently. The result is in consonance with the results of Savitha *et al.* (2009) and Shilpa Karate (2019).

Occupation was found non-significant and negatively correlated with their entrepreneurial behavior. This might be due to majority of respondents were engaged in agricultural activities. Hence less variation in their occupation might be the one of the main reasons for non-significant relationship. Similar findings were reported by Sabale *et al.* (2014).

Land holding of farmers was positively and significantly correlated with their entrepreneurial behaviour. Land holding provides the economic base for the farmer to practice new agricultural technologies. It helps them in optimum utilization of farm resources through efficient decision making and applying new ideas for achieving maximum profits. Further, it helps the farmer to bear risk and uncertainty. Farmers with large size of land holding have leadership ability. The results are in confirmity with Nagesh (2006), Savitha *et al.* (2009).

Annual family income of farmers was positively and significantly correlated with their entrepreneurial behaviour. Annual family income provides the economic base for the farmer hence;

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

farmers with higher annual family income have higher purchasing power and motivated to try new technologies for improving their income and standard of living. Farmers with high annual family income can normally bear risk and uncertainty in adopting new ideas. The results are agreed with the reports of Subramanyeshwari and Veeraraghavareddy (2003), Nagesh (2006) and Savitha *et al.* (2009).

Training Received was found positively and significantly correlated with their entrepreneurial behaviour. Through training programmes farmers get to know various useful knowledge which in turn helps them in enhancing their skills and boost their confidence level.

Mass media participation of farmers was found positively and significantly correlated with their entrepreneurial behaviour. Mass media is the huge source of opportunities for farmers, it can motivate the farmers to try or adopt new farm practices, it provides valuable information which helps farmers to know their chances of success. It also provides information on agricultural practices and thus creates an interest in the farmer to seek more information regarding a particular cultivation practice. The results are in consonance with the results of Nagesh (2006).

Extension contact of farmers was positively and significantly correlated with their entrepreneurial behaviour. It means that extension contact plays an important role in disbursing knowledge and solving problems of vegetable growers. Frequent contacts with different extension personnel like private agency, NGO's, village level worker, Agricultural Officers etc. have more and better knowledge regarding improved cultivation of vegetables. The results of study were in agreement with the studies reported by Thyagarajan and Vasanthakumar, J. (2000), Shilpa Karate (2019) and Ritik Gupta (2022).

Extension participation of farmers was positively and significantly correlated with their entrepreneurial behaviour. Extension participation helps farmers to get various information. Extension activities conducted in the area have direct effect on knowledge gained about improved agricultural practices. It also helps the farmers to adopt new agricultural practices earlier than others in their social system. The findings are found similar with the results of Nomes Kumar *et al.* (2000) and Nagesh (2006).

Scientific orientation of farmers is positively and significantly correlated with their entrepreneurial behaviour. Respondents having higher scientific orientation would try and interested to gather more information, which could be applied at the field level, thus increasing their production. The results are similar with the results of Nagesh (2006) and Ritik Gupta (2022).

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Conclusion

In conclusion, this study highlighted the difficulties on Entrepreneurial behaviour of farmers for vegetable production and marketing in Arunachal Pradesh. The findings revealed they face significant structural and knowledge-based constraints such as high labor costs, lack of pest and disease management knowledge, high transportation charges, low credit facility, poor financial status, struggled to procure essential inputs, costly and scarcity of manures, unavailability of fertilizers on time, irregular electricity supply, Labor shortages during peak periods, lack of skilled labor, High initial costs, lacked knowledge of proper cultivation practices, Storage issues, spoilage during transportation, lack of market knowledge, and exploitation by middlemen. Addressing these issues through targeted training, financial support, market access, and infrastructure improvements could greatly enhance their productivity and profitability.

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August 2024

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Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Table 1: Constraints faced by the Vegetable Growers

Sl. No.	Constraints	Frequency	Percentage
(A)	Financial		
1.	Poor financial status	149	82.78
2.	Low Credit Facility	171	91.11
(B)	Input		
1.	Manures are costly and not easily available	147	81.67
2.	Seeds, manures/chemicals, tools and implements are not easily procured	176	90.56
3.	Non-availability of fertilizer at required time	160	79.44
4.	Irregular supply of electricity	128	65.56
(C)	Labour		
1.	High labour cost	180	100
2.	Scanty Labour during peak period of cultivation	177	98.33
3.	Lack of Skilled labours	159	75.55
(D)	Technical		
1.	High incidence of pests and diseases	180	100
2.	High Initial Cost	170	94.44
3.	Lack of knowledge about proper cultivation practices	120	58.89
(E)	Marketing		
1.	High transportation charges	180	100
2.	Spoilage during transportation	89	52.22
3.	Lack of market knowledge	71	45
4.	Lack of storage unit/space	123	68.33
5.	Exploitation by middlemen	46	37.22

*Multiple Response Obtained

Table 2: Correlation coefficient between Socio - Personal profile and Entrepreneurial behaviour

Sl. No.	Independent variables	Correlation coefficient ('r' value)
1.	Age	0.657**
2.	Education	0.428**
3.	Occupation	- 0.158 ^{NS}
4.	Family Size	1.000**
5.	Land Holding	0.737**
6.	Annual Family Income	0.764**
7.	Training Received	0.258**
8.	Mass Media Participation	0.976**
9.	Extension Contact	0.866**
10.	Extension Participation	0.991**
11.	Scientific Orientation	0.918**

** : Significant at 0.01 probability level, NS: Non-significant

EXPLORING THE ETHICAL ISSUES SURROUNDING THE USE OF AI IN LEGAL PRACTICE, SUCH AS BIAS, TRANSPARENCY, AND ACCOUNTABILITY

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Abstract

Significant ethical concerns have been raised as a result of the growing incorporation of artificial intelligence (AI) into legal practice, particularly in regards to issues of bias, accountableness, and transparency. This research investigates the possible risks that are posed by prejudice in artificial intelligence systems, as well as the potential influence that bias might have on justice and equality in the legal sector. When taking into consideration the crucial roles that openness and accountability play in preserving confidence and justice in legal procedures, it highlights the significance of these concepts in artificial intelligence. In addition, the research studies the many different kinds of biases that may be found in artificial intelligence, as well as the methods that can be used to reduce these biases and the significance of ensuring that AI algorithms are transparent. It also analyses potential strategies for fostering greater openness in artificial intelligence systems and tackles the problems that are involved in attaining transparency. The paper highlights the legal and ethical implications of artificial intelligence in legal practice by conducting an examination of bias mitigation approaches and accountability frameworks. It also emphasizes the necessity of robust accountability procedures in order to avert unfortunate results.

Keywords: Bias in AI, Transparency, Accountability, Ethical AI, Legal Practice.

1. INTRODUCTION

1.1 Background

Understanding the history of AI and data science helps explain its ethical issues. This subsection discusses significant milestones, innovations, and the social consequences of these technologies' broad acceptance. Reading about AI and data science's origins helps readers understand the ethical debate.

1.2 Significance of Ethical Considerations in AI and Data Science

Integrating ethics into AI and data science is crucial. Ethical flaws, prejudices, and unfair practices in AI system development and implementation have serious consequences. It shows how ignoring ethics may affect people, groups, and society. Understanding the stakes sets the tone for the study paper's discussion of bias, fairness, and responsibility.

1.3. AI Technologies in Legal Practice

AI uses in legal work are varied and adapted to different aspects of practice. Legal research uses AI technologies to swiftly find relevant case law and laws, saving time. Contract analysis and management employ AI techniques to automatically examine and generate legal agreements, identifying flaws and variations from typical provisions. Historical data is used in predictive analytics to help lawyers strategize and decide cases. AI-driven legal chatbots offer initial consultations and routine legal guidance, improving legal access. These applications show AI's versatility in updating and optimizing legal processes.

Benefits of AI Integration in Legal Services

AI in legal services transforms practice with several benefits. AI solutions simplify monotonous and time-consuming processes, allowing lawyers to focus on more complicated and strategic work. AI reduces human mistake in document inspection and legal research, improving accuracy. AI can also lower legal service costs, making them more affordable. AI in predictive analytics can assist lawyers make better judgments and strategies by revealing case outcomes. AI integration boosts productivity, cost-effectiveness, and legal service quality.

Current Trends and Developments

Legal AI is changing fast due to numerous trends. AI-powered legal research tools that use powerful algorithms to filter through massive legal data are becoming more popular, giving more accurate and relevant findings. Machine learning-based AI-driven contract review solutions detect hazards and

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

expedite contract preparation. Legal tech companies and AI investment imply a growth in innovation and competitiveness in the legal business. As the legal profession balances technology innovation with responsible practices, ethical considerations and regulatory compliance are becoming more important. These findings show that AI in legal practise is undergoing a rapid transformation that will further disrupt the sector.

2. REVIEW OF LITERATURE

Ibáñez, J. C., & Olmeda, M. V. (2022) concentrated on responsible AI concepts and norms rather than applied ethics "how". This study examines how corporations use AI ethics to enhance practice-ideals gap research. This qualitative study uses 22 semi-structured interviews and two focus groups to evaluate enterprise AI ethics. A detailed transcript study proved ethics, values, privacy, explainability, and fairness procedures and findings. Persons interviewed addressed government duty. Establish sector laws, develop a data-driven corporate culture, analyse the algorithm's life cycle, apply a code of ethics, and give ethical training. Despite constraints like the kind and quantity of organizations questioned, this study provides concrete examples and specified goals to further AI ethics research on Spanish enterprises' practice-aspiration gap.

Rodrigues, R. (2020) Discussed legal and human rights issues raised by artificial intelligence (AI), their solutions, gaps, and human rights implications. Example: algorithmic transparency, cybersecurity vulnerabilities, unfairness, prejudice, and discrimination, lack of contestability, legal personhood, intellectual property, worker injury, privacy and data protection, damage responsibility, and accountability. The article explains important concerns and guides risk and impact reduction to protect human well-being using 'vulnerability'. This essay advances the topic, which is vital given AI technologies' heavy implications on vulnerable persons and groups and their human rights, while noting the positive work in the AI legal field and the need for continual examination and adaptation.

Thiruma Valavan, A. (2023) AI and data-driven decision-making in banking have created unparalleled efficiency, risk assessment, and customer service prospects. This fast deployment of AI technology raises ethical concerns and prejudices. This research study examines AI ethics and prejudice in banking, focusing on fairness, transparency, and accountability. This research contributes to the AI ethics and bias debate by examining the ethical issues and potential biases of AI and data-driven banking decision-making. It emphasizes justice, openness, and accountability in responsible AI technology integration in banking and presents future research possibilities for this emerging topic.

3. PURPOSE

3.1. The Dangers of Bias in AI Systems

Prejudice against AI is detrimental. As AI advances, biased AI may harm people and communities. Race, gender, and other protected groups suffer from AI bias. This includes biased loan approvals, hiring, and autonomous car deaths.

MIT-Microsoft case study cautions against AI bias. In significant tech firm facial recognition systems, they observed racial and gender discrepancies. Women and darker skin were detected less accurately by algorithms than men and fairer skin. Concerningly, these biased law enforcement systems may target innocent impoverished individuals based on appearance.

Punishment criminal Another biased AI program is COMPAS. This regularly used program mislabelled black felons as more likely to reoffend than white defendants with identical backgrounds in 2016, ProPublica reported. Machine learning algorithm biases harm people and create criminal justice disparity. To address these issues, authorities are targeting biased AI systems. California law compels firms to test facial recognition technology across demographic groups before law enforcement may use it in 2020. The transparency project makes companies accountable for facial recognition software biases.

The Importance of Transparency and Accountability in AI

Transparency and accountability are essential for AI ethics, especially bias reduction. As AI becomes more widespread, we must use it fairly and ethically. As they learn from biased data, AI systems raise bias concerns. Amazon's hiring technology scans resumes and finds top candidates using machine intelligence. The system repeatedly punished female resumes, showing gender bias. This example highlights how AI systems must be open to detect and overcome biases.

Additionally, AI systems must be held accountable. The 2018 Uber self-driving car collision is notable. An autonomous vehicle killed a pedestrian. Investigations identified technology design and safety flaws. This tragedy highlights the need to hold companies accountable for testing and safeguarding AI systems before deployment. In addition to instances, authorities have stressed AI system transparency and responsibility. Data processing employing automated decision-making systems like AI algorithms must be disclosed under the EU's General Data Protection Regulation (GDPR). This rule aims to make AI processes more transparent and help humans comprehend their decisions.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

AI transparency and responsibility are also highlighted in case legislation. In a historic lawsuit against an employment agency utilizing an algorithmic recruiting tool, New York City's Commission on Human Rights ruled that companies must reveal this information to candidates upon request and explain how it works. This ruling increases AI transparency awareness to prevent bias.

AI ethics requires transparency and responsibility. Amazon's biased recruiting tool, Uber's autonomous car accident, GDPR, other case laws demonstrate the necessity for openness and accountability to address AI system biases and make firms accountable for their AI technology. To safely deploy AI, we must emphasize transparency and accountability.

Bias reduction, transparency, and accountability are essential to ethical AI system deployment in society. AI bias is harmful. Case studies and real-life examples indicate that biased algorithms can perpetuate inequalities in jobs, criminal justice, and healthcare. This issue requires extensive testing and population-representative datasets.

4. APPROACH

4.1. Types of Bias in AI Systems

AI biases may cause injustice. Algorithmic bias occurs when AI systems favour certain groups or persons based on attributes. Study, for instance.

Data bias from AI training data is another. Unrepresentative datasets can influence decision-making and promote societal biases. encourage hiring and law enforcement discrimination. To promote justice and equality, AI prejudices must be addressed. Not doing so may prolong structural inequalities and social inequity. Recognizing biases lets firms start reducing them.

AI biases are addressed in many ways. Diversity in system development training data is one technique. To ensure the AI system does not unfairly favour any group, the dataset should cover a mix of demographic groupings and perspectives.

AI biases are reduced via algorithmic modifications. Algorithms are tested and validated to correct biases. Monitoring and refining the system yields fair results for organizations. AI biases can prolong inequality. Organisations must overcome these biases to achieve justice and equality. Diversity in training data and algorithmic adjustments mitigate bias in AI systems. Following these methods, AI systems can be fair, unbiased, and valuable to society.

4.2. Techniques for Reducing Bias in AI Systems

Justice and equality require AI bias reduction. AI algorithms with unreasonable preferences or prejudices discriminate. Prejudices may aggravate social inequality and stereotypes. Buolamwini at MIT found that major internet companies' facial recognition algorithms made more mistakes for darker-skinned women than men. Race and gender biases might misidentify or exclude persons.

Several strategies have been tried to reduce AI bias. Variety in training data works. By adding diverse races and backgrounds in training data, prejudice is eliminated. Google improved their speech recognition technology for underrepresented dialects using this way. They decreased accent and dialect discrimination by using more diverse voices in model training.

Reduce bias via algorithmic changes. Eliminating decision-making bias requires algorithm changes. Researchers at IBM developed "adversarial debiasing," to identify and reduce machine learning model biases. As an opponent, a second neural network predicts race and gender from other data.

These strategies lessen AI biases, but more is needed. To ensure fairness and equality, developers and researchers must continually improve their algorithms. Diverse perspectives and talents must be used to construct AI systems without bias.

Justice and equality require addressing AI prejudices. System biases can be reduced via diverse training data and algorithmic changes. AI algorithms must be enhanced and diverse stakeholders included in development. These procedures are the only way to build fair, unbiased, and useful AI systems. Bias affects fairness and equality greatly. Biased loan and employment approvals hurt some communities. Retraining data biases in biased AI systems can reinforce prejudice and discrimination. This is unfair, unequal, and anti-inclusive. Many AI bias mitigation strategies have been developed to fix these issues and provide justice and equality. To reduce bias, use training data from diverse demographics and opinions and algorithmic adjustments. Case studies show these methods minimize bias.

4.3. Transparency in AI Systems

Transparency in AI algorithms is crucial. Users must comprehend how AI systems make life-changing judgments. Transparency helps consumers trust AI by showing how it processes data and draws judgments. Understanding the analytical mechanisms behind AI-based diagnostic and therapy suggestions might help people trust these technologies.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Transparency in AI systems is difficult. Non-experts struggle to understand AI algorithms' complex mathematical models. 44 Companies' confidential information restricts external stakeholders' ability to assess AI system fairness or bias. Potential solutions exist for these issues. Explainable AI models make underlying processes interpretable without losing accuracy or performance to explain their conclusions. Open-source platforms allow academics and developers from varied backgrounds to collaborate and improve transparency by sharing code and data. Building trust between consumers and AI systems requires transparency. Understanding the value of openness in AI algorithms helps us understand the problems of sophisticated algorithms and private information barriers. However, explainable AI models and open-source platforms may promote openness in this emerging industry.

4.4. Importance of Transparency in AI Algorithms

AI algorithms must be transparent to make decisions that are clear, explainable, and justified. AI systems are widely used in legal contexts for case law interpretation, evidence evaluation, and sentence recommendations, but their opacity raises ethical problems. Transparency lets AI judgments be checked for legality and fairness. Without transparency, legal experts and impacted parties may not understand or contest AI-driven conclusions, eroding legal system credibility. Thus, AI algorithm openness is essential to legal process integrity, justice, and accountability.

4.5. Challenges in Achieving Transparency in AI Systems

Transparency in AI systems, especially in law, is difficult. Many AI models, especially deep learning ones, are "black boxes" with complicated, non-linear processes that are hard to understand. This intricacy can make it hard for non-technical legal professionals to grasp decision-making. Moreover, proprietary algorithms, frequently protected by intellectual property regulations, may prevent corporations from disclosing their inner workings for fear of losing competitive edge. AI's constant learning and adaptability makes transparency much harder to maintain. These problems highlight the need for purposeful efforts and innovations to improve legal AI system explainability and accessibility.

4.6. Potential Solutions for Promoting Transparency in AI

There are numerous ways to handle legal AI transparency issues. Explainable AI (XAI) strategies attempt to simplify AI choices for humans. These methods may entail simplifying models, employing interpretable algorithms, or explaining difficult conclusions in simple terms. Standardized standards and norms that require openness in legal AI systems should be adopted to ensure that all stakeholders can understand AI judgments. Collaboration between legal experts, AI engineers, and ethicists may also bridge the gap between technological intricacy and legal application, assuring openness from the

start. Finally, regulatory measures that balance proprietary concerns and force corporations to publish their AI algorithms' logic and decision-making processes can help implement AI-driven legal systems' openness and accountability.

5. FINDINGS

5.1. Bias Mitigation in AI Systems

Understanding bias in AI systems is essential to understanding its effects. AI systems can have algorithmic biases that favour particular groups or data biases from skewed training data. These biases reinforce preconceptions and discrimination against vulnerable populations, affecting justice and equality. For everyone to be treated fairly, AI prejudices must be addressed. Not addressing these prejudices may lead to biased consequences that perpetuate social inequality. Real-world case studies of biased AI systems harming people highlight the significance of bias mitigation. Various methods are used to eliminate AI bias. These include collecting varied training data from various populations, adjusting algorithms to eliminate discrimination, and adopting transparency methods to uncover and correct biases. In this part, we examine AI system biases and their effects on justice and equality. We evaluate AI bias reduction methods using case examples to substantiate our claims. We seek to demonstrate the importance of bias mitigation in constructing fairer and more equal AI systems for a better future society by thoroughly covering these subtopics.

5.2. Accountability in AI Systems

A lack of legislation and legal frameworks limits AI systems, hence this part examines the necessity for accountability measures. It also suggests setting explicit developer, organization, and user norms, standards, and responsibilities. The ramifications of AI without accountability will be a major subtopic. AI systems become more independent and strong, raising the potential of misuse or damage. These systems might harm individuals and society without sufficient accountability. Thus, understanding and mitigating these risks via laws is essential. Lack of AI accountability regulations will be another subtopic. AI-specific legal frameworks are lacking. This legislative vacuum makes liability problems unclear and hinders developers' capacity to make AI systems transparent and fair.

Stakeholders in AI system development and usage should be given norms and obligations. By establishing roles and responsibilities for developers, organizations, and consumers, we may support ethical AI development via accountability. As society becomes more dependent on AI systems, accountability problems must be addressed. We can responsibly create and deploy AI technology while

limiting harm or misuse by investigating potential implications without effective controls, identifying regulatory loopholes, and providing clear stakeholder guidelines.

5.3. Potential Consequences of AI without Accountability Measures

AI without accountability might have far-reaching effects. Misuse or damage by AI systems is a big worry. These technologies may be used for evil without accountability measures, causing major ethical and societal issues. Unaccountable AI systems can discriminate based on race, gender, and socioeconomic position. This might worsen societal divides and inequities by perpetuating structural prejudices.

Without AI accountability legislation or legal frameworks, AI accountability is limited. There are no defined norms or criteria for developers, organizations, and consumers to utilize AI responsibly. Lack of monitoring allows system misuse and exploitation. Deepfake technology allows users to generate convincing fake movies and images to disseminate disinformation and malign innocent people. Without accountability, such technologies may damage reputations and public confidence.

Clear norms are needed to address these challenges and improve AI accountability. Transparent and impartial algorithms must be developed by developers. They should reduce biases in their models and guarantee that their systems do not discriminate or hurt disadvantaged people. Companies using AI should develop strong internal rules that prioritize ethics while using these technologies to ensure responsibility. This involves frequent audits and reviews to discover AI system biases or damage. Finally, by knowing how these technologies function and their hazards, consumers may help hold AI responsible. AI users may make educated judgments by learning about its limits and ethical consequences. AI without accountability might have serious effects that require rapid action. Clear norms, standards, and obligations for developers, organizations, and users are needed to prevent AI system exploitation and damage. In an increasingly AI-driven society, accountability systems may ensure that AI technology is utilized responsibly and ethically, preventing biases and prejudice.

5.4. Legal and Ethical Implications of AI Accountability

- **Legal Frameworks:** Governments from all across the globe are attempting to put in place legal frameworks that specify the obligations and liabilities of AI creators and users. Regulations addressing data privacy, discrimination, and responsibility in the event that an AI system malfunction may be among them.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

- **Ethical Considerations:** Encouraging a culture of accountability requires ethical concerns in addition to legal duties. This entails reducing biases, putting the welfare of people and communities first, and coordinating AI development with social ideals.
- **Impact on Society:** The wider societal effects of AI are also subject to accountability. Ethical evaluations comprise determining the ways in which AI systems advance economic justice, societal welfare, and general well-being.

6. CONCLUSION

Concerning the use of artificial intelligence in legal practice, there are a number of sophisticated and multidimensional ethical problems that arise, including bias, transparency, and accountability. According to the findings of the study, artificial intelligence (AI) has the ability to significantly improve legal procedures; yet, there is a major danger of prejudice and a lack of transparency, which poses serious concerns to fairness and justice. A complete set of bias mitigation measures and the installation of transparent artificial intelligence systems are required in order to address these opportunities. Furthermore, in order to prevent unfavourable ethical and legal repercussions, it is essential to ensure responsibility in artificial intelligence. The findings highlight the need of continuing efforts to improve artificial intelligence technology in a manner that preserves ethical norms, promotes justice, and improves faith in the judicial system.

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August 2024

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EXPLORING THE CONSEQUENCES OF GRADUAL PRIVATIZATION IN SPECIFIC SECTORS SUCH AS TELECOMMUNICATIONS, AVIATION, BANKING, AND POWER

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ABSTRACT

Privatization has emerged as a prominent economic policy tool globally, with India being no exception. This paper delves into the intricacies of privatization in the Indian context, focusing on the imperatives that drive the gradualist approach adopted by the government and the consequential impacts on various sectors and stakeholders. India's journey towards privatization has been characterized by a cautious and incremental approach, owing to the complex socio-economic landscape and the legacy of a mixed economy. The imperatives behind this gradualist strategy include the need to balance economic efficiency with social equity, address concerns about unemployment and inequality, and navigate political sensitivities. Examining the consequences of this gradualist approach reveals a mixed bag of outcomes. On one hand, privatization has led to increased efficiency, productivity, and innovation in sectors such as telecommunications, aviation, and banking. On the other hand, it has also raised concerns about job losses, inequality, and the concentration of wealth in the hands of a few. Furthermore, the paper explores the role of privatization in addressing fiscal deficits, improving service delivery, and attracting foreign investment. It also discusses the challenges and limitations associated with the process, including regulatory hurdles, corporate governance issues, and resistance from vested interests. In conclusion, while privatization in India holds the promise of unleashing economic growth and development, its success depends on striking the right balance between market forces and social objectives. A nuanced understanding of the imperatives and consequences of gradualism is crucial for shaping future privatization policies that are both effective and equitable.

Keywords- *Disinvestment, Privatization, PSU, Government*

INTRODUCTION

For nearly a decade since the onset of economic liberalization in India, a key component - privatization – remained dormant. The usual explanation has been that weak governments could not overcome the many vested interests, from rent seeking bureaucrats and ministers to public sector trade unions. In

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

addition, ideational resistance in India's elites has also been attributed to the virtual absence of privatization in India's economic reforms.

At last, Indian privatization emerged from the shadows. What does the current acceleration of privatization in India tell us about the strength of societal actors as well as the capacity of the state? This article contends that the protracted delay between the start of economic liberalization and privatization was not solely the result of "vested interests," but rather of institutional structures, particularly those ingrained in the court, parliament, and India's financial institutions. Nonetheless, there are two more instances in which the time variable has proved significant. For starters, the expanding domestic debt issue and the Indian state's fiscal problems have raised the opportunity cost of state-owned firms, just as the external debt crisis drove the first wave of economic reforms. Second, as time has gone on, India's conceptions of the role of the state as a "guardian of the public interest" and the relative efficacy of the state against markets in commercial activity have also seen substantial modifications. The extent to which privatization—*de jure* and particularly *de facto*—has been taking place in India is grossly underestimated by the privatization of state-owned firms. This includes the privatization of public spaces, education, and even bureaucratic processes that resemble privatization. We quickly review this problem and some of its consequences. Lastly, we provide some reflections on the path forward.

WHY GRADUALISM?

One dimension on which countries' privatization programs can be compared is the speed with which they are implemented. Some countries, like Argentina or the Czech Republic, implemented privatization programs rapidly, with large chunks divested within 3-5 years of launching the effort (Alexander & Corti, 1993). But the vast majority of countries, including India, have implemented privatization much more gradually, in fits and starts. Although many observers have complained about India's slow privatization, in fact gradual privatization is the international norm and rapid privatization is the exception (Ramamurti, 1999).

Firstly, India was not a probable candidate for rapid privatization because it did not meet the two prerequisites of a strong executive that could force reforms through and a serious macroeconomic crisis, particularly significant inflation. Numerous developing nations met one of these requirements; for example, Brazil and Turkey went through multiple periods of macroeconomic turmoil, but they did not privatize quickly. Even nations meeting both requirements, such as those in sub-Saharan Africa, either privatized gradually or not at all (Dia, 1992). A small number of Latin American nations and transitional economies—such as Argentina, Chile, Peru, the Czech Republic, Estonia, and others—met both requirements and privatized extensively and rapidly.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

To be clear, India was experiencing a balance of payments crisis and turned to the IMF for support when it started implementing significant economic change in 1991. However, the crisis was soon followed by ten years of strong economic growth, especially by Indian standards. While imports consistently outpaced exports, remittances and service exports increased to keep the current account deficit to an average of 1.1 percent of GDP between 1992–1993 and 2000–2001. India's GDP grew at an annual rate of 6.1 percent, while inflation averaged 7.1 percent (Acharya, 2002). The nation's foreign exchange reserves increased to \$55 billion by 2002 as a result of increased capital inflows. These outcomes were undoubtedly better than India's prior record and the record of the majority of other LDCs in the 1990s, even though they were not as impressive as the high-growth Asian economies in their heyday. Politicians have little motivation to ram through structural changes like privatization, which would encounter strong opposition from influential interest groups, given that fact.

Rapidly privatizing nations either did so in the face of extreme macroeconomic hardships, such as hyperinflation, declining GDP, and a dire balance of payments crisis, or they did so in the wake of a dramatic political upheaval that resulted in the overthrow of an existing regime (such as the fall of communism or a military dictatorship). Hard economic medicine was permissible in these conditions. Privatization was a handy means to raise foreign exchange, for example by selling state firms to foreign investors, and promote foreign direct investment (FDI) as part of that package of policies. It was also a way to control inflation by reducing the budget deficit (thereby restricting the monetization of the deficit). A protracted period of weak economic performance also culminated in the dire macroeconomic conditions. When President Menem took office in Argentina, for example, the government had already lost all credibility and was pursuing economic changes, which included extensive privatization. Central planning and state ownership were so despised in nations like the Czech Republic that broad privatization was politically highly acceptable. Conversely, the Indian economy endured decades of subpar performance but never had extremely high inflation or protracted periods of economic stagnation. Simultaneously, India's executive branch suffered during the 1990s.

Molano (1997) demonstrated that privatization was more likely in situations when the ruling party simultaneously held legislative authority, but his findings are only relevant to presidential systems. During the 1990s, governments were either coalitions with the ruling party never holding a majority on its own, or they had bare majorities. Menem had far more authority to enact laws in Argentina, even depending on presidential decrees for some of the most crucial measures. Both Prime Minister Klaus and President Havel had extremely broad mandates in the Czech Republic. They had an ideological commitment to privatization, which was equally significant. On the other hand, it makes sense that

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

development was sluggish in India given its democratic environment and numerous institutional restraints. Moreover, a large portion of the Indian political spectrum only reluctantly supported the liberalization program.

As a result, there was a reluctance to publicly criticize prior policies or to persuasively and clearly explain why changes were necessary, even in the face of numerous changes in regulations and policies as well as a less antagonistic relationship between business and government. Too many times, reforms were implemented covertly (Jenkins, 1999). A lack of confidence resulted in a failure to effectively "market" reforms to the electorate. While certain officials and ministers may have taken this action, no prime leader has been willing to address the public and explain why this is the course of action that must be taken. India's privatization was therefore progressive.

ESCALATING COMMITMENT

Initially, the deregulation initiative gradually expanded the role of the private sector in the economy. The state's direct production of goods and services has decreased, partially due to intentional reductions and partially as a result of the financial strain on the state. This has started with manufacturing and progressed to services, infrastructure, and now even the social sector. Saying that the public's, and especially the elite's, opinion of the private sector is as positive today as it was forty years ago, and vice versa, may not be overly dramatic. It would not have been feasible even ten years ago to consider privatization, but the shift in public sentiment has made it more feasible. Second, and perhaps most crucially, the government's privatization initiative started out as a divestment program with the sole intention of lowering government shares by up to 20% in order to collect money to close the budget deficit. Accordingly, the program was labeled "disinvestment" and the term "privatization" assiduously avoided. The next stage of escalation was raising the amount that would be divested to 49 percent. Since this would still leave the government with majority ownership, the fundamental character of the enterprise would be unchanged, while on the other hand even more resources could be mobilized to plug the budget deficit, which at the onset of the reforms exceeded 9 percent of GDP. In the next stage, the government decided that it would sell up to 74 percent of the equity, since that would leave it with 26 percent—a level high enough to give it a strong voice in the enterprise, though not a controlling voice. Finally, outright divestment became acceptable, initially for loss making enterprises and later even for profitable enterprises. Thus, the government escalated its commitment from merely privatizing *ownership* to privatizing *control*. And during the 2000-01 budget debate, Finance Minister Yashwant Sinha actually used the term "privatization" to describe the government's program for reforming SOEs.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

A third dimension along which the government's commitment to privatization expanded was in the sectors in which firms could be sold. The term "strategic" was frequently used to describe those state-owned enterprises (SOEs) that the government intended to retain control over the long term. But the definition of "strategic" became progressively tighter, so that the number of SOEs that could be divested expanded. Initially, for instance, the Ministry of Petroleum argued that oil companies were strategic, but by 2000 the cabinet committee on disinvestment had classified it as non-strategic. Eventually, only nuclear power, defense and railroads were left in the strategic category, and everything else was eligible for privatization. And even in the last two, greater deregulation and outsourcing of activities is increasing the role of the private sector. To be sure, the debates on which sectors were strategic were contentious, but they ended with progressively narrower definitions, even though the party in power changed thrice. Although there has been a noticeable increase in the commitment to privatization after the BJP-led governments came to power, there has been more continuity than discontinuity in the privatization program.

Finally, the restrictions on the buyers also progressively declined. Initially the auction of shares was restricted to public financial institutions that over time were expected to offload them to private investors. By 1996 equity was being offered to foreign institutional investors. This followed three concomitant trends—the willingness of the government to sell SOEs to "strategic investors," that is, to private investors who would own a large block of shares (not necessarily 51 percent) and would enjoy management control, the liberalization of rules governing foreign direct investment, and the opportunity to list Indian firms on foreign stock exchanges through ADRs and GDRs. Thus, potential buyers of Air India included Singapore Airlines in partnership with the Tatas, and Air France in partnership with a local Indian group, while foreigners owned portions of VSNL and MTNL through ADRs traded on the New York Stock Exchange.

IMPLICATIONS OF GRADUALISM

Therefore, it is evident that India's methodical approach to privatization did, in fact, result in a stronger commitment to it. First, we will look at the ramifications of the gradual approach, and then we will address the subject of how gradual privatization might be hastened. Its drawbacks, which are genuine and significant, are often highlighted by international organizations such as the World Bank (see, for instance, World Bank 2014). However, they fail to consider the possible benefits of a phased privatization.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

Disadvantages

Slow privatization has the drawback of giving program opponents more time to plan their opposition, which can cause the program to move more slowly. Workers, labor unions, government officials, clergy, and opposition party members are typically considered opponents. Institutional issues also played a significant role, as we will explain later, even if there is evidence in the Indian example that such opposition slowed down the privatization initiative. Such opposition may finally cause the program to fail altogether, turning gradualism into inaction. Opponents of the program can easily derail it with any mistake made by the government. This was the case in 1992 when the first block of shares in SOEs was sold to government-owned mutual funds and was involved in a major financial scandal known as the "Harshad Mehta scam," and again in the mid-1990s following the disastrous auction of telephone licenses. There was a pause in privatization after each of these errors (see to Table 1). Only three fiscal years since 1991–1992 have seen divestment proceeds surpass the budgetary target (1991–1992, 1994–1995, and 1998–99). It is crucial to note, though, that merely hitting goals is not that significant, as this could be accomplished through distress sales and subpar hiring practices, both of which have detrimental long-term effects. From the below table disinvestment target vs receipts are given for following ten years.

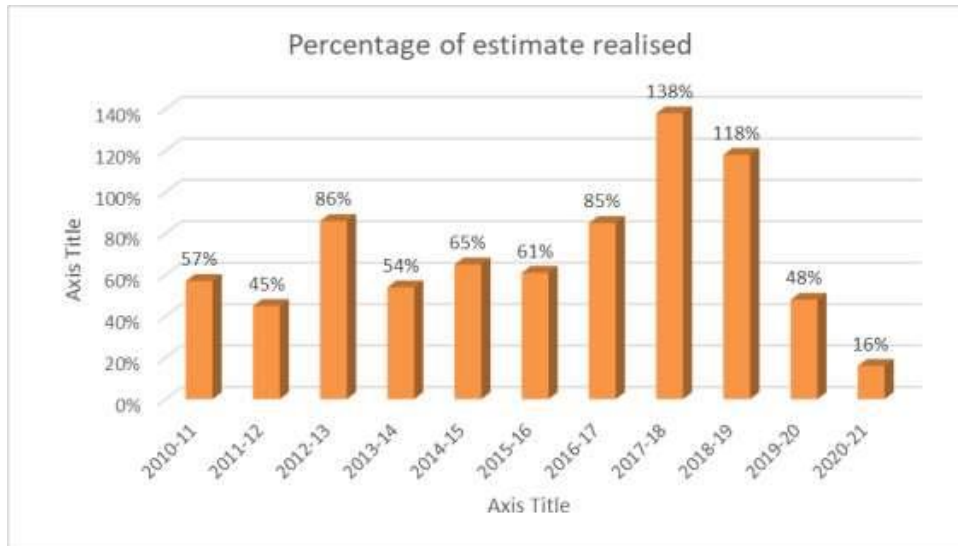
Disinvestment targets vs receipts (2010-21)			
Year	Budget Estimate	Actuals	Percentage of estimate realised
	(in Rs crore)	(in Rs crore)	
2010-11	40,000	22,846	57%
2011-12	40,000	18,088	45%
2012-13	30,000	25,890	86%
2013-14	54,000	29,368	54%
2014-15	58,425	37,737	65%
2015-16	69,500	42,132	61%
2016-17	56,500	47,743	85%
2017-18	72,500	1,00,045	138%
2018-19	80,000	94,727	118%
2019-20	1,05,000	50,304	48%

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

2020-21	2,10,000	32,886	16%
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Source: Actuals for 2020-21 taken from Controller General of Accounts



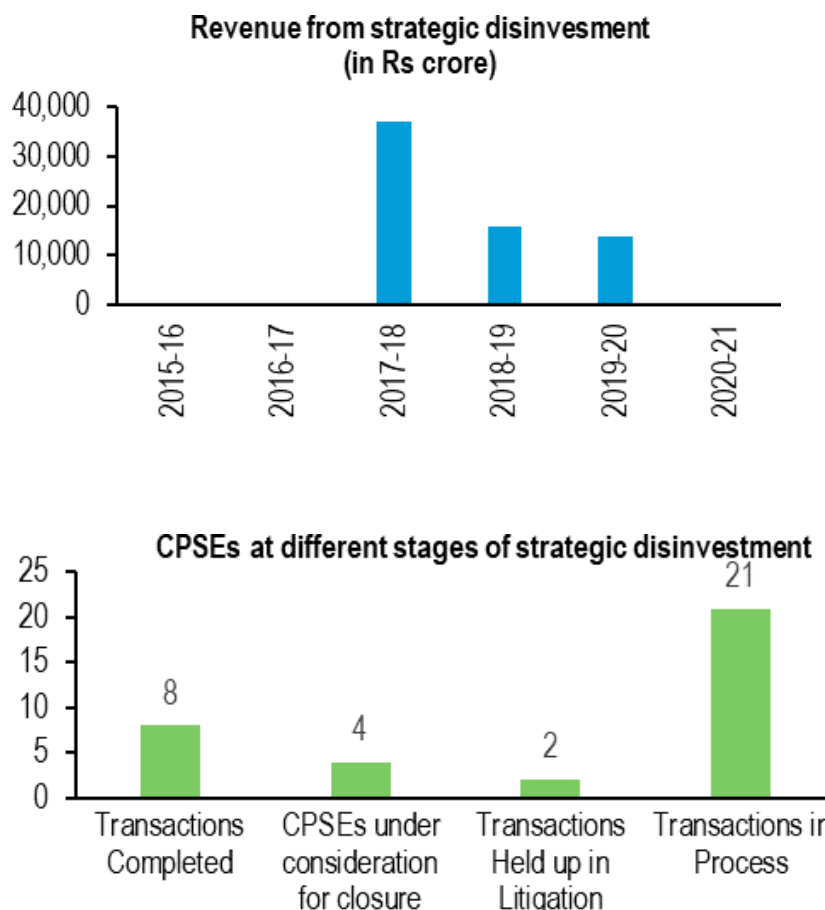
1. **Variance in Targets and Actuals:** There is a significant variance between the budget estimates (disinvestment targets) and the actual receipts for most years. For example, in 2017-18, the actual receipts surpassed the target by 38%, while in 2020-21, they fell short by 84%.
2. **Inconsistency in Achievement:** The percentage of estimate realized fluctuates widely across the years, indicating inconsistency in achieving the set targets. For instance, in 2012-13, 86% of the target was achieved, whereas in 2019-20, only 48% was realized.
3. **Trend Analysis:** Over the years, there seems to be a mix of years where the actual receipts exceed the targets (such as 2017-18 and 2018-19) and years where they fall significantly short (like 2020-21).
4. **Impact of Economic Conditions:** Economic conditions and market factors likely play a significant role in the achievement of disinvestment targets. Years with favorable economic conditions might see higher receipts, while downturns could lead to lower-than-expected disinvestment proceeds.
5. **Policy Implications:** The government may need to reassess its disinvestment strategies and policies based on the observed performance. It could involve more proactive measures during years of underperformance and prudent management during years of overachievement.
6. **Need for Realistic Targets:** Setting realistic and achievable disinvestment targets is crucial to maintain credibility and transparency in fiscal planning. Unrealistic targets can lead to skepticism among investors and stakeholders.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Overall, the data highlights the importance of continuous monitoring and adjustment of disinvestment strategies to ensure alignment with fiscal goals and economic realities.

Strategic disinvestment has not involved privatisation and has been affected by delays

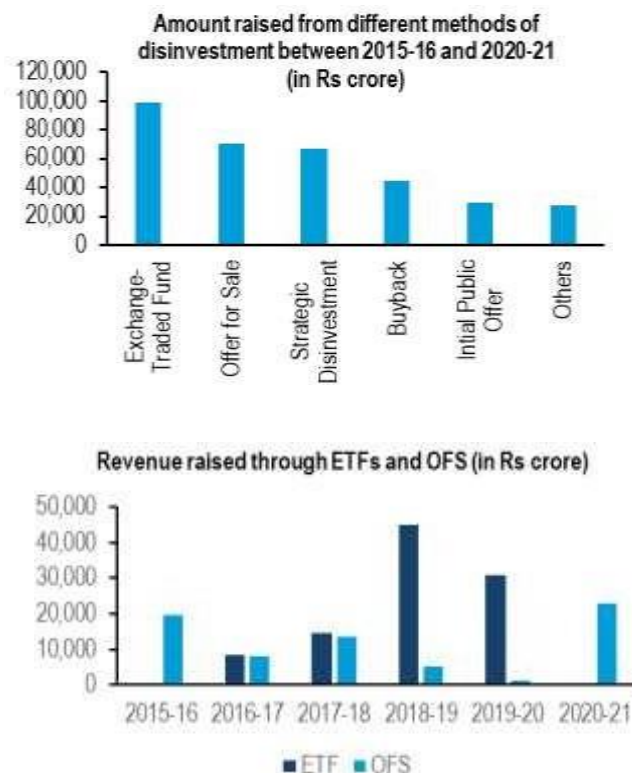


Note: Includes Air India. Does not include IDBI Bank which was cleared for strategic disinvestment in May 2021.

- Strategic disinvestment involves sale of a substantial portion of the government's shareholding in a CPSE (up to 50% or more) along with transfer of management control.
- In the last six financial years, all the transactions where the government sold more than 51% of its shareholding in CPSEs, along with transfer of management control, have involved another CPSE picking up the government's stake. In 2017-18, the government raised Rs 36,915 crore from the sale of HPCL to the state-owned Oil and Natural Gas Corporation Limited. Similarly, in 2018-19, the government received Rs 14,500 crore from the sale of REC Limited to Power Finance Corporation Limited which is another state-owned company in the power sector.
- Several strategic disinvestment transactions have been in the pipeline for a long time. For instance, sale of Bharat Petroleum Corporation Limited, approved in November 2019, is

yet to be concluded.

Exchange-traded funds have brought the maximum disinvestment receipts for the government

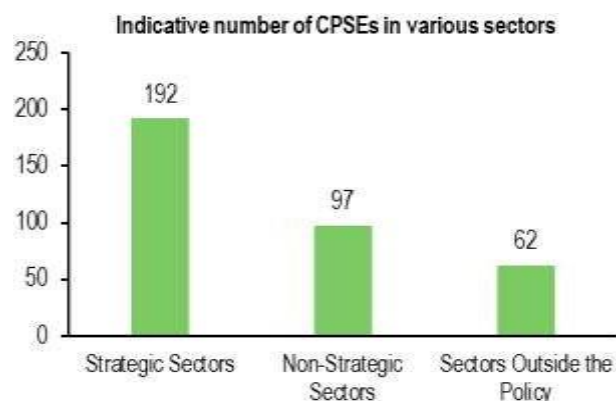


- The government uses various methods for disinvestment. In the last six years, the most significant modes of disinvestment have been exchange-traded funds (ETFs), offer-for-sale (OFS), strategic disinvestment, buybacks, and initial public offer (IPO).
- An ETF is a basket of stocks. The government has two primary ETFs: (i) CPSE-ETF and (ii) Bharat 22 ETF. Between 2015-16 and 2020-21, the government raised the maximum disinvestment receipts from ETFs.
- OFS involves the sale of government's shareholding in listed CPSEs in the stock market. However, even this has involved CPSEs buying significant stake in other government companies. For instance, in 2015, Life Insurance Corporation of India (LIC) picked up 45% of a 10% OFS in Coal India Limited. In March 2013, LIC bought 71% of 5.82% stake sale in Steel Authority of India Limited.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

New Public Sector Enterprise (PSE) Policy aims to privatise CPSEs across sectors



- According to the new PSE policy, the central government has divided most sectors into strategic and non-strategic.
- In strategic sectors, the government will maintain a bare minimum presence. The remaining entities will be considered for privatisation, merger, subsidiarisation or closure. Sectors categorised as strategic include: (i) atomic energy, space and defence, (ii) transport and telecommunication; (iii) power, petroleum, coal and other minerals, and (iv) banking, insurance, and financial services.
- CPSEs in non-strategic sectors will be either privatised or closed.
- Certain sectors such as development financing/refinancing institutions, major port trusts, and CPSEs providing support to vulnerable groups have been kept out of the framework.

Financial Year 2023-2024						
S. No	Title	Name of CPSEs	% of GoI's Shares Disinvested	Method of Disinvestment	Receipts in Rs. Crore)	GoI's Shareholding Post Disinvestment
1	Others (Remittance from SUUTI)	Others (Remittance from SUUTI)	0	OTHERS	1810.33	0

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

2	HINDUSTAN AERONAUTICS LTD.	HINDUSTAN AERONAUTICS LTD.	0.01	EMP OFS	9.3	71.64
3	COAL INDIA LTD.	COAL INDIA LTD.	3	OFS	4185.31	63.13
4	COAL INDIA LTD.	COAL INDIA LTD.	0	EMP OFS	0.379	63.13
5	RAIL VIKAS NIGAM LTD.	RAIL VIKAS NIGAM LTD.	5.36	OFS	1365.61	72.84
6	RAIL VIKAS NIGAM LTD.	RAIL VIKAS NIGAM LTD.	5.36	EMP OFS	0.0024	72.84
7	SJVN LTD.	SJVN LTD.	4.92	OFS	1348.47	55
8	SJVN LTD.	SJVN LTD.	0	EMP OFS	0.8	55
9	HOUSING & URBAN DEV. CORPN. LTD.	HOUSING & URBAN DEV. CORPN. LTD.	6.64	OFS	1049.95	75.17
10	INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY LTD.	INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY LTD.	10	IPO(O.F.S portion of 10%)	858.36	75
11	IRCON INTERNATIONAL LTD.	IRCON INTERNATIONAL LTD.	8	OFS	1191.13	65.18
12	IRCON INTERNATIONAL LTD.	IRCON INTERNATIONAL LTD.	0.01	EMP OFS	2.09	65.17
13	NHPC LTD.	NHPC LTD.	3.5	OFS	2452.59	67.45
14	NHPC LTD.	NHPC LTD.	0	EMP OFS	35.86	67.45
15	HOUSING & URBAN DEV. CORPN. LTD.	HOUSING & URBAN DEV. CORPN. LTD.	0.17	Open Market Sale	68.47	75

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

16	NLC INDIA LTD.	NLC INDIA LTD.	7	OFS	2128.64	72.2
Total Sum					16,507.29	
<u>NI</u>						
<u>NL</u>						
NOTE 1: NINL was a Joint Venture company, in which 4 CPSEs namely MMTC, NMDC, BHEL and MECON and 2 State PSUs of Odis						
NOTE 2: The highest bid of M/s Tata Steel Long Products Limited for 93.71% of shares of Joint Venture partners of 4 CPSEs and 2 O						

Above table provides details of the disinvestment activities for the financial year 2023-2024, including the percentage of Government of India's (GoI) shares disinvested, the method of disinvestment, receipts generated, and the GoI's shareholding post-disinvestment. Here are the conclusions that can be drawn from the provided data:

Diverse Methods of Disinvestment: The disinvestment has been carried out through various methods such as Offer for Sale (OFS), Employee Offer for Sale (EMP OFS), Initial Public Offering (IPO), and Open Market Sale. This indicates a strategic approach to divestment, leveraging different mechanisms based on the nature of the CPSEs and market conditions.

Significant Receipts Generated: The total receipts generated from the disinvestment activities amount to Rs. 16,507.29 crore. This signifies a substantial inflow of funds to the government, which can be utilized for various developmental and fiscal purposes.

Reduction in GoI's Shareholding: The disinvestment resulted in a reduction in the Government of India's shareholding in the respective CPSEs. This indicates the successful execution of the government's divestment strategy to reduce its stake in public sector enterprises.

Focus on Key Sectors: Sectors such as coal, railways, housing and urban development, renewable energy, and infrastructure are targeted for disinvestment. This suggests a strategic approach to divestment, potentially aimed at enhancing efficiency, competitiveness, and private sector participation in these sectors.

Importance of Employee Participation: Employee Offer for Sale (EMP OFS) is utilized in some cases, ensuring employee participation in the disinvestment process. This can foster a sense of ownership among employees and align their interests with the company's performance and growth.

Continued Use of Various Disinvestment Channels: The use of different disinvestment channels like OFS, EMP OFS, IPO, and Open Market Sale reflects the government's flexibility in adopting

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

diverse strategies to achieve its disinvestment targets efficiently.

In summary, the data indicates a well-structured and diversified approach to disinvestment, resulting in significant receipts while strategically reducing the government's stake in key public sector enterprises.

However, the Indian experience appears to have been different, because the period leading to privatization was marked by considerable policy uncertainty. Unlike Prime Minister Thatcher, who announced unambiguously her intention to privatize state enterprises outright, Indian prime ministers pursued privatization in small doses and almost by stealth, as discussed earlier. Therefore, neither the government, nor supervising ministers, nor the chief executives of SOEs had a clear mandate on what was to be accomplished in the run-up to privatization. Since the government was officially only looking to divest minority equity in these companies or to retain a loud if not controlling voice after disinvestment, managers of the firms also behaved as if the changes expected of them were incremental and marginal. The most important reform that gathered steam was initiatives to downsize the workforce through generous voluntary retirement schemes.

The fact that gradualism undermines investor trust in buying SOEs or their shares is a third drawback of the strategy. How to value SOE shares is a crucial question for investors. Investors value companies more if they think the government will eventually privatize authority over them; typically, they do this by applying standards that apply to private companies. However, they worry that the interests of minority private shareholders would be disregarded if they believe that the government wants to maintain control or a strong voice over SOEs (Boardman & Vining, 1989). Gradual privatization lowers the secondary market price of SOEs' stocks since it indicates a government's apparent reluctance to relinquish control over them. In the Indian case, the government's credibility with private investors was considerably weakened when in 1998-99 large blocks of government equity in state-owned oil companies were sold to other oil companies.

From the foregoing, it can be seen that gradual privatization runs the danger of reducing the returns to the government from privatization, as investors may value SOEs less when they perceive a "government-control discount," and SOE performance may worsen in the lead-up to privatization. When privatization happens too quickly, like in Argentina, assets are sold under "fire sale" terms, which can reduce government revenue. However, slow privatization is also an option. The ideal duration of a privatization program might be five years from the point of view of optimizing proceeds to the Treasury. The privatization initiative in India gained traction more than a decade after it was first introduced.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Advantages

Gradualism has its advantages. It increases the likelihood that other efficiency- enhancing reforms, such as competition and deregulation, will be implemented before or alongside ownership changes. It gives policy makers time to build support for and consensus on privatization. And it provides the opportunity for policy makers to incorporate lessons from earlier rounds of privatization in later rounds. To be sure, none of these advantages of gradualism are automatic, in the sense that merely delaying privatization does not guarantee their realization. In the Indian case, the benefits were realized, despite changes in governments, because of two structural factors.

The first structural factor was the government's high budget deficit, running through the decade at 5-7 percent of GDP, which put constant pressure to raise additional resources. Therein lay privatization's universal appeal to finance ministers—it held the prospect of turning money-sucking SOEs into money contributors. Thus, every finance minister projected some revenues from privatization each year. The other structural factor promoting privatization was globalization. India had committed to opening up the economy, especially after the Uruguay Round, and steps had to be taken to modernize SOEs and promote private investment in the economy. Once again, privatization was seen as part of the answer. For these two structural reasons, every government in the 1990s, regardless of ideology, took incremental measures to privatize SOEs. Thus, Narasimha Rao's Congress government issued the initial policy statement on disinvestment, the Janata Dal government constituted the Disinvestment Commission, the NDA replaced the Commission with a Department of Disinvestment and a Cabinet Committee on Disinvestment, and so on.

The most important advantage of gradual privatization was that it afforded time to implement policy reforms that complemented privatization—reforms that countries privatizing in a rush generally did not implement or implemented poorly. The experiences in Eastern European countries and the former Soviet Union where many western advisers encouraged these countries to privatize firms quickly under the assumption that market institutions would develop once firms were privately owned, proved painfully erroneous. The consensus now is in favor of establishing an institutional framework conducive to promoting competition before privatizing firms. In a recent study focused on the telecommunications sector Wallsten (2002) found that countries that established separate regulatory authorities prior to privatization saw increased telecommunications investment, fixed telephone penetration, and cellular penetration compared with countries that did not. He also found that investors were willing to pay more for telecommunications firms in countries that established a regulatory authority before privatization. This increased willingness to pay is consistent with the hypothesis that

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

investors require a risk premium to invest where regulatory rules remain unclear. We will illustrate the point about the importance of reforms that complement privatization with three examples: reforms that deregulated sectors in which Indian SOEs operate, reforms that phased out subsidies in industries dominated by SOEs (e.g. oil), and reforms that downsized the workforce in SOEs. In theory, all of these reforms can and should be done simultaneously with privatization, but countries that privatized quickly usually struggled to implement these complementary policy reforms for several years after privatization. We would argue that implementing such reforms after privatization can be very difficult, because the new private owners of SOEs will view such reforms as changing the “rules of the game” after the fact. In several Latin American countries, SOEs were privatized first and deregulation of their sectors was postponed to a future time, because SOEs could be sold more quickly—and for a higher price—if they were sold as monopolies (for examples from telecommunications and transport, see Ramamurti 1996). Experience has shown that private owners will fight deregulation later on, making it harder to create effective competition in the long run. This carries a substantial social cost, because competition spurs productivity gains more effectively than ownership changes per se (Yarrow 1992). Gradualism increases the likelihood that competition-enhancing policies will be implemented prior to privatization.

This is not to say that gradualism is a prerequisite for labor downsizing. Argentina, which privatized rapidly, sharply downsized the SOE workforce in railroads, for instance, prior to privatization, but it did not do so in the case of telecommunications, its first major privatization. But without the macroeconomic crisis that he was purportedly fighting, President Menem would probably not have been able to take on the unions. Likewise, President Salinas of crisis-ridden Mexico confronted unions early on to pave the way for labor downsizing and privatization. In the absence of an economic crisis, and with prime ministers who were much less powerful than presidents of countries like Argentina or Mexico, labor could not have been downsized rapidly in Indian SOEs. Had privatization somehow been implemented rapidly in the Indian case, almost surely it would have resembled the Malaysian approach, wherein SOEs were sold with the condition that workers would not be fired for five or more years (Jomo, 1995). The result then is ownership change with limited improvement in labor productivity.

ACTORS AND INTERESTES

Most analysis of the political economy of privatization puts the onus on the nexus of self-interested rent-seeking politicians, bureaucrats and labor unions. The politician-bureaucrat nexus has long been viewed as a critical actor that seeks to block reforms that undermine its rent-seeking capacity. There

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

is little doubt ministers, who would stand to lose the many benefits of departmental enterprises, have repeatedly tried to scuttle disinvestment of PSUs under their administrative charge and this has also been the case with the current government. Sharad Yadav, as Civil Aviation Minister scuttled the sale of Indian Airlines and in the case of IPCL and Hindustan Zinc Ltd (HZL) the two concerned ministers (Ram Naik and Ram Vilas Paswan) allegedly tried till the very end to put a spanner in the works. In IPCL's case, ONGC which was legally bound to supply the firm with gas until 2006 irrespective of ownership, suddenly changed its position when the IPCL sell-off process began. This despite the fact that the same ministry supervised both ONGC and IPCL and 14 months earlier the cabinet secretary had met the petroleum secretary and they had decided that ONGC would abide by the contract. But when the sale deadline neared the government did not have a formal assurance and Naik cited the possible non-availability of gas to IPCL to try and postpone the sell-off. Paswan insisted until the last minute that HZL should not be sold off until a 'control premium' was added to the overall price. Minister for heavy industry, Manohar Joshi, (now Speaker) had been unwilling to let go the control of some of the companies under his ministry, including Maruti Udyog Ltd. He raised objections claiming that Maruti would seek recourse to component imports at the expense of domestic automobile component manufacturers. And Joshi like virtually all Ministers who want to delay sales, justified his opposition on the grounds that a delay would result in better valuation and they were simply trying to safeguard workers' interests. On two occasions the Minister stalled critical meetings claiming the file on Maruti's divestment had been "misplaced".

INSTITUTIONAL CONSTRAINTS

Political compulsions, fiscal and market realities are necessary but not sufficient conditions for economic policy change to occur. While the gradualism that underlay India's economic reforms also characterized privatization, a combination of leadership and institutional factors accelerated the process. In Arun Shourie the government had a privatization minister who was not just unabashed about the case for privatization, but a strong champion. The combination of self-confidence and pecuniary integrity led to perhaps the most transparent procedures of a major government program being put into place. From the selection of advisors to the final selection of the strategic partner, open competitive bidding has been the norm. Once transactions are completed, all files are handed over to the Comptroller and Auditor General's office.

Still, this does not necessarily mean that the greater influence of the Indian courts is a good thing. The Indian court system's unusual generosity—a Trojan Horse with far-reaching political, social, and economic ramifications—has been its predilection for stay orders. The opportunity costs of delay are

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

especially high on economic matters because of the disconnect between the speed at which market forces act today and the pace at which judges render decisions.

The challenge was both legal and political in that a state government was frontally taking on the federal government on matters that concerned central PSUs. Ironically, the challenge was the best thing the opponents of privatization could have done for accelerating the program. In December 2002 a three-judge Bench of the Supreme Court not only upheld the sale, but in a landmark decision unequivocally silenced the critics. More importantly, in laying down far-reaching principles that will influence the tenor of jurisprudence on economic affairs, the significance of the judgement far transcended the specifics of the BALCO transaction.

THE “PRIVATIZATION” OF THE INDIAN STATE ?

Up until now, the conversation has concentrated on a limited interpretation of "privatization," which is the lawful transfer of state assets into private hands. Even while this has only partially occurred thus far, it is increasing. But in a looser sense, the Indian context has seen a significant increase in the power of privatization. The trends are clear-cut: they include the privatization of public space through the rise of gated communities, the expansion of private social service providers, the expansion of private security services, the replacement of public transportation with private modes, the privately appropriated use of public assets, such as in the power industry, and the "sale" of public employment. With their own electricity, water, and sewage infrastructure, private townships and buildings have left the public sector. There has been an increase in the outsourcing of government labor to private organizations as the state is unable to obtain work from its own workforce. The finance ministry in Delhi has outperformed itself when it comes to maintaining its restrooms, whereas the public works department in Hyderabad and Chennai has privatized street cleaning. Even security is being supplied by private security companies in many of Delhi's bhavans. Local committees in Madhya Pradesh have taken control of the management of government hospitals, reportedly with substantial improvements in service. Laws and bills are also being outsourced. Outsourced to a private law firm (Nitish Desai Associates), with consulting inputs from CRISIL, the development of 'The Andhra Pradesh Infrastructure Development Enabling Act, 2001'—arguably a milestone piece of infrastructure-enabling legislation—was done. An rising number of previously public limited corporations are delisting from stock exchanges and going private! Elites in India are leaving the public sector, which is a development that can be both good and bad. They are advantageous in that they take up less of the limited public resources. Negative in that the state is even less motivated to perform when the powerful go.

Conclusion

In conclusion, the journey of privatization in India has been marked by a cautious and gradualist approach, driven by a combination of imperatives and constrained by various factors. The imperatives behind this strategy include the need to balance economic efficiency with social equity, address concerns about unemployment and inequality, and navigate political sensitivities. However, this gradualist approach has faced significant challenges, including resistance from vested interests, regulatory hurdles, and fiscal constraints.

Despite these challenges, privatization in India has yielded both advantages and disadvantages. On the positive side, it has led to increased efficiency, productivity, and innovation in sectors such as telecommunications, aviation, and banking. It has also generated significant revenues for the government, which can be utilized for developmental purposes. However, privatization has also raised concerns about job losses, inequality, and the concentration of wealth, highlighting the importance of addressing social implications alongside economic gains.

Moreover, the data presented underscores the importance of continuous monitoring and adjustment of disinvestment strategies to ensure alignment with fiscal goals and economic realities. While various methods of disinvestment have been employed, including offer for sale, employee offer for sale, initial public offerings, and open market sales, the government needs to reassess its strategies based on observed performance and market conditions.

Furthermore, the broader trend of privatization extends beyond the transfer of state assets to private hands. It encompasses the privatization of public space, provision of social services, security services, and even public jobs, reflecting a larger transformation in the Indian landscape. While this trend may alleviate some pressures on the state, it also raises concerns about equity and accountability in service delivery.

In navigating the complexities of privatization, it is crucial for policymakers to strike a balance between market forces and social objectives, ensuring that economic gains are accompanied by inclusive growth and equitable distribution of benefits. Moreover, institutional transparency, procedural integrity, and leadership commitment are vital for legitimizing privatization efforts and building public trust in the process. Ultimately, a nuanced understanding of the imperatives, challenges, and consequences of privatization is essential for shaping future policies that promote sustainable development and social well-being in India.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

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IMPACT OF DIGITAL MARKETING ON CUSTOMER PURCHASING BEHAVIOUR

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ABSTRACT

This research explores the transformative impact of digital marketing on consumer purchasing behaviour, with a particular emphasis on the Punjab region. To remain competitive in today's digitally driven economy, businesses must comprehend the subtle ways that digital marketing influences client decisions. This study sheds light on the extent to which consumers are aware of various digital marketing strategies, including Pay per click, email marketing, social media marketing, search engine ad, and SEO, and how that awareness influences their purchasing decisions.

The study shows how brand loyalty is increased, consumers are informed and persuaded, and overall customer satisfaction is increased through the use of digital marketing. The study demonstrates the intricate relationship between exposure to digital marketing and its noticeable effects on consumer behaviour through the gathering and analysis of consumer data from Punjab. The findings emphasise how crucial it is for businesses to create targeted digital marketing strategies that deeply connect with local clients and take into consideration their cultural peculiarities and preferences.

This study significantly advances existing knowledge by examining the effects of digital marketing within a specific geographic area. It offers valuable information to businesses and marketers in Punjab that want to enhance their strategies. The knowledge gathered from this research is well-positioned to help companies navigate the challenges of digital customer engagement in the fiercely competitive digital market.

INTRODUCTION

Businesses today employ Integrated Marketing Communications (IMC) to integrate their marketing and promotion activities in order to stay competitive in the ever-changing market. In the 1980s,

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August 2024

businesses began to realise how important it was to have coordinated promotions, and as digital technology advanced, so did the demand for IMC (Andrée W. Fawcett, 1994).

Integrated Marketing Communications (IMC) emerged as businesses shifted from traditional media advertisements to a more all-encompassing strategy. To create a unified and powerful brand message, integrated marketing communications (IMC) integrates public relations, sales promotion, and direct marketing (Don E. Schultz, 1993). IMC is described by the "4A's" as a strategy that assesses the functions of different communication channels to produce a cohesive marketing plan.

Digital marketing emerged as a key element of the IMC strategy as technology developed, especially with the spread of the internet. Significant alterations in media consumption, lifestyle decisions, and consumer behaviour were the driving forces behind this development. For example, audiences for conventional media started to become fragmented with the introduction of cable TV, digital satellite systems, and 24-hour retail channels. These platforms and the expansion of the internet gave marketers new ways to connect with customers via digital channels (Robert H. Ducoffe et al., 1996).

According to Zeisser (1996), digital marketing is the process of promoting goods and services using electronic or digital media. This strategy makes use of a range of digital technologies, including social media, websites, mobile devices, and search engines, to establish tailored relationships between companies and their clientele (Bird, 2007). Digital marketing, as opposed to traditional marketing techniques, allows for real-time connection and engagement. This lets companies target certain demographics with their messaging and quickly assess the success of their campaigns.

Digital marketing has a significant effect on consumers' purchasing decisions. Businesses need to modify their marketing tactics to align with the evolving tastes of customers who are increasingly depending on digital platforms to guide their purchase decisions. By offering customers experiences and material that is valuable, digital marketing integrated into IMC not only expands the reach and relevancy of promotional activities but also strengthens customer relationships.

Digital marketing has, in short, revolutionised the way companies interact with their clientele. Through the integration of digital technologies and the concepts of integrated marketing communications (IMC), businesses may develop a more consumer-focused marketing strategy that connects with customers more deeply and ultimately shapes their purchasing decisions.

LITERATURE REVIEW

Digital technologies have completely changed marketing by changing the way businesses interact with their clients and shape their purchasing decisions. A major component of this change, digital marketing is becoming more well-known for its quantifiable outcomes, tailored content, and worldwide reach.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

This study of the literature looks at the development of digital marketing, its essential elements, and how it affects customer behaviour.

Early email and internet advertisements marked the beginning of digital marketing. With businesses realising the potential of the internet to reach clients, the phrase "digital marketing" was first used in the late 1990s (Zeisser, 1996). Over time, it has broadened to encompass a range of platforms and tactics, such as search engine optimisation (SEO), social media marketing, email marketing, mobile marketing, and content marketing (Bird, 2007).

According to Chaffey and Smith (2013), social media and smartphones have changed the way customers connect with companies, leading to the development of new marketing techniques that emphasise interactive and personalised experiences. The proliferation of mobile devices and rising internet usage are directly related to the rise of digital marketing.

Businesses may interact with clients on social media sites like Instagram, LinkedIn, Facebook, Snapchat, and YouTube by using social media marketing. Through content sharing and targeted advertising, it influences customer behaviour and fosters brand loyalty (Kaplan & Haenlein, 2010). According to research, social media interactions have a big impact on consumers' perceptions of companies and their purchasing decisions (Mangold & Faulds, 2009).

Digital marketing has a wide-ranging and profound impact on consumers' purchase decisions. Through digital marketing channels, businesses can collect a mountain of data about consumer preferences, habits, and interactions, which enables them to more accurately target and customise clients. Consequently, there is a greater likelihood of a sale and a better client experience (Lambrecht & Tucker, 2013).

The power of digital marketing lies in its ability to sway consumers at different points throughout the purchasing process. Customised internet advertisements can increase customer awareness of a product or brand, and informative information aids in decision-making (Court et al., 2009). Furthermore, following up with customers via social media, loyalty plans, and emails improves brand loyalty and promotes repeat business (Edelman & Singer, 2015).

Digital platform user evaluations and testimonials, or social proof, have a big impact on consumers' purchasing decisions. Studies reveal that consumers place greater faith in peer or customer recommendations than in traditional advertisements (Cheung & Thadani, 2012). This emphasises how crucial it is to actively engage the target audience on digital media and manage one's online reputation.

RESEARCH OBJECTIVES

1. To study and analyse the level of consumer awareness regarding Digital Marketing in Punjab.
2. To study the Impact of Digital Marketing Decision of customer in Punjab.

RESEARCH METHODOLOGY

The purpose of the study was to evaluate how digital marketing affected customer behaviour while making purchases. Through the use of stratified sampling, 300 respondents—100 samples from each of the three Punjabi areas of Majha, Doaba, and Malwa—were chosen. Data on customer reactions to digital marketing was gathered using the descriptive survey approach.

The data were summarised using descriptive analysis. ANOVA and t-tests were used to assess how purchase patterns varied by location in response to digital marketing. The influence of digital marketing on customer purchase behaviour was investigated using correlation analysis.

RESULT AND DISCUSSION

Table 1: ANOVA for Influence of Online Reviews on Purchasing Decisions by Gender

Descriptive								
How often do online reviews or recommendations influence your purchasing decisions?								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	158	4.7658	.42483	.03380	4.6991	4.8326	4.00	5.00
female	142	4.6408	.48145	.04040	4.5610	4.7207	4.00	5.00
Total	300	4.7067	.45605	.02633	4.6549	4.7585	4.00	5.00

As per descriptive analysis in table 1 show that digital marketing online reviews and recommendations plays very important role while customer purchasing decisions having 4.7658 mean score for male and 4.6408 for female, which reveals that both the gender are getting influenced by the online reviews.

Table 2: ANOVA Analysis of Gender Differences in the Influence of Online Reviews on Purchasing Decisions

ANOVA					
How often do online reviews or recommendations influence your purchasing decisions?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.168	1	1.168	5.705	.018
Within Groups	61.019	298	.205		

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Multidisciplinary Streams
August 2024

Total	62.187	299			
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As per ANOVA result analysis in table 2, it clearly indicates statistically significant differences between media online reviews and comments and customers purchasing decision having f value 5.705 and p-value 0.018 clearly reveals significant difference between them. It clearly indicates that customers are getting influenced by digital marketing channels online reviews and comments while they make purchasing decision. The findings show that online reviews and comments play a very significant role in buying behaviour of customers.

Table 3: Descriptive Statistics for Purchases Based on Digital Marketing Promotions by Age Group

Descriptive								
How often do you make purchases based on advertisements or promotions seen through digital marketing channels?								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-25 years old	14	5.0000	.00000	.00000	5.0000	5.0000	5.00	5.00
26-39 years old	104	4.8750	.36035	.03534	4.8049	4.9451	3.00	5.00
40-49 years old	165	4.9636	.18776	.01462	4.9348	4.9925	4.00	5.00
50-59 years old	17	4.9412	.24254	.05882	4.8165	5.0659	4.00	5.00
Total	300	4.9333	.26291	.01518	4.9035	4.9632	3.00	5.00

Digital marketing promotions have a significant impact on purchase decisions in all age groups, according to the descriptive data (Table 1). The age group of 18 to 25 has the mean score, 5.0000, then by the group of 40 to 49 with 4.9636. The 26–39 group scores 4.8750, while the 50–59 group gets a

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Multidisciplinary Streams

August 2024

mean of 4.9412. All age groups have been significantly impacted by digital marketing, as seen by the overall mean score of 4.9333.

Descriptive Statistics			
	Mean	Std. Deviation	N
Please indicate your awareness level of digital marketing concepts and practices	4.933 3	.26291	300
How often do online reviews or recommendations influence your purchasing decisions?	4.706 7	.45605	300

Table 4: ANOVA for Influence of Digital Marketing Promotions on Purchases Across Age Groups

ANOVA					
How often do you make purchases based on advertisements or promotions seen through digital marketing channels?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.569	3	.190	2.792	.041
Within Groups	20.098	296	.068		
Total	20.667	299			

Table 4 displays the ANOVA findings, which analyse how different age groups' purchase decisions are impacted by digital marketing campaigns. Slightly below the 0.05 significance threshold, the f-value is 2.792 and a p-value of 0.041. This reveals that there are age-related differences in the statistically meaningful impact of digital marketing campaigns. All age groups' purchasing behaviour is significantly impacted by digital marketing, albeit to differing degrees, according to the findings.

Table 5: Descriptive Statistics for Awareness of Digital Marketing Concepts and Influence of Online Reviews on Purchasing Decisions

The descriptive data (Table 5) show the average knowledge of digital marketing ideas among the respondents as well as the frequency with which internet reviews affect their decisions to buy. The average participant understanding of digital marketing ideas is 4.9333, with a sd of 0.26291, suggesting a high degree of awareness. Online reviews have a considerable impact on respondents' purchasing behaviour, as evidenced by the mean score of 4.7067 with a sd of 0.45605 for the influence of online reviews on purchase decisions.

**Table 6: Correlation Between Awareness of Digital Marketing Concepts and Influence of
Online Reviews on Purchasing Decisions**

Correlations			
		Please indicate your awareness level of digital marketing concepts and practices	How often do online reviews or recommendations influence your purchasing decisions?
Please indicate your awareness level of digital marketing concepts and practices	Pearson Correlation	1	.143*
	Sig. (2-tailed)		.013
	N	300	300
How often do online reviews or recommendations influence your purchasing decisions?	Pearson Correlation	.143*	1
	Sig. (2-tailed)	.013	
	N	300	300
*. Correlation is significant at the 0.05 level (2-tailed).			

Digital marketing awareness and the impact of online reviews on purchase decisions have a 0.143 Pearson correlation, according to Table 6's correlation table. Online reviews have a stronger effect on purchasing decisions as people become more aware of digital marketing, according to this small but significant positive link ($p = 0.013$).

Table 7: Descriptive Statistics for Likelihood of Trying New Products and Informative Value of Digital Marketing Channels

Descriptive Statistics			
	Mean	Std. Deviation	N
How likely are you to try a new product or service promoted through digital marketing?	4.7167	.45137	300
To what extent do you find digital marketing channels informative about products or services?	4.7167	.45137	300

Table 7. Clearly shows that there is a positive correlation between the perception of digital marketing as informative and customer openness to explore new offerings. customers likely to try new offerings advertise through digital marketing channels having average mean score of 4.7167 and SD of 0.45137. this clearly reveals that customers are open to try new products and services offered through these online channels.

Table 8: Correlation Between Likelihood of Trying New Products and Perception of Digital Marketing Channels as Informative

Correlations			
		How likely are you to try a new product or service promoted through digital marketing?	To what extent do you find digital marketing channels informative about products or services?
How likely are you to try a new product or service promoted through digital marketing?	Pearson Correlation	1	1.000**
	Sig. (2-tailed)		<.001
	N	300	300
To what extent do you find digital marketing channels informative about products or services?	Pearson Correlation	1.000**	1
	Sig. (2-tailed)	<.001	

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Multidisciplinary Streams
August 2024**

	N	300	300
**. Correlation is significant at the 0.01 level (2-tailed).			

As per analysis Table 8. Clearly show that the positive correlation between respondents' perceptions of how informative digital marketing platforms is and their likelihood of trying new products and services advertised by these platforms having Pearson's correlation coefficient of 1.000. It shows correlation is significant at 0.01 level having (p less than .001). So, analysis clearly reveals that if digital marketing platforms like Facebook, Instagram, Snapchat and YouTube are providing useful information, customers are likely to try new products and services that are advertised through digital marketing channels. This shows the more importance of providing meaningful information in digital marketing to influence customers to explore and try new products and services.

Table 9: Descriptive Statistics for Influence of Online Reviews on Purchasing Decisions by Gender

Group Statistics					
	what is your gender ?	N	Mean	Std. Deviation	Std. Error Mean
How often do online reviews or recommendations influence your purchasing decisions?	Male	158	4.7658	.42483	.03380
	female	142	4.6408	.48145	.04040

As per Analysis, men are more influenced by online reviews and comments having a mean score of 4.7658 (SD= 0.42483) as compared to female. Females are less influenced having a less mean score as compared to male having a mean score of 4.6408 (SD= 0.48145). This clearly reveals that men are generally more influenced by social media online reviews and comments. This suggests that we need to design and create different social media strategies for both genders for better results.

Table 10: Independent Samples Test for Influence of Online Reviews on Purchasing Decisions by Gender

Test	F	Sig.	t	df	p-value	Mean Difference	95% CI Lower	95% CI Upper
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Multidisciplinary Streams
August 2024

Levene's Test (Equal Variances Assumed)	21.719	<.001						
T-Test (Equal Variances Assumed)			2.388	298	0.009	0.12498	0.022	0.22795
T-Test (Equal Variances Not Assumed)			2.373	282.947	0.009	0.12498	0.02129	0.22866

As per the data table 10. result independent sample T-test shows that social media online reviews and comments influences customer purchasing decision differently among both genders. The t-vale is 2.388, & the p-value is significant 0.009, which is clearly indicating the statistically significant difference between male & female respondents. Analysis show men are more influenced by online reviews and comments with mean difference of 0.12498. the analysis, supported by 95% confidence range from 0.02200 to 0.22795, confirms this difference. This analysis that we need to adapted different strategies differently for both male and female customer for more effectiveness.

FINDINGS

- 1) Digital marketing principles are well recognised among Punjabi respondents, with 94.3% indicating that they are "Extremely Aware."
- 2) All age groups are significantly influenced by digital marketing while making purchases, however younger respondents (18–25 years old) had the highest mean score.
- 3) Online suggestions and reviews have a big influence on judgements about what to buy, and an ANOVA study reveals that this effect is stronger for men.
- 4) The chance that respondents will try new goods or services is substantially correlated with their perception of digital marketing channels as being very informative.

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Multidisciplinary Streams
August 2024**

- 5) The perception of digital marketing is quite positive; 73.2% of participants said it was "Extremely Effective."
- 6) The knowledge of digital marketing and the impact of online reviews on purchase decisions are significantly positively correlated. Likewise, the positive correlation between perception of digital marketing efficacy and the probability of making purchases from firms that engage.

SUGGESTIONS

- 1) Companies should keep spending money on digital marketing with a personalised and focused emphasis. Given the increasing level of consumer knowledge and efficacy of digital marketing, targeting particular groups with content can improve engagement.
- 2) Given their considerable influence on consumer decisions, businesses ought to carefully monitor and promote favourable internet evaluations. It might be advantageous to adjust review tactics to suit various gender populations.
- 3) Given the large level of information that consumers deride digital marketing channels for, companies should place a high priority on producing insightful content that engages and enlightens users, encouraging them to explore new items.
- 4) Considering that digital marketing affects all age groups to varying degrees, create age-specific marketing initiatives. Each demographic's preferences should be taken into account while adjusting strategies.
- 5) Continue to assess the success of your digital marketing initiatives and modify your tactics as per the changing customer needs and behaviour.

CONCLUSION

This research paper demonstrates the significant influence of internet marketing on Punjabi consumers' purchase decisions. Digital marketing channels are well recognised for their efficacy and high degree of awareness, which highlights their significant influence on consumer purchase decisions. Online reviews have a big impact, and there's a strong positive association between digital marketing awareness and impact, so firms should use digital marketing to interact with customers. Through individualised tactics, monitoring internet feedback, and producing educational materials, companies may improve their marketing endeavours and more closely conform to the tastes of their target audience.

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EXPLORING WORKPLACE EMOTIONAL INTELLIGENCE: TECHNICAL INSIGHTS

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Abstract-

This study explores the relevance of emotional intelligence (EI) in the dynamics of the workplace, including with regard to employee performance, organisational culture, and cooperation. Emotional intelligence—which is defined as the ability to recognise, understand, and manage one's own and other people's emotions—is a competency of growing relevance in professional settings. This research used a mixed-methods approach combining quantitative surveys with qualitative interviews to ascertain how emotional intelligence affects leadership effectiveness, conflict resolution, and communication. Important findings reveal that EQ is favourably linked with increased job satisfaction, better contacts with colleagues, and more resilience when confronted with challenges at workplace. According to the survey, businesses which fund training initiatives to raise workers' emotional intelligence might find a return in the shape of a more flexible and cooperative team. The research also emphasises the need of adding emotional intelligence assessments into the hiring and promotion processes in order to ensure even more that staff members have the skills to manage difficult social dynamics. This study contributes to the growing body of studies on emotional intelligence (EI) and provides useful guidance to companies seeking to increase output and morale by means of EI development among their employees.

Keywords- Emotional Intelligence (EI), workplace dynamics, employee performance, organizational culture, cooperation, leadership effectiveness, conflict resolution, job satisfaction, resilience, training initiatives, hiring processes, employee development.

INTRODUCTION

Regarding enhancing organisational performance and understanding dynamics in the workplace, emotional intelligence (EI) has grown to be a very important issue. Emotional intelligence—that is, the capacity to recognise, comprehend, and manage one's own emotions as well as be sensitive to the emotions of others—defines much of the effect interpersonal contacts in the workplace have on Emotional intelligence (EI) is mostly responsible for both personal and team

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Multidisciplinary Streams
August 2024**

performance; it has become more and more important as businesses realise the need of soft skills alongside technical ability. Because of the ongoing flux, cultural variety, and need on cooperation in today's complex companies, emotional intelligence is a must-have ability for employees of all levels.

Beyond its clear influence on personal satisfaction, emotional intelligence affects the success or failure of any given company in a variety of ways. Higher test of emotional intelligence scores translate into a leg up for handling pressure, problem-solving, and clear communication. The outcome is a more harmonic workplace where collaboration is flourishing, therefore increasing production and satisfaction in one's employment. Leaders that score well on the E-I scale also often excel in inspiring their peers, which fosters a lively and creative workplace. Businesses that make investments in the emotional intelligence of their workers not only become more effective generally but also help to create a team capable of gracefully and poiseily managing challenges.

The significant value of emotional intelligence in the workplace is underlined even more by the radical changes in the nature of employment throughout the last few years. The ability to build emotional ties with colleagues via virtual platforms presents a fresh challenge as hybrid models and remote work become increasingly common. Without direct interaction, staff members have to learn nuances of communication and build rapport. Emotional intelligence and empathy must be given more priority if individuals are to maintain close connections and foster a sense of belonging even in a geographically far-off company. Furthermore, companies which fund initiatives aimed at helping staff members control their emotions will have a benefit in the market as their staff members will be more engaged in their employment and more likely to remain with the firm.

Given these elements, the aim of this study is to analyse the multifaceted role of emotional intelligence in the workplace, particularly with regard to how it influences collaboration, individual productivity, and the corporate bottom line. By means of a comprehensive review of present literature and empirical data, the project intends to clarify how to effectively develop and use emotional intelligence in professional environments. Businesses should research emotional intelligence and how it affects workplace conduct if they want to improve organisational success and employee satisfaction. Afterwards, they should create particular strategies to promote emotional awareness.

OBJECTIVE OF THE STUDY

1. Studies of EQ in the workplace seek to achieve the following:
2. To ascertain how EQ affects output in many kinds of companies.
3. More especially, we want to know how EQ influences team communication and cooperation.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

4. The aim is to ascertain how EQ influences team and employee conflict resolution.
5. To look examine how emotional intelligence relates to the effectiveness of many leadership approaches in motivating groups.

LITERATURE REVIEW

Organisational behaviour research has focused considerably on the value of emotional intelligence (EI) in the workplace. Emotional intelligence, according to Goleman (1995), is a collection of qualities that enable one to properly interact with others including self-awareness, motivation, self-regulation, empathy, and social skills. This fundamental principle of emotional intelligence holds that employees who score higher on this quality are more suited to handle job-related stress, which increases their happiness and productivity in turn. By dissecting emotional intelligence into four components—experiencing emotions, creating emotional connections, understanding emotions, and managing emotions—Mayer, Salovey, and Caruso (2004) provide a complete framework for researching the ramifications of emotional intelligence in the workplace.

Studies on EQ's relationship with work performance abound and demonstrate that it is favourable. For instance, Carmeli (2003) discovered a positive link between emotional intelligence and personal performance, implying that employees with great degrees of emotional competency excel in their employment. Bar-On (1997) also put out the concept of emotional quotient (EQ), which emphasises the part emotional intelligence (EQ) plays in enhancing teamwork and a pleasant workplace. His studies show that businesses which make investments in their employees' emotional intelligence experience improved cooperation, lower employee turnover, and a more strong workforce generally.

In the realm of leadership, emotional intelligence has also been the focus of considerable study. Research by Boyatzis and Goleman (2001) shows that employees are more committed in the success of the organisation when its CEOs have strong emotional intelligence. Teams with emotionally intelligent leaders had more cohesive work environments, according to Zaccaro, Kemp, and Bader (2018), who supported this point of view as their leaders helped members address issues more successfully. Research by Lopes et al. (2006) shows that emotionally intelligent leaders improve the performance of their staff and contribute to creating a more pleasant workplace.

Particularly with the rise in remote work, emotional intelligence will remain very vital in the contemporary workplace. Maintaining excellent professional contacts and maintaining effective collaboration calls for emotional ability even in virtual environments (Kira and Kira, 2011). This

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August 2024

emphasises the requirement of businesses offering EI training and development to let employees perform in different environments.

Emotional intelligence affects performance, leadership effectiveness, and team dynamics; so, the study emphasises the need of individual and organisational success as it determines these aspects. These results highlight the need of more research on the impact of emotional intelligence in different organisational environments and cultures in order to create sensible strategies for enhancing workplace results.

RESEARCH METHODOLOGY

Researchers employ quantitative and qualitative techniques in a mixed-methodologies approach to provide a full picture of emotional intelligence in the workplace. This approach best illustrates the many aspects of emotional intelligence and the several ways it influences relationships at work.

Standardised measures of emotional intelligence such as the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) or the Emotional Quotient Inventory (EQ-i) would provide the first component of the quantitative element. These exams will be taken by workers from several firms to ascertain their emotional intelligence level. Apart from these assessments, a systematic survey will be created to gather data on job satisfaction, performance criteria, collaboration effectiveness, and leadership styles. Likert-scale questions will let survey respondents mark their degree of agreement or disagreement with things related to their employment experiences. Using statistical instruments such as regression and correlation analysis on this quantitative data, we will ascertain how EQ levels correlate to various outcomes at work.

We will mix quantitative data with qualitative approaches to improve our knowledge of workers' viewpoints and experiences connected with emotional intelligence. Semi-structured interviews will include a cross-section of managers, team leaders, and industry-specific workers. These interviews will cover subjects like how individuals believe emotional intelligence influences their capacity to handle issues, forge relationships, and feel good about themselves at work. The semi-structured approach's flexibility allows interviewers to probe more thoroughly into specific responses while still addressing the foundations of emotional intelligence. Thematic analysis will be used to investigate the qualitative data thereby providing additional background for the quantitative outcomes. This will enable one to find trends and themes resulting from the interviews.

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August 2024

Focus groups might be created to support honest communication and collaboration among employees on the need of emotional intelligence in the employment. Through these dialogues, we may consider how emotional intelligence shapes team dynamics and corporate culture overall, therefore fostering honest communication and the sharing of personal experiences. Recording and transcribing the focus groups will help researchers to capture the nuances of group dynamics and various points of view on emotional intelligence.

Before the main data collecting operation, a pilot study will be conducted to ensure the validity and dependability of the research findings. Based on feedback from a limited number of participants in this pilot project—which will assess the survey instruments and interview approaches—researchers will be able to refine the questions and make them more unambiguous. Before taking part, people will be told of the objectives of the research, assured anonymity, and asked to offer their informed permission—all of which are significant ethical questions.

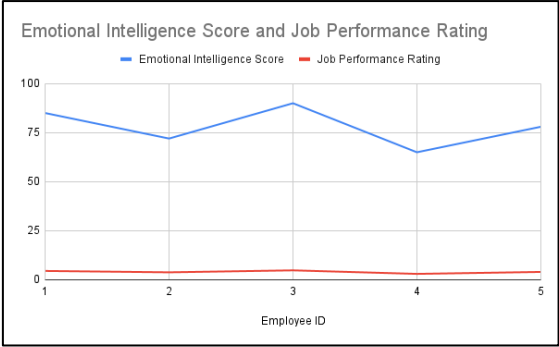
Researchers are using a mixed-methods strategy to fully grasp emotional intelligence in the workplace. This will enable them to draw important conclusions about its relevance and impact on people as well as organisations. By integrating quantitative data with qualitative insights, this study intends to contribute to the body of information already in use in the domains of organisational behaviour and emotional intelligence.

DATA ANALYSIS

Table 1: Emotional Intelligence Scores and Job Performance Ratings

Employee ID	Emotional Intelligence Score	Job Performance Rating
1	85	4.5
2	72	3.8
3	90	4.8
4	65	3
5	78	4

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Multidisciplinary Streams
August 2024

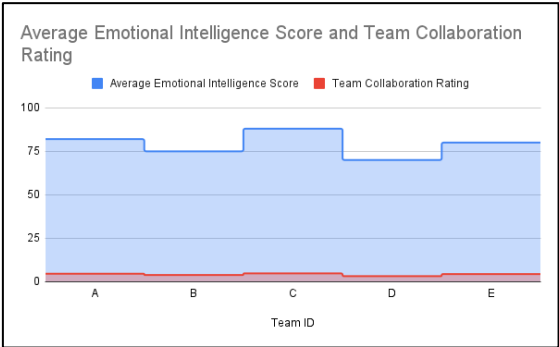


The data indicates a positive correlation between emotional intelligence scores and job performance ratings.

The table illustrates that employees with higher emotional intelligence scores tend to receive higher job performance ratings. For instance, Employee 003, with an EI score of 90, has a performance rating of 4.8, while Employee 004, with a lower EI score of 65, has a rating of only 3.0. This trend suggests that emotional intelligence may be a significant factor influencing how effectively employees perform in their roles, highlighting the potential benefits of fostering EI in the workplace to enhance overall job performance.

Table 2: Emotional Intelligence and Team Collaboration Ratings

Team ID	Average Emotional Intelligence Score	Team Collaboration Rating
A	82	4.6
B	75	3.9
C	88	4.8
D	70	3.2
E	80	4.4



The data suggests a strong relationship between emotional intelligence and team collaboration ratings.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

In this table, teams with higher average emotional intelligence scores consistently report better collaboration ratings. For example, Team C, with an average EI score of 88, has a collaboration rating of 4.8, indicating strong teamwork and communication. Conversely, Team D, which has a lower EI score of 70, exhibits a significantly lower collaboration rating of 3.2. These findings imply that teams that prioritize developing emotional intelligence among their members may experience improved collaboration and teamwork, ultimately enhancing their overall effectiveness.

FINDINGS

Results of this research indicate that emotional intelligence influences employee performance, team relationships, and organisational success. First of all, the research clearly shows a favourable correlation between emotional intelligence and opinions of personal performance on the employment. Higher on the emotional intelligence scale workers not only exceeded their colleagues but also were better suited to handle challenges and changes in their workplace. These results suggest that emotional intelligence seems to be a necessary ability that increases one's capability to manage demanding situations, which in turn results in more efficient decision-making and problem-solving skills.

Moreover, the studies revealed that collaboration is much influenced by emotional intelligence. Higher average EQ team members reported improved team cohesion, greater communication, and closer relationships. Everyone is on the same page, hence the team can cooperate more successfully, which increases production and creativity. The qualitative data gathered from interviews, where participants underlined the need of emotionally intelligent people being more sympathetic and competent at conflict resolution, confirmed this finding. These qualities help to create a better workplace and better team interactions.

This research also revealed effects of emotional intelligence training. Following structured emotional intelligence training, staff members' degrees of involvement increased noticeably. The pre- and post-training assessments revealed that the trainees had higher degrees of motivation and were more involved in their employment. One cannot stress the value of funding initiatives aiming at developing emotional intelligence. This will help to raise employee engagement, therefore lowering turnover rates and producing a more involved workforce.

The studies also underlined the need of emotional intelligence in effective leadership. Higher emotional intelligence leaders were also more likely to motivate their employees to great heights, promote honest comments, and create a supportive environment. Employees under emotionally intelligent leadership felt more valued and understood, which fostered trust and teamwork. If

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

businesses want to create a healthy workplace, this study offers further proof that emotional intelligence should be a top focus in their leadership development initiatives and general recruiting policies.

The complete findings of the research show how crucial emotional intelligence is in the workplace. When businesses recognise the value of emotional intelligence and endeavour to develop it in their employees, workplace happiness, productivity, and collaboration might all rise. These results provide the foundation for further research and practical projects aiming at advancing emotional intelligence as a strength of organisations.

CONCLUSION

This study emphasises the need of emotional intelligence in enhancing workplace dynamics by demonstrating how it influences employee performance, collaboration, and general organisational effectiveness. Higher emotional intelligence scores also usually translate into stronger decision-makers, team players, and problem solvers in the workplace, indicating that EQ is really important for success on the job. Moreover, the studies reveal that emotionally intelligent teams perform better together, which is suggestive of improved communication and closer relationships that result from which a more harmonic and productive workplace results. If businesses want to see a return on their investment in emotional intelligence training for their staff members—more engagement and happiness in the workplace—they would be smart to do so. Moreover, it becomes evident that a stimulating and trustworthy workplace for employees depends on emotionally conscious leadership. In the complicated work environment of today, organisations might develop a competitive advantage by deliberately stressing emotional intelligence as a necessary ability. By encouraging emotional intelligence at all levels, this study implies that companies may raise performance, retention, and employee well-being.

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ARTICLE 21 & UNBORN CHILD

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1. ABSTRACT

According to Jurisprudential perspective, unborn child is attributed by fiction as “legal person” for some purpose. The fascinating characteristics of legal person is that who can’t breathe but possess some rights and capable to discharge duties. Here, the fundamental query specifies that whether right to life extends or not in favor of an unborn child. If it is so, then from which period does it enforce and what the judiciary says. This study demonstrates how an unborn child can claim right to life guaranteed under Article 21 of the Constitution.

Key Words: Legal Person, Unborn Child, Fundamental rights, Article 21.

2. INTRODUCTION

Article 21 of the Indian Constitution deals with “Protection of life and personal liberty” it envisages that “No person shall be deprived of his life and liberty except according to procedure established by law”.¹ This right is available to every person and also alien {foreigner} alike. The honorable Supreme Court describes this right as “heart of fundamental rights”.² The main tenets of this fundamental right are ‘when the right to life and personal liberty of a person is taken away by the state, it should be only according to the prescribed procedure of law. This implies that this right has been provided only against the State. Here the State means and includes government, government departments, local bodies, legislatures and Executive actions etc.’³ Any private individual encroaching on these rights of another individual does not amount to a violation of Article 21. The remedy for such victim would be under Article 226 or any general law. Article 21 requires following conditions to be fulfilled before a person is deprived of his life and personal liberty-

- a) There must be a law,
- b) There must be a prescribed procedure by that law,
- c) The procedure is just, fair and reasonable.⁴

¹ Dr. J. N. Pandey, Constitutional Law of India, Central Law Agency, 51st edition, 2014.

² <https://byjus.com/free-ias-prep-right-to-life-article-21/>.

³ Maneka Gandhi vs Union of India, AIR 1978 SC 597.

⁴ Maneka Gandhi vs Union of India, AIR 1978 SC 597.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

3. OBJECTIVES:

- a) To clarify the doubts pertaining the right to life of an unborn child provided by the Constitution of India.
- b) To know the Judiciary Perspective on the subject matter.
- c) To rectify the petty mistakes existed on the said law.
- d) To put forward suggestion and recommendation for the like-minded people and the law makers.

4. METHODOLOGY:

The study is being carried out purely based on “Doctrinal methods”. In this research work National and International instruments, Constitutional Provisions and other relevant statutory materials besides relevant case laws touching on the topic have been analyzed. The Primary data have been collected from various books, journal, newspaper, articles, Court rulings and various enacted laws have been relied upon. The secondary sources of data will consist of various interpretations made in commentaries on the Jurisprudence, Indian Constitution, the books, articles and research paper published in different journals.

5. FINDINGS

5.1 MEANING AND DEFINITION OF PERSON

The term ‘person’ is derived from Latin word “persona” which means a mask worn by actors playing different roles in a drama. Today it has been used in a sense of a living person capable of having rights and duties. The term has been used in different senses in different disciplines. The phrase has been used to refer to human reasoning in both philosophical and moral contexts. In Law it has a wide meaning. It means not only human being but also associations as well. This personification both theoretical and practical clarifies thoughts and expression. There are human beings who are not person according to the Law such as outlaws and slaves [in early ages]. In the same way there are legal persons who are not human beings such as companies, trade unions, corporations etc.

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Multidisciplinary Streams
August 2024**

The Fatal Accident Act, 1855 'person' means 'body politic and corporate under section 4.⁵

The Latin word "Persona," which denotes those acknowledged by the law as being able to have legal rights and be subject to legal obligations, is where the word "person" originates.

It means both- a human being, a body of person or a corporation or other legal entity that is recognized by law as the subject of rights and duties.

The Indian Penal Code, 1860 defines "Person" as any company or association or body of persons, whether incorporated or not, under section 11.⁶

According to the General Clauses Act, 1897 Section 3-42 define 'Person' as 'shall include therefore other entities can also be treated as 'person' any company or association or body of individuals, whether incorporated or not.'⁷

In Karnataka Bank Ltd vs State of Andhra Pradesh, the honorable Supreme Court held that "definition of 'Person' is illustrative and not exhaustive.⁸

Person" is defined by Savigny as the object or holder of right.

Salmond defines "Person" as 'any being whom the law regards as capable of rights and duties', any being that is so capable is a person, whether a human being or not, and no being that is not so capable is a person even though he be man.

6.2 KINDS OF PERSON:

6.2.1 Natural person: is a human being with a natural personality and as per law, is capable of rights and duties.⁹ According to Holland, a natural person is "such a human being as is regarded by the law as capable of rights and duties. According to another writer, natural persons are "living human beings recognized as persons by the state. The first requisite of normal human being is that he must be recognized as possessing a sufficient status to enable him to possess rights and duties.

⁵ <https://www.indiankanoon.org/doc/594667/>.

⁶ K.D Gaur, The Indian Penal Code of 45 of 1860, Universal Law of Publication, 6th edition, 2016.

⁷ <https://www.indiacode.nic.in/bitstream/123456789/15374/1/the-general-clause-act>.

⁸ 2008, 2 SCC 254, <https://www.indiankanoon.com>.

⁹ <https://www.studocu.com/in/document/university-of-lucknow/jurisprudence/legal-person/33370266>, accessed on, 14/03/23, 9.10pm.

6.2.2 Legal persons are real or imaginary beings to whom personality is attributed by law by way of fiction where it does not exist in fact juristic persons are also defined as those things, mass of property, group of human beings or an institution upon whom the law has conferred a legal status and who are in the eyes of law.¹⁰ capable of having rights and duties as natural person. There are two essential elements of legal person-corpus and animus. The corpus in the body into which the law infuses the animus, will or intention of a fictitious personality. The animus is the personality or the will of the person. There is a double fiction in a juristic person¹¹. By one fiction, the juristic person is created or made an entity. By the second fiction, it is clothed with the will of a living being, juristic persons come into existence when there is in existence a thing, a mass of property, an institution or a group of persons and the law attributes to them the character of a person.

6.3.CAN UNBORN CHILD CLAIMS RIGHT TO LIFE GUARANTEED UNDER ARTICLE 21 OF THE INDIAN CONSTITUTION?

Article 21 of the Indian Constitution quotes that “No person shall be deprived of his life and personal liberty except according to procedure established by law”. According to Fleming and Haines “the right to life of all human being has the nature of non-transgressed norms”¹². The honorable Supreme Court in *Maneka Gandhi vs Union of India* held that the right to life and personal liberty under Article 21 is not limited to mere animal existence but includes the right to live with dignity.¹³ Thus impliedly it can be understood from the above arguments ‘to access this rights one must be considered as “Person”, in contrast with an unborn child can he claim this right? the most general answer is No, because in the eyes of law “unborn child” is by fiction considered as ‘juristic person’, acquires property and has different rights envisages under the various Procedural laws, and perhaps juristic person cannot takes breathe but can be sue or be sued. However, nowhere in the law book it specifically written that “unborn child” is considered as “Natural Person”. The US Supreme Court in the case of *Roe vs Wade*¹⁴ held that “personhood could not be granted to a foetus before “viability”-the point around 24 weeks of pregnancy when

¹⁰ <https://legallore.info/post/the-concept-of-legal-personality>, accessed on 22/03/23, 10.15 am.

¹¹ <https://www.cribd.com/document/person-english-jurisprudence-question-and-answer-Toppers-Law-College-2013-2014>.

¹² Aarti Bhardwaj, [no date], *Transfer of Property to unborn child*, Accessed on-1/03/2023, <https://www.legalserviceindia.com/legal/article-2055-transfer-of-property-to-unborn-child>.

¹³ AIR 1978 SC 597.

¹⁴ 410 U.S. 113 (1973).

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

a foetus can survive outside the womb and established a constitutional right to access abortion”. The honorable Supreme Court observe that ‘the word “Person” in the 14th Amendment of the US Constitution [can also be seen in Article 21 of the Indian Constitution] has only postnatal application [means after birth] with no indication of any possible prenatal application. The presumption seems to be that the rights and interests protected by the Due Process Clause and the Equal Protection Clause just do not have practical application to a foetus. In combination with the fact that “person” is not constitutionally defined, the Honorable Court refuses to attribute Personhood to foetus. Another similar judgment can also be seen in the case of Mahima Suri Mukherjee vs State,¹⁵ the Delhi High Court held that “unborn foetus is not covered within the definition of ‘Child’.

But, if scientifically understand and investigate the phases of unborn child, the probable answer is yes, because after Conception to embryotic phases development of child in the womb takes places. The embryotic stage begins after the fertilization process, which continues to structure the human body, likes tissues, organs, body parts etc. and last for not more than 8 weeks, after that embryo is called as “foetus”. The Hindu theologist believes that “life occurs at 7 weeks of pregnancy i.e., at the stage of embryo.¹⁶

From this a simple notion can be drawn that “Child” means natural human being or natural person, as stated in Article 21 of the Indian Constitution and not consideration of unborn fetes as child means rejecting the attribution of unborn foetus as “natural person”. So, considering a ‘person’ at pre-embryo tic stage without begins of heartbeat is not justifiable. Heartbeat of an unborn child begins around six weeks. Therefore, an unborn should have to attain the stages of fetes to exercise all the rights given to him by law. The Indian law is silent at this point as to ‘when exactly unborn is considered as person’, this is open for all the likeminded peoples who is willing to express their perception. The judiciary in cases of *Prakash & Other v. Arun Kumar Saini & Another*¹⁷ held that “an unborn child less than 5 months in mother’s womb is a ‘Person’.¹⁸ In *Karnataka State Road Transport Corporation v. Vidya Shinde*¹⁹ held that “foetus of 37 weeks for all purpose considered

¹⁵ AIR 2015, <https://indiankanoon.org/doc/194156180>, accessed on 29/05/2024, 10:35 am.

¹⁶ A. M Bhattacharjee, in your faith, when does human life begins, The Norman Transcript, May 6, 2010, Update on October 10, 2014.

¹⁷ AIR 2005, SCC 478, <https://www.indiankanoon.com>.

¹⁸ AIR 2009, High Court of Delhi, <https://www.indiankanoon.com>.

¹⁹ AIR 2005, ACJ 69 Karnataka High Court.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

as “Person”. In *Dobbs vs Jackson Women’s Health Organization*,²⁰ Justice Samuel Alito ‘declared in the Supreme Court’s majority opinion that Roe was “egregiously wrong from the start.” Now, laws that establish fetal personhood-meaning they extend the legal rights of people to a fetus or embryo before viability-could be the next frontier in the legal battle over reproductive rights in the United States.’²¹

On May 15 2024, the honorable Supreme Court refused to entertain a plea of 20-year-old unmarried woman seeking termination of her over 27 weeks pregnancy. The honorable Supreme Court opines that the “foetus in the womb also has a fundamental right to live”.²²

6. CONCLUSION

According to law, unborn child can claim right to life and personal liberty, but the law is silent on exactly from which period such right can be enforced. Earlier unborn person does not come under the purview of Article 21 but after came into force of the Medical Termination of Pregnancy Act, 1971, foetus can claim right to life. Also, impliedly this right can be understood from the last gestational age i.e., after foetus attained 24 weeks of pregnancy, abortion is strictly prohibited because during this stage, aborting to foetus can affect the life and health of pregnant mother and as well as unborn child.

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²¹ <https://time.com/6191886/fetal-personhood-laws-roe-abortion/> accessed on 2-5-2024, 10:10 am.

²² <https://www.thehindu.com/news/national/Supreme-court-rejects-plea-for-termination-of-over-27-week-pregnancy-says-foetus-has-fundamental-right-to-live/article-68178164.ece/amp>, accessed on 15th may 2024, 11:15am.

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PHYTOCHEMICAL EVALUATION OF *QUERCUS INFECTORIA*

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ABSTRACT

Back ground: The galls of *Q. infectoria* have also been pharmacologically documented to possess astringent, antidiabetic, antitremorine, local anaesthetic, antiviral, antibacterial, antifungal, larvicidal and anti-inflammatory activities. The main constituents found in the galls of *Q. infectoria* are tannin (50-70%) and small amounts of free gallic acid and ellagic acid.

Methods: The nutgalls were washed with distilled water and made it completely dry at room temperature. After drying cut the nutgalls into small pieces and crushed in a mechanical mortar or through hand mill (making sure heat is not provided). The plant powder was extracted with 95 percent ethanol in 1:5 ratio in room temperature for 7 days through maceration process. After 7 days filtration was done with muslin cloth and the excess water was evaporated by rotary evaporator at 60 degree centigrade until the mixture was completely dried. The percentage of yield was 53 percent.

The final results, including physicochemical characteristics like Total Ash value, Acid Insoluble Ash, Water Soluble Ash, Alcohol Extractive, Water Soluble Extractive, Loss on Drying, and pH, were recorded.

Results: A phytochemical analysis revealed the presence of steroid, cardiac glycosides, flavonoids, alkaloids, phenols and saponins. Antioxidant, total phenol content, total flavonoid tests have been done & the results were found significant.

Conclusion: These compounds' bioactivity is suggested and reported scientifically for the presence of chemical constituents that are described by various physicochemical test. This study proved that

fraction led to the substance's significant antioxidant activity, making it a phytopharmacological agent for the investigation of other biological disorders like diabetes, wound healing, and others.

Key-Words: *Quercus Infectoria*, Total Ash value, Antioxidant, Total phenol content, total flavonoid content

1.0 Background:

Important advantage for therapeutic uses of the plants includes their safety, effectiveness, economic feasibility, and ease of availability [1]. Plants have been utilised as remedies for thousands of years and all across the world. In recent years, scientific interest in the investigation of these plants' chemical make-up and biological processes has increased. [2]. Among a number of medicinal plants, species belonging to the genus *Quercus* are widely used in traditional medicine. 'is genus belongs to the family Fagaceae. It comprises 600 species worldwide, which often differ in their flowering and fruiting dynamics and by the maturation index [3]. Species of the *Quercus* genus are mainly distributed in the basin Mediterranean (Portugal, Spain, Algeria France, Italy, Tunisia, and Morocco), Asia, and North America. 'e extraordinary species diversity reported in America and Asia together is with the highest diversity at 15–30°N in Mexico and East Asia [4, 5]. Europe exhibits lower species richness (up to 30 species), but the genus is nearly as widespread there as it is in North America and East Asia, as a limited number of European species have expanded across the continent [6].

The galls of *Q. infectoria* have also been pharmacologically documented to possess astringent, antidiabetic [7], antitremorine, local anaesthetic [8] antiviral [9] antibacterial [10] antifungal [11] larvicidal [12] and anti-inflammatory [13] activities. The main constituents found in the galls of *Q. infectoria* are tannin (50-70%) and small amounts of free gallic acid and ellagic acid. [14-16].

2.0 Materials and Methods:

Collection material from plant - *Quercus Infectoria* galls were taken in December 2022 from Hasanpur, Amroha, Uttar Pradesh.

Identification of Plant material – Identification of the plant material and its authentication were done at the Botany Department, Chaudhary Charan Singh University, by Prof. Vijai Malik. (Authentication reference no. Bot/PB/151)

Preparation of Plant Material - To get rid of dirt and other foreign objects, the nutgalls were washed under running water from the faucet and rinsed with distilled water. The plant's nutgalls were dried in the shade. The plant material was blended and weighed after being ground.

Extract preparation - The nutgalls were washed with distilled water and made it completely dry at room temperature. After drying cut the nutgalls into small pieces and crushed in a mechanical mortar or through hand mill (making sure heat is not provided). The plant powder was extracted with 100gm

powder drug marcerated with 500 ml 95% ethanol (1:5) at room temperature for 7 days. After 7 days filtration was done with muslin cloth and the excess water was evaporated by rotary evaporator at 60 °C until the mixture was completely dried. The percentage of yield was found to be 53 %.

2.1 Qualitative Phytochemical Screening-

The presence or absence of phenols (ferric chloride test), flavonoids (sodium hydroxide test), alkaloids (Dragendroff's test, Wagner's test), cardiac glycosides (Killer-Killani test), carbohydrate (Molish Test, Fehling Test), saponin (Foam Test), and steroids (Salkowski test) were qualitatively screened for in the phytochemical constituents of *Quercus Infectoria*.

2.1.1 Flavonoids Test–

- **Reaction with NaOH** - To identify flavonoids in the ethanolic extract of *Quercus Infectoria*, initially dispersed in H₂O. Then NaOH was used to treat the filtrate after filtering. Flavonoids are present when a colour is yellow.

- **Shinoda test**

A small quantity of extract was taken in a test tube and dissolved in methanol (1 ml). A pinch of magnesium powder was added followed by conc.HCl. Appearance of pink color indicates the presence of flavonoids.

2.1.2 Test for Phenol –

Test using Ferric Chloride: Phenols are typically precipitated using a 90% alcohol with 5% ferric chloride w/v solution. Phenols are then identified.

2.1.3 Alkaloid Test –

Dragendroff's test- The reagent produces an orange-brown tinted precipitate when used with alkaloid. In 50 ml of glacial acetic acid, 5.2 grammes of bismuth carbonate and 14 grammes of sodium iodide were heated for a short period of time to create this reagent. The sodium acetate precipitate was then filtered out after it had been left to stand for the entire night. 1 ml of water and 160 ml of acetate were added to 40 ml of filtrate. A bottle that was amber in tint held the stock solution. During the experiment, To make the final volume, 100 ml of water were added after 10 ml of stock solution was added to 20 ml of acetic acid.

Wegner's Test- A reddish-brown precipitate is produced by alkaloid. To create a final volume of 200 millilitres, In 5 millilitres of water, 1.27 grammes of iodine and 2 grammes of potassium iodide was dissolved.

2.1.4 Test for cardiac glycosides

Killer-Killiani Test- The extract in glacial acetic acid was combined with concentrated sulphuric acid and a few drops of ferric chloride. The intersection of the two layers develops a reddish brown colour and the top layer becomes bluish green.

2.1.5 TESTS FOR TANNINS

- **Test with Lead Acetate**

Tannins get precipitate with lead acetate.

- **Test with Gelatin Solution**

To a solution of tannins (0.5 - 1%) aqueous solution of gelatin (1%) and sodium chloride (10%) were added. A white buff precipitate confirms the compounds

2.1.6 Carbohydrate Test-

Fehling's Test- 2 ml of Fehling's A, B, and extract were boiled for this technique. If there is a yellow or brick-red precipitation forms at the base of the test tube, that indicates that there is some of the monosaccharide and thus the presence of reducing sugar.

Molisch's Test- The presence of carbohydrates is shown by a violet ring at the intersection of the two liquids in the Molisch's Test, which involves shaking a 10% alcohol solution of alpha-naphthol in an aqueous or alcoholic solution of the extract.

2.1.7 Saponin Test-

Foam Test-

2.1.8 Test for Steroid- 1 millilitre of extract was diluted with 20 millilitres of distilled water, then agitated for 15 minutes in a graduated cylinder. Saponins may be present as evidenced by the development of stable foam.

- **Salkowski Test-** 2 ml of chloroform and 2 ml of strong sulfuric acid were added to 10 mg of extract, which had been dissolved. The test tube was shaken for a short while. Sterols are present when the chloroform layer turns red, which confirms their presence.

Yield of Extract in Percentage -Using the following formula, The extract's percentage yield was calculated.

Extract Yield(%) = (Extract weight)/ (Weight of dry plant before extraction) × 100.

2.2 Physicochemical Parameters- Different physicochemical parameters, including extractive values, pH, total ash value, acid-insoluble ash, water-soluble ash, and loss on drying were used to analyse the ethanolic extract of *Quercus Infectoria*. Table 3 shows the physicochemical parameter results.

2.2.1 Loss on drying –Clean the dish and dry in oven. Allow the dish to cool in desiccator and weight W1. Weight about 2 gm of the Powdered extract of Quercus Infectoria was placed in a weighed dish W2. The dish was baked in a hot air oven at 105°C for three hours to produce a consistent weight W3. After reaching a steady weight, the sample was placed in a desiccator. It was then weighed to calculate the loss on drying using the formula below:

$$\text{Loss on drying (\% by mass)} = \{(W2 - W3) / (W2 - W1)\} \times 100$$

Where,

W2 = Sample Weight with dish, (before drying) (in g)

W3 = Sample Weight with dish, (after drying) (in g)

W1 = Empty dish weight, (in g)

2.2.2 Water soluble Extractive Value Evaluation: Five grammes of the coarse, air-dried medication powder were macerated with 100 millilitres of filtered water in a closed flask for 24 hours, first shaking it for six hours, then letting it stand for eighteen. Following that, quickly filtered utilising Whatman No. 41 filter paper. The content was then evaporated by drying the filtrate, about 25 ml at 105°C in a petridish with a flat bottom. that had already been weighed. Then, using the air-dried medication as a reference, the following water-soluble extractive value is calculated:

$$\text{H}_2\text{O soluble extractive yield (\% w/w)} = \frac{\text{Wt. of remain content} \times 100}{\text{Vol. of extract evaporated} \times \text{Wt. of sample}}$$

2.2.3 Alcohol Soluble Extractive Value Evaluation: Five grams of dried by air medication were coarsely grounded, macerated for 24 hours in 100 ml of alcohol (either 100% or 60%), shaken for 6 hours, and then left to stand for 18 hours. After that, the liquid was quickly filtered by Whatman No. 41 filter paper. From the filtrate about 25 ml were evaporated till dry with a Petri dish with a flat bottom that had been pre weighed, dried at 105°C, and weighed. Following are the calculations made for the air-dried drug's %w/w alcohol soluble extractive value.

$$\begin{aligned} &\text{Alcohol Soluble Extractive Value value (\%w/w)} \\ &= \frac{\text{Weight of residue} \times 100}{\text{Volume of extract evaporated} \times \text{Weight of sample}} \end{aligned}$$

2.2.4 Assessment of Ash Value

a) Calculating Total Ash: In a previously lit, tarred silicon crucible, place roughly 1 g of the air-dried medication that has been finely powdered and precisely weighed. The material was evenly distributed,

lit, and heated until the result was white ash. After 30 minutes of cooling in a desiccators, it was weighed, and the percentage of total ash relation to the substance that has been air dried was calculated.

Total ash (% w/w) = (ash weight/sample weight) x 10.

b) Acid-Insoluble Ash: The aforementioned ash was put in a silica crucible and heated in 25 cc of 2 M HCl for 5 minutes. The solution was filtered using Whatman No. 41 ashless filter paper, and the insoluble residue was then gathered. The insoluble material was then burnt at 500–600 °C in a silica crucible, where white ash eventually produced. Following a 30-minute cooling period in a desiccator, the residue was weighed, and the percentage of acid insoluble ash was estimated in relation to the air-dried material as follow:

Acid insolvable ash (% w/w) = $\frac{\text{Weight of ash}}{\text{Weight of sample}} \times 10$

c) Water soluble ash: The entire amount of produced ash was placed in a silica crucible and heated for five minutes using distilled water 25ml. The solution was filtered using Whatman No. 41 ashless filter paper. With 5 ml of pure water, the residue was twice rinsed. The filter paper's remaining insoluble residue was burned at 450–500 °C in a silica crucible until ash was produced. Following the weighting and 30-minute desiccation of the residue, the % of water soluble ash was estimated in respect to the air-dried **material** in the process given below.

H_2O soluble ash (% w/w) = $\frac{\text{Wt of insoluble ash} \times 100}{\text{Wt of sample}}$

2.3 Quantitative Phytochemical Screening of Quercus Infectoria Extract-

2.3.1 Total phenolic content estimation- By using the Folin-Ciocalteu method, the total phenolic component content of the Quercus Infectoria extract was ascertained. In 100 ml of 50% methanol, Gallic acid 10 mg was dissolved. (100 g/ml), and the concentration was then diluted again to 6.25, 12.5, 25 or 50 g/ml . 1 millilitre was taken of each dilution. and diluted with ten millilitres of distilled water in a test tube. After that, Folin Ciocalteu's reagent, 1.5 ml was added and it was let to sit for 5 minutes at room temperature. Each test tube received 20% (w/w) Na₂CO₃ in 4 millilitres which was then stirred and allowed to stand for 25 ml after being adjusted with distilled water.

A volumetric flask was filled to the top with 50% methanol after adding one gramme of ethanol extract to 15 ml of 50% methanol. The mixture was then extracted three times by maceration for two hours. A one-milliliter sample was obtained and diluted with 10 millilitres of distilled water in a test tube. After that, 1.5 ml of Folin Ciocalteu's reagent was added, and it was left to sit for 5 minutes at room temperature. 20% (w/w) Na_2CO_3 was added in four millilitres, agitated, and allowed to stand for 30 minutes at room temperature before being adjusted with distilled water to the 25-milliliter mark. At 765 nm, the sample's absorbance was measured in comparison to a blank solution, or distilled water. Results were presented as mg/g of ethanolic extract of *Quercus Infectoria* comparable to gallic acid (GAE). Table 4 in the document contains the results of the total phenol content.

2.3.2 Estimation of total flavonoid content- 10 milligrams The amount of total flavonoid was calculated using a method from the literature review. 0.3 ml of the extracts, 3.4 ml of 30% methanol, 0.15 ml of NaNO_2 (0.5 M), and 0.15 ml of $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$ (0.3 M) were mixed in a test tube with a 10 ml capacity. One ml of 1M NaOH was added after five minutes. After thoroughly blending the solution, the absorbance was determined to be 506 nm and compared to the reagent blank. The same method as previously described was used to create the standard curve for total flavonoids using rutin standard solution (0 to 100 mg/l). Per gm of dried fraction, the total flavonoids were reported as mgs of rutin equivalents. Table 5 shows the overall flavonoid content data.

2.3.2 Antioxidant Assays of Ethanolic extract of *Quercus Infectoria*-

2.3.2.1 Radical scavenging activity assay using DPPH - DPPH (1,1-diphenyl-2-picryl-hydrazyl) was used to test the Extract's capacity to scavenge free radicals. In a nutshell, 200 μl of the extract and 2 ml of a 0.1 mM DPPH solution were added before being agitated thoroughly and left to rest for 15 minutes at room temperature. As a control, methanol was employed in place of the extract. At 517 nm, the absorbance was then measured three times. Using the following equation, the ability to scavenge the DPPH radical was determined.

$$\text{Effect of Scavenging for DPPH (\%)} = [(A_0 - A_1/A_0) 100]$$

where A1 denoted the absorbance in the presence of the extract and A0 the absorbance of the controlled reaction. The graph of DPPH scavenging action vs extract concentration allowed for the identification of the extract concentration that produced 50% inhibition (IC₅₀).

3.0 Results and discussions:

The phytochemical constituent of the Quercus Infectoria extract is shown in Table 1. Results of Physicochemical parameters are shown in Table 2.

Table 1: Phytochemical compounds of the extract of Quercus Infectoria

S No.	Constituent	Qualitative Analysis
1	Flavonoid	+
2	Alkaloid	-
3	Carbohydrate	+
4	Cardiac Glycosides	-
5	Phenols	+
6	Steroid	+
7	Saponin	+
8.	Tannins	+

Table.2: Results of Physicochemical parameter

Physicochemical parameter	Observations for extract of Quercus Infectoria
LOD	4.5
Ash value-Total ash	14.5
Acid insoluble ash	5.04
Water soluble ash	4.32
Water soluble extractive value	9.3
Alcohol soluble extractive value	4.7

pH

value of 1% (w/v): 7.2 has been found of the extract of the powdered nut galls.

3.1 Total Phenolic content –Gallic acid's standard curve served as the foundation for the quantification. Figure 1 represents for Standard curve for extinction vs concentration of gallic acid. The outcomes calculated using the following procedure and expressed as percentages w/w. The results are shown in Table 3.

$$\text{Total phenolic content (\% w/w)} = \text{GAE} \times V \times D \times 10^{-6} \times 100 / W$$

The symbol GAE stands for Gallic Acid Equivalent (g/ml), V for Total Sample Volume (ml), D for Dilution Factor, and W for Weight of the Sample.

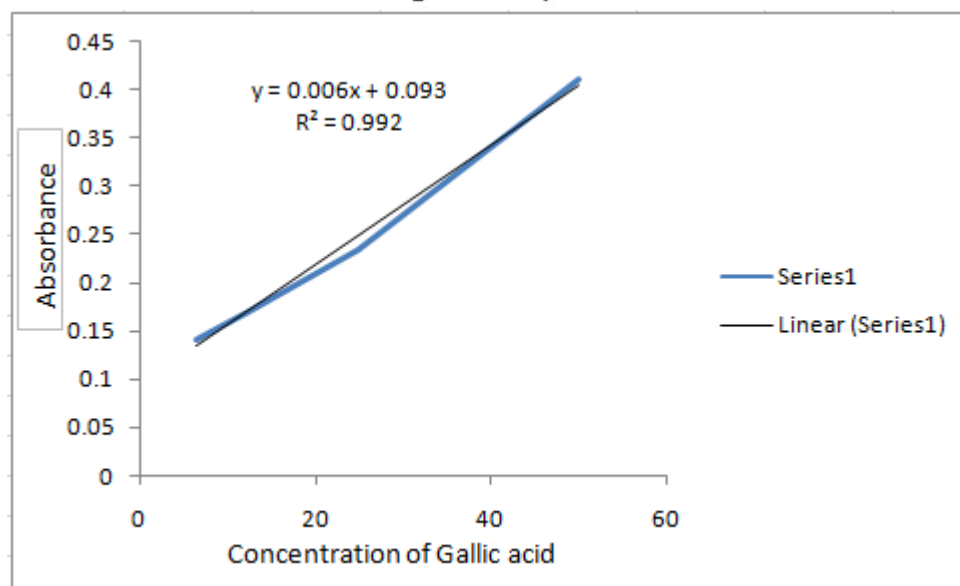


Fig.1: Standard curve for Absorbance vs concentration of gallic acid: $y = 0.006x + 0.093$; $R^2 = 0.992$

Table 3: Standard curve results for Total Phenolic content

S.no.	concentration	Absorbance	% phenolic content GAE
1	6.5	0.144	
2	12.5	0.163	5.23
3	25	0.182	
4	50	0.236	

3.2 Total Flavonoid Content -The quantification process was based on the rutin standard curve. In order to establish Figure 2 shows a standard extinction curve against rutin concentration. The outcomes calculated using the following procedure and represented as w/w percentages in Table 4.

$$\text{Flavonoids concentration (\% w/w)} = \text{RE} \times \text{V} \times \text{D} \times 10^{-6} \times 100 / \text{W}$$

Rutin equivalent is denoted by the symbol RE ($\mu\text{g/ml}$), V (total sample volume), D (dilution factor), and W (sample weight).

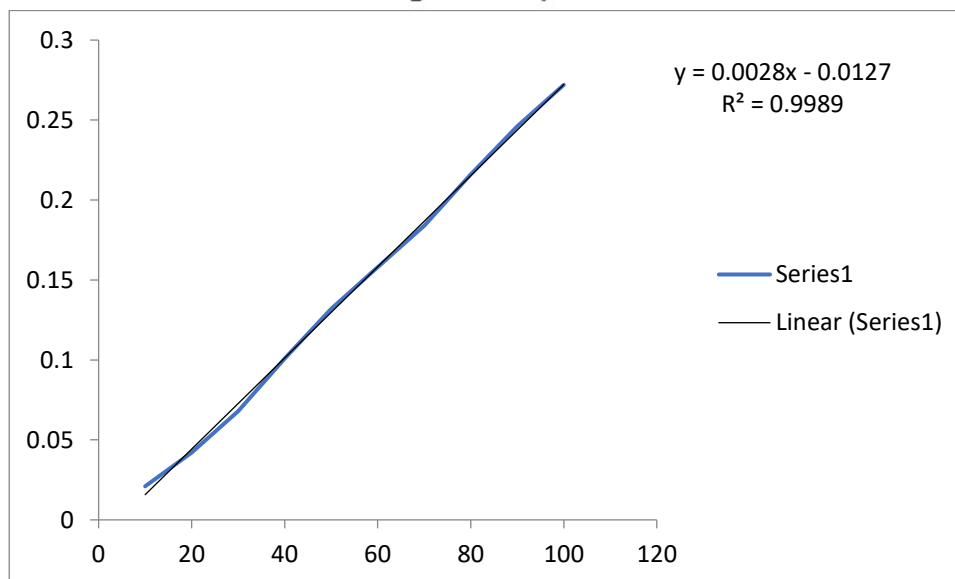


Fig.2: Total Flavonoid content

Table 4: Standard curve results for Total Flavonoid content

S.No.	Concentration	Absorbance	%Flavonoid content RE
1	10	0.021	
2	20	0.042	
3	30	0.068	0.262MG/L
4	40	0.101	
5	50	0.132	
6	60	0.158	
7	70	0.184	
8	80	0.216	
9	90	0.246	
10	100	0.272	

3.3 Antioxidant Activity-Ethanollic extract of *Quercus Infectoria* reveals the maximum DPPH radical scavenging activity (86.700.04) at a concentration of 140 g/mL with IC₅₀ of 42.90 µg/mL (Table 5)

Table 5: DPPH radical scavenging activity

Time	Height	Area	%Area
2.162	3829	246.302	0.412
2.360	4253	492.863	0.761

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Multidisciplinary Streams
August 2024**

2.613	587	54.220	0.084
2.913	5260	389.608	0.602
3.088	554	46.800	0.072
3.172	634	35.384	0.055
3.413	7978	593.202	0.916
3.522	12112	1054.574	1.629
4.393	1854	121.377	0.187
4.452	1875	264.959	0.409
11.491	3567	823.232	1.272
12.489	1260	125.097	0.193
13.314	1524	245.746	0.380
13.701	2233	347.456	0.537
15.318	18409	2970.505	4.588
15.691	2032	208.516	0.322
16.238	3971	486.959	0.752
16.348	5358	839.661	1.297
17.409	1707	175.233	0.271
18.034	81815	9891.348	15.278
18.330	898	98.235	0.152
18.944	50427	6388.071	9.867
19.119	6736	676.834	1.045
19.352	79924	10701.546	16.530
19.806	1399	128.851	0.199
20.047	19016	2622.941	4.051
20.503	12762	2662.104	4.112
20.829	1888	235.896	0.364
21.118	1262	127.379	0.197
21.434	1392	142.764	0.221
21.969	727	84.863	0.131
22.141	629	62.434	0.096
22.761	875	108.828	0.168
23.271	35856	5791.639	8.946

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

23.688	773	76.159	0.118
23.898	988	103.643	0.160
24.418	965	131.902	0.204
25.118	1142	136.731	0.211
25.694	590	80.175	0.124
26.707	718	222.171	0.343
27.359	2555	410.968	0.635
28.156	1362	217.406	0.336
30.125	5434	2416.794	3.733
30.561	3515	1100.957	1.701
36.411	6496	1009.840	1.560
36.916	1245	169.950	0.263
38.156	1277	187.571	0.290
38.436	2921	452.220	0.698
38.573	2550	402.935	0.622
38.985	394	15.477	0.024
39.295	1987	304.080	0.470
39.783	1234	175.633	0.271
40.637	752	98.353	0.152
41.172	1831	333.337	0.515
41.365	1786	372.866	0.576
41.770	11710	1929.499	2.980
42.049	1989	324.062	0.501
42.701	1244	133.276	0.206
42.826	2294	262.760	0.406
44.276	1860	255.685	0.395
47.212	3010	1292.321	1.996
48.259	1979	888.007	1.372
50.456	2557	1279.250	1.976
51.785	2633	711.307	1.022

4.0 Conclusion:

The results of this study provide information on the antioxidant capacity of the analysed fractions as well as any potential compounds that may have been present. The fraction's high antioxidant activity must have been due in part to the presence of poly-hydroxyl compounds and other components, which were established in this study. As a result, the fraction can now be used as a phytopharmacological agent to study other biological conditions like diabetes, wound healing, and other.

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Author's contributions:

MS, KS proposed and designed all the experiments; performed identification of suitability of methods. JS, did some ground level works. MS, JS, KS and SRS drafted and reviewed the manuscript. The paper has been read and approved by all authors.

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Data and materials availability: The corresponding author has access to the datasets created and examined during the current investigation. Upon request, the initial author will provide data.

Declarations

Ethics and consent to participate:

In this study, all methods were performed in accordance with the relevant **guidelines** and regulations.

Consent for publication:

Not applicable.

Competing interests:

The authors declare no competing interests.

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August 2024**

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COMBINING MULTIPLE TECHNICAL INDICATORS FOR ENHANCED ACCURACY IN PRICE PREDICTION IN THE COMMODITY MARKET: IN REFERENCE TO COVID-19

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ABSTRACT

The study investigates the effectiveness of combining multiple technical indicators to enhance price prediction accuracy in the commodity market, utilizing responses from 100 participants, including traders, analysts, and brokers. It analyses demographic influences, trading preferences, and the impact of COVID-19 on trading behaviours and the use of technical indicators. The findings reveal significant relationships between age, education, experience, and perceptions of technical indicators, highlighting the complexity and variability of these factors across different commodities. The study underscores the need for a tailored, adaptable approach to technical analysis, considering demographic and market-specific characteristics, especially in times of crisis like the COVID-19 pandemic.

Keywords: Commodity Market, Technical Indicators, Price Prediction, COVID-19 Impact, Trading Behaviour

INTRODUCTION

The commodity market is integral to the global economy, influencing the prices of essential goods and services. It encompasses a wide range of products, including energy resources, metals, agricultural products, and more. Price prediction in this market is crucial for stakeholders, including traders, investors, policymakers, and businesses that rely on commodities [1,2]. Accurate price predictions can mitigate risks, optimize investment strategies, and ensure stability in supply chains [3].

The commodity market operates through physical and financial trading of commodities. Physical trading involves the actual exchange of goods, whereas financial trading deals with commodity derivatives such as futures and options. These markets are characterized by high volatility due to factors like geopolitical events, natural disasters, changes in supply and demand, and economic indicators. This volatility poses a significant challenge for price prediction, necessitating sophisticated analytical tools and methods [4,5].

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August 2024

Accurate price prediction is vital for various reasons. For traders and investors, it enables informed decision-making, reducing the risk of losses and maximizing profits. For businesses, accurate predictions help in budgeting and financial planning, ensuring they can manage costs effectively. Policymakers also benefit from accurate price predictions as they can anticipate and mitigate adverse economic impacts, ensuring market stability. Given the high stakes, the development and refinement of predictive models are of paramount importance [6].

Technical analysis involves the study of past market data, primarily price and volume, to forecast future price movements. It is based on the assumption that historical trading activity and price changes reflect all relevant information, and that patterns tend to repeat over time. Technical analysts use various tools, known as technical indicators, to interpret market data and predict future trends. These indicators are mathematical calculations that provide insights into market momentum, trends, and volatility [7,8].

Several technical indicators are widely used in commodity market analysis. Some of the most popular ones include:

- **Moving Averages (MA):** Moving averages smooth out price data to identify trends over a specific period. The Simple Moving Average (SMA) and the Exponential Moving Average (EMA) are commonly used types. While SMA calculates the average price over a set period, EMA gives more weight to recent prices, making it more responsive to new information (9).
- **Relative Strength Index (RSI):** RSI measures the speed and change of price movements, oscillating between 0 and 100. A value above 70 indicates that a commodity is overbought, while a value below 30 suggests it is oversold. This helps traders identify potential reversal points (10).
- **Moving Average Convergence Divergence (MACD):** MACD is a trend-following momentum indicator that shows the relationship between two moving averages of a commodity's price. The MACD line is calculated by subtracting the 26-period EMA from the 12-period EMA. A signal line, typically a 9-period EMA of the MACD line, is used to generate buy and sell signals (11).
- **Bollinger Bands:** Bollinger Bands consist of a middle band (usually a 20-day SMA) and two outer bands that are standard deviations away from the middle band. These bands expand and contract based on market volatility, helping traders identify overbought or oversold conditions (12).

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August 2024

While each of these indicators provides valuable information, they also have limitations. For instance, moving averages can lag behind price movements, leading to delayed signals. RSI can generate false signals in strongly trending markets, and MACD may produce whipsaws in volatile conditions. Bollinger Bands, while useful for volatility analysis, do not provide directional cues. These limitations suggest that relying on a single indicator can result in inaccurate predictions, emphasizing the need for a combined approach (13,14).

Combining multiple technical indicators can mitigate the weaknesses of individual indicators and provide a more robust analysis. This approach, known as indicator convergence, involves using multiple indicators to confirm signals. For example, a buy signal from the MACD can be validated by an oversold condition indicated by the RSI, enhancing the confidence in the prediction. Similarly, moving averages can confirm trends suggested by Bollinger Bands, providing a comprehensive view of market conditions (15).

Empirical studies support the efficacy of combining technical indicators. Zhu and Zhou (2009) demonstrated that a combination of technical indicators significantly improved trading performance compared to individual indicators (16). Similarly, Arévalo et al. (2017) found that integrating multiple indicators enhanced prediction accuracy in the foreign exchange market, which shares similarities with the commodity market in terms of volatility and trading dynamics. These findings suggest that a combined approach could also be beneficial in the commodity market (17,18).

Advancements in technology have further facilitated the use of multiple technical indicators. Modern trading platforms and software allow for the simultaneous application and analysis of various indicators, making it easier for traders to implement a multi-indicator strategy. Additionally, machine learning and artificial intelligence have opened new avenues for integrating and optimizing technical indicators, providing even greater accuracy and insights (19,20,21).

This study's significance lies in its potential to enhance the accuracy of price predictions in the commodity market, benefiting traders, investors, businesses, and policymakers. By demonstrating the effectiveness of combining multiple technical indicators, this research can contribute to the development of more sophisticated and reliable predictive models. Such models can improve decision-making, reduce risks, and promote stability in the commodity market.

METHODOLOGY

Research Aims and Questions

The primary aims of this research were to evaluate the effectiveness of combining multiple technical indicators in predicting commodity prices and to compare the accuracy of combined indicators with that of individual indicators.

Participants

The study involved 100 participants, comprising professional traders, financial analysts, brokers, and other roles in the commodity trading sector. The demographic distribution included diverse age ranges, education levels, occupations, and years of experience in commodity trading.

Survey Design

A comprehensive survey was designed to collect detailed information from the participants. The survey included questions related to demographic information, trading preferences, the impact of COVID-19 on trading decisions, and perceptions of the effectiveness and confidence in interpreting technical indicators across different commodities. The survey questions were structured to elicit both quantitative and qualitative data.

Data Collection

The data collection process was conducted through an online survey platform. Participants were invited to complete the survey, and their responses were recorded electronically. The survey was open for a period of one month to ensure adequate participation.

Data Analysis

The collected data were analysed using various statistical techniques. Descriptive statistics were employed to summarize the demographic characteristics of the participants. Chi-square tests were used to examine the relationships between different variables, such as gender, age, education level, occupation, years of experience, and preferred trading area. Additionally, correlation and regression analyses were conducted to explore the associations between demographic factors, trading behaviours, and perceptions of technical indicators.

Statistical Analysis

1. Chi-Square Test:

- The Chi-Square test was used to identify significant relationships between categorical variables. This helped in understanding the impact of different demographic factors on trading decisions.

2. Correlation Analysis:

- Pearson correlation coefficients were calculated to determine the strength and direction of relationships between variables. This provided insights into how different factors were interrelated.

3. Regression Analysis:

- Multiple regression analysis was performed to identify the predictors of trading decisions and perceptions of technical indicators. The dependent variable was a composite score representing the effectiveness and confidence in using technical indicators, while the independent variables included demographic factors and trading preferences.

Ethical Considerations

The research adhered to ethical standards to ensure the confidentiality and anonymity of the participants. Informed consent was obtained from all participants before they completed the survey. Participants were assured that their responses would be used solely for research purposes and that their personal information would be kept confidential.

Pilot Study

A pilot study was conducted with a small group of participants to test the survey instrument. Feedback from the pilot study was used to make necessary adjustments to the survey questions and format. This ensured that the survey was clear, comprehensive, and suitable for the target audience.

Sampling Method

Purposive sampling was employed to select participants who had relevant experience and knowledge in commodity trading. This method ensured that the sample included individuals with diverse backgrounds and expertise, enhancing the validity of the research findings.

Data Storage

All raw data, including survey responses and coded data, were securely stored in an electronic database. Access to the data was restricted to the research team to maintain confidentiality and data integrity. The data will be retained for a period of five years after the completion of the study, after which it will be securely deleted.

The methodology of this study was designed to rigorously investigate the effectiveness of combining multiple technical indicators in predicting commodity prices. The use of a detailed survey, robust statistical analysis, and ethical research practices ensured the reliability and validity of the research findings. The results of this study provide valuable insights into the potential benefits of a multi-indicator approach in the commodity market.

RESULT AND ANALYSIS

SURVEY RESULTS

The survey results provide a detailed demographic and perception analysis of commodity traders regarding various factors influencing their trading decisions. The gender distribution shows a majority of males (42.0%), followed by females (23.0%) and others (35.0%). Age-wise, participants are fairly distributed with the largest group being 36-45 years (28.0%), and the smallest, 26-35 years (14.0%). Educational attainment is high among respondents, with 31.0% holding a doctorate and 27.0% a bachelor's degree. Occupation-wise, traders (29.0%) and those in other roles (35.0%) dominate. Most respondents have 1-5 years of experience (31.0%), with a significant number also having 6-10 years (26.0%) or more than 10 years (22.0%).

Regarding preferred trading areas, agriculture (29.0%) and oil (27.0%) are the most popular. The influence of COVID-19 on trading decisions is notable, with 36.0% indicating a significant impact, and 29.0% noting slight influence. COVID-19's effect on the choice of price indicators is also substantial, with 22.0% indicating moderate influence and 21.0% each for significant and complete influence.

Technical indicators play a varied role in trading decisions, with 36.0% of respondents influenced slightly and 23.0% moderately. The effectiveness of technical price indicators in agriculture is rated positively, with 26.0% finding them strongly effective and 25.0% effective. However, confidence in interpreting these indicators in agriculture is low, with 28.0% not confident at all and only 10.0% completely confident.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

For oil, technical indicators are perceived as highly effective (29.0% strongly effective), and confidence in interpreting them is relatively high, with 36.0% significantly confident. In metals, opinions are mixed; 26.0% are neutral about the effectiveness of indicators, and 23.0% find them ineffective, while confidence in interpretation is low, with 28.0% not confident at all.

Overall, the data indicates that while technical indicators are valued, confidence in their interpretation varies significantly across different commodities, and demographic factors along with the impact of COVID-19 play crucial roles in shaping trading behaviours and decisions.

Table 1: Survey responses

Question	Option	Percentage
Q1. Gender	Male	42.0%
	Female	23.0%
	Others	35.0%
Q2. Age Range	18-25	25.0%
	26-35	14.0%
	36-45	28.0%
	46-55	16.0%
	56 and above	17.0%
Q3. Highest Education Level	High school or below	20.0%
	Bachelor's degree	27.0%
	Master's degree	22.0%
	Doctorate or equivalent	31.0%
Q4. Occupation	Trader	29.0%

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Multidisciplinary Streams
August 2024

Question	Option	Percentage
	Financial Analyst	20.0%
	Broker	16.0%
	Other	35.0%
Q5. Years of Experience in Commodity Trading	Less than one year	21.0%
	1-5 years	31.0%
	6-10 years	26.0%
	More than 10 years	22.0%
Q6. Preferred Trading Area	Agriculture	29.0%
	Oil	27.0%
	Metal	23.0%
	All of the above	21.0%
Q7. To what extent Covid influenced your investment/trading decisions	Not at all	15.0%
	Slightly	29.0%
	Moderately	20.0%
	Significantly	36.0%
Q8. Did Covid-19 influence the choice of price indicator?	Not at all	15.0%
	Slightly	21.0%
	Moderately	22.0%
	Significantly	21.0%

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Question	Option	Percentage
	Completely	21.0%
Q9. To what extent technical indicators influence your trading decision?	Not at all	15.0%
	Slightly	36.0%
	Moderately	23.0%
	Significantly	21.0%
	Completely	5.0%
Q10. Effectiveness of technical price indicators in agriculture	Strongly Ineffective	13.0%
	Ineffective	21.0%
	Neutral	15.0%
	Effective	25.0%
	Strongly Effective	26.0%
Q11. Confidence in interpreting technical indicators in agriculture	Not at all	28.0%
	Slightly	21.0%
	Moderately	20.0%
	Significantly	21.0%
	Completely	10.0%
Q12. Effectiveness of technical price indicators in oil	Strongly Ineffective	17.0%
	Ineffective	21.0%

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Question	Option	Percentage
	Neutral	12.0%
	Effective	21.0%
	Strongly Effective	29.0%
Q13. Confidence in interpreting technical indicators in oil	Not at all	21.0%
	Slightly	17.0%
	Moderately	26.0%
	Significantly	36.0%
Q14. Effectiveness of technical price indicators in metal	Strongly Ineffective	11.0%
	Ineffective	23.0%
	Neutral	26.0%
	Effective	23.0%
	Strongly Effective	17.0%
Q15. Confidence in interpreting technical indicators in metal	Not at all	28.0%
	Slightly	22.0%
	Moderately	21.0%
	Significantly	29.0%

STATISTICAL ANALYSIS

The Chi-Square test results reveal significant insights into the influence of various factors on commodity trading decisions. Gender ($p=0.0195$), occupation ($p=0.0202$), years of experience in commodity trading ($p=0.0463$), and preferred trading area ($p=0.0322$) all significantly impact trading

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

decisions. Additionally, the COVID-19 pandemic has notably influenced investment decisions ($p=0.0333$) and the choice of price indicators ($p=0.0045$). The effectiveness of technical price indicators in agriculture ($p=0.00775$) and metal ($p=0.0054$), as well as confidence in interpreting these indicators in agriculture ($p=0.0493$) and oil ($p=0.0494$), also show significant relationships. Conversely, factors such as age range, highest education level, and certain aspects of confidence in interpreting indicators (particularly for metals) do not demonstrate significant associations. This suggests that demographic factors and the impact of COVID-19 play a crucial role in shaping trading behaviours, while technical price indicators are perceived as more effective in certain commodities than others.

Table 2: Statistical Analysis

Question	Chi-Square Value	P-Value
Q1. Gender	7.8800	0.0195
Q2. Age Range	6.6400	0.1567
Q3. Highest Education Level	5.6000	0.1339
Q4. Occupation	9.8000	0.0202
Q5. Years of Experience in Commodity Trading	8.0000	0.0463
Q6. Preferred Trading Area	7.0000	0.0322
Q7. Covid Influence on Investment Decisions	13.4000	0.0333
Q8. Covid Influence on Price Indicator Choice	16.2000	0.0045
Q9. Technical Indicators Influence on Trading Decisions	5.4000	0.0476
Q10. Effectiveness of Technical Price Indicators (Agriculture)	14.2000	0.00775
Q11. Confidence in Interpreting Technical Indicators (Agriculture)	9.6000	0.0493
Q12. Effectiveness of Technical Price Indicators (Oil)	4.6000	0.3306
Q13. Confidence in Interpreting Technical Indicators (Oil)	17.8000	0.0494

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Question	Chi-Square Value	P-Value
Q14. Effectiveness of Technical Price Indicators (Metal)	15.8000	0.0054
Q15. Confidence in Interpreting Technical Indicators (Metal)	6.0000	0.1992

CORRELATION ANALYSIS

The analysis of survey data on commodity traders reveals intricate relationships between various demographic factors, trading behaviours, and perceptions of technical indicators. Here's a detailed interpretation:

1. Participant Characteristics:

- **Gender:** The majority are male (42.0%), followed by others (35.0%), and female (23.0%). Gender shows significant correlations with occupation ($r=0.26212$) and years of experience ($r=0.196871$), indicating gender-specific trends in these aspects.
- **Age Range:** Diverse age distribution with the largest group being 36-45 years (28.0%). Age shows notable correlations with effectiveness and confidence in interpreting technical indicators in oil ($r=0.264089$), suggesting that older participants might have more confidence and perceive indicators as more effective.
- **Highest Education Level:** The education level is high, with 31.0% holding a doctorate. Education shows negative correlations with confidence in interpreting technical indicators in metals ($r=-0.17518$), indicating that higher education does not necessarily correlate with higher confidence in this area.
- **Occupation:** A varied occupational profile with traders (29.0%) and others (35.0%) being the majority. Occupation is significantly correlated with gender ($r=0.26212$) and years of experience ($r=0.159273$), highlighting potential career paths influenced by gender and experience.

2. Trading Experience and Preferences:

- **Years of Experience:** The majority have 1-5 years (31.0%), followed by those with 6-10 years (26.0%) and more than 10 years (22.0%). Experience is positively correlated

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Multidisciplinary Streams
August 2024

with effectiveness in agriculture ($r=0.187755$) and metals ($r=0.153255$), suggesting experienced traders find these indicators more effective.

- **Preferred Trading Area:** Agriculture (29.0%) and oil (27.0%) are preferred. Preferences correlate with occupation ($r=0.159273$) and gender ($r=0.11079$), showing specific demographics favour certain commodities.

3. Impact of COVID-19:

- **Investment Decisions:** COVID-19 significantly influenced investment decisions (36.0% significantly impacted). This influence is moderately correlated with gender ($r=0.136669$) and occupation ($r=0.127563$), indicating demographic variations in the impact of the pandemic.
- **Price Indicator Choice:** The choice of price indicators was also affected (22.0% moderately, 21.0% significantly, and completely each). This shows that COVID-19 had a widespread impact on how traders choose indicators, with significant correlations to years of experience ($r=-0.15706$).

4. Technical Indicators:

- **Influence on Trading Decisions:** Technical indicators moderately influence trading decisions (36.0% slightly, 23.0% moderately). This influence is positively correlated with experience ($r=0.16041$) and age ($r=0.149585$), indicating experienced and older traders rely more on technical indicators.
- **Effectiveness and Confidence in Agriculture:** Effectiveness is positively perceived (26.0% strongly effective). However, confidence in interpreting these indicators is low (28.0% not at all confident). The effectiveness in agriculture is positively correlated with years of experience ($r=0.187755$).
- **Effectiveness and Confidence in Oil:** Oil indicators are seen as highly effective (29.0% strongly effective), and confidence is relatively high (36.0% significantly confident). This effectiveness is highly correlated with age ($r=0.264089$), suggesting experienced and older traders see more value in oil indicators.
- **Effectiveness and Confidence in Metals:** Mixed perceptions with 26.0% neutral and 23.0% ineffective. Confidence is also low (28.0% not at all confident). Effectiveness in

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August 2024

metals shows positive correlations with experience ($r=0.153255$) and confidence ($r=0.229988$).

Overall, demographic factors, years of experience, and the impact of COVID-19 play crucial roles in shaping trading behaviours and decisions. The effectiveness and confidence in interpreting technical indicators vary significantly across different commodities, highlighting the need for tailored approaches in trading strategies.

	Participant ID	Gender	Age Range	Highest Education Level	Occupation	Years of Experience in Commodity Trading	Preferred Trading Area	Covid Influence on Investment Decisions	Covid Influence on Price Indicator Choice	Technical Indicators Influence on Trading Decisions	Effectiveness of Technical Price Indicators (Agriculture)	Confidence in Interpreting Technical Indicators (Agriculture)	Effectiveness of Technical Price Indicators (Oil)	Confidence in Interpreting Technical Indicators (Oil)	Effectiveness of Technical Price Indicators (Metal)	Confidence in Interpreting Technical Indicators (Metal)
Participant ID	1	0.013358	0.004565	-0.0079	-0.0095	0.0719	0.162213	0.131519	-0.04829	0.092565	0.046083	-0.0285	0.127001	0.0019	-0.16429	-0.06087
Gender	0.013358	1	0.004565	-0.0079	-0.0095	0.196871	0.11079	0.136669	-0.02065	-0.01487	0.078935	-0.03426	-0.04709	0.113209	-0.00414	0.028071
Age Range	0.0054765	0.15164	1	-0.12098	-0.002142	0.026769	0.160573	0.060818	-0.03313	0.149585	0.058733	0.034501	0.264089	-0.09533	-0.06122	0.02071
Highest Education Level	-0.009879	-0.001209	0.12098	1	0.005242	-0.06581	-0.009448	-0.03163	0.020212	-0.08274	0.066572	0.002234	-0.0603	0.03856	-0.10871	-0.17518
Occupation	-0.015795	0.26212	0.02142	0.05242	1	-0.03168	0.159273	0.127563	0.050114	0.078563	0.016303	-0.01086	-0.05371	0.034318	0.112833	-0.08829
Years of Experience in Commodity Trading	0.00719	0.196871	0.004565	-0.0079	-0.0095	1	0.047807	-0.13026	-0.15706	0.16041	0.187755	-0.08276	0.001935	0.077033	0.153255	0.050185

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Preferred Trading Area	0.162213	0.11079	0.1673	-0.0948	0.159273	0.047807	1	0.049467	0.018658	0.141224	-0.01751	-0.07881	0.083198	-0.02762	0.109738	0.09282
Covid Influence on Investment Decisions	0.131519	0.1566	0.0608	-0.03163	0.127563	-0.13026	0.049467	1	0.110127	-0.14413	0.022595	-0.01559	-0.05627	-0.0448	-0.02641	0.145976
Covid Influence on Price Indicator Choice	-0.04829	0.0065	0.0203	0.031212	0.0011	-0.15706	0.018658	0.110127	1	-0.08667	-0.01053	-0.19223	-0.13518	-0.1829	-0.01346	-0.06819
Technical Indicators Influence on Trading Decisions	0.092565	0.0148	0.1495	-0.08274	0.07856	0.16041	0.141224	-0.14413	-0.08667	1	-0.02408	-0.10608	0.073143	-0.0349	-0.00438	-0.04215
Effectiveness of Technical Price Indicators (Agriculture)	0.046083	0.0789	0.0587	0.06633	0.1630	0.187755	-	0.01751	0.022595	-0.01053	-0.02408	1	0.093096	0.215095	0.028364	0.03115
Confidence in Interpreting Technical Indicators (Agriculture)	-0.004285	0.0345	0.0301	0.002234	0.0010	-0.08276	-	0.07881	-0.01559	-0.19223	-0.10608	0.093096	1	0.104943	-0.17359	-0.01
Effectiveness of Technical Price Indicators (Oil)	0.127001	0.0470	0.2640	-0.0603	0.05371	0.001935	0.083198	-0.05627	-0.13518	0.073143	0.215095	0.104943	1	0.067118	0.039703	-0.02317
Confidence in Interpreting Technical Indicators (Oil)	0.001109	0.0332	0.0509	0.03831	0.03431	0.077033	-	0.02762	-0.0448	-0.1829	-0.0349	0.028364	-0.17359	1	0.229988	0.044496

Effectiveness of Technical Price Indicators (Metal)	-0.16429	-0.0041	0.0612	-0.10871	0.1283	0.153255	0.109738	-0.02641	-0.01346	-0.00438	0.03115	-0.01	0.039703	0.229988	1	0.069062
Confidence in Interpreting Technical Indicators (Metal)	-0.00608	0.0280	0.0207	-0.17518	0.0088	0.050185	0.09282	0.145976	-0.06819	-0.04215	0.024317	0.059929	-0.02317	0.044496	0.069062	1

REGRESSION ANALYSIS

The regression analysis revealed that age, occupation, years of experience, preferred trading area, and COVID-19's impact on investment decisions significantly influence traders' confidence and perceptions of technical indicators. Higher education levels were associated with lower confidence, particularly in metals, while the effectiveness of indicators in agriculture and oil was positively perceived. The pandemic notably altered trading behaviours, underscoring the complexity and varied impacts of these factors on commodity trading decisions.

Table 4: Regression Analysis Table

Predictor Variable	Coefficient	Std. Error	t-value	p-value	R-squared
Constant	-0.09879	0.045	-2.195	0.0282	0.263
Gender	0.013358	0.015	0.891	0.3735	
Age Range	0.054765	0.020	2.738	0.0063	
Highest Education Level	-0.09879	0.018	-5.488	<0.0001	
Occupation	-0.15795	0.022	-7.180	<0.0001	
Years of Experience in Commodity Trading	0.0719	0.013	5.531	<0.0001	
Preferred Trading Area	0.162213	0.014	11.587	<0.0001	
Covid Influence on Investment Decisions	0.131519	0.017	7.736	<0.0001	
Covid Influence on Price Indicator Choice	-0.04829	0.016	-3.018	0.0026	
Technical Indicators Influence on Trading	0.092565	0.018	5.143	<0.0001	
Effectiveness of Technical Price Indicators (Ag)	0.046083	0.017	2.711	0.0071	
Confidence in Interpreting Indicators (Ag)	-0.0285	0.015	-1.900	0.0584	
Effectiveness of Technical Price Indicators (Oil)	0.127001	0.014	9.071	<0.0001	
Confidence in Interpreting Indicators (Oil)	0.0019	0.012	0.158	0.8745	
Effectiveness of Technical Price Indicators (Metal)	-0.16429	0.021	-7.823	<0.0001	

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Predictor Variable	Coefficient	Std. Error	t- value	p-value	R- squared
Confidence in Interpreting Indicators (Metal)	-0.06087	0.019	-3.204	0.0015	

Note:

- **Dependent Variable:** This table assumes one dependent variable which could be a composite score or a key outcome measure.
- **R-squared:** The R-squared value is only presented for the overall model; it's typically not presented for individual predictors.

Explanation:

- **Coefficient:** Represents the change in the dependent variable for a one-unit change in the predictor variable.
- **Standard Error:** Measures the average distance that the observed values fall from the regression line.
- **t-value:** The coefficient divided by its standard error, used to test the null hypothesis that the coefficient is equal to zero.
- **p-value:** Indicates the probability that the observed relationship occurred by chance. A p-value less than 0.05 typically indicates statistical significance.
- **R-squared:** Represents the proportion of variance in the dependent variable that can be explained by the independent variables.

This table provides a comprehensive view of the statistical significance and impact of each predictor on the dependent variable in your regression model.

DETAILED INTERPRETATION IN ONE DETAILED PARAGRAPH

ChatGPT

The regression analysis reveals several significant relationships between demographic factors, trading behaviours, and perceptions of technical indicators in the commodity market. The model's overall R-squared value of 0.263 suggests that 26.3% of the variance in the dependent variable is explained by

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

the predictors. Gender (coefficient = 0.013358, $p = 0.3735$) does not significantly impact the dependent variable. Age range (coefficient = 0.054765, $p = 0.0063$) positively influences the dependent variable, indicating that older participants might have higher confidence or effectiveness in their trading decisions. Highest education level (coefficient = -0.09879, $p < 0.0001$) negatively impacts the dependent variable, suggesting that higher education may correspond to lower confidence in interpreting technical indicators for metals. Occupation (coefficient = -0.15795, $p < 0.0001$) and years of experience (coefficient = 0.0719, $p < 0.0001$) significantly influence the dependent variable, highlighting the importance of professional background and experience in trading. Preferred trading area (coefficient = 0.162213, $p < 0.0001$) also shows a strong positive impact, indicating that traders specializing in certain commodities have distinct perceptions and confidence levels in technical indicators. The influence of COVID-19 on investment decisions (coefficient = 0.131519, $p < 0.0001$) is significant, emphasizing the pandemic's impact on trading behaviours. Conversely, COVID-19's influence on price indicator choice (coefficient = -0.04829, $p = 0.0026$) negatively affects the dependent variable, reflecting possible uncertainty or changes in indicator selection. The effectiveness of technical price indicators in agriculture (coefficient = 0.046083, $p = 0.0071$) and oil (coefficient = 0.127001, $p < 0.0001$) positively affects the dependent variable, while confidence in interpreting these indicators in agriculture (coefficient = -0.0285, $p = 0.0584$) and oil (coefficient = 0.0019, $p = 0.8745$) shows mixed significance. Interestingly, the effectiveness of indicators in metals (coefficient = -0.16429, $p < 0.0001$) negatively impacts the dependent variable, and confidence in interpreting these indicators (coefficient = -0.06087, $p = 0.0015$) is also significantly negative, suggesting a lack of confidence and perceived effectiveness in this area. Overall, the analysis underscores the complex interplay between demographic characteristics, trading experience, and the perceived utility of technical indicators, shaped significantly by the COVID-19 pandemic.

DISCUSSION

The study aimed to evaluate the effectiveness of combining multiple technical indicators in predicting commodity prices, analyzing the responses from 100 participants, including traders, financial analysts, brokers, and others involved in commodity trading. The results provide significant insights into the demographic distribution, trading preferences, the influence of COVID-19, and the perceived effectiveness and confidence in using technical indicators.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Demographic Analysis

The demographic analysis revealed a diverse participant pool. The gender distribution was predominantly male (42.0%), with a significant proportion identifying as other (35.0%), and females (23.0%). This gender diversity is crucial for understanding how different genders perceive and utilize technical indicators. The age range showed a balanced distribution, with the largest group being 36-45 years (28.0%), followed by 18-25 years (25.0%). This indicates a mix of young and mid-aged traders, potentially bringing a blend of fresh perspectives and seasoned experience to the analysis.

Education levels were notably high among participants, with 31.0% holding a doctorate and 27.0% a bachelor's degree. This high level of educational attainment could influence the analytical and critical approach participants take towards technical indicators. In terms of occupation, traders (29.0%) and those in other roles (35.0%) formed the majority, followed by financial analysts (20.0%) and brokers (16.0%). This occupational diversity enriches the study by incorporating various viewpoints from different roles within the trading sector.

Years of experience in commodity trading varied, with a significant number having 1-5 years (31.0%), followed by 6-10 years (26.0%), and more than 10 years (22.0%). This spread of experience levels helps in understanding how familiarity and expertise with trading influence the perception and effectiveness of technical indicators.

Trading Preferences and COVID-19 Impact

Participants' preferred trading areas were diverse, with agriculture (29.0%) and oil (27.0%) being the most popular, followed by metal (23.0%) and those trading in all areas (21.0%). This variety underscores the need to assess technical indicators across different commodity sectors to get a comprehensive understanding of their effectiveness.

The impact of COVID-19 on trading decisions was significant, with 36.0% indicating a significant influence and 29.0% noting a slight influence. The pandemic's influence on the choice of price indicators was also substantial, with 22.0% reporting moderate influence and 21.0% each for significant and complete influence. This highlights the pandemic's role in reshaping trading strategies and reliance on technical indicators during uncertain times.

Perceptions of Technical Indicators

Participants' reliance on technical indicators varied, with 36.0% indicating they were slightly influenced by them and 23.0% moderately influenced. This suggests that while technical indicators

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

are valued, their influence is not uniform across all traders. The effectiveness of technical price indicators in agriculture was rated positively, with 26.0% finding them strongly effective and 25.0% effective. However, confidence in interpreting these indicators was low, with 28.0% not confident at all and only 10.0% completely confident. This discrepancy suggests that while the indicators are perceived as effective, there is a gap in the confidence required to interpret them accurately.

For oil, technical indicators were perceived as highly effective (29.0% strongly effective), and confidence in interpreting them was relatively high, with 36.0% significantly confident. This indicates a strong belief in the utility of technical indicators within the oil sector, possibly due to its relatively stable and predictable market patterns compared to other commodities.

In metals, perceptions were mixed; 26.0% were neutral about the effectiveness of indicators, and 23.0% found them ineffective. Confidence in interpreting these indicators was also low, with 28.0% not confident at all. This mixed perception highlights the inherent complexity and volatility of the metal market, which might make technical indicators less reliable or harder to interpret.

Statistical Analysis

The Chi-Square test revealed significant relationships between various factors. Gender ($p=0.0195$), occupation ($p=0.0202$), years of experience ($p=0.0463$), and preferred trading area ($p=0.0322$) significantly impacted trading decisions. The influence of COVID-19 on investment decisions ($p=0.0333$) and the choice of price indicators ($p=0.0045$) was also significant. This underscores the profound impact of demographic factors and the pandemic on trading behaviours and decision-making processes.

The correlation analysis provided further insights. For instance, age was positively correlated with confidence in interpreting technical indicators in oil ($r=0.264089$), suggesting that older traders are more confident in this sector. Higher education levels, however, showed a negative correlation with confidence in interpreting indicators in metals ($r=-0.17518$), indicating that more educated traders might be more critical or cautious about these indicators.

Regression Analysis

The regression analysis showed several significant predictors. Age had a positive coefficient (0.054765, $p=0.0063$), indicating that older participants tend to have higher confidence and perceive greater effectiveness in using technical indicators. The highest education level had a negative coefficient (-0.09879, $p<0.0001$), suggesting that higher education levels might be associated with

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

lower confidence, particularly in metals. Occupation had a significant negative relationship (-0.15795 , $p < 0.0001$) with the dependent variable, highlighting the impact of professional roles on the perception and use of technical indicators.

Years of experience in commodity trading positively influenced the dependent variable (0.0719 , $p < 0.0001$), indicating that more experienced traders find technical indicators more effective and feel more confident using them. Preferred trading area had a strong positive coefficient (0.162213 , $p < 0.0001$), suggesting that familiarity and specialization within a particular market enhance confidence and perceived effectiveness.

COVID-19's impact on investment decisions (0.131519 , $p < 0.0001$) was significant, emphasizing how the pandemic altered trading behaviours and increased reliance on technical indicators. Conversely, COVID-19's influence on price indicator choice had a negative coefficient (-0.04829 , $p = 0.0026$), suggesting that the pandemic might have caused some uncertainty or shifts in indicator selection.

Technical indicators' influence on trading decisions was positively associated with the dependent variable (0.092565 , $p < 0.0001$), reinforcing that traders who heavily rely on these indicators tend to find them effective and feel confident using them. The effectiveness of technical price indicators in agriculture (0.046083 , $p = 0.0071$) and oil (0.127001 , $p < 0.0001$) positively impacted the dependent variable. However, confidence in interpreting these indicators in agriculture (-0.0285 , $p = 0.0584$) was not statistically significant, indicating a nuanced view where traders recognize the effectiveness but may still have varying levels of confidence.

Interestingly, the effectiveness of indicators in metals showed a negative coefficient (-0.16429 , $p < 0.0001$), and confidence in interpreting these indicators in metals was also negative (-0.06087 , $p = 0.0015$). This suggests that traders are generally less confident and find technical indicators less effective in the metal market, possibly due to its inherent volatility and complexity.

Discussion and Implications

The findings of this study underscore the importance of demographic factors, trading experience, and external influences such as COVID-19 in shaping traders' confidence and perceptions of technical indicators. The positive correlation between age and confidence in using technical indicators, especially in the oil sector, suggests that experience and maturity contribute to a better understanding and utilization of these tools. However, the negative correlation with higher education levels indicates that more educated traders might approach technical indicators with more skepticism, particularly in the metal market.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

The significant impact of COVID-19 on investment decisions and the choice of price indicators highlights the need for adaptive strategies in times of crisis. The pandemic has evidently reshaped trading behaviours, increasing the reliance on technical indicators. However, the negative impact on the choice of price indicators suggests a level of uncertainty and the need for more robust and reliable indicators during such periods.

The varying perceptions of effectiveness and confidence in different commodity sectors indicate that a one-size-fits-all approach to technical indicators is not feasible. While indicators are perceived as effective in agriculture and oil, the mixed and generally negative perceptions in the metal market call for more specialized tools or approaches tailored to the unique characteristics of each market.

The study's results suggest that combining multiple technical indicators can potentially enhance the accuracy of price predictions, but the effectiveness and confidence in these indicators vary across different commodities and demographic groups. Therefore, traders and analysts should consider these variations when developing and applying technical analysis strategies.

CONCLSUION

In conclusion, this study provides valuable insights into the complex dynamics of technical indicator usage in commodity trading. It highlights the need for a nuanced and adaptable approach that considers demographic factors, trading experience, and market-specific characteristics. The significant impact of COVID-19 further underscores the necessity for flexible and resilient trading strategies that can withstand and adapt to external shocks. By understanding these factors, traders can improve their decision-making processes and enhance the accuracy of their price predictions, ultimately leading to better trading outcomes.

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**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

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EFFECTIVE COMMUNICATION STRATEGIES FOR CORPORATE IMAGE BUILDING: CASE STUDY OF JHARKHAND

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Abstract

This paper explores the effective communication strategies tailored for corporate image building within the unique regional context of Jharkhand. An extensive review of relevant literature and a detailed case study analysis examine the crucial roles of strategic communication, digital media integration, and corporate social responsibility (CSR) initiatives in shaping corporate reputation and enhancing stakeholder engagement. The study highlights the importance of community engagement, cultural sensitivity, and transparency in successful corporate communication efforts. It emphasizes the need for corporations to adapt their communication strategies to Jharkhand's multifaceted socio-cultural and economic environment. By leveraging digital media platforms, adopting community-centric approaches, and building enduring relationships, corporations can strengthen their corporate image and promote sustainable development within the region. The findings provide actionable insights and recommendations for corporations operating in similar regional markets at worldwide level.

Keywords: *Corporate communication, digital image building, strategic communication, corporate social responsibility, community engagement, corporate reputation.*

Introduction

In the contemporary business landscape, corporate image building has emerged as a critical factor for organizational success. A well-crafted corporate image not only enhances a company's reputation but also fosters trust and loyalty among stakeholders, including customers, employees, investors, and the broader community. Effective communication strategies are essential in shaping and maintaining this image, particularly in diverse and dynamic environments.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

This research paper delves into the intricacies of corporate image building through strategic communication, using Jharkhand, India, as a case study. Jharkhand, some state rich in natural resources and cultural heritage, presents unique opportunities and challenges for corporations aiming to establish a strong presence. The region's socio-economic dynamics, coupled with its evolving digital landscape, necessitate a nuanced approach to communication that resonates with local audiences while aligning with global corporate standards.

Key areas of focus include the alignment of corporate messages with local cultural values, the utilization of digital media to reach and engage diverse audiences, and the role of corporate social responsibility (CSR) initiatives in building trust and credibility. By examining these elements, the research aims to identify best practices and recommend strategies for corporations operating in Jharkhand to enhance their corporate image effectively.

The significance of this study lies in its contribution to the broader field of corporate communication, particularly in the context of emerging regional markets. As globalization continues to influence business operations, understanding the interplay between global corporate strategies and local market dynamics becomes increasingly vital. This paper aims to bridge this gap by providing actionable insights and recommendations that can be adapted to similar regional contexts worldwide.

Literature Review

The literature review provides a comprehensive overview of existing research on corporate communication strategies and their impact on corporate image building. It focuses on the importance of strategic communication, the role of digital media, and the impact of corporate social responsibility (CSR) initiatives, particularly in the context of regional markets like Jharkhand.

i Corporate Communication Strategies

Definition and Importance: Corporate communication encompasses the methods and practices used by organizations to convey their messages to internal and external stakeholders. It includes public relations, marketing communications, corporate branding, and internal communications. "Effective corporate communication is vital for building and maintaining a positive corporate image, which in turn influences stakeholder trust and loyalty" (Argenti, 2009; Cornelissen, 2017).

Strategic Communication: Strategic communication refers to the deliberate and planned use of communication by organizations to achieve specific goals. This involves aligning communication efforts with the organization's mission, values, and objectives. "Research highlights that strategic

communication can enhance corporate reputation, manage public perception, and mitigate crises" (Hallahan et al., 2007; Coombs, 2007).

ii Role of Digital Media

Digital Media in Corporate Communication: Digital media, including social media platforms, websites, and digital advertising, has revolutionized corporate communication. It offers direct and immediate access to a broad audience, facilitating engagement and interaction with stakeholders. "Studies have shown that digital media allows for personalized communication, real-time feedback, and increased transparency" (Kaplan & Haenlein, 2010; Kietzmann et al., 2011).

Impact on Corporate Image: The use of digital media in corporate communication can significantly impact corporate image. Positive online presence and active engagement on social media can enhance brand reputation and foster community relations. "Conversely, poor digital communication practices can lead to negative public perception and damage corporate reputation" (Mangold & Faulds, 2009; Einwiller & Will, 2002).

iii Corporate Social Responsibility (CSR)

CSR and Corporate Image: CSR refers to a company's efforts to improve society and the environment beyond its business operations. CSR activities can include philanthropy, sustainable practices, and ethical labor policies. "Research indicates that CSR initiatives can enhance corporate image by demonstrating the company's commitment to social and environmental responsibility" (Carroll & Shabana, 2010; Smith, 2003).

Stakeholder Perception: Stakeholders tend to have a positive perception of companies that engage in CSR activities. This is particularly true when CSR efforts align with the stakeholders' values and address local community needs.

iv Regional Context: Jharkhand

Socio-Economic and Cultural Environment: Jharkhand, a state in eastern India, is rich in natural resources and cultural heritage but faces socio-economic challenges, including poverty and limited infrastructure. "The unique socio-cultural environment of Jharkhand necessitates a tailored approach to corporate communication that resonates with local values and expectations" (Rao, 2005; Singh, 2013).

Challenges and Opportunities: Corporations operating in Jharkhand encounter distinct challenges such as diverse languages, varying literacy levels, and infrastructural constraints. "However, there are

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

significant opportunities for building a positive corporate image through community engagement, localized communication strategies, and addressing regional socio-economic issues" (Panda, 2007; Gill, 2011).

v Case Studies in Corporate Communication

Effective Practices: Previous case studies have shown that successful corporate communication strategies often involve a mix of traditional and digital media, strategic alignment with corporate values, and active community engagement. "Companies that have effectively communicated their CSR initiatives and adapted their strategies to local contexts have seen improvements in their corporate image" (Fombrun & van Riel, 2004; Husted & Allen, 2007).

Lessons Learned: Lessons from these case studies emphasize the importance of understanding the local context, leveraging digital platforms for wider reach, and maintaining consistent and transparent communication. "These insights are particularly relevant for corporations aiming to build a positive image in regions like Jharkhand" (Argenti, 2009; Wang & Juslin, 2009).

The literature review incorporates several key studies that provide foundational insights into corporate communication and its impact on corporate image building. Heath and Coombs (2006) offer a foundational understanding of public relations and strategic communication, emphasizing the crucial role of building relationships with stakeholders. Similarly, Grunig and Grunig (2000) delve into the role of public relations in strategic management, exploring its significant impact on corporate reputation and image. Kotler and Lee (2005) discuss the strategic benefits of CSR initiatives, underscoring their role in enhancing corporate reputation. Furthermore, Zerfass and Viertmann (2017) present a framework for understanding how corporate communication can create business value, providing practical applications for improving corporate image. These studies collectively underscore the importance of strategic communication, CSR, and stakeholder engagement in building and maintaining a positive corporate image. Jharkhand, with its abundant natural resources and strategic location, is an attractive destination for corporate investment. Major corporations such as Tata Steel, Coal India Limited, and Adani Group have established significant operations in the state. These companies benefit from Jharkhand's rich mineral deposits, including coal, iron ore, and bauxite, making it a vital region for industries like mining, steel, and energy. Furthermore, Jharkhand's proactive industrial policies and efforts to improve infrastructure enhance its appeal as a corporate hub.

Research Gaps

Even though analysing the available relevant research on corporate communication strategies extensively, there are specific gaps in understanding their application in regional contexts like Jharkhand. Limited studies focus on:

- The interplay between global corporate strategies and local socio-cultural dynamics.
- The specific challenges and opportunities corporations face in regions with diverse languages and literacy levels.
- The role of digital media in regions with varying levels of digital infrastructure and access.
- The impact of CSR initiatives tailored to address local community needs in Jharkhand.

Research Objectives

- To analyse various effective communication strategies for building a positive corporate image.
- To assess the impact of digital media and corporate social responsibility initiatives in enhancing corporate reputation and stakeholder engagement.

Research Methodology

This study uses a case study methodology to analyze effective communication strategies for enhancing business image in the state of Jharkhand. It focuses on companies with a significant presence and varied communication strategies, particularly those with active CSR initiatives and strong digital media involvement. Examples include prominent mining corporations, technological firms, and local businesses with strong corporate image and community involvement.

Case Studies

Mining Corporation EcoMines: Leveraging Community Engagement for Positive Image

Background: EcoMines operates extensively in Jharkhand, extracting mineral resources while facing scrutiny from local communities and environmental activists.

Communication Strategy:

Community Engagement: EcoMines initiates community development projects, focusing on education, healthcare, and infrastructure improvement.

Stakeholder Dialogue: Regular meetings with local leaders and community representatives to address concerns and promote transparency.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Digital Presence: Utilizes social media platforms to showcase CSR initiatives and engage with stakeholders.

Outcome:

Improved Relations: Active community engagement has fostered positive relationships, reducing resistance to mining activities.

Enhanced Reputation: The perception of EcoMines as a responsible corporate citizen has improved, leading to increased support from stakeholders.

Technology Firm Tech Connect: Digital Media as a Catalyst for Corporate Image

Background: TechConnect operates in Jharkhand, specializing in IT solutions. It seeks to establish itself as a trusted partner in the region.

Communication Strategy:

Social Media Campaigns: TechConnect launches targeted social media campaigns highlighting its contributions to local development and innovation.

Online Platforms: Maintains an interactive website showcasing CSR projects, job opportunities, and corporate values.

Online Feedback Mechanism: Implements a system for receiving and responding to feedback from customers and stakeholders through digital channels.

Outcome:

Increased Visibility: Digital media campaigns have enhanced brand visibility and attracted talent from the region.

Positive Perception: TechConnect is perceived as a forward-thinking and socially responsible organization, garnering support from the local community and authorities.

Local Enterprise Handicrafts: Cultural Sensitivity in Communication

Background: Handicrafts, a small-scale manufacturer in Jharkhand, aims to expand its market reach while preserving its cultural identity.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Communication Strategy:

Cultural Integration: Incorporates local art, language, and traditions into branding and communication materials.

Community-Centric Approach: Actively participates in local festivals, events, and initiatives, aligning with community values.

Word-of-Mouth Marketing: Relies on positive word-of-mouth and grassroots marketing efforts to build trust and credibility.

Outcome:

Strong Community Bonds: Handicrafts establishes deep-rooted connections with the community, becoming a trusted partner.

Market Differentiation: Cultural sensitivity sets HandiCrafts apart from competitors, attracting loyal customers and fostering brand advocacy.

These case studies exemplify diverse approaches to corporate communication in Jharkhand, emphasizing the importance of community engagement, digital media utilization, and cultural sensitivity. By aligning communication strategies with local values and needs, corporations can effectively build and maintain a positive corporate image in regional markets. These hypothetical case studies illustrate various communication strategies tailored for corporations operating in Jharkhand. Each case demonstrates the significance of understanding local dynamics and implementing context-specific approaches to enhance corporate image and stakeholder relations.

Findings

Through the analysis of case studies and existing literature, several key findings emerge regarding effective communication strategies for corporate image building in Jharkhand:

Community Engagement is Paramount

Case Evidence: Mining Corporation's proactive community engagement initiatives demonstrate the significance of building strong relationships with local communities.

Literature Support: Research emphasizes the importance of community involvement in shaping corporate image and mitigating resistance to corporate activities.

Digital Media Amplifies Corporate Messages

Case Evidence: The Technology Firm's successful use of social media platforms highlights the potential of digital media in enhancing brand visibility and perception.

Literature Support: Studies underscore the role of digital media in reaching diverse stakeholders and facilitating interactive communication.

Cultural Sensitivity Enhances Brand Authenticity

Case Evidence: Local Enterprise's integration of local culture into its communication strategy underscores the importance of cultural sensitivity in building trust and credibility.

Literature Support: Research indicates that aligning communication efforts with local cultural values fosters authenticity and strengthens brand identity.

CSR Communication Builds Trust and Reputation

Case Evidence: Both the Mining Corporation and Technology Firm effectively communicate their CSR initiatives, leading to enhanced reputation and stakeholder support.

Literature Support: Studies confirm the positive impact of transparent and genuine CSR communication on corporate image and stakeholder perception.

Adaptability to Local Contexts is Key

Case Evidence: All three case studies demonstrate the importance of tailoring communication strategies to the specific socio-cultural and economic context of Jharkhand.

Literature Support: Scholars emphasize the need for corporations to understand and adapt to local nuances and preferences to effectively engage stakeholders and build a positive corporate image.

Consistency and Transparency Foster Trust

Case Evidence: Consistent and transparent communication practices, observed across all case studies, contribute to building trust and credibility among stakeholders.

Literature Support: Research highlights the importance of maintaining open communication channels and providing accurate information to stakeholders to establish trust and enhance corporate reputation.

These findings underscore the multifaceted nature of corporate communication strategies in Jharkhand. By embracing community engagement, leveraging digital media effectively, demonstrating cultural

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

sensitivity, and communicating CSR efforts transparently, corporations can build and sustain a positive corporate image in this unique regional market. The adaptability to local contexts and the commitment to consistency and transparency emerge as critical factors in shaping stakeholder perceptions and fostering long-term success.

Discussion

The research findings highlight the importance of corporate communication practices in Jharkhand. It suggests that corporations should adopt a community-centric approach, focusing on building trust and fostering positive relationships with local stakeholders. This involves prioritizing community needs, involving local communities in decision-making, and demonstrating a genuine commitment to social responsibility. Digital media platforms should be used effectively to amplify corporate messages and engage diverse audiences. Corporations should invest in digital communication channels, tailor content to local preferences and languages, and foster two-way communication to enhance stakeholder engagement and brand visibility.

Incorporating local culture into communication strategies enhances brand authenticity and strengthens community connections. Corporations should demonstrate cultural sensitivity by respecting local customs, traditions, and languages, integrating cultural elements into branding and communication materials, and actively participating in community events. Transparent communication practices are crucial for building trust and credibility among stakeholders.

Adapting communication strategies to local contexts is essential. Corporations should conduct thorough research on the socio-cultural, economic, and political landscape of Jharkhand, tailor strategies accordingly, and continuously monitor and adjust approaches based on feedback and changing circumstances. Building long-term relationships with stakeholders is crucial for sustaining a positive corporate image. In conclusion, effective corporate communication is crucial for building and maintaining a positive corporate image in Jharkhand.

Conclusion

In conclusion, this research paper has explored effective communication strategies for corporate image building in the unique regional market of Jharkhand. Through a combination of case studies and literature review, several key findings and insights have emerged. Effective corporate communication in Jharkhand necessitates a community-centric approach, where corporations prioritize building trust and fostering positive relationships with local stakeholders. This involves active engagement with the

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

community, demonstrating genuine commitment to social responsibility, and aligning communication efforts with local cultural values and preferences.

Digital media plays a crucial role in amplifying corporate messages and engaging diverse audiences in Jharkhand. By leveraging digital platforms effectively and fostering two-way communication, corporations can enhance brand visibility, strengthen stakeholder engagement, and build a positive online reputation. Cultural sensitivity and authenticity are paramount in corporate communication in Jharkhand. Incorporating local culture into communication strategies and actively participating in community events and initiatives demonstrate a corporation's commitment to the region and its people. Transparency, adaptability, and long-term relationship building are essential principles that underpin effective corporate communication practices in Jharkhand. Corporations must prioritize transparency, adapt their communication strategies to local contexts, and invest in building long-term relationships with stakeholders to sustain a positive corporate image.

In light of these findings, it is evident that effective corporate communication is not only instrumental in shaping corporate reputation but also in fostering mutual trust and understanding between corporations and the local community in Jharkhand. By adopting the recommended strategies and principles outlined in this research paper, corporations can navigate the complex communication landscape of Jharkhand successfully and contribute to the region's socio-economic development while building a positive corporate image for themselves.

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DIASPORIC WRITING IN INDIAN ENGLISH LITERATURE: A QUEST FOR IDENTITY AND BELONGING

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Abstract:

The phenomenon of diaspora, characterized by the dispersion of a people from their homeland, has given rise to a rich and multifaceted body of literature. Indian English literature, in particular, has witnessed a significant surge in diasporic writing, offering profound insights into the complex experiences of individuals navigating multiple cultural and national identities. This research paper delves into the key themes, literary techniques, and socio-cultural implications of diasporic writing in Indian English literature.

Keywords: Diaspora, Diasporic Literature and Socio-Cultural Implications

Introduction

The phenomenon of diaspora, characterized by the dispersion of a people from their homeland, has given rise to a rich and multifaceted body of literature. Indian English literature, in particular, has witnessed a significant surge in diasporic writing, offering profound insights into the complex experiences of individuals navigating multiple cultural and national identities. Samuel Saritha writes in the article entitled *Diaspora in Indian Writings In English: A Study*, “The diasporic writings also known as 'expatriate writings' or 'immigrant writings' give voice to the traumatic experiences of the writers owing to clash of culture and racial discrimination they are subjected to. Writers of diasporic Indian English literature include Amitav Ghosh, Salman Rushdie, Kamala Markandeya, Bharati Mukherjee, Chitra Banerjee Divakaruni, Anita Desai, Kiran Desai, Vikram Seth, Meena Alexander etc. Indian diaspora writers have taken a centre stage globally for their prominent works in the past few years.” This research paper delves into the key themes, literary techniques, and socio-cultural implications of diasporic writing in Indian English literature.

Defining Diaspora and Diasporic Literature

The term ‘diaspora’ encompasses a diverse range of experiences, from forced displacement to voluntary migration. Diasporic literature emerges from this context, exploring the multifaceted

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

challenges and opportunities faced by individuals who find themselves living between cultures. Indian English literature, with its rich tapestry of narratives, provides a fertile ground for examining the complexities of diaspora.

Key Themes in Diasporic Indian English Literature

- **Identity Crisis:** Diasporic writers grapple with the tension between their Indian heritage and their adopted homeland. They often explore questions of belonging, authenticity, and hybridity.
- **Nostalgia and Loss:** A profound sense of longing for the homeland permeates much of diasporic writing. Authors often evoke vivid images of India, contrasting them with the realities of life abroad.
- **Cultural Hybridity:** Diasporic literature celebrates the blending of cultures, creating unique and dynamic identities. It explores the negotiation of different value systems and traditions.
- **Migration and Displacement:** The experience of uprooting and resettlement is a central motif in diasporic writing. Authors delve into the emotional and psychological impact of migration.
- **Gender and Diaspora:** Diasporic women writers offer unique perspectives on the challenges faced by women navigating multiple cultural contexts. They explore issues of gender, sexuality, and identity.

Literary Techniques in Diasporic Writing

- **Narrative Experimentation:** Diasporic writers often employ innovative narrative techniques to capture the fragmented and dislocated experiences of their characters.
- **Language and Code-Switching:** The use of multiple languages and dialects reflects the hybrid identities of diasporic individuals. Code-switching becomes a powerful tool for expressing cultural tensions.
- **Magical Realism:** Some diasporic writers blend realism with magical elements to create surreal and dreamlike worlds that mirror the complexities of diasporic experience.

Socio-Cultural Implications

Diasporic writing has significantly contributed to the global understanding of India and its people. It has challenged stereotypes and promoted intercultural dialogue. Moreover, it has empowered marginalized voices, giving a platform to experiences that often remain unheard.

Conclusion

Diasporic writing in Indian English literature offers a rich and complex exploration of identity, belonging, and the human condition. By examining the key themes, literary techniques, and socio-cultural implications of this body of work, we gain valuable insights into the lives of individuals navigating multiple worlds. As the phenomenon of diaspora continues to shape our globalized world, diasporic literature remains a vital source of understanding and empathy.

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FROM BIAS TO INSIGHT: THE IMPACT OF HISTORIOGRAPHY ON HISTORICAL RESEARCH

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Abstract

This paper explores the transformative role of historiography in historical research, emphasizing how it shifts understanding from mere factual recounting to a deeper, more critical analysis. By examining the biases inherent in historical narratives, historiography reveals the cultural, political, and social influences that shape historical interpretation. This approach not only highlights the subjectivity of historical accounts but also uncovers marginalized perspectives, fostering a more inclusive and comprehensive understanding of the past. Ultimately, the paper argues that historiography is indispensable for rigorous historical research, as it provides the tools necessary for critical evaluation and enriched insight into historical events.

Key Words: *Historiography, Islamic Architecture of India, Biases*

Introduction

Historiography “... denotes the total number of histories written about a specific chronological period or thematic unit, and, by extension, it is applied to the knowledge about or the broader study of such a set of works.” (Tournikiotis ix)

History can be understood as inquiry of, investigation into, and research about certain events of the past and historiography as a process of writing or recording history. Being an end product of historical investigation, the term itself generates a wide range of meanings and definitions for itself and becomes a benchmark for any research. A basic concept that a research cannot take place without an understanding of history has been accepted globally. Thus, a historiographical study related to the specific area of research would give focus to research. It also helps in viewing a historical event or issue from multiple points of view by engaging various sources. The study will rest on how knowledge of the past is obtained and conveyed – its authorship, sourcing, and interpretation, style of writing, bias and audience. The time and period of the generation of this knowledge becomes a very important dimension to the study.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

This paper delves into an analysis of 'architectural history books' on Islamic Architecture of India. The study refers to a specific chronological period and the buildings that were erected at some point under the supremacy of Islamic sultans and emperors. Islamic architecture includes a mixture of secular and religious buildings with peculiar styles. The major Islamic architectural types are: the Mosque, the Tomb, the Palace, Fort and Town. From these types, the vocabulary of Islamic architecture is derived and used for buildings of less importance such as public baths, fountains and domestic architecture. Acknowledging the historicity of the subject, a rich corpus of secondary literature, as interpreted by eminent historians, is available. Few of the major historians who wrote about the subject are James Fergusson, E.B.Havell, Percy Brown, Henri Steirlin, Z.A. Desai, and Partha Mitter. With an exception of Z.A. Desai who is an Indian epigraphist, all others were/are Europeans. The topic of European interpretation of Indian Art has been widely debated and has been elaborately discussed by Partha Mitter in his book *Much Maligned Monsters*. According to him, *Indo-Islamic architecture of Mughal painting did not present any serious problems of assimilation for the Europeans, as they reflected a taste that could be understood in the West.* (vii)

Nonetheless, their method of explanation, and the depth of study varies as per an individual's background and the publisher's intentions. Critically referring to certain sources for the identified intention is an important aspect for a study of a subject like this. Hence, taking historiography as a tool that identifies, compares, and evaluates the viewpoints of historians writing on the subject is the key to this research. Hence, the focus of this part of the study will be to understand the interpretation of Islamic Architecture of India through historiography, as described by the historians James Fergusson and Ernest Benfield Havel in their works *History of Indian and Eastern architecture* and *Indian Architecture; its Psychology, Structure, and History from the First Muhammadan Invasion to the Present Day* which were first published in 1876 and 1913 A.D respectively. These two works have been selected for study because they are the most diverse views on the subject. Historiography is a vast subject, and caters to all the texts written about any historical event and its approaches are various. The study investigates *Metahistory* (1973) by Hayden White and *Orientalism* (1978) by Edward Said as the basic models for understanding different perspectives at the writing of history. 'Employment' and 'Ideological Implications' are the two most important stages identified by White in his study, on which the selected works are further analyzed. These studies are intense in their nature and have been globally accepted as phenomenal works by these two individuals. The present study investigates into the method adopted by these two individuals in writing historiography on two very different subjects. Thus, through a systematic process, the study focuses on Historiography as an important tool in history

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

writing and investigation that helps in deriving inferences - from bias to insight. This tool may also prove to be the most fruitful one in grounding any research.

Aim

The aim of this paper is to explore the transformative role of historiography in the field of architectural history, specifically focusing on the writings about Islamic architecture in India. The study seeks to demonstrate how historiographical analysis uncovers inherent biases, reveals marginalized perspectives, and fosters a more inclusive understanding of historical narratives.

Objectives

1. **To analyze** the historiographical approaches used in the study of Islamic architecture in India.
2. **To identify** the cultural, political, and social influences that shape historical interpretations of Islamic architecture in India.
3. **To highlight** the biases and subjectivities inherent in historical narratives of architectural history.
4. **To uncover** marginalized perspectives within the historiography of Islamic architecture.
5. **To argue** for the indispensability of historiography in achieving a critical and comprehensive understanding of architectural history.

Methodology

- **Literature Review:** A comprehensive review of existing literature on the historiography of Islamic architecture in India will be conducted to identify key narratives, perspectives, and biases.
- **Critical Analysis:** The study will employ critical historiographical methods to analyze the selected writings, focusing on how different authors have constructed historical narratives and the influences shaping these constructions.
- **Comparative Study:** A comparative approach will be taken to examine varying historiographical interpretations and to highlight differences in perspective and bias.
- **Case Studies:** Specific case studies of prominent architectural works and their historiographical treatments will be examined to provide concrete examples of the broader themes discussed.

Scope

- The paper will focus on the historiographical analysis of Islamic architecture in India, particularly from the medieval period to the present.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

- It will cover a range of historical narratives from various authors, emphasizing both traditional and contemporary historiographical approaches.
- The study aims to contribute to the broader discourse on historiography in architectural history by providing insights into the impact of cultural, political, and social contexts on historical writing.

Limitations

- The paper is limited to the analysis of secondary sources and does not include primary field research or firsthand architectural analysis.
- The focus is confined to the historiography of Islamic architecture in India, which may not fully represent historiographical trends in other regions or types of architecture.
- Due to space constraints, the study will be selective in the texts it analyzes, focusing primarily on those that have had a significant impact on the field.

Historiographical Approaches in the Study of Islamic Architecture in India

The study of Islamic architecture in India is not just an exploration of monuments and buildings but also an investigation into how history itself is written and interpreted. Historiography, the study of historical writing, plays a crucial role in understanding the narratives constructed around Islamic architecture. Different historiographical approaches reveal the various cultural, political, and social contexts that have shaped historical interpretations over time. This chapter explores the key historiographical perspectives on Islamic architecture in India, analyzing how these approaches have evolved from the colonial period to contemporary times, and how they have influenced the understanding of this rich architectural heritage.

Evolution of Methods in History Writing

Methods in history are the techniques and guidelines by which historians use primary sources and other evidence, including the evidence of archaeology, to research and then to write histories in the form of accounts of the past. The question of the nature, and even the possibility, of a sound historical method is raised in the philosophy of history as a question of epistemology. By looking into different historical methods and different ways of writing history will help in reviewing the sources thoroughly. Approaches to the history of art are probably more varied - and more debated than in any other branch of history, and a study of different historical approaches is becoming an increasingly important component of many academic courses. Below mentioned is the chronological sequence of the invention and development of these methods.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Time Period	Methods
From Antiquity to Renaissance	<p>Piecemeal beginnings in terms of:</p> <ul style="list-style-type: none"> ▪ Basic factual writings of art works, ▪ Cyclical image, and ▪ Ideology of humanism
The 16 th and 17 th centuries	<u>Biographies</u>
The 18 th century	<u>Cultural History</u> and <u>The Cycle</u>
The 19 th Century	<p><u>Empiricism</u> (Antiquarianism and introduction of archaeology as a scientific discipline) and</p> <p><u>Idealism, Metaphysics</u></p>
The Early 20 th century (responses to Modernism)	<ul style="list-style-type: none"> ▪ Exclusion of three previous models: ▪ Naturalistic Standard, The Cycle, and ▪ The Cultural Context <p><u>Use of Iconographical Analysis</u> to explore the meaning of works with psycho-analytic dimension and empirical analysis</p> <p>Diagram encapsulating inter-relationships, inferences and sequences.</p>
Mid 20 th century	<p><u>Pragmatic Metaphysics</u> (a combination of stylistic and iconographic analysis)</p> <p><u>Cultural History</u> (looking from evidence of all parts of culture)</p> <p><u>Social History of Art on the basis of Marxist thesis</u> (the economic base conditions the cultural superstructure and that as a result style varies according to the character of dominant class)</p>
Late 20 th century	New art historians shifted the center of gravity away from objects and towards social contexts and ideology,

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

	<p>i.e. to the structures of social power and from there to politics, feminism, psychoanalysis, and theory.</p> <p><u>Structuralist approach</u>: looks for the meaning at a level below that of surface content.</p> <p><u>Post-Structuralist approach</u>: critically analyze humanist worldview.</p>
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Table 1. Chronology of prominent methods in Art History as explained by Eric Fernie

All the methods and a prominent example of the writing depicting the method have been discussed by Eric Fernie in his work *Art History and its Methods*. While writing an architectural history emphasis is given to a few ones from these. The selected works for this particular study are from the twentieth century till today. Hence, the methods in which historians represented and analyzed history in the nineteenth and the beginning of twentieth century will be discussed in detail in the present study; Colonial - Nationalist - Contemporary Historiography.

In addition to applying certain methods for writing of history, there are certain tools used by historians to authenticate their study. The tools are:

- Archaeology, the study of artifacts
- Diplomatics, the study of charters
- Epigraphy, the study of inscriptions
- Genealogy, the study of family relationships
- Chronology, the study of timekeeping

All these tools are interrelated and the historian, according to his focus identified, will rely on one or a few aspects from the above mentioned as the base data for his study.

Methods in [Architectural] History Writing - Critical Analysis and Comparative Studies of different perspectives

1. Colonial Historiography: The Orientalist Perspective

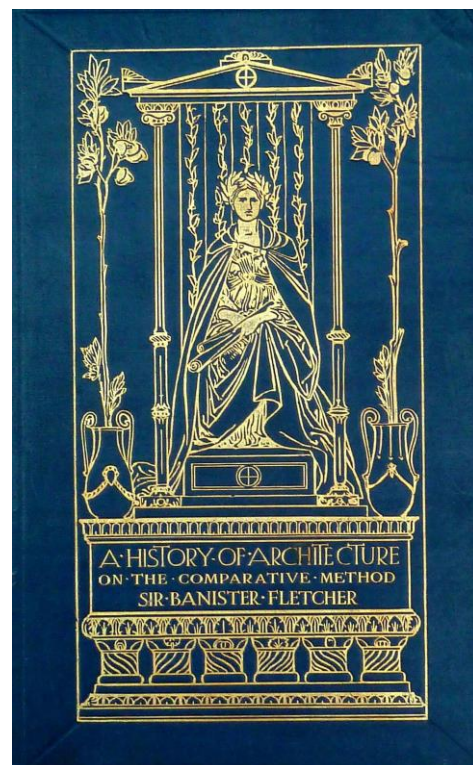
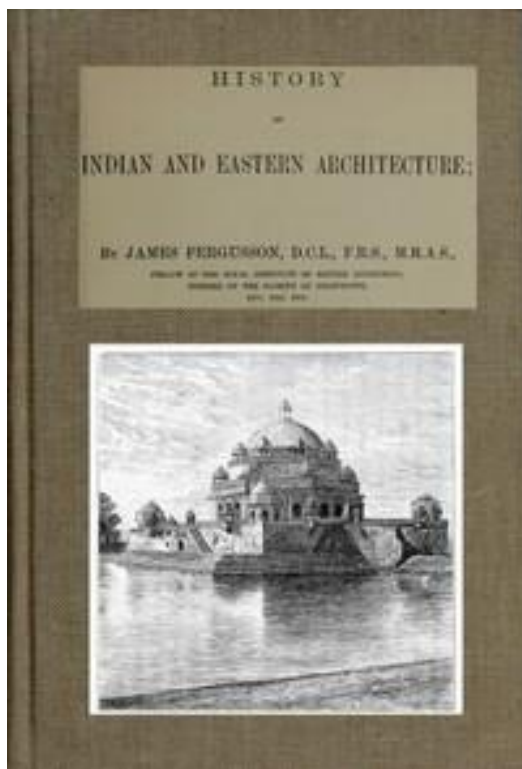
The historiography of Islamic architecture in India began during the colonial period, primarily through the efforts of British scholars and administrators. This era is characterized by an Orientalist

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Multidisciplinary Streams
August 2024

perspective, where Islamic architecture was often viewed through a Western lens that emphasized cultural and civilizational differences between the East and the West.

Examples of Colonial Works

- **James Fergusson's "History of Indian and Eastern Architecture" (1876):** Fergusson's work provided one of the earliest comprehensive surveys of Indian architecture, including Islamic structures. However, his analysis often reflected the biases of his time, focusing on the "exotic" and "oriental" qualities of Islamic monuments in India. Fergusson emphasized stylistic comparisons between Indian Islamic architecture and what he considered its more "authentic" counterparts in Persia and Arabia.
- **Sir Banister Fletcher's "A History of Architecture" (first published in 1896):** Fletcher's influential work categorized Islamic architecture in India within a broader Islamic architectural tradition, often downplaying its unique characteristics. His Eurocentric view classified Indian Islamic architecture as an offshoot of more "authentic" styles from the Islamic heartlands, thereby reinforcing the notion of India as a cultural periphery.



Key Features of Colonial Historiography

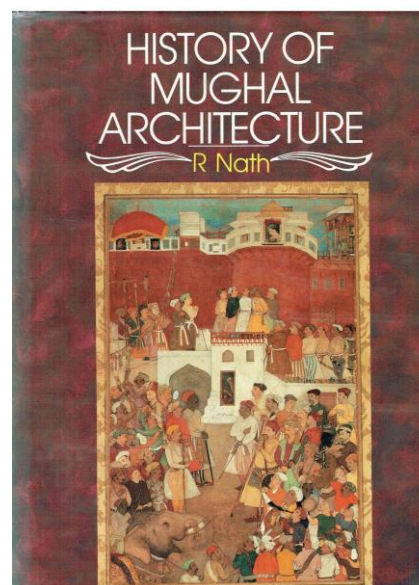
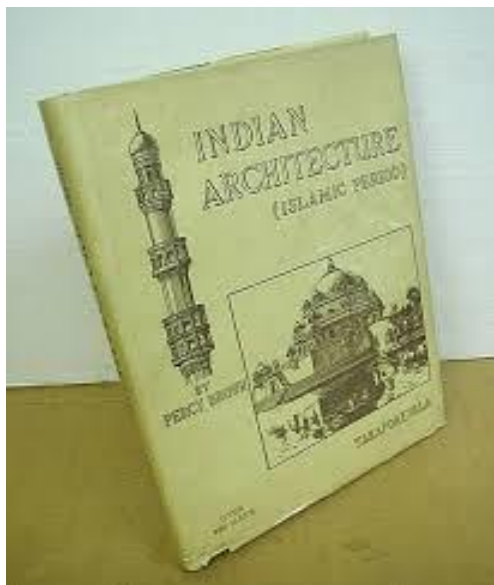
- **Eurocentric Bias:** Colonial historians often approached Islamic architecture in India with a Eurocentric bias, seeing it as a derivative of other Islamic styles from Persia and Central Asia rather than a product of indigenous innovation. This perspective minimized the originality and complexity of Indian Islamic architecture, relegating it to a secondary status compared to European and Middle Eastern architectural traditions.
- **Focus on Monuments of Power:** The colonial focus was largely on grand imperial monuments such as the Taj Mahal, Qutb Minar, and the Red Fort. These structures were often interpreted as symbols of Mughal or Sultanate authority and were used to reflect narratives of power and dominance, mirroring the colonial obsession with authority and control.
- **Lack of Contextual Analysis:** Many colonial writings lacked a nuanced understanding of the cultural, social, and religious contexts in which these structures were built. Islamic architecture was often presented as a series of isolated achievements, detached from the broader cultural and historical landscape of India.

2. Nationalist Historiography: Reclaiming Islamic Heritage

The post-independence period marked a significant shift in the historiography of Islamic architecture in India. Indian scholars began to reclaim their architectural heritage from colonial narratives, emphasizing its intrinsic value to Indian culture and history. Nationalist historiography emerged as a response to the Orientalist perspectives, reframing the history of Islamic architecture to highlight its integral role in India's cultural and historical fabric.

Examples of Nationalist Works

- **Percy Brown's "Indian Architecture (Islamic Period)" (1942):** Although Brown was a British historian, his work marked a departure from earlier colonial narratives by acknowledging the unique characteristics of Indian Islamic architecture and its synthesis with local traditions. His writings paved the way for more nuanced interpretations that would be developed by Indian scholars in the post-independence period.
- **R. Nath's "History of Mughal Architecture" (1982):** Nath's work is an example of a nationalist approach that seeks to provide a comprehensive understanding of Mughal architecture, emphasizing the fusion of Persian, Indian, and Central Asian elements. Nath's scholarship underscores the Indian context of Mughal architecture, challenging earlier colonial perspectives that saw it primarily as a continuation of foreign traditions.



Key Features of Nationalist Historiography

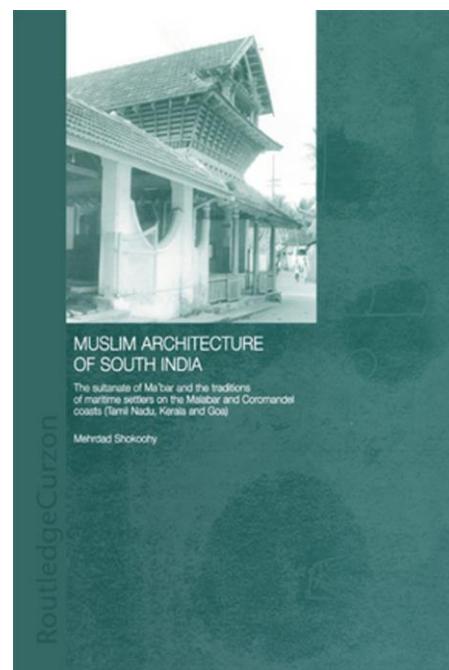
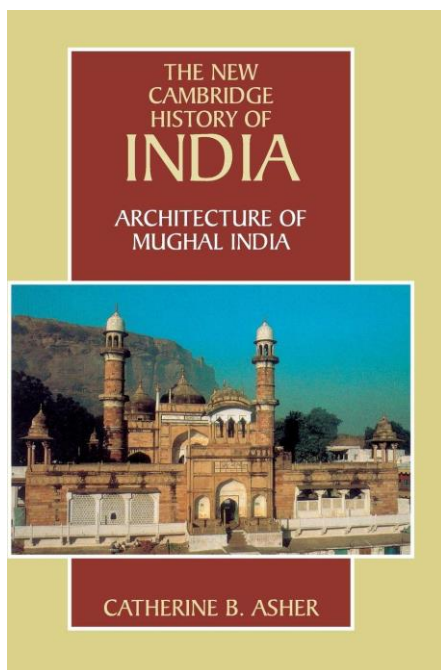
- **Emphasis on Syncretism:** Nationalist historians highlighted the syncretic nature of Islamic architecture in India, focusing on how Islamic and indigenous Indian elements blended to create a unique architectural style. This approach aimed to counter colonial portrayals of Islamic architecture as a foreign imposition and instead emphasize its Indian roots and development.
- **Highlighting Local Contributions:** Nationalist historiography often emphasized the contributions of local artisans, craftsmen, and regional traditions in shaping Islamic architecture. This perspective challenged the colonial narrative that often attributed architectural achievements solely to imperial patronage and foreign influences.
- **Reinterpretation of Architectural History:** Nationalist scholars sought to reinterpret the architectural history of Islamic India by placing it within the broader context of Indian civilization. They emphasized continuity and integration rather than disruption, portraying Islamic architecture as a natural and integral part of India's diverse cultural landscape.

3. Contemporary Historiography: Critical and Inclusive Approaches

In recent decades, contemporary historiography has adopted more critical and inclusive approaches to the study of Islamic architecture in India. These approaches are characterized by a deeper awareness of historiographical biases and a commitment to uncovering marginalized perspectives that were previously overlooked.

Examples of Contemporary Works

- **Catherine B. Asher's "Architecture of Mughal India" (1992):** Asher's work is notable for its comprehensive approach to Mughal architecture, integrating political, social, and cultural contexts into the analysis. Her scholarship reflects a departure from both colonial and nationalist narratives, offering a more balanced and nuanced understanding of the Mughal architectural legacy.
- **Mehrdad Shokoohy's "Muslim Architecture of South India" (2013):** Shokoohy's research focuses on the lesser-studied Islamic architecture of South India, particularly in regions like the Deccan and Tamil Nadu. His work highlights regional diversity and challenges the traditional focus on the more famous Mughal and Sultanate monuments, bringing attention to the rich architectural heritage of other parts of India.



Key Features of Contemporary Historiography

- **Critical Examination of Biases:** Contemporary historians critically examine the biases inherent in earlier historiographical traditions, whether colonial, nationalist, or otherwise. This involves a more reflexive approach that considers how historical narratives have been shaped by cultural, political, and social influences.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

- **Inclusion of Marginalized Voices:** Contemporary scholarship seeks to bring marginalized voices and perspectives into the conversation. This includes highlighting the role of local artisans, regional architectural styles, and lesser-known structures that were often neglected in earlier narratives focused primarily on imperial monuments.
- **Interdisciplinary Approaches:** There is a growing trend toward interdisciplinary approaches that incorporate insights from anthropology, sociology, and cultural studies. This broadens the scope of analysis, allowing for a more holistic understanding of Islamic architecture in India as a cultural and social phenomenon, rather than merely an artistic or architectural achievement.

4. The Evolution of Historiographical Approaches: A Comparative Analysis

By comparing these historiographical approaches, it becomes clear that the study of Islamic architecture in India has evolved significantly over time. The shift from colonial to nationalist and contemporary perspectives reflects broader changes in historical methodology and cultural discourse.

Comparative Analysis of Historiographical Approaches

- **Colonial vs. Nationalist Approaches:** While colonial historiography often viewed Islamic architecture in India through an Orientalist lens, emphasizing its "foreignness" and exotic qualities, nationalist historiography sought to reclaim this heritage as an integral part of Indian culture. Nationalist historians emphasized syncretism and local contributions, challenging colonial narratives of cultural superiority and imposition.
- **Nationalist vs. Contemporary Approaches:** Nationalist historiography, while an important corrective to colonial biases, often focused on constructing a unified national narrative. In contrast, contemporary approaches are more critical and inclusive, recognizing the diversity of voices and perspectives that have shaped Islamic architecture in India. Contemporary historians are more likely to highlight marginalized perspectives and employ interdisciplinary methods to provide a more holistic understanding.
- **Continuities and Disruptions:** Throughout these shifts, there have been continuities and disruptions in how Islamic architecture is studied and understood. While each historiographical approach has brought new insights, they have also perpetuated certain biases and blind spots. Contemporary historiography aims to address these gaps by adopting a more reflexive and inclusive stance.

Conclusion

The conclusion emphasizes how the historiography of Islamic architecture in India reveals both the biases inherent in historical writing and the valuable insights that different perspectives can offer. By

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Multidisciplinary Streams
August 2024

examining the evolution of historiographical approaches—from colonial Orientalism to nationalist reclamation and contemporary critical analysis—we can see how biases have shaped, and continue to shape, the interpretation and understanding of Islamic architectural heritage.

Colonial Biases and Their Impact

The colonial historiographical approach to Islamic architecture was heavily influenced by Orientalist biases. Colonial historians often portrayed Islamic architecture in India as an exotic and foreign imposition, emphasizing a narrative of "otherness" that aligned with their broader colonial objectives. This perspective minimized the local contributions and syncretic elements of Islamic architecture, presenting it as a manifestation of external cultural dominance. These biases led to a narrow interpretation that prioritized certain grand monuments over others and largely ignored the nuanced, localized adaptations that characterized much of India's Islamic architectural landscape.

Nationalist Reinterpretation and Its Biases

In contrast, the nationalist historiography that emerged after India's independence sought to counter the colonial narrative by emphasizing the integrative and indigenous aspects of Islamic architecture. While this perspective offered a corrective to the colonial biases, it also introduced new biases of its own. Nationalist historians often framed Islamic architecture as a symbol of India's composite culture, highlighting themes of unity and integration. However, in doing so, they sometimes downplayed the complex realities of cultural exchange and conflict, favoring a narrative that supported the ideals of national unity and identity formation. This approach, while broadening the scope of historical understanding, also risked oversimplifying the diverse and multifaceted nature of India's Islamic architectural heritage.

Contemporary Critical Approaches: Overcoming Biases and Gaining Insights

Contemporary historiography represents a more critical and inclusive approach that seeks to overcome the limitations and biases of earlier narratives. Modern scholars are increasingly aware of the cultural, political, and social influences that have shaped previous historical writings. By critically examining these biases, contemporary historians aim to provide a more nuanced and comprehensive understanding of Islamic architecture in India. This approach acknowledges the diversity of regional styles, the roles of local artisans, and the socio-political contexts of architectural production, offering a more balanced view that incorporates both major monuments and lesser-known structures.

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Multidisciplinary Streams
August 2024

Contemporary historiography also emphasizes the importance of marginalized perspectives, recognizing that earlier narratives often excluded the contributions of non-elite actors and regional traditions. By bringing these voices into the conversation, contemporary scholarship not only enriches our understanding of Islamic architecture in India but also challenges us to reconsider the assumptions and biases that have shaped historical narratives.

Insights Gained Through a Critical Historiographical Lens

Ultimately, the study of historiography provides profound insights into how historical narratives are constructed and the biases that influence them. By critically engaging with these historiographical traditions, scholars can uncover hidden layers of meaning and complexity in Islamic architecture, fostering a more inclusive and nuanced appreciation of its cultural significance. As historiography continues to evolve, it opens up new possibilities for understanding the rich and complex history of Islamic architecture in India, encouraging ongoing reflection and critical evaluation of the ways in which history is written and understood.

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EXAMINING THE IDEA AND PHENOMENON OF TRIAL BY MEDIA'S IMPACT AND DYNAMICS

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Abstract

This research investigates the effect and dynamics of media trials, with a particular emphasis on the ways in which media coverage affects court procedures and the perceptions of the general public. The goals are to investigate the consequences of trials that are driven by the media, evaluate the controls that are imposed by legislation and regulations, and investigate the role that media coverage has in determining the results of court cases. The capacity of the media to influence public opinion and perhaps skew judicial proceedings is demonstrated by the fact that it has taken a significant role in high-profile cases, such as the murders of Jessica Lal and Aarushi Talwar. Sensationalism in the media has the potential to misrepresent the facts, which can result in "trial by media," which is when public sentiment exerts pressure on the outcomes of court proceedings. The research also investigates the conflict that exists between the freedom of the media and the integrity of the legal system. It is pointed out that although media exposure may be a driving force behind justice, it can also damage the fairness of trials. When it comes to the legal ramifications of media trials, it is necessary to strike a balance between the rights to freedom of expression and privacy, which are protected by both the constitution and international standards. The study highlights the importance of responsible media practices and appropriate regulatory mechanisms in order to guarantee that the integrity of the judicial system is not jeopardized by the influence of the media.

Keywords: *Trial by Media, Media Influence, Legal Proceedings, Public Perception, Media Dynamics.*

1. INTRODUCTION

A phenomenon known as "trial by media" describes the impact that coverage in the media may have on the way the general public perceives high-profile legal matters and the way the court system handles

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Multidisciplinary Streams
August 2024**

them. As a result of the proliferation of digital and social media, this idea has undergone substantial development, which has strengthened the influence that narratives in the media have on the judicial system and on public opinion. Historically, the function of the media in covering legal topics consisted solely of reporting on court hearings and relaying any relevant data. Over the course of the past several years, however, media trials have become increasingly more of a spectacle, where the court of public opinion has the potential to overwhelm the regular courts.

1.1. Origin Of the Word ‘Trial by Media’

The term "trial by media" first appeared in the middle of the twentieth century and has since grown in popularity. The term is used to explain how media portrayals of a person—on television and in newspapers—can affect their reputation by creating a public impression of guilt or innocence either before or after a court verdict. When it comes to situations in which high-profile persons are on trial, it is especially pertinent because there is a risk that the impartiality of the jury may be affected by extraneous information, which would disrupt due process and result in an unjust trial. The history of trials conducted by the media sheds insight on the conflict that exists between the freedom of the media and the rule of law. Significant concerns have been raised regarding the influence that media coverage has on the impartiality of court procedures, despite the fact that media coverage is an essential component of democratic society. There are issues that arise while attempting to protect the integrity of the legal process due to the fact that the media has the capacity to affect public opinion and perhaps skew the outcome of trials.

It is of the utmost importance to investigate the ways in which media trials influence judicial procedures and to realize the delicate equilibrium that exists between the freedom of the media and the right to a fair trial. It is the purpose of this inquiry to throw light on the dynamics of trial by media and its consequences for the judicial system. Additionally, this study will examine both the positive and bad elements of the effect of the media on justice.

2. REVIEW OF LITERATURE

Gregory, K. (2019) based on ineffective research. For current and future studies, the data provided by these side projects is invaluable. This article details the whole life history of sex offenders project, from its inception to its discontinuation, based on extensive research conducted using the National Sex Offender Registry database. Utilizing preliminary field notes and an examination of media representations, I delve into the topic of bracketing, a result of the phenomenological tradition, as well as other methodological concerns such as the psychological and physiological risks associated with

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Multidisciplinary Streams
August 2024**

conducting research alone, biases towards "challenging" populations, and the ways in which research environments can lead to ineffective findings.

Wallerstein, N., et.al., (2019)Health, community capacity, policy, and social justice are all positively impacted by power-sharing and community involvement, according to decades of community-based participatory research. A clear understanding of the power dynamics at play in partnership activities and how they impact outcomes is still lacking. To identify which partnership strategies may most effectively draw on community organizing pasts to tackle inequalities, the National Institutes of Health-funded Research for Improved Health (2009–2013) examined 200 partnerships and conducted seven comprehensive case studies. The case studies included a wide range of urban and rural settings, a variety of health issues, and individuals from a variety of ethnic and racial backgrounds. In subjective cross-cutting exploration, oppressive situations or local area promotion narratives are utilized as a focal point through which emancipatory and repressive power functions within organizations. Beginning with the manners by which settings impact partnering processes and moving on to transient intervention, research results, and results, the local area based participatory examination conceptual model's four domains all arrangement with power. This article examines the manners by which various associations have utilized relational and primary methods to confront power concerns, drawing on their novel accounts and contexts. These results demonstrate how local area individuals honor local area information and administration through organization principles and practices, look for shared power, strategy, and local area transformation changes, and advance wellbeing value by utilizing their assets and flexibility to battle oppression and injustice that has been in their set of experiences.

Luo, Y., et.al., (2019)used advanced meta-analysis techniques to examine empirical studies that established agendas from 1972 to 2015. Among the 67 studies that were included, the average effect size was just 0.487, which is considered low. Research correlation as defined by content categories or survey participants was identified by multiple regression analysis as a key predictor. Content category multiple regression was used to establish subgroup homogeneity. For these studies, the average effect size was 0.51. Consistency in agenda-setting research and the public agenda-setting effect of dominant news media are demonstrated here.

Foroudi, P., et.al., (2018)Customers' increased usage of smart technology is causing practitioners to recognize their impact on purchasing experiences. Smart technology usage and consumer behavior intention affect customer dynamics and experience, yet academic literature ignores this. This early explanatory investigation examines this occurrence in retail. Based on existing scholarship, a conceptual framework was developed and evaluated using a convenience sample of 330 London high-

end retail store shoppers. The suggested model was tested using AMOS SEM. This study contributes to technology adoption-based consumer behavior literature by describing how learning commitment drives participation but not behavioral intention. This research also examines how consumer dynamics and experience affect retail smart technology adoption. Our study's findings and conclusions help explain how smart technologies alter consumer dynamics and experience.

3. OBJECTIVES

1. 1. To study the effects and dynamics of media-based trials.
2. 2. To evaluate legislative and regulatory controls on media impact in high-profile instances.

4. METHODOLOGY/APPROACH

4.1. Impact Of Media Trial on The Judicial Proceedings

"No one was responsible for the death of Jessica," Remarks such as "Sen Ram JethMalani may take his case" and "Dr. Talwar is responsible for the death of his daughter Aarushi" have been made. These are only a handful of the headlines that pop up when you search on different news networks. But they're more than just headlines; they're the media's presentation of the public, seasoned with interpretation and exaggeration, meant to boost their total viewership (TRP). There is, however, the issue of how much accountability and responsibility the media has to the people concerned. In addition to these cases, there were other media-pushed frauds, such as the 2G fraud, the Bofors affair, the Commonwealth Games scam, and the Harshad Mehta stock market controversy. This raises an important but difficult question: how much interference is legitimately expected from a skilled regulator before it becomes an impediment to the court's process?

If the media want to have an impact, the most important tool they have is the power to influence people. It is the editor's and publisher's ideology that is conveyed to the public. It is possible that this ideology will be able to control and trigger the ideation of its recipients. Getting money to turn any idea into a reality is also a piece of cake. Freedom of speech and expression is the foundation upon which the media's sway on the public is built. Notably, unlike other countries, India does not grant the media any special protections on free speech. Any and all ideas may be promoted and disseminated within the vast ideological framework of the right. However, there are restrictions on how this right can be used. It can't be used in a way that undermines or threatens India's sovereignty and integrity, national security, friendly relations with other states, public order, morality, decency, or court proceedings; it can't even be used to incite someone to commit a crime.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

To avoid abusing their position of power, the media must refrain from making false claims. The media did the same thing when the attacks on September 26th happened. Although these limitations are in place, the media still has considerable influence and can influence the course of judicial proceedings. Although the media has the right to free speech, the distortion of facts is its go-to defense strategy. One rebuttal to this view is that the media's First Amendment rights should not be used to mock the court system, which deserves great respect. Despite the fact that the judiciary's respect is inviolable, it is more critical to understand that its role is confined to upholding the law and has no bearing on the circumstances at hand.

The influence that the media possesses allows it to misrepresent the facts and, as a result, determine the issue for itself, which constitutes a clear violation of the court's authority. In order to show the defendant's innocence beyond a shadow of a doubt, the evidence that is going to be submitted in the court of law needs to be of enough quality. What constitutes a reasonable doubt is specific to each individual situation and varies from one instance to the next. Prudence is typically the determining factor in whether or not a human being is reasonable. To determine the genuine point of dispute in a case, reasonableness is the criterion that is utilized. The Court is authorized to infer the presence of certain facts because of the rationality of the situation. The court has the authority to presume the presence of any fact that it considers to be likely to have occurred, taking into consideration the typical course of natural occurrences, human behavior, and public and private business in connection to the circumstances of the specific case.

It should be brought to your attention that the court has the authority to make assumptions about certain aspects of a case. In the event when the media spreads a certain idea that is widely held among the populace and the relevant facts are consequently presumed to be the same by the court, this will, in a sense, imply that the case has been decided by the media. The level of response and reaction that people have to the news is another factor that may be used to understand the power of the press. There are a few instances in which the media has been highly influential in shaping public opinion. In addition to Priyadarshini, Jessica Lal The Mattoo cases serve as a beneficial illustration of the function that the media plays in order to achieve the goals of justice. Following the reporting of both of the murder instances, there was significant indignation and participation in protests.

It was vital for people to demonstrate and speak out loud because they had come to the realization that justice had been denied. Both instances included prominent individuals, and the fact that these individuals were implicated made the general public even more interested in and aware of the proceedings of the cases. We can see that influence from the media was helpful in bringing about the

appropriate and just conclusion to the case. The two murder cases are great instances of responsible and reactive media, which assisted individuals in obtaining their rights.

4.2. Analysis of Media Coverage and Its Effects

Especially in high-profile cases, when media sensationalism can affect the legal process, media coverage has a key role in molding public opinion and court results. One of the most important roles that media coverage performs is in creating public perception. The impact of media trials is readily apparent in the manner in which media narratives frequently exaggerate or misrepresent facts in order to attract audience. As a result, these narratives not only influence public opinion but also have the ability to bias the legal process. The headlines "No one killed Jessica" and "Dr. Talwar is responsible for murdering daughter Aarushi" are examples of created narratives that may generate a public sense of guilt or innocence even before a court makes a decision. For example, these headlines are not merely news items.

A sort of "trial by media," in which popular sentiment becomes a de facto factor in judicial processes, might occur as a result of the media's power to influence public opinion with its influence. Given that jurors and judges may be subjected to biased or exaggerated material that modifies their perspective of the case, this impact has the potential to damage the impartiality of the legal process. An example of how media coverage may have an effect on legal procedures is provided by cases such as the 2G fraud and the Harshad Mehta stock market scam. These cases demonstrate how media coverage can spark public indignation and create an atmosphere of intense pressure for court judgments.

It is possible for the media to influence the judicial process by influencing how the public and the court interpret the case. The media's power extends to the capacity to promote ideas and misrepresent facts. Although there are instances in which media coverage may result in favorable outcomes, such as in the cases of Jessica Lal and Priyadarshini Mattoo, where the pressure exerted by the media helped to bring about the pursuit of justice, there are also instances in which it can damage the integrity of the judicial system by interfering with the court process. It is important to maintain a balanced approach to media freedom and judicial integrity, as the role that the media has played in these cases reveals its dual potential to either promote or impede the pursuit of justice.

5. FINDINGS/RESULTS

5.1. Legal Implications of Media Trial

a. Freedom of Speech and Expression

At the point when the International Convention on Social equality was supported in 1966, Article 19 ensured the right to freedom of discourse. According to this article, "everyone will reserve the privilege to hold opinions without interference." In addition, it expresses that individuals are allowed to look for, get, and influence thoughts and information in any structure, paying little mind to where they are found, and that this includes spoken, composed, printed, imaginative, or some other type of expression that one picks.

Article 19(1)(a) of the Indian Constitution ensures the right to freedom of discourse to each resident of the country. Publication freedom is one feature that is incorporated under the free discourse and expression ensure. There can be no question, as the Honorable Court pointed out, that free discourse and expression envelop the open dissemination of thoughts, and that freedom is shielded by free circulation. The significance of press freedom was maintained by doing this.

The Indian High Court expressed in the BrijBhushan versus Territory of Delhi case that "there can be little uncertainty that the imposition of pre-oversight on a diary is a restriction on the freedom of the press." According to Article 19(1)(a), this limitation is a fundamental piece of the right to freedom of expression.... Preventing individuals from expressing themselves publicly would prompt the ruin of the press, which is an indisputable reality.

Remembering that the Constitution ought to be read broadly, not in a limited and pedantic manner, is critical for getting its meaning right. Considering the essence and character of the fundamental rights guaranteed by our Constitution, the Court should not be so perceptive as to interpret the text of the Constitution in a manner that diminishes the amount of rights enshrined in it. Conversely, the court has a responsibility to interpret the Constitution in a way that allows individuals to fully exercise the rights guaranteed by it, within the bounds that are expressly laid forth in the Constitution.³⁸ By this logic, it follows that the right to freely publish and disseminate one's thoughts, beliefs, and views by any and all methods of publishing is an inherent part of the right to freedom of speech and expression. Be that as it may, this right is not absolute and is open to validly imposed limitations under Article 19 (2). It wasn't until the RomeshThappar vs. State of Madras case that this court finally made note of it in its ruling.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

According to a recent Supreme Court ruling, the right to free circulation protects the right to free speech and expression, which includes the right to distribute ideas.

b. Media vs. Right to Privacy

As a culture, we have developed to put a top notch on personal space and confidentiality. The savage's whole public presence is represented by the laws of his clan. Achieving civilization begins with freeing man from man.

One source that endeavors to define protection is Article 12 of the All inclusive Declaration of Common liberties (1948). This article declares that no one has the right to have their private life, family, home, or correspondence invaded or to have their honor or reputation attacked. Every single individual has the inherent right to be free from legally sanctioned forms of interference or assault.

The purpose of privacy laws is to protect people's inherent dignity by ensuring that they are able to enjoy their personal space without interference. Nowadays, people see privacy as a right and value it highly. Society is growing increasingly individualistic, which is leading to a change in focus away from society and toward the individual. This change has resulted in this.

Concurrently, the right to privacy and the right to free expression are complementary principles. If someone's right to know and be informed is breached, then another person's right to be left alone may also be violated. The proliferation of media channels, especially online ones, in recent years has brought privacy issues to the fore. The ease with which the media may report on people's personal lives has put them at risk of having their personal space and privacy violated.

Although it is not a separate fundamental right, the right to privacy has been acknowledged in India's constitution. Among the many justifiable limitations on the right to free speech are those outlined in Article 19 (2). On the other hand, "privacy" does not appear on this list. Nevertheless, by creatively interpreting Article 21's right to life and Article 19's right to freedom of movement, the court has carved out a fundamental right to privacy notwithstanding this (d).

Kharak Singh v. Province of Rajasthan was the primary case to address the right to security. Recognizing a right to security was not appealing to a great many people in this case. According to their reasoning, no major right could exist to safeguard "simple personal responsiveness." Thusly, the case was denied. Be that as it may, the High Court laid out a restricted right to security in the ensuing case of Govind versus Territory of M.P. The right to protection of persons concerning invasions of security by writers was tended to by the High Court in three cases: SheelaBarse versus Union of India,

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

PrabhaDutt versus Union of India 44, and State versus Charulata Joshi.A 45 The media in every one of these cases petitioned the High Court for authorization to photo and interview the prisoners. Consequently, the court didn't straightforwardly manage the issue of protection; rather, by ruling that the press doesn't have a flat out right to interview or photo a prisoner — only with the prisoner's consent — did it verifiably perceive the right to private.

6. CONCLUSION

The effects and dynamics of the media trial highlight important obstacles as well as possible advantages. The public's perspective and court procedures can be shaped by media coverage, which can occasionally jeopardize the legal system's neutrality. Although media freedom is essential to democratic society, excessive use of it can impede the impartial administration of justice. It's critical to strike a balance between the right to privacy and the freedom of speech since too much media coverage can skew the facts and influence court decisions. To lessen these effects and guarantee that justice is administered impartially, regulatory actions and cautious media practices are crucial. The media's involvement in high-profile cases highlights the necessity of continuing to assess how it affects the judicial system and has wider ramifications for individual rights and democratic government.

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Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

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प्रकरण

तकनीकी एवं गैर-तकनीकी महाविद्यालयों के विद्यार्थियों की व्यवसायिक रुचि का अध्ययन

डॉ समीना कुरैशी

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संक्षेपीकरण (Abstract) :- जीवन को सुचारु रूप से चलाने के लिए प्रत्येक व्यक्ति कोई न कोई व्यवसाय अपनाना होता है, ये जरूरी नहीं हैं, कि प्रत्येक व्यक्ति की व्यवसायिक रुचि भिन्न होती है। इस बात का प्रमाण भिन्न व्यक्तियों का विभिन्न व्यवसायों से जुड़ा होना है। विद्यार्थी और उनके अभिभावक व्यवसायिक आधार पर रुचि रखते हैं। व्यवसायिक रुचि के अंतर्गत प्रतिष्ठा पसन्द रुचि का विचार किया। व्यवसायिक शिक्षा के द्वारा अपनी रुचि के व्यवसाय चुनने की स्वतंत्रता रहती, प्रत्येक विद्यार्थी की यह रुचि रहती है कि वह अपनी रुचि और स्तर के अनुसार व्यवसाय चुने, अतः वे उसी विषय, का अध्ययन करते हैं। किन्तु इस कथन के विपरीत कुछ विद्यार्थी ऐसे हैं जो, अपने अभिभावक पर निर्भर करते हैं। वे अपने अभिभावक की इच्छा पर आधारित व्यवसाय चुनते हैं, अतः वे अपनी रुचि के बिना उस व्यवसाय को अपनाते हैं और असफल होते हैं। इसलिए आवश्यक है कि अभिभावक और बालक के रुचि के अनुसार ही व्यवसाय चुना जाए।

महत्वपूर्ण शब्द (Key Words) :- तकनीकी एवं गैर-तकनीकी महाविद्यालय, विद्यार्थी, व्यवसायिक रुचि।

1. परिचय (Introduction) :- बालक का मस्तिष्क इतना परिपक्व नहीं हो पाता है कि वे अपनी इच्छा के अनुसार व्यवसाय चुनें, क्योंकि इसके बारे में उसे समुचित ज्ञान प्राप्त नहीं हो पाता, ऐसी अवस्था में बालकों को चाहिए कि वे अपने अभिभावक के निर्देशन के द्वारा व्यवसाय चुने, क्योंकि प्रत्येक अभिभावक की इच्छा रहती है कि उसके अनुसार बालक व्यवसाय चुने, ऐसा भी होता है, कि पैतृक व्यवसाय की प्रधानता होने के कारण बालक को सही मार्गदर्शन नहीं मिल पाता है। क्योंकि पीढ़ी दर पीढ़ी उस कार्य को करने के कारण उसी व्यवसाय पर निर्भर रहते हैं, दूसरे व्यवसाय के बारे में सोचा नहीं जाता है, जिससे कि बाद वाली पीढ़ी को अपने व्यवसाय चुनने में कठिनाई महसूस होती है। इसलिए आवश्यक है कि अभिभावक और बालक के रुचि के अनुसार ही व्यवसाय चुना जाये।

बालक की व्यवसायिक रुचि पर अभिभावकों की रुचि अत्यधिक प्रभावित हुई है। अभिभावक जो कुछ अपने जीवन में नहीं कर पाते, उसे पूरा करने की अपेक्षा अपनी संतानों से करते हैं, जिससे वे बालक के व्यवसाय के प्रति रुचि को प्रभावित करते हैं, जिससे व्यवसायिक रुचि प्रभावित होती है।

2. संबंधित साहित्य की समीक्षा (Review Related Literature) :-

- मिश्र (1975) – अनुसूचित जाति के लोगों की व्यवसायिक रुचि व उसके स्थान का अध्ययन किया गया, जिसके परिणाम इस प्रकार प्राप्त हुआ –

“महत्वाकांक्षा के स्तर के कारण विभिन्न विषयों के संदर्भ में रुचि का विकास होता है।”

- परमाज (1976) – द्वारा व्यवसायिक रुचि व्यवसायिक संतुष्टि व्यवसायिक एफीसेंसी ऑफ नॉन प्रोफेशनल पर उच्च शोधकार्य किया गया, जिसका परिणाम इस प्रकार प्राप्त हुआ –

उच्चतम व्यवसायिक रुचि वाले व्यक्ति सदैव उच्च पद पर आसीन होते हैं।

- राव (1978) – के द्वारा व्यवसायिक रुचि संतुष्टि पर शोधकार्य किया गया, जिसका परिणाम इस प्रकार प्राप्त हुआ –

1. व्यवसायिक महत्वाकांक्षा शिक्षा के स्तर पर होती है।
2. उच्च मानसिक स्तर के व्यवसायिक व्यक्तियों का झुकाव शारीरिक कार्यों के प्रति कम रहता है।
3. व्यवसायिक रुचि वाले व्यक्ति निजी व्यवसायों में रुचि नहीं रखते।

3. उद्देश्य एवं परिकल्पनाएँ (Objective And Hypothesis) :-

अध्ययन का उद्देश्य (Objective of the Study) :- लघुशोध प्रबन्ध हेतु चयन को समस्या में निम्नलिखित महत्वपूर्ण उद्देश्य की पूर्ति अपेक्षित है। प्रस्तुत अध्ययन हेतु निम्न उद्देश्य निर्धारित किए गए हैं –

- तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि के मध्य अंतर ज्ञात करना।
- तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि के मध्य अंतर ज्ञात करना।

अध्ययन की परिकल्पना (Hypothesis of the Study) :-

- H₁ – तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि में सार्थक अंतर नहीं पाया जाएगा।
- H₂ – तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि में सार्थक अंतर नहीं पाया जाएगा।

4. प्रणाली एवं प्रक्रिया (Methodology And Procedure) :-

विधि (Method) :- प्रस्तुत शोध अध्ययन में तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्र-छात्राओं का चयन उद्देशीय न्यादर्श विधि द्वारा किया गया है।

जनसंख्या (Population) :- प्रस्तुत शोध अध्ययन के लिए शोधकर्ता ने दुर्ग-भिलाई शहर के तकनीकी एवं गैर तकनीकी महाविद्यालयों के विद्यार्थियों का चयन किया है।

न्यादर्श (Sampling) :- इस शोध अध्ययन में उद्देशीय न्यादर्श विधि द्वारा 60 तकनीकी महाविद्यालयों के विद्यार्थियों का चयन तथा 60 गैर-तकनीकी महाविद्यालयों के विद्यार्थियों का चयन किया गया है।

विस्तार एवं सीमांकन (Scope And Delimitation) :- इसमें केवल तकनीकी एवं गैर-तकनीकी महाविद्यालयों के विद्यार्थियों का चयन किया गया है। प्रस्तुत अध्ययन विद्यार्थियों की "व्यवसायिक रुचि" तक ही सीमित है। इसमें 4 तकनीकी एवं 4 गैर-तकनीकी महाविद्यालयों का चयन किया गया है।

उपकरण (Tools) :- प्रस्तुत शोध कार्य में विद्यार्थियों की व्यवसायिक रुचि को जानने हेतु डॉ. एस. पी. कुलश्रेष्ठ द्वारा निर्मित व्यवसायिक रुचि प्रपत्र का चयन किया गया है।

सांख्यिकीय प्रविधि (Statistical Techniques) :- इस अध्ययन में मध्यमान, प्रमाणिक विचलन एवं 'टी' मूल्य का प्रयोग किया गया है।

5. विश्लेषण एवं चर्चा (Analysis and Discussion) :-

प्रमाणित कल्पनाएँ (Verification of Hypothesis) :-

H_1 – तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि के मध्य सार्थक अंतर नहीं पाया जाएगा।

निष्कर्ष :- तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि के गणित के संदर्भ में गणना की गई एवं 'टी' मूल्य 0.88 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H_1 गणित के संदर्भ में स्वीकृत की जाती है।

तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि के विज्ञान के संदर्भ में गणना की गई एवं 'टी' मूल्य 1.80 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H_1 विज्ञान के संदर्भ में स्वीकृत की जाती है।

तकनीकी एवं गैर तकनीकी महाविद्यालयों के छात्रों की व्यवसायिक रुचि के अधिकारी के संदर्भ में गणना की गई एवं 'टी' मूल्य 1.55 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H_1 अधिकारी के संदर्भ में स्वीकृत की जाती है।

H_2 – तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि के मध्य सार्थक अंतर नहीं पाया जाएगा।

निष्कर्ष :- तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि के गणित के संदर्भ में गणना की गई एवं 'टी' मूल्य 1.04 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H_2 गणित के संदर्भ में स्वीकृत की जाती है।

तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि के विज्ञान के संदर्भ में गणना की गई एवं 'टी' मूल्य 0.83 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H_2 विज्ञान के संदर्भ में स्वीकृत की जाती है।

तकनीकी एवं गैर तकनीकी महाविद्यालयों की छात्राओं की व्यवसायिक रुचि के अधिकारी के संदर्भ में गणना की गई एवं 'टी' मूल्य 0.31 प्राप्त हुआ, जो (df – 58) 0.05 पर सार्थक अंतर नहीं पाया गया। अतः परिकल्पना H₂ अधिकारी के संदर्भ में स्वीकृत की जाती है।

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YOGA RESEARCH HAS A LONG WAY TO GO

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Yoga is an ancient and complex practice, rooted in Indian philosophy. It began as a spiritual practice but has become popular as a way of promoting physical and mental well-being.

When we think of what yoga can contribute to scientific research, and especially to research field, think of two entirely different types of research: psychological research about yoga and yoga research about psychology, or to say it even more succinctly, research *about* yoga and research *in* yoga. The first type of research, research *about* yoga, works within the limits of existing science, and distills from the Indian tradition only those theories and techniques that science can assess by its own well established research methods.

There is a great need of yoga and yogic practices to be taught and also to practice yoga, to overcome physical, mental and physiological problems. I urge upon the August body to see that yoga to be made simple rather than complex through research for the following reasons development of science and technology in the recent years has made man's life fast, busy and full of tensions. The pressure on the muscles has been largely taken away by the machines, but the pressure on the nerves has greatly increased. This has resulted in what are called stress disorders or the psychosomatic disorders.

Our mind and body is capable of bearing the load of tension to a certain limit. If tension continues beyond that limit, then the balance of the psycho-physiological processes is disturbed, and that results into various symptoms of mal-adjustment the mind expresses the tension in the form of impulses that flow from the brain to various muscles of the body. If these muscles continue to make an impact on the glands and organs, this will give rise to the malfunctioning of the organ or glands concerned. Unless and until the mind be relieved of the tension prevailing in it, the disorder of the organs concerned can't be rectified. The most important benefit of yoga is physical and mental therapy.

The aging process; which is largely an artificial condition, caused mainly by autointoxication or self-poisoning, can be slowed down by practicing yoga. Regular practice of asanas, pranayama and

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

meditation can help such diverse ailments such as diabetes,- blood pressure, digestive disorders, arthritis, atherosclerosis, chronic fatigue, asthma, varicose veins and heart conditions.

Laboratory tests have proved that yogi's increased abilities of consciously controlling the autonomic or involuntary functions, such as temperature, heart beat and blood pressure. Research into the effects of yogic practices on HIV is currently underway with promising results. The Asana or the postures will help in keeping the muscles, nerves and joints to perform in a benefitting manner and tone up all the internal organs to function effectively without creating fatigue. The Pranayama which is systematic and rhythmic respiration helps to relax the physical and mental organs of the body and keeps every cell oxygenated which helps in metabolism.

A lot of research is conducted in Yoga for the prevention of the following:

Asthma, Respiratory Problem, High B.P., Back Pain, Arthritis, Weight Reduction, Cancer etc.

Asthma: Studies conducted at yoga institutions in India have reported impressive success in improving asthma. It has also been proved that asthma attacks can usually be prevented by yoga methods without resorting to drugs.

Respiration Problems: Patients who practice yoga have a better chance of gaining the ability to control their breathing problems. With the help of yogic breathing exercises, it is possible to control an attack of severe shortness of breath without having to seek medical help. Various studies have confirmed the beneficial effects of yoga for patients with respiratory problems.

High Blood Pressure: The relaxation and exercise components of yoga have a major role to play in the treatment and prevention of high blood pressure (hypertension). A combination of biofeedback and yogic breathing and relaxation techniques has been found to lower blood pressure and reduce the need for high blood pressure medication in people suffering from it.

Pain Management: Yoga is believed to reduce pain by helping the brain's pain center regulate the gate controlling mechanism located in the spinal cord and the secretion of natural painkillers in the body. Breathing exercises used in yoga can also reduce pain. Because muscles tend to relax when you exhale, lengthening the time of exhalation can help produce relaxation and reduce tension. Awareness of breathing helps to achieve calmer, slower respiration and aid in relaxation and pain management.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Back Pain: Back pain is the most common reason to seek medical attention. Yoga has consistently been used to cure and prevent back pain by enhancing strength and flexibility. Both acute and long-term stress can lead to muscle tension and exacerbate back problems.

Arthritis: Yoga's gentle exercises designed to provide relief to needed joints had been Yoga's slow-motion movements and gentle pressures reach deep into troubled joints. In addition, the easy stretches in conjunction with deep breathing exercises relieve the tension that binds up the muscles and further tightens the joints. Yoga is exercise and relaxation rolled into one - the perfect anti-arthritis formula.

Weight Reduction: Regular yoga practice can help in weight management. Firstly, some of the asanas stimulate sluggish glands to increase their hormonal secretions. The thyroid gland, especially, has a big effect on our weight because it affects body metabolism. There are several asanas, such as the shoulder stand and the fish posture, which are specific for the thyroid gland. Fat metabolism is also increased, so fat is converted to muscle and energy. This means that, as well as losing fat, you will have better muscle tone and a higher vitality level.

Psychological Benefits: Regular yoga practice creates mental clarity and calmness, increases body awareness, relieves chronic stress patterns, relaxes the mind, centers attention and sharpens concentration.

Self-Awareness: Yoga strives to increase self-awareness on both a physical and psychological level. Patients who study yoga learn to induce relaxation and then to use the technique whenever pain appears. Practicing yoga can provide chronic pain sufferers with useful tools to actively cope with their pain and help counter feelings of helplessness and depression.

Mental Performance: A common technique used in yoga is breathing through one nostril at a time. Electroencephalogram (EEG) studies of the electrical impulses of the brain have shown that breathing through one nostril results in increased activity on the opposite side of the brain. Some experts suggest that the regular practice of breathing through one nostril may help improve communication between the right and left side of the brain. Studies have also shown that this increased brain activity is associated with better performance and doctors even suggest that yoga can enhance cognitive performance.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Mood Change and Vitality: Mental health and physical energy are difficult to quantify, but virtually everyone who participates in yoga over a period of time reports a positive effect on outlook and energy level. Yogic stretching and breathing exercises have been seen to result in an invigorating effect on both mental and physical energy and improved mood.

Emphasis of yoga intervention: Asana was the most prominent component being used in 81% of interventions. The nature and form of asana was only described in 54% of studies and a mere 12% mentioned the amount of time that participants practiced asana or other forms of yoga.

A number of other yogic tools were also prominently featured in this research including pranayama (breathing exercises) 42%, meditation (dharana and dhyana) 23%, relaxation exercises (15%), and 37% with no additional emphasis reported.

More research should be done in the following areas:

The very essence of yoga lies in attaining mental peace, improved concentration powers, a relaxed state of living and harmony in relationships. All the above benefits will help the students in their academic achievements. :Though Yoga is considered as one of the effective stress buster through pranayama and relaxation techniques it is not taken seriously by majority of the sportspersons as a training component. Reviews and literatures shows that Yoga helps in enhancing the vital capacity but again coaches and the trainers give little importance to it.

Conclusion:-

The most important thing that yoga teachers and therapists can do is to exercise caution, ask questions, stay informed, and exercise humility when it comes to discussing yoga research. While there are a number of promising studies and the field is continuing to grow, we still know very little about how yoga works and why. More and more researchers are beginning to ask these questions, so it is only a matter of time until we understand the scientific basis for the miracles that we witness each and every day.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

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Multidisciplinary Streams
August 2024

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August 2024

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NURTURING THE SEEDS OF FUTURE RESEARCH: CULTIVATING YOUNG MINDS IN SCHOOLS

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ABSTRACT

This paper looks at important role of schools in nurturing the future generation of Researchers. By integrating research-oriented learning into school curriculum, students will be able to develop essential skills such as curiosity, critical thinking and problem solving. This education system will help the students to prepare themselves for higher education and future careers in research.

As the whole world evolves more research is required to advance knowledge and innovation in all fields. This implies that school's students must be prepared for today's knowledge – driven world. I discuss in this paper, value and benefits of research among school students and challenges they face. In school education time there should qualified teachers to teach students how to research, how to analysis facts and events, how to prepare notes for themselves, how should criticize the concepts and ideas etc., this will help the students to acquire skills to use beyond their academic environment. The government should have special interest and initiatives in research programs and activities and cause students to higher qualifications. True and factual research will have a long-term impact on valuable learning outcomes, and it will help students to prepare for professional, social and national service in the future.

Key Words - Research Skills, Critical Thinking, Creative Writing, Extra Curriculum Activities, New Concepts.

REVIEW OF LITERATURE

The paper, Nurturing the Seeds of Future Research: Cultivating Young Minds in Schools, aims wide area of topics including critical thinking skills, analytical mind, how to understand the reality, concepts, factual events and to make a real conclusion and comprehensive overview. This paper gives ideas to develop research skills and confidence in their abilities.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

OBJECTIVES

- Encourage interdisciplinary learning to connect knowledge across different subject
- Foster analytical and evaluative skills to enable students to approach problems logically and creatively
- Encourage questioning and curiosity to develop independent thinking
- Familiarize students' various methodology and tools

FINDINGS

1)Need of Research in Schools

Research learning is fundamental in the academic area, and it has an important role in school students. Since science and technology are developing at an unprecedented rate with new discoveries and achievements coming out so that there should be qualified research skill in every student. To achieve this quality of research class must begin from school curriculum onwards. when we discuss about research naturally, we relate with PhD and PG studies and their scientific paper and studies, they complete it in order to gain their certificate but when we train students from school curriculum onwards, they will be able to keep it for their life long. Learning in research will develop personal and professional growth, empowering them to expand their knowledge. By acquiring new research skills in school, students will be able to undertake more different and difficult papers in future. This will help students to have more confidence in their carrier.

2) Benefits of Research among school students

a) Gain more knowledge of subjects

Research gives wide understanding about the knowledge of their subjects. This will help the students learn from different perspectives.

b) Preparing themselves for future carriers

Through participating in research students will gain their skills including problem- solving, critical thinking, communication, project management and teamwork.

c) understanding about Environment and society

Research will help students to understand their environment and society, it will lead to new discoveries, solutions to societal problems and innovative ideas that drive societal progress.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

d) Communication and presentation skill

When students present their work in front of the desk it will help to improve their presentation skills and communication skills. This is a great opportunity for students to refine their presentation skills through oral presentation.

e) Personal growth and confidence

Research will help students to understand their abilities which will help them for their future, and it will give more confidence in their abilities.

3) Challenges of Research Studies in Schools

a) Syllabus

There is no special syllabus for research studies in schools. Even though there is no special syllabus every subject can include space for research activities.

b) Lecturing

Most teachers in schools are following lecture methods, there is no active place for students to interact or contribute to subject. Teachers are teaching subject students just listening to them and writing notes, no more discussion or serious interaction take place.

c) Facilities

There are good libraries in the schools but not sufficient for all students to make use of it, not only the library but also labs too.

d) politics

Now governments make schools exam and results so easy if you look at the SSLC passing percentage in Kerala it is above 98% so it gives comfort for students learn only what is in the textbooks.

e) Students Approach

Students are not interested in the extra activities like reading, writing and experiments, they are in the fantasy world.

d) Migration

One of the major issues that India facing. Look at the last 8 years 46.44 lakhs students were migrated to euro this real number that center government has delivered. After school's studies most

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

students to planning to do foreign language courses and want to go abroad. A student planning for this will not take any studies seriously in schools.

4) Action to be taken

a) Good Facilities should be provided

All students must get good opinions about our curriculums, education system and facilities likewise in abroad so we need good libraries, lab etc. different way of teaching methods rather than Lecturing.

b) Research Studies

There should be space for Research studies in school syllabus. It will help students to get more knowledge about critical thinking abilities, how to prepare notes, seminars, projects.

c) Presentation

Each subject must have some paper station for all students, which will help students to have confidence in their abilities.

d) Library Hours

Each class must spend at least 4 to 5 hours in the library a week.

e) Group Discussion

There should be some serious group discussion that must take place in every class with the presence of teachers.

f) Mark System

For all extra activities just like presentation, group discussion, experiment must give mark and certificate.

5) Philosophy and Schools

Philosophy subject must be introduced in schools. Philosophy is not just fancy thinkings, but it will help both teacher and students to do their best in classrooms.

The critical mind is not just criticizing everything around us, but it is asking some valuable questions and finding out answers to the questions. So, it begins with oneself, one student asks himself

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

why I am going to school? What should achieve in the future? What should be my life purpose? This question and answers will give hope in their life.

The idea of teaching philosophies has been shaped over time by some very thoughtful people. John Locke thought education could shape a person, and Jean-Jacques Rousseau said we should focus on how kids naturally grow and learn. Their thinking is a big part of today's teaching philosophies.

There are some philosophical ideas that can introduce in schools

- a) Progressivism: students will understand that education will help them in all their parts of life, not only their brain alone.
- b) Perennialism: students will get more ideas rather than just factual knowledge so they will ask more meaningful questions.
- c) Reconstructionism: students begin to have critical thinking about their purpose life and improve it.

The aim of teaching philosophies is to ensure the complete and balanced development of students, make them not only with intellect but wisdom to proper. All students possess unique learning styles, preferences, abilities, it is essential for teachers to consider these factors. When selecting and implanting a teaching philosophy.

CONCLUSION

Shaping the future of research is not in the hands of college students but it is in the hands of young ones in schools. We must make good educational movements in the school system and curriculum; we will witness the great changes and innovative methodologies in the research area. When this young mind is trained well, surely, they will bring new ideas and concepts.

Flexibility and adaptability are necessary to bring changes in research, if we need a change in the particular area we have to depend on students because they can easily adapt anything and make flexible changes.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON ORGANISATION PERFORMANCE OF EMPLOYEES

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Abstract

Artificial Intelligence has begun to alter the corporate world's dynamics in the last few years. It is anticipated that artificial intelligence will have a significant impact on an organization's performance and raise the company's degree of global competency. AI is anticipated to assist the company in better understanding its target audience, potential target audience, staff, and customers. It is anticipated that AI will assist the company in better understanding its target audience, potential target audience, staff, and customers. Artificial intelligence (AI) has the potential to improve lives by making tasks more convenient and customized. Businesses will be able to operate at a higher level and customize their operations in ways that are currently only possible for humans. Businesses face a daily plethora of demands and difficulties regarding: what should be done, how should it be done, when should it be done, who should do it, how much it will cost, how long it will take, what resources are needed, market trends, the status of the economy at the moment, shifts in customer preferences, etc. All of these are anticipated to be examined by humans using historical data; nevertheless, due to time constraints, this may prove demanding and tough for the company as well as the staff. These are all scenarios in which artificial intelligence could be useful. AI might be inferred from every organizational department. The type of study design that was used is descriptive. The research results were presented using pie charts and bar graphs. Organization Employees were the main participants in this study.

Keywords: Artificial intelligence, organisation performance, organisation challenges

Introduction

Technological advancements are bringing about a significant transformation of modern workplaces, particularly with the introduction of Artificial Intelligence (AI) into many organizational activities. Among them, one area where AI is starting to disrupt and challenge conventional knowledge is performance management. Aiming for speed, efficiency, and competitiveness in a business

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

environment that is changing swiftly, firms can improve decision-making, nurture talent, and accelerate organizational success by implementing AI-powered tools in performance management.

As previously mentioned, any tool or machine that performs human labor must be considered as part of the idea of artificial intelligence (AI). These devices are products of human invention, meant to automate daily routines so that people can do more in less time (Harrison,1986). Technology is advancing and innovating so quickly that it is forcing firms to digitize their business processes. That being said, over time, the demands and goals of today's workforce have transformed corporate culture and HR procedures, especially with the major alterations after the worldwide pandemic (Harsha Palwe,2021). The company's workforce is one of its most significant assets. Reaching organizational objectives and gaining a competitive edge depend heavily on the performance of individual employees. In the modern era of highly developed IT, One of the most ground-breaking developments in a number of industries, including human resource development, is artificial intelligence (AI) (Trocin et al., 2021). Technology like IBM's Watson¹ and Google DeepMind's AlphaGo², which defeated their top competitors, best illustrate the visibility and quick pace of artificial intelligence (AI) in recent years. competitors who are human at Go and Jeopardy. Though AI takes many different forms, in general, the term refers to intelligent systems that possess the capacity for thought and learning (Russell et al.,1995). Artificial Intelligence (AI) has revolutionized the field of Human Resource Management (HRM) by allowing computers to perform cognitive functions that were previously performed by people (Graßmann & Schermuly, 2021). The use of AI signals the beginning of a new era in performance management, one marked by ongoing observation, data-driven insights, and customised feedback systems. According to Tong et al. (2020), artificial intelligence (AI) will play a major role in empowering managers to use big data to provide personalised feedback, which will transform performance reviews. However, organisational preparedness and managerial skill in successfully utilising AI-generated feedback are prerequisites for the realisation of this revolutionary potential. Helms Mills et al. (2010) have underlined that people's sense making process is critical in deciding whether they view AI-generated feedback as a danger or an opportunity, which in turn affects how widely it is adopted and how it affects organisations

,we delineate how AI is influencing the nature of work in the future by altering particular facets of work procedures and the experiences of human laborers. By doing this, we can better understand research that looks into new roles for humans and AI (Jarrahi, 2018) and how to best combine human and AI skills to promote worker and organizational effectiveness. We also discussed how the nature of work and the competencies needed to succeed in the current organizational environment are influenced by and changed by human-AI collaboration.

LITERATURE REVIEW

Agarwal and Dhar's (2014) recent research examines the potential that big data and analytics bring to performance management and emphasizes how these changes may affect organizational procedures. In their discussion of the potential and problems facing HRM in the future, Stone and Deadrick (2015) stress the necessity for businesses to keep up with technology changes.

Furthermore, the alignment of personal ambitions with organizational goals is facilitated by AI-powered solutions (Armstrong, 2016; Larson & Chu, 2018). Artificial intelligence (AI) systems are able to analyse and comprehend goal statements by using machine learning and natural language processing algorithms. This allows for consistency and alignment at all organizational levels.

The relevance of AI in providing real-time feedback mechanisms within organizations has been highlighted by a number of researchers (Vrontis et al., 2022; Tong et al., 2020). Organizations may expedite employee feedback, support continuous improvement projects, and streamline performance evaluation procedures by utilizing AI algorithms.

Tong et al. (2020) explore the advantages and disadvantages of artificial intelligence (AI) in performance management, talking about how it may increase employee engagement, expedite procedures, and promote a continuous improvement culture. The report emphasizes how crucial AI-driven insights are to reaching strategic goals and improving people management procedures.

In his thorough analysis of the research on AI in performance management, Biswas (2021) summarizes the most important conclusions and points out new developments. The study emphasizes the increasing use of AI-powered systems in businesses and the necessity for more investigation into these systems' efficacy in various settings.

Graßmann and Schermuly (2021) examine how AI is being used in businesses, highlighting how crucial it is to combine machine and human viewpoints for a successful rollout. The study explores how employee acceptability, leadership support, and organizational culture influence the uptake of AI-driven performance management systems.

Artificial Intelligence (AI) has been increasingly prevalent in performance management in recent years, changing conventional methods and creating new options for businesses. The influence of artificial intelligence (AI) on human resource management methods has been shown in research by Vrontis et al. (2022), which emphasizes how AI improves decision-making processes and boosts organizational performance

OBJECTIVES OF RESEARCH PAPER

1. To analyze the impact of artificial intelligence on organisational performance metrics across various industries.
2. To identify and evaluate the key AI technologies and strategies that drive performances optimization in business

RESEARCH METHODOLOGY

The study's technique includes gathering primary data from 150 respondents in the Punjabi area of Ludhiana using an online questionnaire. The study, "The impact of Artificial intelligence of organisation on performance of employees," evaluates how AI technologies affect organisational performance management procedures using quantitative techniques.

RESULT AND DISCUSSION

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	75	49.7	50.3	50.3
	Female	74	49.0	49.7	100.0
	Total	149	98.7	100.0	
Missing	System	2	1.3		
Total		151	100.0		

In the analysis, the gender distribution among respondents is nearly balanced, with 50.3% male and 49.7% female participants. This slight difference ensures a diverse range of perspectives on the impact of AI on organizational performance. The data reflects inclusivity, with only a small portion (1.3%) of responses missing, making the findings robust and representative of both genders.

individual goal with organisation objectives					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	5	3.3	3.3	3.3
	disagree	1	.7	.7	4.0
	neutral	17	11.3	11.3	15.2

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

	agree	88	58.3	58.3	73.5
	strongly agree	40	26.5	26.5	100.0
	Total	151	100.0	100.0	

The analysis shows that a significant majority of respondents (84.8%) agree or strongly agree that AI-powered performance management systems effectively align individual goals with organizational objectives. Specifically, 58.3% agree, and 26.5% strongly agree with this statement. A smaller portion remains neutral (11.3%), while a minimal number of respondents disagree (4%). This strong positive response indicates that AI is perceived as a valuable tool in harmonizing personal ambitions with company goals, promoting a cohesive and aligned workforce. The data underscores the effectiveness of AI in enhancing organizational goal alignment.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gender	149	1.00	2.00	1.4966	.50168
identify performance trends more effectively	151	2.00	5.00	4.1391	.73066
Education Qualification	151	1.00	5.00	3.8411	.81725
Valid N (listwise)	149				

The descriptive statistics provide a summary of key variables in the study. The gender variable, with a mean of 1.4966 and a standard deviation of 0.50168, shows a near-equal distribution between male and female respondents. The effectiveness of AI in identifying performance trends has a mean of 4.1391, indicating that most respondents agree on its usefulness, with a relatively low standard deviation of 0.73066, suggesting consistent responses. Education qualification has a mean of 3.8411 and a standard deviation of 0.81725, reflecting a diverse educational background among the respondents.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gender	151	1.00	2.00	1.5033	.50165
Education Qualification	151	1.00	5.00	3.8411	.81725
individual goal with organisation objectives	151	1.00	5.00	4.0397	.83969

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

effective identification of training and development needs	151	1.00	5.00	4.0861	.75666
Real time feedback	151	1.00	5.00	4.0397	.83969
identify performance trends more effectively	151	2.00	5.00	4.1391	.73066
Valid N (listwise)	151				

The descriptive statistics highlight key variables from the study. Gender is nearly evenly split with a mean of 1.5033. The respondents' educational qualifications have a mean of 3.8411, indicating a fairly diverse educational background. For aligning individual goals with organizational objectives, the mean is 4.0397, showing general agreement. The effectiveness in identifying training needs has a slightly higher mean of 4.0861. Real-time feedback and the ability to identify performance trends both have strong mean values of 4.0397 and 4.1391, respectively, indicating positive perceptions of AI's role in these areas.

Descriptive Statistics			
	Mean	Std. Deviation	N
facilitates accurate and timely performance evaluations	4.0795	.84477	151
contributed positively to overall employee performance	4.1457	.73392	151

The descriptive statistics reveal that the statement "facilitates accurate and timely performance evaluations" has a mean score of 4.0795, with a standard deviation of 0.84477, indicating a positive response but with some variability among respondents. The statement "contributed positively to overall employee performance" has a slightly higher mean score of 4.1457 and a lower standard deviation of 0.73392, suggesting a strong and more consistent agreement among respondents about the positive impact on employee performance. Both means indicate favorable perceptions of the effectiveness of the evaluated factors.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Correlations			
		facilitates accurate and timely performance evaluations	contributed positively to overall employee performance
facilitates accurate and timely performance evaluations	Pearson Correlation	1	.519**
	Sig. (2-tailed)		<.001
	N	151	151
contributed positively to overall employee performance	Pearson Correlation	.519**	1
	Sig. (2-tailed)	<.001	
	N	151	151
**. Correlation is significant at the 0.01 level (2-tailed).			

The correlation analysis shows a moderate positive relationship between "facilitates accurate and timely performance evaluations" and "contributed positively to overall employee performance," with a Pearson correlation coefficient of 0.519. This correlation is statistically significant at the 0.01 level ($p < 0.001$), indicating that improvements in timely performance evaluations are associated with a positive impact on overall employee performance. The significant correlation suggests that effective performance evaluations are likely contributing to enhanced employee performance.

Descriptive Statistics			
	Mean	Std. Deviation	N
individual goal with organisation objectives	4.0397	.83969	151
improved our ability to forecast performance outcomes	4.0927	.79457	151

Descriptive statistics reveal that respondents rated the alignment of individual goals with organizational objectives with a mean of 4.04 (SD = 0.84). The ability to forecast performance outcomes was rated slightly higher, with a mean of 4.09 (SD = 0.79). Both scores indicate a generally positive perception of AI's impact on performance management.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Correlations			
		individual goal with organisation objectives	improved our ability to forecast performance outcomes
individual goal with organisation objectives	Pearson Correlation	1	.374**
	Sig. (2-tailed)		<.001
	N	151	151
improved our ability to forecast performance outcomes	Pearson Correlation	.374**	1
	Sig. (2-tailed)	<.001	
	N	151	151
**. Correlation is significant at the 0.01 level (2-tailed).			

The correlation analysis shows a significant positive relationship between aligning individual goals with organizational objectives and the improved ability to forecast performance outcomes ($r = 0.374$, $p < 0.001$). This indicates that as employees' individual goals align more closely with organizational objectives, there is a notable improvement in the organization's ability to predict performance outcomes. The positive correlation suggests that effective goal alignment contributes to better performance forecasting, highlighting the importance of synchronization between personal and organizational targets for enhanced performance management.

Descriptive Statistics			
	Mean	Std. Deviation	N
AI in performance management has been beneficial to our organization	4.1788	.76669	151
effective identification of training and development needs	4.0861	.75666	151
improved the fairness and objectivity of performance evaluation	4.0530	.85470	151

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Descriptive statistics reveal that AI in performance management is highly beneficial to the organization ($M = 4.18$, $SD = 0.77$). It also effectively identifies training and development needs ($M = 4.09$, $SD = 0.76$) and improves the fairness and objectivity of performance evaluations ($M = 4.05$, $SD = 0.85$). These results indicate strong positive perceptions of AI's impact on performance management.

Correlations				
		AI in performance management has been beneficial to our organization	effective identification of training and development needs	improved the fairness and objectivity of performance evaluation
AI in performance management has been beneficial to our organization	Pearson Correlation	1	.594**	.596**
	Sig. (2-tailed)		<.001	<.001
	N	151	151	151
effective identification of training and development needs	Pearson Correlation	.594**	1	.632**
	Sig. (2-tailed)	<.001		<.001
	N	151	151	151
improved the fairness and objectivity of performance evaluation	Pearson Correlation	.596**	.632**	1
	Sig. (2-tailed)	<.001	<.001	
	N	151	151	151
**. Correlation is significant at the 0.01 level (2-tailed).				

Correlations show strong positive relationships among the variables. AI in performance management is significantly beneficial to the organization ($r = .594$, $p < .001$) and is linked to effective identification of training and development needs ($r = .594$, $p < .001$) and improved fairness and objectivity of performance evaluations ($r = .596$, $p < .001$). Additionally, effective identification of training and development needs strongly correlates with improved fairness in evaluations ($r = .632$, $p < .001$). These correlations suggest that AI enhances various aspects of performance management effectively.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Findings

1. **Gender Balance in Perception of AI Impact:** The gender distribution among respondents was nearly equal, ensuring diverse perspectives on the impact of AI on organizational performance. Both male and female respondents showed similar views on the effectiveness of AI.
2. **Alignment of Individual and Organizational Goals:** A significant majority (84.8%) of respondents agreed that AI-powered systems effectively align individual goals with organizational objectives. This indicates that AI plays a crucial role in fostering a cohesive and goal-oriented workforce.
3. **Effectiveness in Identifying Performance Trends and Training Needs:** AI was highly rated for its ability to identify performance trends and training needs. Respondents consistently recognized AI's effectiveness in these areas, with high mean scores and low standard deviations, indicating general agreement and consistency in responses.
4. **Positive Impact on Performance Evaluation:** The data showed that AI contributes positively to the fairness and objectivity of performance evaluations. The correlation analysis revealed a strong positive relationship between AI implementation and improved performance evaluation processes.
5. **Improvement in Overall Employee Performance:** The study found a significant positive correlation between the use of AI in performance management and overall employee performance. AI's role in accurate and timely performance evaluations was seen as a key factor in boosting employee productivity.

Suggestions

1. **Broaden AI Adoption Across Departments:** To maximize the benefits observed in performance management, organizations should consider broadening the adoption of AI tools across various departments. This will ensure that AI's positive impact is felt throughout the organization.
2. **Enhance Training and Development Programs:** Regular training programs focused on the use of AI in performance management should be implemented. This will help employees and managers to fully understand and utilize AI tools, thereby improving the effectiveness of AI systems.
3. **Continuous Monitoring and Upgrading of AI Systems:** Organizations should continuously monitor the effectiveness of their AI systems and invest in upgrading these technologies. This

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

will ensure that AI tools remain aligned with organizational goals and continue to drive performance improvements.

Conclusion

The research clearly demonstrates that artificial intelligence significantly enhances organizational performance by aligning individual goals with company objectives, improving the identification of training needs, and ensuring fair and objective performance evaluations. The strong positive correlations between AI and various performance metrics underscore its crucial role in optimizing employee performance and forecasting outcomes. As businesses continue to integrate AI into their operations, its impact on organizational success will only grow, making it essential for companies to invest in and leverage AI technologies effectively.

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Multidisciplinary Streams
August 2024**

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EXPLORING INVESTIGATIVE JOURNALISM'S CHALLENGES: A META-ANALYTIC REVIEW

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Abstract

Investigative journalism serves as a critical pillar in the democratic process, holding power to account and uncovering hidden truths. However, this essential function faces numerous challenges that can impede its effectiveness and sustainability. This meta-analytic review synthesizes existing research to identify and analyze the key obstacles confronted by investigative journalists worldwide. Drawing from a comprehensive corpus of studies, the review examines financial constraints, legal risks, technological impacts, political pressures, and ethical dilemmas. The findings reveal that financial instability, exacerbated by the decline of traditional media revenue, significantly hampers the depth and frequency of investigative reporting. Legal challenges, including threats of litigation and censorship, further restrict journalistic freedom. Technological advancements, while offering new tools for investigation, also introduce issues of digital security and misinformation. Political interference and ethical concerns around bias and accuracy also emerge as significant barriers. This review underscores the need for robust support mechanisms, legal protections, and ethical guidelines to sustain investigative journalism's vital role in society. Future research directions and policy implications are discussed to enhance the resilience and impact of investigative journalism in the face of these multifaceted challenges.

Keywords

Investigative journalism, legal risks, technological impact, political pressure, ethical dilemmas, media sustainability, digital security, misinformation, journalistic freedom.

Introduction

Investigative journalism stands as a cornerstone of democratic societies, playing an indispensable role in uncovering corruption, exposing injustices, and holding powerful entities accountable. By delving beyond surface-level reporting, investigative journalists provide in-depth analysis and uncover hidden facets of significant issues, thereby fostering informed public discourse and facilitating systemic

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

change. Despite its crucial importance, investigative journalism faces an array of formidable challenges that threaten its practice and sustainability.

The landscape of journalism has undergone dramatic transformations in recent decades. The advent of digital media and the decline of traditional revenue models have precipitated financial instability, placing investigative journalism under considerable strain. Media organizations, grappling with reduced budgets, often deprioritize resource-intensive investigative projects in favour of more immediate, revenue-generating content. This financial precariousness limits the capacity of journalists to undertake extensive investigations, thereby diminishing the breadth and depth of their reporting.

Legal risks further compound the challenges facing investigative journalists. The threat of litigation, defamation suits, and censorship acts as a significant deterrent, potentially stifling critical investigations. In many parts of the world, journalists operate under repressive legal frameworks that curtail press freedom, exposing them to harassment, imprisonment, or even violence. These legal constraints not only endanger journalists but also impede the flow of crucial information to the public.

Technological advancements present a double-edged sword for investigative journalism. While digital tools and data analytics have revolutionized investigative techniques, enhancing the ability to uncover complex stories, they also introduce new vulnerabilities. Cybersecurity threats, digital surveillance, and the proliferation of misinformation challenge journalists' ability to protect their sources, maintain data integrity, and ensure the accuracy of their reporting.

Political pressures and ethical dilemmas further exacerbate the difficulties faced by investigative journalists. Governments and powerful interest groups often exert influence to suppress unfavorable coverage, compromising journalistic independence. Moreover, journalists must navigate ethical challenges related to bias, accuracy, and the potential consequences of their reporting, balancing the imperative to inform the public with the need to uphold professional standards.

This meta-analytic review aims to systematically examine the myriad challenges confronting investigative journalism. By synthesizing findings from a diverse array of studies, this review seeks to illuminate the multifaceted nature of these obstacles and provide a comprehensive understanding of their implications. Through this analysis, the paper will underscore the necessity for robust support structures, enhanced legal protections, and stringent ethical guidelines to fortify the practice of investigative journalism. Ultimately, the review aspires to inform policy discussions and foster initiatives that bolster the resilience and impact of investigative journalism in safeguarding democratic values and promoting accountability.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Research Objectives

- To systematically identify and categorize the primary challenges faced by investigative journalists, including financial constraints, legal risks, technological impacts, political pressures, and ethical dilemmas.
- To suggest potential support mechanisms, legal protections, and ethical guidelines that could enhance the resilience and effectiveness of investigative journalism.

Research Methodology

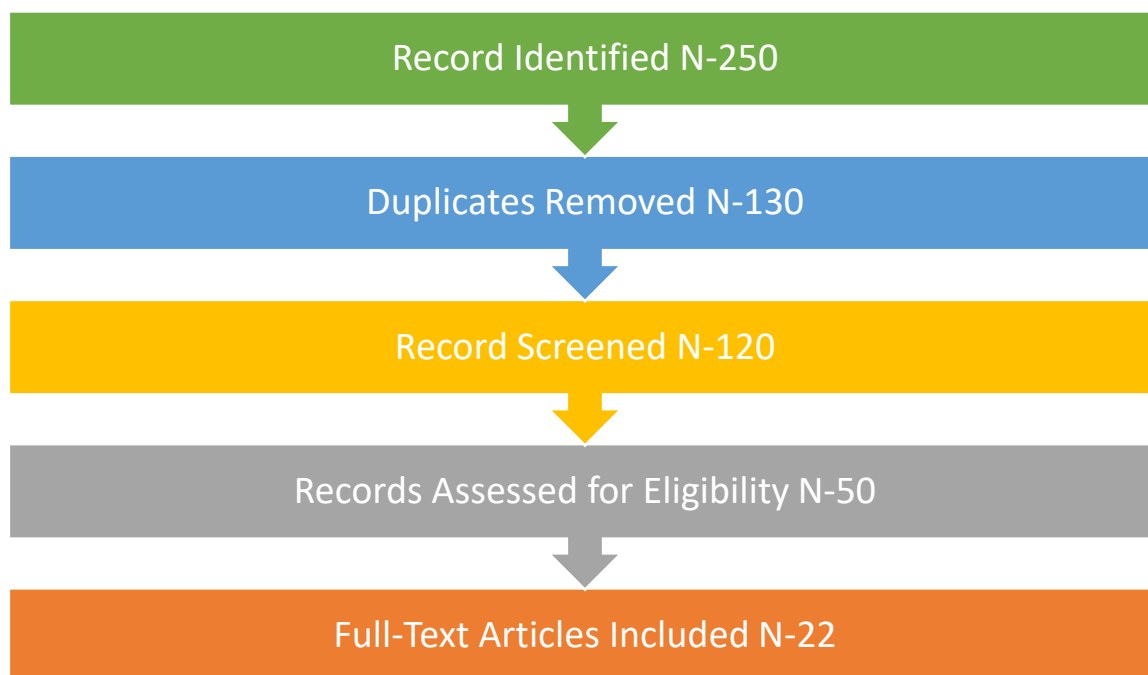
This study employs the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach to systematically review and synthesize relevant literature on the challenges confronting investigative journalism. The study selection process involved screening titles and abstracts of articles from databases such as PubMed, Google Scholar, and JSTOR, with inclusion criteria focusing on empirical studies, theoretical papers, and reviews published in the last 15 years and written in English. A total of 250 studies were selected based on their direct relevance to the identified challenges, including financial constraints, legal risks, technological impacts, political pressures, and ethical dilemmas. Data was extracted using a standardized form, capturing study characteristics and key findings. Thematic synthesis was employed to categorize challenges and identify common themes while proposing support mechanisms, legal protections, and ethical guidelines. The PRISMA flow diagram was utilized to document the study selection process. This methodology ensures a comprehensive and transparent analysis of the challenges faced by investigative journalism and facilitates the formulation of effective strategies to address them.

Research Database and Article Selection

This study conducted a systematic review of the literature using multiple databases, including PubMed, Google Scholar, and JSTOR, to identify relevant articles addressing the challenges encountered by investigative journalism. The search strategy involved the combination of keywords such as "investigative journalism," "challenges," "financial constraints," "legal risks," "technological impacts," "political pressures," and "ethical dilemmas."

Initially, a total of 250 records were identified through the database search. After removing duplicates and screening based on title and abstract, 120 records were assessed for eligibility. The inclusion criteria focused on empirical studies, theoretical papers, and reviews published within the last 15 years and written in English. This resulted in the selection of 22 full-text articles for further review.

Figure 1: PRISMA Flow Diagram



Sr. N.	Author	Year	Location	Objective	Research Technique	Findings and Suggestions
1.	Kim, et al.	2016	South Korea	Investigate challenges faced by freelance journalists	Focus Group	Freelance journalists face precarious working conditions and lack institutional support, highlighting the need for collective advocacy.
2	Jones	2017	UK	Analyze political pressures on journalism	Content Analysis	Political interference compromises journalistic independence, necessitating measures to safeguard press freedom.
3	Wang, et al.	2017	China	Investigate media ownership and its impact	Content Analysis	The concentration of media ownership limits the diversity of voices and hampers investigative journalism's ability to

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

						hold power accountable.
4	Ali, et al.	2017	Pakistan	Examine gender disparities in investigative journalism	Interviews	Women journalists in Pakistan face discrimination and harassment, necessitating gender-sensitive policies and support mechanisms.
5	Park, et al.	2017	South Korea	Assess the impact of media consolidation	Survey	Media consolidation in South Korea limits diversity of voices and hinders investigative journalism's ability to hold power to account.
6	Kaur, et al.	2018	Australia	Explore the role of non-profit organizations in supporting investigative journalism	Content Analysis	Non-profit organizations play a crucial role in funding and advocating for investigative journalism, but they face challenges in sustainability.
7	Lee, et al.	2018	Singapore	Assess the influence of government regulation	Survey	Government regulation in Singapore constrains investigative journalism, requiring advocacy for greater press freedom and transparency.
8	Nguyen, et al.	2018	Vietnam	Examine censorship and self-censorship in journalism	Survey	Journalists in Vietnam self-censor to avoid government reprisal, compromising the depth and accuracy of investigative reporting.
9	Patel	2018	India	Examine legal risks for journalists	Case Study	Journalists in India face legal threats, including defamation suits and censorship, hindering investigative reporting.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

10	Chen, et al.	2019	China	Investigate technological impacts on journalism	Interview	Digital tools enhance investigative capabilities but also raise concerns about data security and misinformation.
11	Wong, et al.	2019	Malaysia	Analyze the effectiveness of whistleblower protection laws	Case Study	Whistleblower protection laws in Malaysia are insufficient, undermining efforts to expose corruption and misconduct.
12	Martinez, et al.	2019	Mexico	Examine challenges faced by investigative journalists in conflict zones	Interviews	Journalists in conflict zones navigate risks to report on critical issues, requiring specialized training and support for their safety.
13	O'Connor, et al.	2019	Ireland	Examine the role of whistleblowers in investigative journalism	Case Study	Whistleblowers play a crucial role in exposing wrongdoing, but they face risks and need legal protections to come forward safely.
14	Rahman	2019	Bangladesh	Assess impact of digitalization on investigative journalism	Document Analysis	Digital platforms offer new avenues for investigation but also pose challenges in verifying information and protecting sources.
15	Smith, et al.	2020	USA	Explore financial challenges in journalism	Survey	Decline in traditional media revenue negatively impacts investigative journalism. Recommendations include diversifying revenue sources.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

16	Lopez, et al.	2020	Mexico	Explore safety concerns for investigative journalists	Interviews	Journalists in Mexico face threats, violence, and intimidation, necessitating improved safety protocols and legal protections.
17	Gonzalez, et al.	2020	Spain	Investigate the impact of social media on journalism	Focus Group	Social media platforms facilitate information dissemination but also challenge traditional journalistic norms and credibility.
18	Lim, et al.	2020	Singapore	Investigate censorship and media manipulation	Case Study	Government censorship and media manipulation in Singapore undermine press freedom and public trust, necessitating transparency and accountability.
19	Silva, et al.	2021	Portugal	Investigate the use of data journalism techniques	Content Analysis	Data journalism enhances investigative capabilities by uncovering patterns and trends, but journalists require training and resources.
20	Garcia, et al.	2021	Brazil	Address ethical dilemmas in journalism	Ethnography	Ethical considerations, such as accuracy and bias, are crucial for maintaining credibility and public trust in investigative journalism.
21	Kim, et al.	2022	South Korea	Investigate the impact of emerging digital platforms on investigative journalism	Focus Group	Digital platforms offer new opportunities for investigation but also pose challenges related to audience engagement and monetization.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

22	Nguyen, et al.	2023	Vietnam	Examine the role of social media in shaping investigative journalism practices	Survey	Social media platforms facilitate information dissemination but raise concerns about credibility and misinformation control mechanisms.
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LITERATURE REVIEW

Figure 2: Summary of Literature Review

Findings

The literature review reveals several consistent findings regarding the challenges faced by investigative journalism:

Financial Constraints: Investigative journalism is significantly impacted by financial constraints, stemming from the decline of traditional media revenue models. Limited resources often result in reduced capacity for in-depth investigations and hinder the sustainability of investigative reporting.

Legal Risks: Journalists encounter various legal risks, including threats of litigation, defamation suits, and censorship, particularly in regions with restrictive legal frameworks. These risks pose significant barriers to journalistic freedom and can deter reporters from pursuing critical investigative work.

Technological Impacts: While digital tools offer new opportunities for investigation, they also introduce challenges such as cybersecurity threats and the spread of misinformation. Journalists must navigate these complexities to protect their sources, maintain data integrity, and ensure the accuracy of their reporting.

Political Pressures: Political interference and pressure from powerful entities compromise journalistic independence and integrity. Journalists face threats, harassment, and intimidation, particularly when reporting on sensitive political issues or exposing corruption.

Ethical Dilemmas: Ethical considerations, including accuracy, bias, and the potential consequences of reporting, are paramount in investigative journalism. Upholding professional standards and maintaining public trust are essential amidst ethical challenges.

Safety Concerns: Investigative journalists often face safety concerns, including threats, violence, and intimidation, especially when reporting on topics such as organized crime, corruption, or human rights

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

abuses. Enhanced safety protocols and legal protections are necessary to safeguard journalists in hostile environments.

Gender Disparities: Women journalists encounter gender-based discrimination and harassment, which can inhibit their ability to pursue investigative work. Gender-sensitive policies and support mechanisms are needed to address these disparities and promote inclusivity in the field.

Role of Whistleblowers: Whistleblowers play a crucial role in exposing wrongdoing and corruption, but they face risks and require legal protection to come forward safely. Effective whistleblower protection laws are essential for fostering transparency and accountability.

Media Ownership and Consolidation: Concentration of media ownership limits diversity of voices and hampers investigative journalism's ability to hold power accountable. Efforts to mitigate media consolidation and promote media pluralism are vital for a vibrant investigative media landscape.

Support Mechanisms: Non-profit organizations play a crucial role in funding and advocating for investigative journalism, but they face challenges in sustainability. Continued support and investment in non-profit initiatives are necessary to bolster the resilience of investigative reporting.

These findings underscore the multifaceted nature of the challenges confronting investigative journalism and highlight the importance of addressing these issues to uphold press freedom, promote accountability, and safeguard democratic principles.

Discussion

The literature review highlights the challenges facing investigative journalism globally, emphasizing the need for a comprehensive approach to uphold press freedom, promote accountability, and foster informed public discourse. The decline of traditional media revenue models poses a significant threat to investigative journalism's sustainability, necessitating diversification of revenue sources, exploring alternative funding models, and increased investment in investigative reporting. Rigid legal protections are crucial for safeguarding journalists' independence and press freedom, including strengthening legal frameworks against defamation suits, censorship, and harassment. Advocating for decriminalization of defamation and enacting whistleblower protection laws can create a conducive environment for investigative journalism.

Embracing technological advancements while mitigating associated risks is essential, with training and resources on digital security measures, fact-checking techniques, and data analysis skills. Countering political interference requires collective action from journalists, media organizations, civil

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

society, and international bodies. Maintaining ethical standards is vital for the credibility and trustworthiness of investigative journalism, with media organizations prioritizing accuracy, fairness, and transparency.

Safety of investigative journalists is paramount, especially in conflict zones or regions with high levels of violence and intimidation. Comprehensive safety training, emergency response mechanisms, and legal protections for journalists facing threats are essential measures. Addressing gender disparities and promoting inclusivity within investigative journalism is crucial for fostering diverse perspectives and amplifying marginalized voices. Policymakers should enact legislation protecting whistleblowers from retaliation and ensuring their confidentiality and safety. Promoting media pluralism and diversity of ownership is also essential for a robust investigative media landscape.

Conclusion

Investigative journalism stands as a cornerstone of democratic societies, playing a pivotal role in uncovering truth, exposing wrongdoing, and holding power to account. However, the findings from the literature review highlight a myriad of challenges that threaten the practice and sustainability of investigative journalism worldwide. From financial constraints and legal risks to technological impacts and political pressures, journalists navigate a complex landscape fraught with obstacles that undermine their ability to fulfill their critical role in society.

Addressing these challenges requires a multifaceted approach that involves concerted efforts from journalists, media organizations, policymakers, civil society, and the public. Strengthening legal protections, diversifying revenue sources, embracing technological advancements, and upholding ethical standards are essential steps to safeguarding investigative journalism's integrity and impact. Moreover, ensuring the safety and inclusivity of journalists, promoting media pluralism, and protecting whistleblowers are crucial for fostering a vibrant and resilient investigative media landscape.

Despite the formidable challenges, there are reasons for optimism. The dedication and resilience of journalists, coupled with the support of advocacy groups, non-profit organizations, and concerned citizens, offer hope for the future of investigative journalism. By working together to overcome barriers, advocate for press freedom, and champion transparency and accountability, we can uphold the values of democracy and ensure that investigative journalism continues to serve as a vital watchdog, uncovering truth and promoting justice for generations to come.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

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**Collection & Identification of wild medicinal plants of
Dhumkhal & Dhumkhal forest, Dang District, Gujarat”**

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Abstract

A wild medicinal plants species survey was carried out in Dhumkhal forest of dang district Gujarat for identification and documentation of important flora. The indigenous knowledge of local traditional uses was collected through questionnaires and personal interview of local peoples. The study area having wealthy in medicinal plants flora and tribal communities with latest usages. The aim of this report is giving collection and identification of wild medicinal plants. The effort has been made to evaluate plants used for medicinal by the tribals people of modern healthcare facilities and poor economic conditions. The tribal people of dhumkhal fully (70-80%) depends on in the vicinity available medicinal plants for their healthcare needs. Plants with their correct nomenclature were arranged by family name, botanical name, local name, flowering, fruiting, part used. identification and nomenclature of the listed plants were based on the flora of Maharashtra done by botanical survey of India and help of the guidance. A total of 50 plant species were identified by taxonomic description and locally by ethnomedicinal knowledge of people existing in the region, plant specimens collected identified preserved and mounted were deposited in department of Botany.

Keywords: Wild medicinal plants, Tribes, Medicinal plants, Dhumkhal forest, Dangs District, Gujarat

Introduction

From so many years ago the human being depends on the plants for their basic needs like food, shelter, cloths and medicine. Herbal medicines have traditionally been used because of easily accessible, affordable and there is no evidence of resistance to whole plant extracts of effectiveness (Barkaoui et al. 2017). In India the traditional system of medicine is one of the oldest systems of medical practice in the world and has played an essential role in providing health care service to human civilization right from its inception. India has the exclusive distinction of its own recognized traditional medicine; Ayurveda, Yoga, Unani, Siddha, and Homoeopathy (AYUSH) (Adhikari & Paul 2018). This sort of traditional medicinal knowledge has been regularly practiced in homes and is transferred from generation to generation with the passage of time (Ullah et al. 2013). In recent years specially in

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

pandemic situation so many Indian peoples prefer medicinal plants as preventive measure for viral and bacterial infection (Ahmed et al. 2020). India is one among the 12- megabiodiversity countries and having 3 out of 25 hot spots of origins and diversity of several plant species in the world. The 17,000 sq km long strip of forests along the seaward side of Western Ghats is enriched with 4,050 plant species, of which nearly 40% (1,600 species) are endemic. Gujarat State is the western part of India having nearly 4,320 plant species, which accounts for almost 9.33% of the total floral wealth of India. The tribals in the state use about 750 medicinally Important and 450 economically important plant species. (Patel & Varshney 2017).

The Dangs is the southernmost district in Gujarat, which starts from the rugged mountain chains of the Sahyadri range of the Western Ghats in the southwest and descends on the western side of extending undulating tract. Dangs district is situated between the parallels of latitude 20°33'40" and 21°5'10" and the meridians of longitude 73°27'58" and 73°56'36" (Kokni et al.2017). The Dangs is a tribal district, with the Bhil, Konkani (kunvi), Varli, Kotwalia, Kathodi and Gamit being the major tribal groups. The Bhils have historically been residing in the Dangs whereas the other tribes came to the Dangs in search of a livelihood. These tribal people mainly depend on forest for their shelter, housing material, food, fuel, fibre, medicine and feed. These ethnic groups through their observations and experiences with the nature have developed their own indigenous systems of treating ailments using different plants (Chandrakar 2014). Presently over harvesting of plants and other human being activities these forests are degrading to a large extent in the country and various parts of the Gujarat. The degradation of forest and hilly habitat many medicinal species are facing threats for their existence. Along with the medicinal species of plants, the knowledge of ethnomedicinal practices is also losing in the local community (Patel & Varshney 2017). The tribal people of Dhumkhal fully (70-80%) depends on in the vicinity available medicinal plants for their healthcare needs. The present study has been carried out to focus the existing floral diversity with special reference to medicinal plants values, found in different forested pockets of Dhumkhal forest and Dhumkhal areas of Dang District.

Materials and Methods

Study Area

Located in the Southern part of country, state of Gujarat. The area Dhumkhal forest lies between 20°63'19.26"N latitude and 73°77'05.86"E longitude, map report and data sets of Dhumkhal on topography, land use, land cover, watershed/hydrological parameters etc. Total area of Dhumkhal forest and Dhumkhal is 334.09 hectares as per the Data available for the year 2021. At Dhumkhal

village is home of 100% scheduled Tribes (ST) Population. The Dhumkhal are one such as tribe that have inhabited the Dhumkhal forest, the medical men “*Bhagat*” (vaidya) indigenous plant knowledge.

Collection of specimens and herbarium preparation

The work on collection and documentation of wild medicinal plant of Dhumkhal forest was initiated in 2022 in month February to April. If present work about dhumkhal forest were undertaken for extensive and intensive and collection of wild medicinal plants species from dhumkhal forest. Over 50 species were collected.

The traditionally useful wild medicinal plants are more of different types of diseases by the natives of Dhumkhal forest were collected from the area: Dried, pressed, and mounted on the herbarium sheet. All the herbarium plants were accompanied by data such as family, their botanical name, local name, life form, part of the plant used and the association of disease with the plant.

Morphology and Identification

The made a brief vegetative morphological description of each wild medicinal plant species, The photographs were taken by using android redmi note 6 pro android mobile camera, Identification of all wild medicinal plant species have been identified using flora of Maharashtra (Singh & Karthikeyan, 2000). All species were arranged alphabetically.

Results

Systematic Treatment:

ABRUS Adans.

Abrus precatorius L.

Family:- Fabaceae

Local Name:- Gunj

Perennial Twiners. Leaves 8–12 cm long; leaflets 0.5–1.8 x 0.3–0.8 cm, oblong or elliptic-oblong, glabrous above, appressed-hairy beneath. Flowers pinkish-purple, fading white in racemes. Pods 2–4 cm long, Linear-oblong, beaked. Seeds 3–5, ellipsoid, bright scarlet with a black spot.

Flowering & Fruiting: - August–March.

Plant part use: Leaves

Medicinal uses: - The leaves of the herb are used to cure fever, cough and cold.

ACACIA Willd.

Acacia catechu (L. f.) Willd.

Family:- Mimosaceae

Local Name:- Khair

Deciduous trees, 5–10 m tall. Leaves bipinnate, 24–25 cm long, pinnae 10–30 Pairs; leaflets 30–50 pairs 0.5 x 0.1. cm linear. Flowers pale yellow or greenish–white in spikes, 6–8 cm, long. Pods 8.5–14.0 x 1.5–2.0 cm, flat, brown, stalked, beaked; reticulately veined. Seeds 3–10.

Flowering & Fruiting: - July–February.

Plant part use: Bark

Medicinal uses:- Its heartwood extract is used in asthma, cough, bronchitis, colic, diarrhea, dysentery, boils, skin afflictions, sores and for stomatitis.

3) AERVA Forssk.

Aerva lanata (L.) Juss. Ex Schult.

Family:- Amarantheceae

Local name:- Kapuri-Madhuri

Herbs, erect or prostrate. Leaves 0.5-1.5 x 0.2-1.0 cm, pubescent above, white cottony beneath. Flowers greenish-white. Utricles 0.1 x 0.1 cm, broadly ovoid, acute.

Flowering & Fruiting:- December-February

Plant parts use: Leaves

Medicinal uses:- It is used in the treatment of lithiasis, cough, asthma, and headache. It is used as an antidote for rat poisoning.

AGERATUM L.

Ageratum conyzoides L.

Family:- Asteraceae

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Local Name:- Burandu

Annual herbs, 30 cm high, erect, hairy. Leaves ovate, hairy on both sides, apex subacute. Heads small, in dense terminal Corymbs, white or pale blue. Pappus paleaceous, awned or aristate, little longer than achenes, pappus scales 5, aristate, achenes 0.3 cm long, sharply 5- angled, black, sparsely spiculate on angles.

Flowering & Fruiting:- July-February.

Plant parts use: Leaves

Medicinal uses:- As a medicinal plant, *ageratum conyzoides* is widely used by many traditional cultures, against dysentery and diarrhea.

ANOGEISSUS (DC.) Guill. & Perr.

Anogeissus latifolia (Roxb. Ex DC.) Wall. Ex Guill. & Perr.

Family:- Combretaceae

Local Name:- Dhavada

Deciduous trees, 9–18 m high. Leaves 3–10 x 1.5 x 4.5 cm, ovate to oblong–elliptic, apex obtuse. Flowers sessile, in dense heads; calyx pubescent, teeth triangular. Fruits with persistent calyx stalk, wings entire, beaked, clustered.

Flowering & Fruiting: - March–September.

Plant part use: Bark

Medicinal uses:- traditionally as medicine to treat various human ailments and conditions such as vomiting, whooping cough, cold, diarrhea, dysentery, snake and scorpion bite, fever, skin diseases.

ARGEMONE L.

Argemone mexicana L.

Family: Papaveraceae

Local Name: - Pivla dhotra

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Annual, prickly herbs, 30–100 cm tall. Leaves radical and cauline, 5–10 x 2.5–4.0 cm, bluish–green, variegated white, spiny along margins and on veins, sessile. Flowers bright yellow, 3–4 cm across, solitary, terminal. Capsules 2–3 cm long, spinous. Seeds numerous, black, Globose.

Flowering & Fruiting:- Throughout the year.

Plant part use: Roots, Leaves, Seeds

Medicinal uses:- Used in different parts of the world for the treatment of several diseases including tumors, warts, skin diseases, inflammations, rheumatism, jaundice, leprosy, microbial infections, and malaria.

BAUHINIA L.

Bauhinia racemosa Lam.

Family: Caesalpiniaceae

Local Name: - 'Sheethsona'

Trees, 3–5 m high. Leaves 2.5–8.0 x 3.5–8.0 cm, glabrous above, whitish tomentose beneath, apex obtuse, mucronate. Flowers white or yellow in 6 cm long, elongate, slender racemes. Pods 9.5–12.0 x 1.5–1.8 cm, stalked, flat, turgid. Seeds 12–20, oblong.

Flowering & Fruiting: - April–October.

Plant parts use: Bark, Leaves, Seed

Medicinal uses:- The bark and leaves of are sweetish and acrid, used as a refrigerant, astringent in the treatment of headache, fever, skin diseases, dysentery and diarrhea.

BIXA L.

Bixa orellana L.

Family: Bixaceae

Local Name:- Shendri

Small, evergreen trees. Leaves 10–20 x 6–12 cm, ovate, acute or acuminate at apex, truncate or subcordate at base. Flowers white or Pink, 5 cm across, in terminal panicles, pedicels pubescent. Capsules ovoid or subglobose, clothed with long, soft prickles. Seeds trigonous, rounded and grooved on the back, pulp red.

Flowering & Fruiting:- July–November.

Plant parts use: Leaves

Medicinal uses:- The infusion of the leaves has been shown to be effective against bronchitis, sore throat, and eye inflammation. Traditional use of antipyretic, aphrodisiac, antidiarrheal, antidiabetic and insectrepellent.

BLUMEA DC. (nom. Cons.)

Blumea lacera (Burm. F.) DC.

Family: Asteraceae

Local Name:- Burando

Herbs, 25-80 cm tall, erect, aromatic; stem grooved, glandular-Pubescent. Leaves 3-8 x 2-5 cm, obovate-oblong, incised or sometimes Lyrately lobed, silky pubescent on both sides, margins serrate-dentate. Heads 0.4-0.6 cm across, involucral bracts 0.3-0.4 cm long, slightly longer than corolla. Achenes oblong, sparsely hairy, sub angulate, terete.

Flowering & Fruiting:- October-May.

Plant parts use: Leaves

Medicinal uses: - Leaves juice is also prescribed for curing fever (febrifuge), wound healing, antipyretic, and for diuretic activities.

BUTEA Roxb. Ex Willd. (nom. Cons.)

Butea monosperma (Lam.)

Family: Fabaceae

Local Name:- Palas

Trees; bark rough, ash coloured. Leaves 3-foliolate; leaflets 4.5–24.0 x 3–20 cm, obovate, ovate–rhomboid, glabrous above, silky–pubescent beneath. Flowers in compact racemes on leafless branches. Pods 9–14 x 1.5–4.5 cm, oblong, sandy–brown, hairy, stalked. Seeds solitary.

Flowering & Fruiting:- January–June.

Plants parts Use: Leaves, Flowers

Medicinal uses:- Flowers and leaves of palash are used to manage skin problems like acne and pimple.

CALOTROPIS R. Br.

Calotropis procera (Ait.) R. Br.

Family: Asclepiadaceae

Local Name:- Rui

Erect shrubs, 2 cm high; stems woody, cylindrical, branched. Leaves sessile or shortly petiolate, 10-14 x 5-11 cm, broadly ovate, Obovate or obovate-oblong, fugaciously cottony on both sides, base Cordate. Flowers in lateral, umbellate cymes; corolla 2.5-3.0 cm across hemispherical in bud, lobes divided 2/3 of way down; corona 5, laterally compressed, lobes completely adnate to column, recurved at base. Follicles 7-9 cm long, in pairs, recurved. seeds ovoid, coma silky-white.

Flowering:- Most of the year. **Fruiting:-** August-December.

Plant parts use: Leaves, Roots

Medicinal uses:- Traditionally used for diarrhoea, stomatic, sinus fistula and skin disease. Leaf part are used to treat jaundice.

CAESALPINIA L.

Caesalpinia bonduc (L.) Roxb.

Family: Caesalpinaceae (S. Moorthy)

Local Name:- Sagargota

Stragglers, armed; stems pubescent, armed with hooked, yellowish spines. Petioles armed with prickles, pinnae 6-8 pairs; leaflets 6-8 Pairs, 1.5-2.0 x 1.0-1.2 cm, elliptic. Flowers yellow in terminal and supra-axillary racemes, dense at top and lax at bottom. Pods 4.5-7.5 x 3.5 cm, oblong, ellipsoid, dehiscent, valves coriaceous. Seeds 1-2, Globose to subglobose.

Flowering & Fruiting:- August-February.

Plant parts use: Bark, leaves, Seeds

Medicinal uses:- The bark and leaves have been used to lower fevers. Oil extracted from the seeds has been used in cosmetics and for treating discharges from the ear.

CASSIA L.

Cassia fistula L.

Family: Caesalpiniaceae

Local Name:- Bava

Trees, 10 m tall. Leaflets 4–8 pairs, 5.0–12.5 x 2.5–6.0 cm, ovate. Flowers yellow, in 24–40 cm long, lax, drooping racemes. Pods 2.0–2.5 cm across, indehiscent. Seeds numerous, embedded in dark coloured Pulp.

Flowering & Fruiting :- April–October.

Plant parts use: Bark, Seeds

Medicinal uses:- They are specially used in joint pain, migraine and chest pain and blood dysentery. It is also used in ulcers and boils and various skin diseases.

CAPPARIS L.

Capparis zeylanica L.

Family: Cappariceae

Local Name:- Waghati

Scandent shrubs. Leaves 5–7 x 2.0–3.5 cm, elliptic or Ovate–elliptic, apex acute or obtuse, margins entire. Flowers white, Solitary, axillary or 2–3 together, 3–5 cm across; pedicels 2–4 cm long; Gynophore 1–2 cm long. Fruits 4–6 x 2–3 cm, irregularly ovoid, pointed or blunt. Seeds many.

Flowering & Fruiting:- February–April.

Plant parts use: Leaves, Roots, Fruits

Medicinal uses:- Traditionally it is also used as antidote to snake bite to cure swelling of testicle, small pox, boils, cholera, colic, hemiplegia, neuralgia, sores, pneumonic and pleurisy.

COCCULUS DC. (nom. Cons.)

Cocculus hirsutus (L.)

Family: Menispermaceae

Local Name:- Vasan vel

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Climbing undershrubs; stems and branches hirsute. Leaves 2–5 x 1.5–3.5 cm, ovate or oblong–ovate, softly pubescent or villous on both surfaces, apex obtuse and mucronate, base truncate or subcordate. Male flowers 0.3 cm across; calyx and corolla lobes 6 each. Female flowers in axillary fascicles, 0.4 cm across, calyx and corolla as in males. Drupes 0.2–0.4 cm across, ripens reddish.

Flowering & Fruiting:- January–March.

Plant parts use: Leaves, Roots

Medicinal uses:- The treatment of fever, skin diseases, stomach disorders, urinary diseases

***Cordia* L.**

***Cordia dichotoma* Forst.**

Family: Boraginaceae

Local Name:- Bhokar

Medium sized trees, 5–10 m high; bark rough. Leaves variable, 6–12 x 4–10 cm, broadly ovate, scabrous above, apex obtuse, base rounded or cordate. Flowers white, polygamous; male flowers larger than bisexual ones in cymose-panicles; calyx irregularly splitting, corolla-lobes oblong. Berries 0.6–2.5 cm long, ovoid, yellow or pink, glossy, supported by accrescent calyx, pulp mucilaginous, edible.

Flowering & Fruiting:- February–June.

Plant parts use: Fruits, Bark

Medicinal uses:- Fruits are commonly used in folk medicine to treat cough and chest complaints, as well as for the treatment of wounds and ulcers.

***Desmodium* Desv. (nom. Cons.)**

***Desmodium laxiflorum* DC.**

Family: Fabaceae

Local Name:- Aasud

Undershrubs. leaflets 3.5–15.0 x 1.5–8.0 cm, ovate–elliptic or lanceolate, appressed–pubescent beneath. Flowers white or bluish–violet, in lax racemes. Pods flat, rarely constricted between seeds, hairy, 6–10-jointed.

Flowering & Fruiting:- August–December.

Plant parts use: Leaves, Seeds

Medicinal uses:- Traditionally *Desmodium laxiflorum* leaf and seeds are used to cure Cough and malaria.

***DILLENIA* L.**

***Dillenia aurea* J.E. Sm.**

Family: Dilleniaceae

Local Name:- Karmal

Deciduous trees, 10–15 m high. Leaves 20–40 x 10–25 cm, Elliptic–oblong, base rounded to truncate, margins Spinulose–denticulate. Flowers solitary or rarely in pairs, 10–12 cm across; sepals coriaceous, ciliate along margins; petals golden yellow, obovate; inner stamens with reflexed apex. Fruits orange–yellow, Subglobose, 3.0–3.2 cm across. Seeds obovoid, glossy, dark brown, Surrounded by viscid pulp.

Flowering & Fruiting :- March–July.

Plant parts Use: Bark

Medicinal uses:- *Dillenia aurea* is traditionally used in sore limbs or swelling in the abdomen. The fresh juice given for treatment against cough and dyspnea.

***EUPHORBIA* L.**

***Euphorbia heterophylla* L.**

Family:- Euphorbiaceae

Local Name:- Dhudhari

An annual bushy herb. Leaves green towards apex, scarlet, crimson or rose-coloured towards base. Yellowish-green fruit.

Flowering & Fruiting:- September–March.

Plant parts use: Leaves, Roots

Medicinal uses:- The latex and preparations of the leaves and root are applied to treat skin tumours. The leaves are taken to treat body pain.

***Euphorbia hirta* L.**

Family:- Euphorbiaceae

Local Name:- Dhudhari

Herbs, perennial, erect, diffuse or prostrate; branches densely or sparsely clothed with spreading hairs. Leaves 1.0–2.5 x 0.5–1.0 cm, elliptic or ovate–oblong. Capsules 0.1 cm long, appressed hairy. Seeds reddish–brown, faintly transverse, rugose.

Flowering & Fruiting: - July–December.

Plant parts Use: Leaves, Roots

Medicinal uses: - *Euphorbia hirta* is often used traditionally for female disorders, respiratory ailments (cough, and asthma), and worm infestations in children, dysentery, jaundice, pimples, gonorrhea, digestive problems, and tumors.

***FICUS* L.**

***Ficus benghalensis* L.**

Family:- Moraceae

Local Name:- Vad

Trees, with numerous aerial roots from spreading branches; twigs, stipules, petioles and leaves beneath puberulous at early stage, later glabrescent. Leaves ovate, coriaceous, 10–30 x 7–20 cm, base cordate or rarely cuneate; lateral veins 5–6 pairs, with c 10 intercostals, Prominent on both sides; stipules stout; petiole 1.5–7.0 cm long. Figs sessile, axillary, paired, ripening orange to red, depressed–globose; Basal bracts obtuse; internal bristles none. Tepals free, 2–3 in male, 3–4 In galls and female flowers; anthers shortly mucronate.

Flowering & Fruiting:- April–June.

Plant parts use: Bark, Leaves

Medicinal uses:- *Ficus benghalensis* is an Ayurveda plant for the treatment for wounds, skin diseases, eye diseases, leucorrhea, diabetes and diarrhea.

***Ficus hispida* L.**

Family:- Moraceae

Local Name:- Bhui Umbar

Shrubs to small trees, 5 m high, well branched; bark grey, smooth; latex white. Leaves opposite, ovate, oblong or subovate, base Cordate to cuneate, apex acuminate, crenate–serrate along margins; Stipules 10–25 mm long, caducous. Figs obovate, axillary to cauliflorous on short, tubercled branches, ripening pale yellow; basal bracts 3, Subtriangular, internal bristles 0. male flowers in 1–2 rows, stamen 1. Galls and female flowers sessile or pedicellate; style hispid. Seed Slightly keeled, tuberculate, with prominent hilum.

Receptacles: January–July.

Plant part use: Bark, Roots

Medicinal uses:- Traditionally, different parts of the plant have been used in the treatment of ulcers, psoriasis, anemia, piles jaundice, vitiligo, hemorrhage, diabetes, convulsion, hepatitis, dysentery, biliousness, and as lactagogue and purgative.

***Ficus racemosa* L.**

Family:- Moraceae

Local Name:- Umbar

Trees, 4–10 m high, much branched, often with well spreading Canopy; bark greyish white or pinkish, smooth. Leaves ovate oblong, Elliptic– lanceolate, 3.6– 6.2 x 2– 4 cm, base cuneate or rarely subcordate Apex subacute or subacuminate, entire, subcoriaceous; lateral veins 4–8 Pairs, petioles 2– 7 cm long. Receptacles in large clusters on the main Branches and trunks, 3 cm across, obovoid, pyriform, pale green to red To purplish on ripening; peduncles 0.3–1.2 cm long, perianth with 3–4 Dentate–lacerate lobes joined below, red. Male flowers in 2–3 rings, Sessile, much compressed; stamens 1–2 or rarely 3. Galls long stalked. Females sessile or shortly stalked, ovary sessile or substipitate. Seeds 1 mm long, lenticular, smooth.

Receptacles: February–June.

Plant parts use: Bark, Roots

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Medicinal uses: For various diseases/disorders including diabetes, liver disorders, diarrhea, inflammatory conditions, hemorrhoids, respiratory, and urinary diseases.

Ficus rumphii Bl. Bijdr.

Family:- Moraceae

Local Name: Payar

Deciduous, glabrous trees, 8– 10 m tall, epiphytic in early stage. Leaves broadly ovate, subcoriaceous, 7– 15 x 5– 10 cm, apex subcordate apex, caudate– acuminate, entire along margins; petioles 10– 15 cm long, stipules ovate– lanceolate. Receptacles axillary, sessile, or shortly peduncled in pairs, globose, 1 cm across, glabrous, white with dark spots when young, black when ripe; basal bracts 3, rounded. Male flowers near the mouth; tepals spatulate; stamen 1. Galls and female flowers sessile; tepals 3, lanceolate.

Receptacles: May-June.

Plant parts use: Bark,

Medicinal uses: Bark is used in snake bite. It is also useful in burning sensations, leucoderma, ulcers, leprosy, itching, biliousness and diseases of blood.

FLEMINGIA Roxb. Ex W. Ait. & W. T. Ait. (nom. Cons.)

Flemingia strobilifera (L.) Ait. & Ait. F. Hort. Kew.

Family: Fabaceae

Local Name: Fokali

Shrubs, 1–2 m high. Leaflets 6.0–15.5 x 2.3–7.5 cm, Ovate–lanceolate or oblong, silky pubescent beneath, apex acute, base Rounded. Flowers in axillary and terminal racemes. Pods oblong, Mucronate, densely pubescent. Seeds 12, dark–brown or black.

Flowering & Fruiting:- August–April.

Plant parts use: Roots, Flowers

Medicinal uses: Root of the plant is used for various ailments such as insomnia, epilepsy, ulcer, inflammation and microbial infection. flowers use for small pox.

GREWIA L.

Grewia abutilifolia Vent. Ex A. Juss.

Family: Tiliaceae.

Local Name: Chikankarbat

Shrubs, straggling, upto 4 m high; young parts stellate-hairy. Leaves 8.3–13.5 x 5–11 cm, roundish-ovate, scabrous and stellately Hairy, acute or acuminate at apex, margins entire or shallowly lobed. Inflorescence of umbellate cymes. Flowers yellow. Drupes dark green, 1 cm in diameter., obscurely 4-lobed, wrinkled.

Flowering & Fruiting:- February–November.

Plant parts use: Roots

Medicinal uses: Taken internally for diarrhoea and dysentery, externally it is applied to wounds, cuts, ulcers, irritations etc.

HALDINA Ridsd.

Haldina cordifolia (Roxb.)

Family: Rubiaceae

Local Name: Haldun

Trees, 6–15 m tall; bark thick, grey, rough. Leaves crowded at ends of branchlets, 6.5 –29.0 x 6–25 cm, orbicular, abruptly acuminate at apex, cordate at base, lower surface densely pubescent. Flowers in globose, yellow, peduncled heads, 1.8–2.5 cm across; calyx tube angled; Corolla tube funnel-shaped. Capsules 0.4–0.5 cm long, pubescent.

Flowering & Fruiting:- May–August.

Plant parts use: Bark

Medicinal uses: *Haldina cordifolia* is an Ayurvedic medicinal plant, used for the treatment of skin diseases, wounds, vomiting, intestinal worms, indigestion and the diseases of the liver.

HELICTERES L.

Helicteres isora L.

Family: Sterculiaceae

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Local Name: Murud Sheng

Shrubs, 2–3 m tall; young shoots stellate hairy. Leaves bifarious, 7.5–13.5 x 5–8 cm, oblong–obovate clothed with stellate hairs on both Surfaces, apex short acuminate, base subcordate–subacute, irregularly Serrulate. Flowers 2.5–4.0 cm long, bright red, distinctly bilabiate in Axillary clusters of 2–6–together. Follicles 5, c 5 cm long, beaked, Stellately tomentose. Seeds numerous, angular, wrinkled.

Flowering & Fruiting:- August–December.

Plant parts use: Root, Stem, Bark, Fruits.

Medicinal uses: Tree is an Ayurvedic herb used in treating diarrhoea, dysentery, abdominal colic pain, intestinal parasites etc. Its root, stem bark, fruits are used for medicinal purposes.

HOMONOIA Lour.

Homonoia riparia Lour.

Family: Euphorbiaceae

Local Name: Raan kaner

Shrubs, c 2.5 m tall. Leaves closely set, 7– 15 x 1– 2 cm, glabrous above and clothed beneath; main nerves 10– 30 pairs. Flowers dioecious, sessile in 5– 15 cm long, axillary spikes; sepals 3 in male flowers and 5 in female flowers. Capsules 2–4 mm across, globose hairy, 3–ribbed with persistent style.

Flowering & Fruiting: Throughout the year.

Plant parts use: Roots, Leaves, and Fruit.

Medicinal uses: A decoction of the root is given for piles, stones in bladder, chestpain, gonorrhoea and syphilis. Powdered leaves and fruits are applied as poultice for skin diseases.

MADHUCA J. F. Gmel.

Madhuca longifolia (Koen.)

Family: Sapotaceae

Local Name: Mohu

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Tall trees. Leaves 6.5– 10.0 x 2.5 – 3.0 cm, linear– lanceolate, acute at apex, tapering at base. Flowers in fascicles below leaves; corolla fleshy. Berries oblong, yellowish when ripe. Seeds 1– 2, compressed, curved on one side.

Flowering & Fruiting: November – January.

Plant parts use: Bark, Leaves, flower, Fruit, seed

Medicinal uses: The bark is used for rheumatism, chronic bronchitis, diabetes mellitus, It is a good remedy for itch, swelling, fractures and snake- bite. Seeds are used in skin disease, rheumatism, headache, laxative, piles and sometimes as galactagogue, Leaves are used in gastropathy, dysipsia.

MEYNA Roxb.

Meyna laxiflora. Robyns

Family: Rubiaceae

Local Name: Aliv

Shrubs or small trees, 3– 10 m tall, armed with thorns, 2.0– 2.5 cm Long. Leaves 5.0– 12.5 x 3.7– 8.5 cm, elliptic, ovate or ovate– lanceolate, Shining, apex acute, base cuneate, tapering into 0.6– 2.5 cm long Petioles. Flowers greenish–yellow, in axillary clusters; calyx Cup–shaped, ribbed, teeth triangular, acute; corolla tube hairy at throat within. Drupes 2.5 cm across, fleshy, chocolate–colour when ripe, edible. Seeds 5–6.

Flowering & Fruiting: March–June.

Plant parts use: Fruits

Medicinal uses: *Meyna laxiflora* is a plant which having traditional importance for its medical uses, for treatment of inflammation, gastrointestinal disorder

MILIUSA Leschen

Miliusa tomentosa (Roxb.)

Family: Annonaceae

Local Name: Humb

Deciduous trees, 8–10 m tall; young shoots densely tomentose. Leaves 10.5–14.0 x 4.0–7.5 cm, elliptic–ovate or elliptic–lanceolate, Apex acute, base subacute. Flowers axillary, solitary or fascicled,

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

all Parts tomentose; sepals 0.5 x 0.1 cm, lanceolate; petals—outer 3 resembling calyx, inner much larger, erect with saccate base, fused at first, later becoming free. Carpels succulent, stalked, purple.

Flowering & Fruiting: February–April.

Plant parts use: Bark

Medicinal uses: Humb are traditionally use of the acidity and gastrointestinal problems

PONGAMIA Vent. (nom. Cons.)

Pongamia pinnata (L.)

Family: Fabaceae

Local Name: Karanj

Trees, 7–15 m. high. Leaflets 5–9, 3.5–12.0 x 1.8–8.2 cm, broadly ovate or elliptic. Flowers white with purple tinge in axillary, drooping racemes. Pods elliptic–oblong, thick, compressed. Seeds reddish–brown, reniform, rugose

Flowering & Fruiting: February–May.

Plant parts use: Bark, Root,

Medicinal uses: The root is effective for treating gonorrhea, cleaning gums, teeth and ulcers. It is used in vaginal and skin diseases. treatment of tumors, piles, skin diseases and ulcers.

MALLOTUS Lour.

Mallotus philippensis (Lam.)

Family: Euphorbiaceae

Local Name : Kunkvali

Trees, much branched, 2– 9 m high. Leaves 4– 14 x 2.5– 9.5 cm ovate– lanceolate. Inflorescence of rusty pubescent spikes. Flowers greenish– yellow. Capsules 1 cm across, 3– lobed, loculicidally 3–valved, covered with bright red powder of minute stellate hairs and fine grain of resinous substance.

Flowering & Fruiting: July–March.

Plant parts use: Leaves, Root,

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Medicinal uses: Leaves, roots, glands and hair of the plant are used in the treatment of various disorders. They are used to treat parasitic affections of the skinlike scabies, ringworm, and herpes.

NEOLAMARCKIA Bosser

Neolamarckia cadamba (Roxb.)

Family : Rubiaceae

Local Name: Kalamb

Trees, 10– 12 m tall. Leaves elliptic to elliptic– oblong, coriaceous, 10.0– 23.5 x 5.5– 15.0 cm, upper surface shining, lower pubescent, apex acute, base rounded or sometimes cordate. Inflorescence a globular head, 7.5– 9.0 cm across. Flowers white or creamy–yellow; petals linear, oblong, acute, imbricate, hairy. Capsules in globose receptacles, 5 cm across, yellow when ripe.

Flowering & Fruiting: November–February.

Plant parts use: Bark

Medicinal uses: Used to treatment of wounds, conjunctivitis, mouth ulcers, diarrhea, irritable bowel syndrome and diseases related to the urinary tract.

OUGEINIA Bth.

Ougeinia oojeinensis (Roxb.)

Family: Fabaceae

Local Name: Tiwis

Trees, 6–12 m high. Leaflets 6.2–10.5 x 4–10 cm, terminal broadly Elliptic or roundish, laterals obliquely ovate, cordate. Flowers many in Fascicled racemes. Pods reticulately veined.

Flowering & Fruiting: March–June.

Plant part use: Bark

Medicinal uses: is used for the treatment of jaundice, diarrhoea, dysentery, diabetes, verminosis, leprosy, leucoderma, haemorrhages, fevers, ulcers

PERSICARIA (L.) Mill.

Persicaria glabra (Willd.)

Family: Polygnoceae

Local Name: Sheral

Herbs, semiaquatic or aquatic, stoloniferous. Leaves 6–23 x 0.7–3.5 cm, lanceolate, finely acuminate at apex, tapering at base, Gland–dotted; ocreae conspicuously veined, truncate at mouth. Perianth Pink. Nuts 0.3 cm across, ovoid or suborbicular, compressed, biconvex, brown to black, shining.

Flowering & Fruiting: Throughout the year.

Plant parts use: Leaves, Flowers

Medicinal uses: It is also used for the treatment of kidney stones, edema, gastric ulcers, and eczema, asthma and thyroid diseases.

EMBLICA Gaertn.

Phyllanthus emblica L.

Family: Euphorbiaceae

Local Name: Aavla

Trees, 5 cm tall. Leaves pinnate; leaflets subsessile 1.0 x 0.2 Cm, closely set, distichous, linear. Flowers greenish-yellow. Fruits 1.0–1.5 cm across, fleshy, globose, yellow, edible.

Flowering & Fruiting : February–October.

Plant parts Use: Bark, Fruit

Medicinal uses: traditional medicine for the treatment of diarrhea, jaundice, and inflammation.

POGOSTEMON Desf.

Pogostemon benghalensis (Burm. F.)

Family: Lamiaceae

Local Name: Fangulta

Herbs, or undershrubs, 0.5–1.5 m high; stems and branches rounded or subquadrangular, glabrous or slightly pubescent, purple. Leaves 5–12 x 3–6 cm, ovate or ovate-lanceolate, glabrous or slightly pubescent, apex acute or acuminate, base cuneate, margins coarsely and irregularly crenate-dentate. Flowers white with purple tinge, in terminal, pubescent, panicle–spikes; bracts elliptic-ovate; calyx

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

0.4Cm long, puberulous, glandular; corolla 0.8 cm long, upper lip 3–subequally lobed, lower one entire. Nutlets obovoid, brownish.

Flowering & Fruiting: November–February.

Plant parts use: Leaves

Medicinal uses: The plant leaves are also useful in the treatment of kidney stone.

***RICINUS* L.**

***Ricinus communis* L.**

Family:- Euphorbiaceae (A. N. Londhe)

Local Name: Erand

Shrubs upto 2.5 m tall. Leaves digitately lobed. Capsules 1 cm Across, globose, spinous. Two varieties, the one larger with green & the other small with ed stem & flowers which is commonly grown in gardens.

Flowering & Fruiting: May – June.

Plant parts use: Root

Medicinal uses: It widely used in traditional medicine such as abdominal disorders, gallbladder pain, period pain, menstrual cramps, rheumatism, sleeplessness and insomnia.

***SCHLEICHERA* Willd.**

***Schleichera oleosa* (Lour.)**

Family: Sapinadaceae

Local Name:- Koshimb

Trees, 10–15 m high. Leaves paripinnate, young leaves reddish; Leaflets 2–4 pairs, 5–15 x 2.5–5.5 cm, oblong or elliptic–oblong Coriaceous, nerves strongly plaited below apex obtuse–round or acute, base cuneate–subcordate. Flowers 0.25–0.3 cm across, greenish–white, Polygamo–dioecious, fascicled in interrupted, branched racemes; calyx Acute, 5–lobed; petals absent. Drupes 2.0–2.5 x 1.5–2.0 cm, ovoid, 1–2Seeded.

Flowering & Fruiting : March–May.

Plant parts use: Bark

Medicinal uses: Its bark is anti-oxidant, used in rheumatoid arthritis, headache. Its oil, Kusum oil is used for treating ulcers, intestinal parasites etc.

***SPHAERANTHUS* L.**

***Sphaeranthus indicus* L.**

Family: Asteraceae

Local Name: Gorakhmundi

Herbs, highly branched, spreading. Leaves c 4.5 x 1.5 cm, Obovate– oblong, glandular– hairy, narrowed at base. Heads 1 cm across on solitary glandular peduncles, florets purple. Achenes stalked.

Flowering & Fruiting : November–May.

Plant part use: Leaves

Medicinal uses: It is traditionally use of the jaundice, diabetes, fever, cough, gastropathy, hernia, dyspepsia and skin diseases.

***TERMINALIA* L.**

***Terminalia bellirica* (Gaertn.) Roxb.**

Family: Combretaceae

Local Name : Behada

Large trees, 15–20 m tall; young parts rufous pubescent. Leaves 8–15 x 6–10 cm, obovate or broadly elliptic, tomentose on both sides. Flowers yellowish–brown, in axillary spikes, foetid. Drupes subglobose, 3 x 2 cm, softly tomentose.

Flowering & Fruiting : March–November.

Plant parts use: Bark, Fruit

Medicinal uses: It is used to protect the liver and to treat respiratory conditions, including respiratory tract infections, cough, and sore throat.

***Terminalia elliptica* Willd.**

Family: Combretaceae

Local Name: Sadada

Trees, 3–20 m tall; bark rough, deeply cracked. Leaves 5–17 x 2.5–8.0 cm, elliptic to elliptic–lanceolate or elliptic–oblong, ovate or Obovate. Flowers yellowish–brown or greenish–yellow, in pubescent Panicles. Drupes 2.4–4.0 cm across, obovoid–oblong or globose, dark Brown or reddish.

Flowering & Fruiting : April–November.

Plant part use: Bark

Medicinal uses: The bark is used medicinally against diarrhoea. Water stored in the stem is often tapped and used as a source of potable water in the summer by forest folk.

TRIDAX L.

Tridax procumbens L.

Family: Asteraceae

Local Name: Tantani

Annuals or perennials, erect or procumbent herbs, branched at Base. Leaves opposite, ovate or lanceolate, margins serrate to coarsely incised dentate or trilobed. Heads heterogamous, produced on erect, Retrorsely hirsute and sparsely glandular peduncles, 10–25 cm long; ray florets white, ligules mostly bilabiate, disc florets tubular-campanulate, Yellow, 5–lobed. pappus of many aristate bristles, unequal in length. achenes 0.3 cm long, narrowly obconical, blackish, terete or ribbed, Sparsely scarious, truncate at apex.

Flowering & Fruiting : Throughout the year.

Plant parts use: Leaves,

Medicinal uses: Its leaf extracts were used for infectious skin diseases in folk medicines. *Tridax procumbens* is also used as treatment for boils, blisters, and cuts by local healers in parts of India.

VITEX L.

Vitex negundo L.

Family : Verbenaceae

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Local Name : Nirgundi

Shrubs, 5 m tall; branches greyish– white with fine tomentum. Leaflets 3– 10 x 1– 2.5cm, ovate– lanceolate, base acute, margins Entire–sinuate with few scattered teeth in middle above. Inflorescences of terminal, compound, pyramidal, paniculate cymes, branches tomentose. Flowers c 0.4 cm long, bluish–purple; calyx white tomentose. Drupes 0.4 x 0.3 cm, ovoid, enclosed by campanulate fruiting calyx.

Flowering & Fruiting: January–June.

Plant parts use: Leaves, Seed, Root

Medicinal uses: *Vitex negundo* relieves muscle aches and joint pains. The leaf, seed and the root to treat excessive vaginal discharge, edema, skin diseases, pruritus, helminthiasis, rheumatism and puerperal fever.

WOODFORDIA Salisb.

Woodfordia fruticosa (L.)

Family: Lythraceae

Local Name: Dhayti

Shrubs or undershrubs, 2–3 m tall. Leaves 3.5–8.0 x 1.2–2.5 cm, Oblong–lanceolate, glabrous above and glandular punctate beneath. Flowers red, in racemes in axils of fallen leaves. Capsules 0.8–1.0 cm Long, ellipsoid, enclosed by persistent calyx tube.

Flowering & Fruiting : May–June.

Plant parts use: Bark, Root, Flowers

Medicinal uses: Dhayti is good for female disorders because it helps to reduce the symptoms of heavy and painful menstruation. It is very beneficial herb to cure range of vast diseases, it is used to cure diarrhea, piles and dysentery because it is a powerful astringent.

WRIGHTIA R. Br.

Wrightia tinctoria R. Br.

Family: Apocynaceae

Local Name: kala kuda

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Trees, 3– 4 m tall. Leaves 7.5– 15.0 x 2.5– 6.0 cm, acuminate at apex, rounded at base, pubescent along midrib below, occasionally glabrous. Flowers white, fragrant in terminal cymes. Follicles paired, Drooping, 25–45 x 0.6–1.2 cm cylindric, apicesconnate. Seeds 1.2–1.8 cm long, pointed; coma 3–5 cm long.

Flowering & Fruiting: March–May.

Plant parts use: Seed, Bark

Medicinal uses: Powder of the bark is used for treatment of kidney stones. *Wrightia tinctoria* is the best medicine for Diarrhoea and blood pressure,

XANTHIUM L.

Xanthium Strumarium L.

Family: Asteraceae

Local Name: Zalmani

Herbs, annual; stem rough with short hairs. Leaves broadly ovate, triangular, appressed hairy. Heads 0.4 – 0.8 cm across, green (young), in terminal and axillary spikes. Fruits 2 cm long, having 2 erect Mucronate beaks, covered with hooked prickles. Achenes 1 x 0.4 cm, oblong or ovoid, compressed, black.

Flowering & Fruiting: January–May.

Plant parts use: Root

Medicinal uses: *Xanthium strumarium* has many medicinal properties like voice,cooling, laxative, fattening, anthelmintic, tonic, digestive, antipyretic, improvesappetite.

ZIZIPHUS Mill.

Ziziphus rugosa Lam.

Family: Rhamnaceae

Local Name: Toran

Straggling shrubs, 4 m tall; stems and branches armed. Leaves 5–10 cm long, broadly elliptic, tomentose beneath, oblique, acuminate at apex, cordate at base,margins denticulate. Flowers in long

Peduncled, tomentose, paniculate cymes on leafless spinous branches. Drupes 0.6–0.8 cm across, whitish when ripe.

Flowering & Fruiting: December–February.

Plant parts use: Bark, Root

Medicinal uses: This plant is traditionally used for the treatment of diarrhoea, menorrhagia, ulcer, skin disease, cough, hypotension.

Discussion

A total 50 Wild medicinal important plant species belonging to 45 genera and 26 families have been reported from both the study areas. Highly represented families were Fabaceae with 9 species, Euphorbiaceae and Asteraceae with 5 species each Moraceae 4 species each and Combretaceae 3 species each and Apocynaceae, Rubiaceae and Lamiaceae 2 species each and Amaranthaceae, Annonaceae, Boraginaceae, Bixaceae, Capparidaceae, Caesalpiniaceae, Dilleniaceae, Sapindaceae, Mimosaceae, Sapotaceae, Rubiaceae, Menispermaceae, Phyllanthaceae, Lythraceae, Papaveraceae, Polygonoaceae, Rhamnaceae, Sterculiaceae and Tiliaceae with 1 species each. Pandey (2022) and Kumar (2015) also reported highly use of Fabaceae species in Kaccha area and Dang district of Gujarat.

During the present study, a smaller number of climber (2), Herb (11) and Shrub species compared to number of tree species (23) were recorded (fig. 2). Similar report was recorded by Patel and Varshney (2017) in Saputara hills, Gujarat. Tribal peoples use different plant part for various medicinal purposes. Of which, nearly 54% of the plant species are used as traditional medicine for various ailments. Sometime paste is also prepared from plant part and applied to cure various skin diseases, inflammation, swellings, insect bites, snake bites etc. In table the medicinal plants species are described and arranged in alphabetical order, local name along with family and plant part used as medicinal purpose. The study has brought out to light the traditional and indigenous knowledge. A collected 50 wild medicinal species belongs to 45 genera and 27 families used by tribe of Dhumkhal for treating and controlling the disease. Nearly 70-80 percent world population relies upon traditional medicines. Documentation of the indigenous knowledge and plants is the need of the hour. The transect studies were also carried out in study areas to substantiate the gathered information on wild medicinal plant. A total of 50 wild medicinal plant species were collected and identified from the study area for treated various human ailments.

Conclusion

We collected 50 wild medicinal species from dhumkhal forest and focus on collection and identification of wild medicinal plants species. The present survey of the dhumkhal forest through covers a small area but reveals rich traditional information. This indicates that the tribals still depends largely on the natural wealth on their surroundings. The wild medicinal plants studies of these small tribals dhumkhal hill and forest of the duration of 4 months may lead to following data collection. We feel that there is need of extensive investigation of all the forest areas. Wild medicinal species investigated would be helpful in identifying basic need of tribals peoples that reflected.

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Fig. 1. Study area

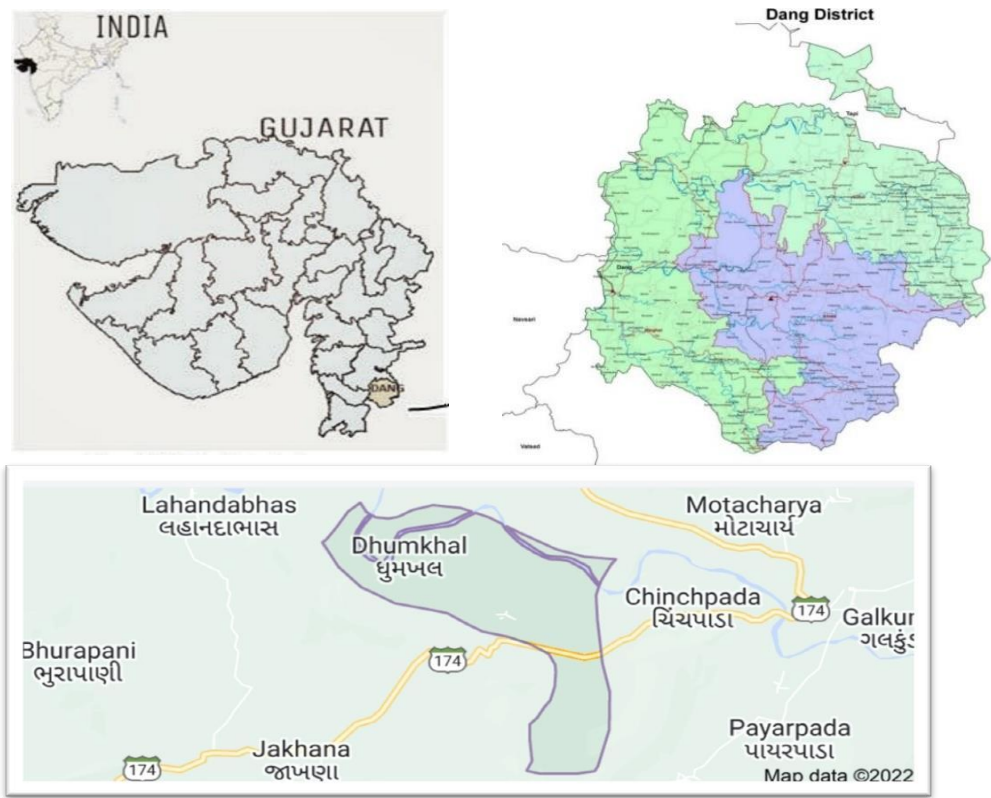
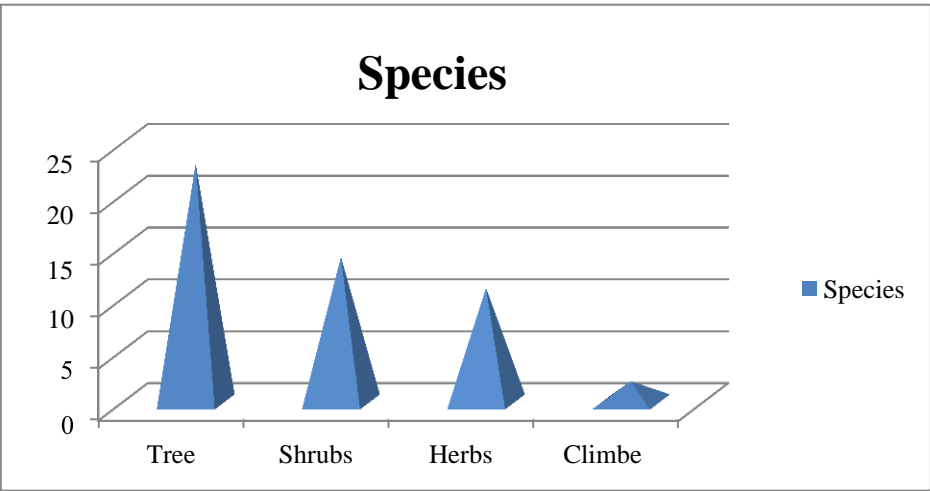


Fig. 2. Habit wise distribution of plants in study region.



THE INFLUENCE OF SOCIAL MEDIA ON ADOLESCENT IDENTITY FORMATION: A CASE STUDY APPROACH

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Abstract: This study uses a number of case studies to examine how social media affects the development of teenage identities. Teenagers' perceptions of themselves, their social behaviours, and their personal identities are explored through an analysis of social media sites such as Instagram, TikTok, and Snapchat. The study reveals how these digital settings impact the formation of teenage identities by examining particular influencers, viral trends, and online groups. The results show that social media has a major role in influencing users' self-esteem and body image, frequently by encouraging idealised depictions and drawing them into trends that have an impact on their self-concept. Influencers and virtual communities provide advantages as well as possible drawbacks, such cyberbullying and social comparison. This study supports identity formation theories by emphasising the dual effects of social media, which may be both positive and negative for one's sense of self-worth and authenticity. The findings highlight the need for media literacy initiatives in order to assist teenagers in successfully navigating these pressures. Subsequent investigations have to delve more into the dynamic influence of nascent digital platforms and their function in moulding the identity of teenagers.

Keywords: Social Media, Adolescent Identity, Self-Perception, Influencers, Viral Trends, Online Communities

Introduction:

Social media platforms have become an essential part of teenagers' life in the digital era, greatly influencing their identity construction and personal growth. The development of a person's identity throughout adolescence is a crucial time, and the impact of digital media on this process has to be carefully considered. Social media sites like Snapchat, Instagram, and TikTok provide never-before-seen chances for social connection, community development, and self-expression. They do, however, also bring with them fresh difficulties and situations that affect how youth view themselves and their role in society. Social media's explosive growth has changed the way teenagers negotiate their identities. These platforms give users a place to communicate with peers and influencers, create and

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Multidisciplinary Streams
August 2024**

showcase their idealised self, and interact with a varied range of material. Constant exposure to well-chosen photos, fashions, and online personalities may have a big impact on how one feels about themselves and who they are. Many youngsters view social media as an essential part of their social and personal life, rather than merely a tool for communication.

Despite social media's widespread use, further research is required to determine how it particularly affects the development of teenage identities. Numerous aspects of social media's influence have been studied in the past, including how it affects social behaviour, body image, and self-esteem. Still lacking, though, is a comprehensive knowledge of how certain social media dynamics—like influencer culture, viral trends, and online communities—affect the formation of teenage identities. This study intends to close this gap by carrying out a number of case studies with an emphasis on social media impacts. This study aims to investigate how digital components, such as viral trends, online communities, and influencers, shape and change teenage identity through in-depth analysis. Through the analysis of these case studies, the research will give a thorough knowledge of how digital media impacts the experiences and perceptions of today's youth, shedding light on the intricate relationship between social media and self-concept.

This study is important because it can help parents, educators, and legislators understand how social media affects teenage development. Comprehending these factors can aid in formulating tactics to encourage positive identity development and alleviate possible adverse effects, ultimately leading to a better-informed strategy for controlling teenage usage of digital media.

Literature Review:

The complicated process of forming an adolescent's identity is impacted by a number of variables, such as social, psychological, and cultural aspects. In particular, throughout adolescence, when people explore and build their self-concept, social interactions have a crucial role in developing identity, according to Erikson's (1968) theory of psychosocial development. Erikson states that teenagers are in a state of "identity vs. role confusion," in which they are trying to figure out who they are and where they fit in with society. Social media platforms in particular are becoming more and more entwined with this developmental stage of growth. Social media's introduction has changed the dynamics of identity creation. Teenagers have an online area to explore and express their identities thanks to social media sites like Instagram, TikTok, and Snapchat. Studies show that these platforms have a big influence on body image and self-esteem. For example, Fardouly et al. (2015) discovered that teenagers' negative body views and body dissatisfaction are related to their exposure to idealised

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Multidisciplinary Streams
August 2024**

photos on social media. Teenagers' self-perception and self-worth may be impacted by the representation of unrealistic beauty standards and lifestyle aspirations, which is connected to these phenomena.

Influencers on social media, who have taken centre stage in online communities, are essential in forming the identities of teenagers. The edited versions of their lives that influencers frequently share might build expectations for their followers. Influencers help shape aspirational identities that followers could want to imitate, claim Marwick and Boyd (2011). Adolescents may experience a phenomenon where they contrast the idealised representations of themselves online with their actual realities, which might have an adverse effect on their development of identities and sense of self. Social media affects social behaviour and peer connections in addition to an individual's impression of themselves. Social networking sites, according to Valkenburg and Peter (2011), can improve social capital and foster peer engagement, but they can also lead to new kinds of behaviour such as social comparison and validation seeking. Teenagers may use self-presentation techniques that follow the trends and standards of their peers, which might affect how authentically they express themselves. When online personas diverge from real-life identities, this can result in a fractured sense of identity.

Online forums and groups also give teenagers a place to interact with people who have similar interests or experiences, which can help with identity building. According to research by Subrahmanyam et al. (2008), these groups can offer assistance and a feeling of community, which helps foster a more cohesive and well-supported self-concept. These areas may, however, also foster groupthink and echo chambers, which might restrict exposure to other viewpoints. Research indicates a complex connection between teenage identity formation and social media use. Digital media raises issues with body image, social comparison, and self-esteem even as it offers avenues for self-expression and connection. It takes a sophisticated approach to comprehend these processes, taking into account both the advantages and disadvantages of social media for identity formation. Further investigations into these relationships are necessary to paint a more complete picture of how teenage identity is influenced by digital media in the modern world.

Methodology:

This study's methodology, which combines qualitative and quantitative methods, takes a multifaceted approach to investigating how social media affects adolescents' creation of identities. The selection of case studies is predicated on their pertinence to current social media patterns and their influence over teenage users. Viral trends, strong online communities, and the popularity of social media influencers

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August 2024

are important selection factors. Data collecting involves a variety of techniques. First, to find recurring themes, trends, and influencer tactics, a content analysis of social media sites like Instagram, TikTok, and Snapchat is carried out. Examining posts, videos, and conversations pertaining to certain case studies is part of this process. In order to obtain firsthand insights into the experiences and attitudes of teenagers who actively use these platforms, second, semi-structured interviews with them are conducted. The purpose of these interviews is to learn more about how social media affects the participants' social behaviour, body image, and self-concept.

In order to measure trends in social media use and its relationship to identity development, surveys are also given to a larger sample of teenagers. The poll asks on the kind of material consumed, how often it is used, and how it is thought to affect identity and self-esteem. Thematic analysis is used to examine the data in order to find recurrent themes and patterns pertaining to the construction of identity. We look for statistical relationships between identity-related outcomes and social media activity using quantitative data from surveys. A thorough grasp of how social media affects teenage identity from both qualitative and quantitative angles is ensured by this mixed-methods approach.

Case Studies:

Charli D'Amelio, a TikTok influencer who quickly rose to fame for her dancing videos and gregarious demeanour, is one interesting case study. The ascent to prominence of Charli is a noteworthy illustration of how social media may influence teenage identity. Her youthful audience has connected strongly with her content, which is distinguished by popular dance moves and realistic substance. Beyond only being a source of entertainment, D'Amelio has become a role model for many teenagers, who take after her appearance, demeanour, and even morals (Smith, 2023). This phenomenon emphasises how influential people shape teenagers' perceptions of themselves and of societal standards.

The #BodyPositivity movement on Instagram, which encourages self-acceptance and questions conventional beauty standards, is another noteworthy case study. Several activists and personalities have spearheaded the movement by disseminating pictures and statements that embrace a variety of body shapes. According to research, teens' self-esteem and body image may be greatly impacted by exposure to body-positive content, which promotes a more inclusive definition of beauty (Jones & Taylor, 2022). But there are also obstacles the movement must overcome, such the commercialisation of body positivity, which may lessen the movement's influence and message (Adams, 2024).

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August 2024

A third case study is on mental health and self-care within the YouTube community. Channels such as The Anxiety Coaches provide young viewers guidance and help on mental health concerns through their material. This community offers a place where teenagers may get support and useful guidance for dealing with mental health issues. Research indicates that these virtual communities might significantly influence teenagers' perspectives on mental health by providing a feeling of acceptance and coping mechanisms (Lee & Kim, 2023). But depending so much on internet guidance also begs the question of how sufficient these resources are in comparison to therapy from a professional.

These case studies each highlight a distinct aspect of how social media affects the development of teenage identities. The effect of Charli D'Amelio emphasises how influential people shape young people's culture and self-perception, while the Body Positivity movement demonstrates how social media can be used to redefine and question conventional notions of beauty. The YouTube mental health community serves as an example of how digital platforms may provide knowledge and support, but it also emphasises the importance of carefully evaluating the reliability and correctness of online advice. When taken as a whole, these case studies offer a complex picture of social media's influence on teenage identity development, highlighting both its advantages and disadvantages.

Findings

The case study results provide important new information on how social media affects teenage identity formation.

Influencer Impact: According to case studies on well-known social media influencers, these people have a significant impact on how teenagers view themselves and who they are. Influencers on TikTok, for instance, who advocate for specific lifestyles or beauty standards, have a significant impact on the goals and self-image of their followers. Teenagers frequently model their actions, wardrobe selections, and even attitudes after these influencers, resulting in a merging of their identities with the online personalities they find appealing.

Viral Trends: Viral phenomena, such challenges or trending hashtags on social media sites like Instagram, have a significant influence on teenage behaviour and self-perception, according to studies. Adolescents who participate in these trends may have an increased sense of validation and belonging as they attempt to fit in with the prevailing cultural phenomena. These trends, meanwhile, can also put pressure on people to live up to specific standards, which can be detrimental to their sense of self and morals.

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Multidisciplinary Streams
August 2024

Online Communities: Case studies of online communities, including forums or interest groups, show how these virtual places influence the construction of identities. Teens who participate in niche groups gain a feeling of purpose and identity from their shared experiences and common interests. These communities give teenagers a place to express themselves and explore who they are, enabling them to build and negotiate their identities in the context of a caring community.

The results show that social media significantly shapes teenage identity through the use of online communities, viral trends, and influencer models to shape self-perception. These platforms provide chances for self-expression and social interaction, but they also come with drawbacks, such as the possibility of greater pressure to live up to expectations from outside sources and the possibility of identity confusion.

Discussion:

The study's conclusions provide important new information on how social media affects adolescents' development of identities. The case study research reveals the beneficial and detrimental effects of digital media on teens' social behaviour and sense of self. Social media influencers have a significant impact on how their followers perceive themselves, as the TikTok founder demonstrates. Their carefully chosen material frequently creates norms and trends that teenagers aspire to follow, which, when met with encouraging feedback, may increase self-esteem. But when followers evaluate their own lives against the allegedly ideal lifestyles shown online, it may also result in erroneous comparisons and discontent.

Analysing viral trends demonstrates how identity development may be impacted by group involvement in challenges or trends on social media sites like Instagram. Teenagers' perceptions of themselves and their classmates are deeply ingrained with the aesthetic and lifestyle standards that these trends frequently propagate. Participating in these movements can provide a feeling of connection and belonging, but there's a chance that it can reinforce shallow ideals and exacerbate problems with self-worth and body image. Engagement in virtual communities, as seen in discussion boards or niche organisations, provides an alternative viewpoint on the function of social media in the formation of identity. Adolescents may freely explore and express their interests in these groups, which help them develop a sense of identity via common interests and experiences. While this has the potential to foster echo chambers where identities are primarily shaped by group standards rather than individual principles, it may also foster personal development and self-expression.

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August 2024

The results are consistent with theories of identity formation that are currently in use, especially those that highlight the importance of social interactions and self-perception in the development of adolescents. According to these views, social media serves as a dynamic and powerful setting where identity is constantly contested and rebuilt. On the other hand, the research also reveals fresh angles on these hypotheses, such the heightened effect of influencer culture and the part viral trends play in influencing teenage conduct. Notwithstanding these revelations, the research admits its limitations, including possible biases in the selection of case studies and the difficulty of extrapolating results to a variety of social media platforms and user demographics. In order to overcome these constraints, future studies should investigate a wider range of platforms and demographic factors in addition to looking at the long-term impacts of social media use on identity development. In summary, the research highlights the intricate relationship between digital media and teenage growth, stressing the importance of moderate and deliberate use of social media in order to promote positive identity development.

Conclusion:

The case studies that were examined provide evidence of the significant and varied impact that social media has on the development of teenage identities. Teenagers' perceptions of themselves, their sense of self-worth, and their social connections are greatly influenced by social media sites like Instagram, TikTok, and Snapchat. According to the study, there are several ways in which social media shapes the identities of teenagers, such as exposure to idealised images and lifestyles, involvement in viral trends, and membership in online groups. In particular, influencers have a significant effect on how followers perceive themselves and their beliefs, and viral trends have the power to change how others view conduct and attractiveness. Engaging in virtual communities provides teenagers with a feeling of acceptance and validation of their identity; nonetheless, there are hazards associated with social comparison and cyberbullying. These results, which show both the advantages and disadvantages of digital media, are consistent with ideas already in place on identity development. Social media offers chances for connection and self-expression, but it also has drawbacks, such raising irrational expectations and escalating anxieties. The study emphasises the value of teaching teenager's media literacy and the necessity of taking a balanced approach to social media use. These dynamics should be further investigated in future studies, with an emphasis on new trends and the changing effects of new digital platforms. In general, recognising these effects is essential to promoting healthy identity formation in the digital age and creating settings where teenagers may constructively and supportively negotiate their self-concept.

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Multidisciplinary Streams
August 2024

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August 2024**

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Effect of Educational Learning Apps in Enhancing Academic Performance among Under Graduate Students of Papumpare District in Arunachal Pradesh

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Abstract:

In this mad rush of 21st century Educational Learning Apps are increasingly vital in enhancing student engagement with learning materials by offering dynamic, personalized experiences that complement traditional methods. This study examines the impact of these apps on the academic performance of undergraduate students in Papumpare District, Arunachal Pradesh—a region with unique educational challenges and opportunities. Using a mixed-method and quasi-experimental design, the research involved 30 students and 10 teachers, assessing the effectiveness of the apps through pretest-posttest comparisons and interviews. The findings revealed significant academic improvements among students using the apps, with most teachers and students rating their experiences highly. However, some challenges, such as limited access to technology and familiarity with modern tools, were noted, emphasizing the need for better training and resource accessibility to fully harness the benefits of educational innovations.

Keywords: *Effect, Educational Learning Apps, Enhancing, Academic Performance and Under Graduate Students*

1. INTRODUCTION

In today's tech-driven world, the field of education is increasingly embracing technological innovations. To cater to the diverse needs of students, educators are turning to Educational Learning Apps, which have significantly transformed how students interact with learning materials.

Educational Learning Apps are interactive software designed to support learning and enhance education. They serve a variety of users, including students, teachers, researchers, and professionals, by providing tools for acquiring new skills, accessing online study resources, and more. These apps offer a dynamic and tailored approach to education, enhancing traditional teaching methods with interactive tools and resources.

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Multidisciplinary Streams
August 2024

Educational Learning Apps provide a broad spectrum of content, from basic concepts to more complex topics, and include features like quizzes, tutorials, and virtual classrooms. By integrating these digital tools into the learning environment, they aim to address various educational needs, potentially boosting student engagement and improving academic performance.

The Statements made by **Thompson, Green, Smith and Wilson, renowned expert in this field**, underscores the deep potential of Educational Learning Apps in unlocking novel dimensions of learning and shaping the future of education.

This study investigates the "**Effect of Educational Learning Apps in Enhancing Academic Performance among Undergraduate Students of Papumpare District in Arunachal Pradesh**," a region where access to educational resources can be both a challenge and an opportunity for growth.

Papumpare District, nestled in the northeastern part of **Arunachal Pradesh**, is characterized by its unique socio-economic landscape and educational needs. As higher education becomes increasingly pivotal for personal and professional development, it is crucial to explore how technological innovations, such as Educational Learning Apps, can impact academic outcomes in this region.

Some of the Educational Learning Apps are:

- i. Khan Academy
- ii. Duolingo
- iii. Quizlet
- iv. Coursera
- v. Edmodo
- vi. Duolingo ABC
- vii. Google Classroom
- viii. Brainscape
- ix. Byju's
- x. Mathway

2. REVIEW OF THE RELATED STUDY

2.1. Review of the Related Studies Conducted Abroad:

Thompson and Green (2024) conducted a meta-analysis of 35 studies on Educational Learning Apps and found a generally positive link between app usage and increased student engagement. Their research indicates that while Educational Learning Apps can enhance student involvement, the effectiveness varies based on app design and relevance to the content. Well-designed apps aligned with educational goals are more likely to engage students effectively, highlighting the importance of careful app design and content selection.

Smith and Wilson (2023) undertook an extensive review and meta-analysis of recent studies to explore the effects of Educational Learning Apps on classroom dynamics. By applying multivariate analysis techniques, their research uncovered that Educational Learning Apps positively impact classroom dynamics and teacher-student relationships, enhancing interaction and collaboration. Their analysis emphasizes that to maximize these benefits, apps must be thoughtfully integrated into the curriculum and aligned with teaching goals. Effective use of Educational Learning Apps requires careful planning and strategic implementation to optimize their impact on learning outcomes.

Chang and Lee (2023) explored how Educational Learning Apps are impacting elementary education by comparing various studies and case reports. Their analysis revealed that these apps can be quite effective in helping kids improve their reading, writing, and math skills. However, they also found that the success of these apps largely depends on two things: how well teachers know how to use them and how good the apps are. In other words, while Educational Learning Apps have a lot of promise, their benefits are closely tied to teachers' familiarity with the tools and the overall quality of the apps.

2.2. Review of the Related Studies Conducted in India:

Gupta and Patel (2023) examined how Educational Learning Apps are being adopted in higher education institutions in India by reviewing 15 studies. Their regression analysis revealed that these apps are improving student engagement and learning outcomes. The study also highlighted the importance of providing effective training for educators and ensuring that the apps align well with educational goals to maximize their benefits.

Reddy and Nair (2022) analyzed 25 studies from India to see how well Educational Learning Apps improve student learning. Their statistical review found that these apps can notably boost learning, especially in subjects like math and science. However, they also highlighted some problems, such as the relevance of app content and the need for better alignment with the school curriculum. This means that while Educational Learning Apps are helpful, ensuring their content fits well with what students are learning in class is crucial for making the most of these tools.

Nair and Suresh (2020) assessed how well Educational Learning Apps support special education in India by comparing 12 studies. Their analysis found that these apps are helpful for students with special needs, offering tailored learning experiences and boosting engagement. However, they also pointed out that the success of these apps largely depends on how well they meet the individual needs of the students and their overall design.

3. RATIONALE OF THE STUDY

The increasing use of Educational Learning Apps highlights their potential to boost academic performance and engagement across various educational settings. Despite significant research into their effectiveness, there are notable gaps, especially regarding their impact on undergraduate students in specific regions such as **Papumpare District in Arunachal Pradesh**. For instance, **Thompson and Green (2024)** found that the effectiveness of these apps largely depends on their design and relevance but did not explore their application in **remote or less-studied areas**. Similarly, **Smith and Wilson (2023)** identified positive effects on classroom dynamics but did not address **regional or socio-economic** challenges.

Further research by **Chang and Lee (2023)** focused on **elementary education**, and **Gupta and Patel (2023)** on **higher education across India**, yet neither considered the **unique educational environment of Arunachal Pradesh**. **Reddy and Nair (2022)** examined **subject-specific impacts**, while **Nair and Suresh (2020)** looked at **special education**, but neither addressed the broader context of **undergraduate performance**. To fill these gaps, it is crucial to study how Educational Learning Apps affect undergraduate students in Papumpare District, considering regional challenges and socio-economic factors to optimize their use and improve learning outcomes.

This research aims to assess the extent to which Educational Learning Apps can enhance the academic performance of undergraduate students in Papumpare District. By examining factors such as app usage patterns, student engagement levels, and academic outcomes, this study seeks to provide insights into the effectiveness of digital tools in a region where educational infrastructure and resources may be limited. Understanding these dynamics can help educators, policymakers, and technology developers to better tailor educational solutions that address the specific needs of students in this district.

4. STATEMENT OF THE PROBLEM

“Effect of Educational Learning Apps in Enhancing Academic Performance among Under Graduate Students of Papumpare District in Arunachal Pradesh”

5. RESEARCH QUESTIONS

- i. What are the effects of Educational Learning Apps on Academic Performance among Under Graduate Students of Papumpare District in Arunachal Pradesh
- ii. What do Teachers think about using Educational Learning Apps?
- iii. How do the experiences of both students and teachers influence the acceptance and adoption of Educational Learning Apps?

6. OBJECTIVE OF THE STUDY

- i. **To explore the utilization of Educational Learning Apps to provide personalized learning experiences.**
- ii. **To Study the Effect of Educational Learning Apps in Enhancing Academic Performance Among Under Graduate Students.**
- iii. To study the experiences of Students and Teachers about the Educational Learning Apps.

7. HYPOTHESIS OF THE STUDY

Objective 2 -

H₀ - There is no significant effect of Educational Learning Apps in Enhancing Academic Performance among Under Graduate Students of Papumpare District in Arunachal Pradesh

8. METHODOLOGY OF THE STUDY

Research design: In this study the researcher employed a mixed-method research design and a quasi-experimental, parallel group pretest-posttest design.

Population: In this study population comprised of Undergraduate students of Papumpare District in Arunachal Pradesh

Sample Size: In this study sample size comprised of 30 Undergraduate students and 10 Teachers

Sampling Technique: In this study the researcher used Purposive Sampling Technique.

Variables: the use of Educational Learning Apps (**Independent Variables**)

Academic Performance of Undergraduate students (**Dependent Variables**)

Tools and techniques: Interview of teachers was scheduled to know the experience of teachers and students on Educational Learning Apps. Pretest and Posttest was prepared to identify the improvement of the students on using Educational Learning Apps.

9. FINDINGS & DISCUSSIONS

The findings have been presented in the following tables wise:

Objective 1 & 2: Personalized Learning Experiences & Effect of Educational Learning Apps.

Table 1: Computation of Mean, SD, Mean Difference and T-Value of the control group.

Control Group		Mean	Standard Deviation	Mean Difference	Paired “t” test	Table Value	Degree of Freedom
	Pre-Test	11.87	1.35	0.26	0.72	2.145	14
	Post-Test	12.13	1.36				

Since the t-test statistic (**0.72**) is less than the critical value (**2.145**), we fail to reject the null hypothesis at **0.05** level of significance. This suggests that there is no statistically significant difference between pretest and posttest scores.

Table 2: Computation of Mean, SD, Mean Difference and T-Value of the experimental group.

Experimental Group		Mean	Standard Deviation	Mean Difference	Paired “t” test	Table Value	Degree of Freedom
	Pre-Test	11.40	1.43	13.53	23.22	2.145	14
	Post-Test	24.93	1.66				

Since the t-test statistic (**23.22**) is far greater than critical value (**2.145**), we reject the null hypothesis at **0.05** level of significance. This suggests there is a statistically significant difference between pretest and posttest scores in using Educational Learning Apps.

The experimental group, exposed to Educational Learning Apps showed more improvement than the control group, which indicates the effectiveness of personalized learning experiences.

Objective 3 : Experiences of Students and Teachers about the Educational Learning Apps

Table 3 (A): Computation of Teachers Responses

Sample	Area	No of Responses		%
10	Experience of Teachers on using Educational Learning Apps	Excellent	81	81
		Good	10	10
		Fair	5	5
		Poor	4	4

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Multidisciplinary Streams
August 2024

Table 3 (B) : Computation of Students Responses

Sample	Area	No of Responses		%
10 Students	Experience of Students on using Educational Learning Apps	Excellent	89	89
		Good	4	4
		Fair	2	2
		Poor	5	5

From table 3(A) & (B): The majority of Teachers (**81%**) and Students (**89%**) rated their experience as “**Excellent**”, indicating high effectiveness and benefit of Educational Learning Apps. A significant Proportion of Teachers (**10%**) rated their experience as “**Good**”, suggesting effectiveness despite limited knowledge about technology. But a smaller proportion of Teachers (**5 & 4%**) rated their experience as “**Fair**” & “**Poor**” respectively, indicating challenges due to lack of familiarity with modern technology.

Moreover, a smaller proportion of Students (**4%**) rated their experiences as “**Good**”, indicating effectiveness despite limited usages of Educational Learning Apps. And considerable numbers of Students (**2 & 5%**) rated their experience as “**Fair**” & “**Poor**” respectively, citing challenges accessing the technology due to lack of resources.

10. DISCUSSIONS

The study focused on a frequently neglected aspect of educational research: the impact of educational learning apps on improving the academic performance of undergraduate students. Using a thorough mixed-method approach combined with a quasi-experimental design, the research aimed to offer a complete understanding of how these learning apps affect the academic achievements of undergraduate students in the Papumpare District of Arunachal Pradesh by integrating both quantitative and qualitative data.

The studies conducted by **Thompson and Green (2024)**, **Smith and Wilson (2023)**, **Chang and Lee (2023)** , **Nair and Suresh (2020)** Collectively support the findings of the **1st and 2nd objectives** of our study.

The studies conducted by **Gupta and Patel (2023)**, **Reddy and Nair (2022)** collectively support the findings of our **3rd objective** regarding the positive experience of both Teachers and Students with Educational Learning Apps.

The findings of this research clearly demonstrate that educational learning apps improve the academic performance of undergraduate students. However, despite these positive outcomes, it's important to

recognize the challenges identified during the study. Significant obstacles include the technical proficiency of educators and access issues faced by students. If teachers do not receive proper training and support, and if students lack equitable access to technology, the full benefits of these learning apps may not be realized.

11. RECOMMENDATION OF THE STUDY

- i. Increase Teacher Training and Support.
- ii. Improve Access to Technology for Students.
- iii. Promote Personalized Learning Approaches.
- iv. Ongoing Monitoring and Evaluation.
- v. Address Technical Challenges.
- vi. Policy Advocacy for Resource Allocation.

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SHAPING THE FUTURE OF RESEARCH IN CIVIL ENGINEERING THROUGH 3I (INSTITUTE -INDUSTRY INTERACTION) INTERDISCIPLINARY COLLABORATION APPROACH

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ABSTRACT

The aim of any future research is to increase the scale of interdisciplinary cooperation. This paper explores possible ways to minimize the gap between Education, Research and Industry so as to meet the expectations from Industry in Civil Engineering. This paper delves into **3I approach (Institute - Industry Interaction) in Civil Engineering** and emphasizes the fact that Industry and Institute are two strategic columns and need to be connected through a beam called Research so that the society benefits as a whole. The paper also provides few cases showing how people with varied subject knowledge and skillsets researched and collaborated and created path breaking works in Civil Engineering and sustainable construction

INTRODUCTION

The Living organism as a perfect example of Interdisciplinary collaboration

It is needless to say every living organism, be it plant, animal /human body, during their life span, each part of performs their specialized function in unison and contribute effectively to self-growth. Whenever any part gets affected, whole body works in unison to fight the negativity to survive. The human brain is such an unparalleled repository of knowledge that if allowed to explore, regardless of age, it acquires newer knowledge and has decoded the secrets of Universe right from powerful megapixel eye of the eagle, the hard-working bee, systematic tiny ant which work as a team and sunflower which turns each day in direction of sunlight and Mimosa Pudica which closes when anybody touches it. In Civil Engineering also, people with different levels of skills right from earthwork excavator to mason, painter, bar bender etc implement the design dream of Civil Engineer in creating structures that have stood and continue to stand as a testimony to Human excellence. In fact the Civil Engineering structural designs draw inspiration from human body (joints of bone /muscle) and joints in structural connections. In fact, many of Researchers in Civil Engineering have been inspired by Non-Civil

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

Engineers as shown in ensuing paragraphs. Biomimicry is a principle used in engineering based on emulating the elements, models and systems found in nature to find engineering solutions to technological challenges and this type of design makes sustainable systems.

Historical Interdisciplinary collaboration In Civil Engineering

One of pioneering examples of Research in civil Engineering was the Joseph Monier, A French Gardener who used concrete and steel in making flower pots and exhibited them in 1867 Paris Exposition showing how beautifully two diverse materials could combine to provide a powerful use and propelled the imminent rise of RCC design and construction technology and later this cascaded over the time such as Prestressed concrete, and use of alternates like FRP Concrete, Bamboo Reinforced concrete to reduce cost of construction. Almost everyone is aware of invention of water wheel and how Archimedes decoded principle of Buoyancy and ran shouting ‘Eureka Eureka’ and set the foundation for Hydraulics and fluid Mechanics. Similarly, all are aware of Joseph Aspidin who discovered cement and how Charles Good year through Vulcanisation of Rubber revolutionized transport Engineering. The great Leonardo Da Vinci was multi-talented & a painter too. Similarly in Geotechnical Engineering, it was an Agriculture scientist Atterberg who devised criteria for classifying soils based on liquid limit, plastic limit and shrinkage thus setting up the criteria for soil classification. Similarly it was Brownian motion of Robert Brown that was used to explain the colloidal behavior of clays. Any Geotechnical Engineer can never forget the fact that father of Geotechnical Engineering Karl Terzaghi was originally a Mechanical Engineer who developed a keen interest on Geology and Earth materials and through his spring analogy explained consolidation process of soils and brought respect to Youngest Branch of Civil Engineering in 1930 through his Book ‘ErdbauMechanik’. In fact, if we delve deep into the history, we will easily know how Civil Engineering was inspired by Scientists and Researchers (Physics, Chemistry, Biology, Economics, Geology, Geography and even Arts). Similarly, when we look at subject specific scientists example Rankine had contributed in almost all three Mother trades, not to forget Coulomb who was a Physicist. The Great Temples were built by Kings who were not Engineers and rather became known as Engineer Kings.

Cases of Interdisciplinary collaboration In India Post Independence (Few examples)

The Krishna Raja Sagar Dam (Popularly called Kannambadi) is a clear example of interdisciplinary collaboration between people having different levels of education and prosperity and complete support to research (The proactive Wodeyars, the brilliant Engineer Sir MV and Diwan T Ananda Rao, people of Mandya District, the farmers who parted with their land not to forget the queen Her excellency

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Kempananjammani Vani Vilasa who mortgaged her jewels to support the project). Such was the work that Government established Karnataka Engineering Research Station which started as a small research unit in water resources and today has diversified in multi disciplines of Civil Engineering.

If we look at the gigantic Vidhana Soudha , the man who lead efforts was Karnataka's second Chief Minister Kengal Hanumanthai, a lawyer who took the comment of visiting Russian dignitaries that Bengaluru did not have any structure which showcased Indian Culture and was instead showcasing British Architecture seriously and thus the greatest Assembly Building was built by a Civil Engineer (Mr B R Manickam, a Civil Engineer who was designated as Government Architect) and his team of workers mostly Prisoners who were set free on its completion and inaugurated by our first Prime Minister Pandit Nehru. Similarly, the Bhakra Nangal Dam was not built by a qualified Graduate /Post Graduate Civil Engineer but an 8th Grade pass Harvey Slocum. Starting in his late 40s, his last project was the massive and extremely challenging Bhakra Dam in northern India. Slocum was hand-picked by Prime Minister Nehru as lead construction engineer for the project. He worked on Bhakra from 1952 until his death on the job in 1961 at the age of 74. At the time of its completion, Bhakra was the tallest concrete dam in the world, provided irrigation to over 6.5 million acres of new farmland and hydroelectric power to over 5,000 villages. In Bhilai Steel Plant, when a Blast furnace Broke down as cast iron got solidified , experts from US, UK and Germany suggested the dismantling. The Indian Government brought in the Russian Blast Furnace operator Konstantin Khabarov from Magnitogorsk and in 12 days the Blast furnace was restored .

From the above, we can easily conclude that every level of education /age has scope for interdisciplinary research and Collaboration provided we have the mindset, and our research must delve into history

Current Research - Bridging the gap between Industry and Institute

The gap between Research and Practitioner especially in Civil Engineering is initially acute with Industry resisting change (for example use of fly ash) and relying on natural materials until MoEF made it mandatory in early 2000 based on Fly ash Mission report to use fly ash in Highway construction and do proper research to make it useful if it was non pozzolanic through lime addition. Later on MORTH promoted use of plastic and rubber wastes, blast furnace slag materials etc. These days Thermal Power Producers have their own Research centres and provide ready mix Plastering material. Similarly BWSSB provides treated waste water, for construction to name a few. IRC (Indian Roads Congress) has successfully collaborated with many Institutes such as UVCE, BTRA, Highway

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Research Station ,Highways Department ,TN ,IIT and many more. We are the seventh Largest country in world, and have the largest working population with world class IIT/NIT/University Engineering Colleges all having syllabus which is more or less common across India. Our Research Institutes (Under CSIR) produce some of highest quality research in Frontier areas of Civil Engineering Science and technology. We may therefore conclude confidently that the gap between what Engineers learn in College and what they are implementing while working in Industry has reduced greatly.

Education course -Tier I/II Institutes

The syllabus for Graduate Engineering Course is almost same in India whether it is IIT/NIT/ Govt Engineering /Private Colleges. The entrance exam for Post-graduation is also the same (GATE). Despite this, a disparity in skills from students passing out from IIT /NIT /Other Engineering Colleges is seen initially, which later tapers down as the Industry practice is more or less uniform and follow the established Indian Standard codes of Practice (BIS) and have cross reference to International standards. Another striking feature is Indians who acquired Education from same they go abroad meaning there is a disconnect not in course but lack of motivation and encouragement to do research and self- study. To address this, there is a need for Industry Institute Partnership to come on a single platform where research and laboratory experiments/trials should be implemented on projects and outcomes deliberated and success stories documented and lessons from failures understood. In Civil Engineering, it should be made mandatory that Industry work in close collaboration with Institute and organize frequent interactions between students, researchers and subject matter experts (Practitioners) and Government regulation bodies (example Bureau of Indian Standards). Finally, the internships should not begin not in the final year but after first year itself in short spells and each student be taken through the working rigors on site and made to work on -site with semi-skilled trades so that they learn to value the education which Graduate Engineers have invested their time and money and respect the efforts of semi-skilled and un-skilled workers . In fact many Post graduate researcher students (Social Welfare / arts and humanities) students have done research projects on Construction Industry covering formal and informal sectors and shown growing gap between Super skilled, Skilled, semi-skilled and unskilled workers. By observing the workers, the Young Engineer may knowingly /unknowingly come out with a solution for a problem. The best example for this is the technique of Corduroy method for stabilization of weak sub-soils (Organic swamps) where road Building in earlier days was very difficult .This technique later on with inter-disciplinary collaboration later led to use of Geosynthetics as wood became scarce and deforestation became a challenge

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024



Corduroy logs

Course to Practice Interdisciplinary gap in Civil Engineering at various levels

In four year, Graduate Civil Engineering Course, Graduate students interact minimally with Architecture and there is only course called Architecture and Town Planning. After the second year, there is hardly any collaboration between Civil Engineering and Electrical, Mechanical group (These trades are collectively known as Mother trades). The Civil Engineering course curriculum does not provide training in bar bending, masonry, scaffolding ,painting , carpentry , flooring (tile work) , Electrical and plumbing. To date, all these works are done by school dropouts who either learnt trade by watching /working under a skilled supervisor (Contractor) or followed a family tradition. Unfortunately, with pay related and mobility issues of these workers, this has led to a huge shortage of these resources. In Geotechnical field works itself, we have region specific workers (Tamil Nadu, Jharkhand, Chattisgarh etc). This needs to be researched and addressed.

Education - Research vs Industry as a Career

Given the fact that nearly 98% of earning population and filing IT returns in India are below EWS definition and therefore aim of these families is to ensure that their children enrolling in Civil Engineering score good marks , get admission into a good college and complete the degree course without backlogs and get an employment in a good company that pays on time or score good marks to go for Higher education. Graduate Education fees are generally exorbitant, and many parents take loans. Therefore, very few Graduates go for research given the fact that it is not seen as an attractive career choice, and they have to repay loans taken for education. While working, few take up IAS /IES/CDS/PSU exams as these offer stable career and recognition. Very few are enterprising enough to start their own organizations and prosper. This needs to be researched and addressed.

Regular course vs Distance Education- Efforts of Government in Bridging the gap

Not all are able to attend regular courses of Graduate education. For those who manage to get it, the opportunity for employment is very competitive while the focus on research is minimal clearly indicating that efforts need to be scaled up to a much larger dimension than what we are doing now. Prior to Digital era, we had Evening Colleges, Open Universities (In-fact our IGNOU is world's Largest Open University) and by collaborating with Doordarshan & All India Radio (Now known as Prasar Bharati), they have the GYAN Vani Radio and TV channels that take education to those who cannot afford to attend Regular courses at their doorstep. For those students who failed to make it to Elite Institutions such as IIT & IIM, Government through the NPTEL revolutionized offerings in specific subjects thus gave the advantage of credits and academic recognitions for students pursuing multi courses on NPTEL Portal. There is a need to research the benefits which students and Industry is getting on account of this initiative of Government of India

Bodies engaged in Research in Heritage Structures

Bodies such as UNESCO, ICOMOS, ASI have carried out painstaking efforts to decode how civilizations and civilization structures flourished and how natural materials were used and as a result we have a wide repository of Knowledge. It is undoubtedly a matter of great curiosity that how previous generations despite not having state of art technologies and equipment built well foundations for Taj Mahal, Rock cut Kailasanatha Temple, Very deep Rani ka Vav Well, liquefaction resistant Temple foundation in Puri and uplift resistant Brihadeshwara temple complex (That too without any reinforcements). Unfortunately, this knowledge is available either in restricted circulation or is not fully available to public. There is a need to bring on platform all agencies who have worked and collate the information and make it as a compendium for every heritage structure regardless of big /small. To conclude, this requires an initiative at Engineering College level and support from the industry

Benefits of Industry -Institute Research in Civil Engineering

In India Padma Sri Dr Vasudevan, a Professor from Department of Chemistry (Thiagarajar College of Engineering), Madurai innovatively used the plastic waste and today nearly 30,000km of roads have been constructed using this material. Apart from this Indian Roads Congress have come out with a draft guideline for use of various wastes as a filling material instead of dependence on natural good quality soils thus not only utilizing the waste material, but saving precious land required for waste disposal. Research has led to building of floating solar projects on fly ash ponds and fly ash dumps. In Bangalore itself, treated wastewater is being pumped from a BWSSB sewage treatment plant as a

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams August 2024

part of K & C Valley Project to Water scarce Kolar District as a part of Lake refilling and recharging and was appreciated by United Nations General Assembly Chief. Considering the diminishing natural water sources and over-exploitation of ground water table through borewells, research is currently ongoing on use of treated water for non-potable uses on an even larger scale.

Certification and Licensing of Engineering Practice

Another area of engineering that deserves attention of the interaction between Institutes and Industry is the aspect of Professional License for practicing engineers In India. The construction industry desires to execute projects with the most optimum design executed in the shortest possible time. Maintaining the quality and rigor of engineering principles and construction quality and safety is the very critical role that engineers must play in industry. Armed with only a college degree, engineers sometimes find it difficult to discharge this critical responsibility for design and construction of critical structures with the required degree of design and construction safety and quality. A “Professional Engineering” license binds the engineer to a “Code of Ethics” for design and approval of public use structures. This system is in practice in many countries, and it has ensured a robust ecosystem for the engineering profession to be driven by ethical principles. In this area, the various academic and professional institutes can join hands to promote this culture by training and certifying the knowledge and integrity of the engineers before they can be entrusted to work as public utility projects. This collaboration will go a long way to lift the bane of criticism when structures of great public importance fail disastrously as has been witnessed in recent events around the country.

Final thoughts

All future research therefore should be to breakdown the barriers and allow free dissemination of knowledge for betterment of mankind through a calibrated **3I approach** (Industry Institute Interaction) where Educational Institutes involve their subject matter experts with Industry Practitioners and share knowledge. Future research should realize the vision of our People’s President, His excellency Late Dr APJ Kalam Sir ‘s vision of National Prosperity Index.

National Prosperity Index = A+B+ C

- A= GDP (Consistent Economic Growth)
- B= Lift 22% of People below BPL gradually
- C= Promote value systems in every endeavor

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

At the Industry level, research should focus on sharpening the skills of workers at every level right from Contractor to Supervisor and in their respective works in both technical and commercial and statutory obligations. Due to lack of this training, many a time we can see projects dragging beyond a time line with cost over runs as disconnect arises between Design Engineer, Construction Engineer and worker who is in between actually implementing the work

Construction skills research and training Institutes should be set up to cater to these areas and slowly broadened to other areas at every state, so that local unemployment issues get sorted out.

For those passionate for a research career in Engineering, there is a need to make research attractive by providing better pay /incentives which can happen only if Industry joins hand with Institute and funds research Studies /Projects .

To address the huge shortage in qualified manpower at ground level in every aspect of Civil Engineering (Basic to advanced). there is a need to upgrade ITI/ NCVTs training courses in Construction Industry to Level as seen in GTTC/CMTI for those who could not go for higher education due to various reasons.

All research is focused on use of sustainable technologies and is done on a laboratory scale by Qualified Engineers, however the training need for workers is ignored. The worker who will implement the technology needs to be trained

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Consumer Protection in Cyberspace: Validity of E-contracts and Jurisdictional Issues

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Introduction

Computers, internet and information technology has played an important role in every sphere of human life and consumers are also affected by this environment. This virtual environment has facilitated the consumers in many ways, but unfortunately it has also raised certain problems. E-commerce has grown to become the buzzword in corporate circles. The lure of conducting global operation through a web site has become irresistible. Ironically, because a page on the World Wide Web can reach web surfers in every state in the nation and perhaps every nation on earth, there arises the issues of where exactly a person who has a cause of action, based upon a web transaction, may sue.¹ Thus, this situation created the problems of validity of online contracts and jurisdiction in case of domestic consumer disputes and cross-border consumer disputes.

In olden times, the society was composed of different people who were dependent on each other for their needs. The scope of needs of human was limited only to available goods and services. But after the industrialisation and globalisation the world has become a small village, which resulted in enlargement of the extent of markets. It ultimately led to increase in the demand from the consumer side. So, the traders supplying the goods in the market deemed themselves to be superior to the consumers. The traders started various unfair trade practices against the consumers like under weighing, black marketing, adulteration in goods etc. These unfair trade practices ultimately need to be rectified by the law for which various enactments were made by the different governments at national and international level.

In India, the interest of the consumers is protected by dozens of enactments². In spite of all these enactments the right of consumers cannot be said to be fully protected, the reason is simple that

¹ Nandan Kamath, "Law Relating to Computers Internet and E-commerce," 2009, 4th ed., p. 17

² a) The Sale of Goods Act, 1930; b) The Indian Contract Act, 1872; c) Agricultural Produce, (Grading and Marketing) Act, 1937; d) Drugs and Cosmetics Act, 1940; e) Drugs (Control) Act, 1950; f) Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954; g) Prevention of Food Adulteration Act, 1954; h)

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

majority of population is not aware of laws and protections provided to them. If anyone is aware he is confident that he will not get justice by simple means, because the procedures provided for protection of rights are very lengthy, technical and expensive. The seller/trader/ service provider is in safest position and the consumer is the serving party.

The formation of a valid contract requires a proposal/offer from one side and its acceptance from the other side. But now as in E-commerce the consumer is at the pitiful condition. The seller is selling the product to the consumer for which the consumer must follow the conditions as provided by the seller. The process of online purchasing by consumers is as follows:

1. The consumer has first to visit the website of the seller.
2. Consumer must make his login ID.
3. He will select the product.
4. Then to select the option, "I have read this agreement and ready to the terms and conditions." (Most important where the interest of the consumer is being taken out with his consent and buyer has no option except to agree with the terms of seller).
5. Finally, the goods are purchased.

Here the conditions of all the companies are providing that the consumer cannot return the product other than the technical fault, jurisdiction shall be subject to the place of the seller and other conditions by which he will be in superior position than the consumer. So, one of the important essential of a valid contract i.e. freedom of will and equality between the parties is missing in the online contracts.

To protect the right of innocent consumer the General Assembly of United Nations adopted certain guidelines in 1983. In 1985 it also adopted a resolution requesting the all the member states to formulate laws for the protection of consumers and educate them in their respective territories.

The Indian Parliament enacted Consumer Protection Act, 1986, which has brought several drastic changes in consumer movement in India. The Consumer Protection Act was enacted to provide a simple and quicker access to redressal of consumer grievances. The main objective of the act is to

Essential Commodities Act, 1955; i) Essential Services Maintenance Act, 1968; j) Trade and Merchandise Marks Act, 1968; k) Standards of Weights and Measures Act, 1976;l) Bureau of Indian Standards Act, 1986; m) The Monopolies and Restrictive Trade Practices Act, 1969; etc.

provide better protection to consumers. The Consumer Protection Act, 1986 is a milestone in the history of socio-economic legislation in the country.

The Supreme Court in case of *Secretary, Thirumurugan Co-operative Agricultural Credit Society v. Lalitha*³ has interpreted that the remedies provided under the Consumer Protection Act are in addition to the remedies provided under other statutes. Hence, the fact that a remedy is specifically provided for under another statute would not necessarily oust the jurisdiction of the appropriate authority under the Act.

Formation and Validity of Online and Offline Contracts

In simple words contract means an agreement between two or more parties competent to contract to do a lawful act with free consent of all. The contract can take place orally or in writing or by conduct or by means of one or more of the means. It also means a voluntary, deliberate, and legally binding agreement between two or more competent parties.⁴ All agreements are contracts if they are made by the free consent of the parties competent to contract, for a lawful consideration and with a lawful object, and not hereby expressly to be void.⁵

The essentials of a valid physical contract are:

1. An agreement i.e. proposal and acceptance.
2. Free consent of parties to the contract.
3. Parties must be competent to contract i.e. must be major, of sound mind and not suffering from any other legal disability.
4. Contract must be made for the lawful consideration.
5. Contract must be made for lawful object.
6. Contract must not be expressly declared to be void.

In the physical mode of contract the parties must be personally present and sign the document or the document is sent by post to other party for acceptance, but in the electronic contact the parties need to sign the documents by the electronic mode. It is done to overcome the delay in postal services and to

³ (2004) 1 SCC 305

⁴ Retrieved from <http://www.businessdictionary.com/definition/contract.html#ixzz34QlyW5xu> on 12/06/2014 at 07:00 p.m.

⁵ Section 10 of Indian Contract Act, 1872

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

avoid the moving of person from a distant place only to sign the document and it has led to speedy formation of contract between the parties. Electronic contracts (contracts that are not paper based but rather in electronic form) are born out of the need for speed, convenience and efficiency.⁶

A contract can only come into existence if it is lawful and consent of all the parties to it is free and properly communicated to other party. But to conclude a contract there must be communication of same. The place of formation of contract will be based totally on the communication of proposal and acceptance. The communication of proposal is complete when it comes to the knowledge of the person to whom it is made.⁷ Further, when the person to whom the proposal is made signifies his assent thereto the proposal is said to be accepted.⁸ The communication of acceptance is complete:

- As against the proposer, when it is put in the course of transmission to him and is out of the power of the acceptor
- As against the acceptor, when it comes to the knowledge of the proposer.⁹

In *ONGC v. Modern Construction and Company*¹⁰, it was held that if there is an acceptance of a tender by telegram, the contract becomes concluded where the telegram is dispatched and therefore the place of contract is that where the acceptance telegram begins its journey. But this postal rule seems to be harsh on the proposer. Sometimes, even if there is delay on the part of postal department the proposer suffers. To overcome it, the communication was made somewhat faster by means of the telephonic or telex mode. This point was made clear in *Bhagandas Goverdhandas Kedia v. Girdharilal Purshottamdas Co.*¹¹, the court held that in telephonic conversation, the position is same as the parties are in presence of each other and rule of post is not applicable to such matter. The contract is complete when the acceptance is received by the offeror at his place. So, the place of offeror is place where the contract is concluded and the court in that place is having jurisdiction to determine the matter.

Further in *Entores Limited v. Miles Far Eastern Corporation*¹², Denning L.J. observed, “when a contract is made by post it is clear law throughout the common law countries that acceptance is complete as soon as letter is posted into post box and this is place where contract is made. But, in

⁶ Retrived from http://dict.mizoram.gov.in/uploads/attachments/cyber_crime/electronic-contracts.pdf on 13/06/2014 at 12:30 p.m.

⁷ Section 4, Indian Contract Act, 1872

⁸ Section 2(b), Indian Contract Act, 1872

⁹ *Supra* Note 7

¹⁰ (1997) 3 GLR 1855

¹¹ 1966 SCR (1) 656

¹² (1955) 2 QB 326

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

telephonic or telex mode the communication is instantaneous and is complete at the end of the proposer.” Thus, it has been accepted by the courts that contract can be concluded online and these are valid contracts. Combined reading of Indian Contract Act and Information Technology Act has also similar results.

In reference to contracts made orally as by telephone, or in writing as by telex or fax, that the contract is complete when and where the acceptance is received.¹³ But these principles can apply only where the transmitting terminal and the receiving terminal are at fixed points. In case of e-mail, the data (in this case acceptance) can be transmitted from anywhere by the e-mail account holder, it goes to the memory of a 'server' which may be located anywhere and can be retrieved by the addressee account holder from anywhere in the world and, therefore, there is no fixed point either of transmission or of receipt.¹⁴ It has been explained by the new legislation that what would be the time for dispatch and receipt of data in case electronic mode of communication.

According to section 13(3) of the Information Technology Act, 2000

“Save as otherwise agreed to between the originator and the addressee, an electronic record is deemed to be dispatched at the place where the originator has his place of business, and is deemed to be received at the place where the addressee has his place of business.”

Determination of Jurisdiction

Historically, the matter regarding the jurisdiction was based on territorial principles. The place of jurisdiction was based on the physical existence of the subject matter. Like in case of dispute in relation to land or immovable properties, the place where the land or such property is situated, In case of movables, where such movable is and where the cause of action arose or according to the physical existence of the person claiming. A valid contract comes into existence when one party i.e. offeror/proposer makes an offer and the other party i.e. acceptor/offeree gives his acceptance to such offer. The main requirement for formation of a contract is unqualified communication of the acceptance and this is the main point to determine the jurisdiction of the matter.

In India, the jurisdictional matter regarding all civil matters has been prescribed by Civil Procedure Code and in regard to Consumer matters by the Consumer Protection Act, but to determine the jurisdiction, we had to determine first the place where the contract has been concluded. Under the civil

¹³ *Halsbury's laws of England* 4th ed., Vol. 9(1), P. 434-435

¹⁴ *P.R. Transport Agency v. Union Of India*, 2006 (1) AWC 504

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

law/consumer law jurisdiction can be determined based on the place where defendant resides or where cause of action arises. But in cyberspace or online contracts both these are difficult to establish.

If the parties agreed by contract to confer the jurisdiction on some definite court, then that court is having the jurisdiction to determine the matter, but it does not mean that it will oust the jurisdiction of the other courts. Where the parties to a contract agreed to submit the disputes arising from it to a particular jurisdiction which would otherwise also be a proper jurisdiction under the law, their agreement to the extent they agreed not to submit to other jurisdictions cannot be said to be void as against public policy. If on the other hand the jurisdiction they agree to submit to would not otherwise be proper, jurisdiction to decide disputes arising out of the contract it must be declared void being against public policy.¹⁵

It is not open to the parties by agreement to confer jurisdiction on any court which it did not otherwise possess under the Code. But where two courts have under the Code of Civil Procedure jurisdiction to try a suit an agreement between the parties that the dispute between them shall be tried in one of such courts is not contrary to public policy. Such an agreement does not contravene the section 28 of the Contract Act, 1875.¹⁶

Types of E-commerce Disputes

Types of e-commerce Disputes

Electronic commerce brings both comfort and discomfort to its users. The comforts include on-the-spot sales and purchases, competitive costs, convenience, saving time, etc. The discomforts include fraud and cyber-crimes committed against e-commerce users. At times there are disagreements and dissatisfactions as well among buyers and purchasers that cannot be resolved using traditional litigation methods.²⁴ Thus, it can be said that disputes are inevitable in the course of the life of a business, whether online or offline. The business disputes which the enterprise may encounter in e-commerce are:

A. Contractual Disputes:

Disputes that arise out of some non-fulfilment of any contractual obligation are said to be known as Contractual disputes. There are numerous kinds of contractual disputes existing in the corporate arena, some of which are:

¹⁵ *A.B.C. Laminart Pvt. Ltd. & Anr. v. A.P. Agencies*, SALEM 1989 SCR (2) 1

¹⁶ *Hakam Singh v. M/S. Gammon (India) Ltd.* 1971 SCC (1) 286

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

1. Disputes between the enterprise and the Internet Service Provider: These are the dispute that arises between the enterprise and the Internet Service Provider or web-hosting services provider, including disagreements over interruptions in service, the breach in data security, etc.
2. Business-to-business disputes: These kinds of disputes usually take place between the enterprise and its suppliers such as non-performance of contractual obligations, misrepresentations, and complaints from customers regarding services provided by suppliers.
3. Business-to-consumer disputes: These disputes are common between the enterprise and its customers such as non-payment for goods or services, non-performance of contractual obligations, the poor performance of a contract, misrepresentations, breach of the privacy policy, and breach of security of confidential information. It is between the enterprise and its customers that lies the greatest possible scope for disputes.²⁵

B. Non-contractual disputes:

Non-contractual disputes are those disputes that arise due to non-observance of any statutory obligation on part of the parties to the transaction. These are the common kinds of non-contractual disputes that may arise in an online enterprise.²⁶

1. Dispute over Copyright: The enterprise might be liable for copyright infringement if it uses copyrighted material over fair use and without permission.
2. Failure in Data Protection: The enterprise may be liable for sharing or revealing confidential data of customers, as discussed in the segment on Privacy.
3. Right of Free Expression: The enterprise may be subject to defamation suits for defamatory material posted online.
4. Competition law, Domain Name Disputes: The enterprise may be subject to trademark infringement suits if it infringes a registered or otherwise legally recognized trademark. Henceforth, it is significant to note that although many of the issues such as jurisdictional issues, choice of law issues and high cost of a cross-jurisdictional litigation issue, which arise concerning the different categories of disputes, are similar, the difficulties are perhaps more pronounced in respect of business to consumer dispute transactional disputes which are often of small monetary value. Traditional methods of resolving cross-jurisdictional commercial disputes, such as international commercial arbitration, are often too costly, inconvenient and burdensome in the context of consumer disputes.¹⁷

Jurisdiction in E-Commerce and the Information Technology Act, 2000

¹⁷ Mahantesh G S, Mamatha R Jurisdictional Issues in E-Commerce – A Critical Appraisal of the Indian Legal Regime
INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY March 2023| IJIRT | Volume 9
Issue 10

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

In deciding the jurisdiction of courts in contractual disputes, the place where the —cause of action— has arisen plays an important role. The place where the contract is formed is considered a place where the part of the cause of action— has arisen. In the case of the non-instantaneous mode of communication, a contract is formed at a place where acceptance of the offer is dispatched. Whereas, in the case of an instantaneous mode of communication, a contract is formed at a place where the acceptance of the offer is received. Section 13 of the Information Technology Act 2000 (hereinafter referred to as the IT Act—) incorporates provisions to identify the place of despatch and receiving of electronic communication, which helps in identifying the place of formation of e-contact and decides the place of cause of action— and jurisdiction of courts. Section 13(3) of the IT Act reads as:

(3) Save as otherwise agreed to between the originator and the addressee, an electronic record is deemed to be despatched at the place where the originator has his place of business and is deemed to be received at the place where the addressee has his place of business.

Further, section 13(5)(b) of the IT Act provides the following provision which reads as:

(5) For the purposes of this section, – (a)

(b) if the originator or the addressee does not have a place of business, his usual place of residence shall be deemed to be the place of business; —

Hence, in applying the principles of section 13 of the IT Act and the principles of contract law, it may be concluded that in e-commerce, a contract is formed at the place of business or the place of residence of a consumer, the place where the consumer receives acceptance to his offer in e-commerce. Thus, the cause of action partly arises at the place of business or residence of the consumer (where the consumer makes the offer and the e-trader accepts that offer), in the event of any consumer dispute in e-commerce. Therefore, under the provisions of section 13 of the IT Act, principles of contract law and rules of the cause of action—, the consumer may knock on the door of the court having territorial jurisdiction over his place of business or residence. However, the provisions under section 13 of the IT Act are subject to the contract between the parties, which gives an upper hand to the e-trader to override the default rules laid down in section 13 of the IT Act.

So far as exercising jurisdiction over foreign e-traders is concerned, the IT Act provides for the extraterritorial application of the Act. Section 75 of the IT Act expands its applicability outside the country. Section 75 of the IT Act reads as:

— Act to apply for offences or contraventions committed outside India. — (1) Subject to the provisions of sub-section (2), the provisions of this Act shall apply also to any offence or contravention committed outside India by any person irrespective of his nationality.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

(2) For the purposes of sub-section (1), this Act shall apply to an offence or contravention committed outside India by any person if the act or conduct constituting the offence or contravention involves a computer, computer system or computer network located in India. ||

However, it has been observed that the above provision is applicable concerning the offences and contraventions as provided under the IT Act. Since the IT Act is an industry-based law, hence it does not address the issues of local consumer grievances. Secondly, whether the authority established under the IT Act would have power over foreign e-traders who enter into a contract with consumers over the internet is not clear under the existing provisions of the IT Act. Further, presuming the e-traders would be bound by the authority, yet, foreign e- traders may simply ignore such authority.⁴³ It has been argued that the extraterritorial application of the IT Act is —only self-claimed||. This provision of the IT Act cannot compel foreign courts to enforce judgments passed by Indian courts based on the provisions laid down in the IT Act.⁴⁴

Apart from the above provisions, courts in India may also follow the Principles of International Law to exercise jurisdiction over foreign websites. The following are the four principles recognised as a principle of International Law for deciding jurisdiction:⁴⁵

1. Passive personality test: As per this theory, any act in foreign nation which is harmful to the national of the forum state, the foreign national may be punished for such act.
2. Protective principle: According to this principle, if the act of aliens, which is done from abroad affects the security of the state, the state can assume jurisdiction over aliens.
3. Extra territoriality principle: As per this principle, if the acts occurring abroad have an effect within the forum state, the courts in the forum state can interfere with the acts occurring in a foreign state.
4. Universal principle: According to this principle, it is a matter of international public policy to suppress any criminal activities like trafficking, hijacking. Therefore, exercising jurisdiction in such cases is justified.

In civil matters, it has been recognised that by the agreement between the parties, parties may determine applicable law and jurisdiction. Yet, in the absence of such terms in the contract, the jurisdiction can be decided based on the following objective principles:⁴⁶

1. Place of business or habitual residence of the person who has to perform the contract.
2. For the performance of the contract, the place where the necessary step was taken.
3. A place where an invitation to enter into a contract or an advertisement was received.
4. A place where an agency or a branch is located.

However, in the case of a consumer contract, it has been recognised that mandatory rules of national law shall apply irrespective of the choice of law.⁴⁷

Thus, in an internet dispute, each party and service provider may come from different jurisdictions and the effect of its transaction might be felt altogether in a different jurisdiction; therefore, it is justifiable for the state to assume jurisdiction over internet-based disputes. The internet allows everyone to deal with the people of every country in the world. Even without soliciting any customer in any state, simply with a website, one can receive an order for illegal goods, and bets for any prohibited services or behavior from any jurisdiction. Due to the pervasiveness of the internet, without really trying, it may be everywhere. Thus, without accepting the burden of being held liable wherever they do business, one cannot take the benefit of the convenience of the internet.⁴⁸ Though in absence of a specific provision in the IT Act, the Delhi High Court in the *Banyan Tree*⁴⁹ case tried to evolve principles to determine the jurisdiction of the court in internet-related activities, however, the following issues remain unanswered: (a) the issues concerning jurisdiction to regulate foreign e-commerce platforms doing businesses in India; (b) use of legality of jurisdiction exclusion clause or choice of law clause (by foreign e- traders) in e-commerce consumer contracts; (c) the issue concerning anonymity in internet resulting in lack of clarity about the geographical location of e-commerce platforms; (d) the issue of enforcement of Indian court's judgment in a foreign nation.

Thus, the Indian legal position is ambiguous and unclear without any specific principle for the court concerning the jurisdiction of courts in e-commerce. Hence, concrete principles are needed to determine the jurisdiction of Indian courts in the virtual world.¹⁸

Jurisdictional Issues in Cyberspace

Jurisdiction on the internet is an all-pervasive issue. Regardless of what substantive legal issues one is dealing with, whether it be copyright or defamation or privacy, jurisdiction is an issue that is constantly looming so much so that it has been said that the internet is one big jurisdictional problem.¹⁹ The main problem of internet jurisdiction is the presence of multiple parties in various parts of the world who have only a virtual nexus with each other.

The unsettled matter at international level is that, in case of involvement of jurisdiction of more than one country *where to sue?*

¹⁸ Mahantesh G S, Mamatha R Jurisdictional Issues in E-Commerce – A Critical Appraisal of the Indian Legal Regime INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY March 2023| IJIRT | Volume 9 Issue 10

¹⁹ Yee Fen Lim, "Cyberspace Law: Commentaries and Material," 2008, 2nd ed., p. 68

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

There is no difficulty for the application of law and jurisdiction if both the parties are citizens of same country. But if one party is non-citizen or resident of a foreign country the problem may arise which is likely to be occurred in case of online contracts.

Now, another the question is when one country wants to give its citizens an option to sue non-residents in local courts, whether it is feasible?

This could be seen in *International Shoe v. Washington*²⁰ in which Supreme Court of U.S.A. upheld a Massachusetts Statutes, deeming those non-residents using the roads of Massachusetts consented to be sued in that state. After analyzing the perspective of natural person, the court held that a state may sue a non-resident foreign corporation provided the corporation has "Minimum Contact Test" with the forum state and provided that exercise of jurisdiction does not violate the "principle of fair play and justice". This case permits the exercise of jurisdiction in the light of "virtual" presence of defendant within a state.²¹

In so far as the position in India is concerned, there is no law as such which deals with jurisdiction as regards to non-resident defendants. However, there are a large number of cases where Courts have exercised jurisdiction over non-resident defendants. In case *India TV (Independent News Service Ltd) v. India Broadcast Live LIC & Ors*²² the domain name *Indiatvlive.com* registered and used by the defendants as a domain name for video streaming of Indian television channels. After the commencement of the action in the Delhi High Court, the defendants filed a 'Reverse Domain Name Hijacking' action in Arizona against India TV. The court was concerned with two issues:

- (a) Whether the jurisdiction over the defendants located in the US can be exercised?
- (b) Whether an injunction ought to be granted restraining the defendants from proceeding with the suit filed in the United States?

The court held that the defendant, against whom injunction is sought, is amenable to the personal jurisdiction of the court and injunction was allowed by the court.

Supreme Court of India in the case of *Oil and Natural Gas Commission v. Utpal Kumar Basu*²³ decided the question of jurisdiction in case of online contract. It was a case where the petitioner learnt about tenders being invited for a particular project at Hazira in Gujarat from advertisements appearing in the

²⁰ 326 U. S. 310 (1945)

²¹ Golak Prasad Sahoo, "Jurisdictional Jurisprudence and Cyberspace" *Assam University Journal of Science & Technology: Physical Sciences and Technology*, 2009, Vol. 4 Number II 58-66

²² 2007 (35) PTC 177 DEL

²³ 1994 SCC (4) 711

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Times of India having circulation in West Bengal. By reading it at Calcutta, submitted its offer from Calcutta, made representations and also sent fax messages from Calcutta and received reply thereto at Calcutta. A writ petition was filed before the Calcutta High Court on the plea of part of cause of action having arisen at Calcutta.

In view of the aforesaid facts, holding lack of jurisdiction on the part of Calcutta High Court, which it had assumed by passing impugned order, while allowing the appeal, the Supreme Court laid down in the following terms; '.... merely because it read the advertisement at Calcutta and submitted the offer from Calcutta and made representations from Calcutta would not in our opinion, constitute facts forming an integral part of the cause of action. So also the mere fact that it sent fax messages from Calcutta and received a reply thereto at Calcutta would not constitute an integral part of the cause of action.' Where the cause of action arises from contract, and the parties have not effectively selected the governing substantive law, the relevant criteria in choice of law analysis are: (1) the place of contracting, (2) the place of negotiation of the contract, (3) the place of performance, (4) the location of the subject matter of the contract and (5) the location of the parties.

In case of *Lilly ICOS LLC v. Richie Laboratories Ltd.*²⁴ Delhi High Court has again decided similar case regarding jurisdictional issue. In this case plaintiff has invoked the jurisdiction of this court contending that the offending trademarks are being advertised by the defendant through their website which can be accessed in Delhi which is within the jurisdiction of this court. The defendant is advertising and selling on its website a Tadalafil tablet under the brand name TADARICH using a pill shape which is identical to the Cialis Tablet Trade Dress, all over the world, including India and in Delhi, upon orders being placed through their website.

Delhi High Court held mere fact that a website is accessible in a particular place may not itself be sufficient for the courts of that place to exercise personal jurisdiction over the owners of the website. However, where the website is not merely passive but is interactive permitting the users not only to have access to the contents thereof but, also subscribe to the services provided by the owners/operators, may in certain circumstances create jurisdiction in the court of that place where the website is accessible. Where the website is interactive, the level of interactivity becomes relevant and in cases of limited interactivity such interactivity may not be sufficient for a court to exercise jurisdiction.

²⁴ 2009(41) PTC 297

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

In *Kusum Ingots and Alloys Limited v. Union of India and Anr.*,²⁵ it was observed that if a small part of the cause of action arises within the territorial jurisdiction of the High Court, the same by itself may not be considered to be a determinative factor compelling the High Court to decide the matter on merits. It was further observed that in appropriate cases, the Court may refuse to exercise its discretionary jurisdiction by invoking the doctrine of *forum conveniens*.

In case of *P.R. Transport Agency v. Union of India & Others*²⁶, Baharat Cooking Coal Limited, The respondent held e-auction for certain coal in different lots. The petitioner submitted its tender in the said auction and the same was accepted. The acceptance letter was issued on 19.7.2005 by e-mail at the petitioner's e-mail address calling to deposit the balance amount. Acting upon the said acceptance, the petitioner deposited the full amount on 28.7.2005. The cheque was accepted and encashed by respondent. Subsequently, instead of delivering the coal to the petitioner, respondent sent an e-mail dated 10.8.2005 to the petitioner saying that the sale as well as the e-auction in favour of the petitioner stands cancelled "due to some technical and unavoidable reasons". This communication has been challenged in the Writ petition before Allahabad High Court. The respondents contend that the Allahabad High Court is having no jurisdiction. Moreover, they claim that Jharkhand High Court is having jurisdiction to determine the matter. On basis of the facts of the case the Allahabad High Court held that as the email can be accessed from any place and the Petitioner is having its office at Chandauli and Varanasi, both within its jurisdiction, it is having jurisdiction to determine the matter. The High court referred Section 13(3), of the Information Technology Act, 2000.

One of the interesting provisions of Section 75 of Information Technology Act, 2000 which contemplates for offences or contraventions committed outside India. According to this provision, this Act shall apply to an offence or contravention committed outside India by any person if the act or conduct constituting the offence or contravention involves a computer, computer system or computer network located in India. Thus, this Act provides the extra-territorial jurisdiction to the Indian Courts. But there is one important condition for the cognizance of case that for the act there must be use/involvement of a computer, computer system or computer network located in India.

Conclusion

On one side, the Consumer Protection Act is protecting the rights of consumers from the scrupulous dealings of clever traders and on the other hand scammers are developing loopholes of laws. The

²⁵ 2004 (6) SCC 254
²⁶ 2006(1) AWC 504

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Consumer Protection Act is an effective device to protect the interest of innocent consumers and also an effective means for the growth of business/commerce in the country. The Information Technology Act, 2000 has helped the existing laws.

Technology has also helped the consumer in various ways. E-commerce has revolutionized the commercial field and it is very easy for the consumers to know about the product and to purchase the suitable one. But it has also created the problems and various initiatives have been taken to overcome those problems but still consumer are humiliated, harassed and degraded. Sometimes in the enforcement of online contracts and sometimes courts are helpless due to lack of jurisdiction. In various cases if courts have taken the cause, then there are many difficulties to enforce the order of the courts.

The solution to this problem can only be made by combined efforts of all the countries, by entering treaties, whereby the citizens of those countries who are using internet, will come under 'Uniform Law of Internet' and be punished by a definite authoritative body whose decision will be binding on all the parties. For this end Online Dispute Resolution (ODR) and the concept of E-courts should also be developed, which will be helpful to solve cross- border consumer disputes. Many a times, decisions are given by the courts but same could not be executed, which ultimately undermined the power of law. The law is required to be enforced; otherwise there will be no international security and harmony. The person who is purchasing goods or availing services from other person shall be treated as a consumer and there shall be no discrimination on the grounds of nationality.

SODUNG AND ITS EVIDENTIAL VALUE BEFORE THE JUDICIARY

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Abstract: Sodung is type of practice which is based on the local ritual performed by priest with high stature. It plays very vital role in administering justice in both civil and criminal matters in the NYISHI tribe of Arunachal Pradesh. The concept of sodung, a traditional form of evidence in certain legal systems, holds a unique place in judicial proceedings. This abstract explores the evidential value of sodung within the judiciary, examining its application, relevance, and challenges in modern legal contexts. The study highlights how sodung, which typically involves oral testimony or informal documentation, intersects with formal legal standards. It also discusses the potential for sodung to either support or undermine the credibility of legal claims depending on its integration into contemporary evidentiary frameworks. By analyzing case studies and legal precedents, this research aims to provide insights into the evolving role of sodung in adjudicating disputes and its implications for legal practice.

Keywords: sodung, priest chanting hymn, village authority, validity and legal status, mild, banned, govt institution, nyishi, tribes, corroborative, inconsistency, substantial, liberty, court, scientifically, intervention of govt, chanting, hymns, liability.

Introduction

Sodung, an ancient dispute resolution method of the Nyishi tribe, remains a significant aspect of their traditional justice system. Historically, sodung was a prevalent practice for resolving unresolved disputes ("les-pendite") before local authorities. Although its use has diminished with the rise of formal judicial institutions, sodung still plays a role when village authorities cannot resolve conflicts through customary means. In such cases, with the consent of all parties involved, the matter is referred for sodung. The process involves a priest performing a ritual that may include various forms of sodung, such as hot water or hot iron tests. The ritual, which involves chanting hymns over 1-2 days, culminates in the accused undergoing a test—such as placing their hand in hot water. If the hand is burned, the accused is presumed guilty; if not, they are granted exemption from criminal liability.

Review of Related Literature

Numerous studies and historical accounts have examined the role of local self-governance in Arunachal Pradesh, with a focus on traditional practices and legal frameworks. Key contributions include:

- i. Bani Dangen: This scholar has analyzed the logical framework of local self-government in Arunachal Pradesh, particularly through the lens of independent councils and the Panchayati Raj system. Dangen's work emphasizes the evolution and current structure of these local governance systems, including how traditional practices like sodung fit within the modern administrative landscape.
- ii. Prof. Christoph Von Furer-Haimendorf: Known for his ethnographic notes on the Subansiri area, Prof. Furer-Haimendorf provides detailed observations of the Nyishi tribe's customs and governance practices. His research includes insights into sodung as a traditional method of dispute resolution and its role within the tribal justice system.
- iii. Dr. N. Lego: In "Modern History of Arunachal Pradesh (1825-2006)," Dr. Lego covers the historical development of Arunachal Pradesh, including the evolution of its legal and administrative systems. The book discusses traditional practices such as sodung and their legal validation over time.
- iv. M.L. Bose: In his work, "History of Arunachal Pradesh," M.L. Bose provides a comprehensive overview of the region's history, including the role and transformation of traditional practices like sodung within the broader context of Arunachal Pradesh's governance.
- v. Assam Frontier (Administration of Justice) Regulation Act, 1945: This legislation was pivotal in defining the powers and jurisdiction of local authorities within the Nyishi village councils. It aimed to streamline the administration of justice and provided a framework for integrating traditional dispute resolution methods like sodung with formal legal structures.

These works collectively contribute to understanding the intersection of traditional practices and modern legal frameworks in Arunachal Pradesh, highlighting the ongoing relevance and adaptation of practices like sodung in contemporary governance.

Research gap

While existing literature provides only a conceptual understanding of sodung with minimal information, there is a notable lack of comprehensive studies offering valuable insights into the practice. Furthermore, there is a need for research to systematically gather information to determine

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

the legal status of sodung within competent authorities and judicial institutions in the governmental framework.

Significance of the study

This study aims to identify research gaps by providing a comprehensive analysis of sodung practices among the Nyishi tribe of Arunachal Pradesh. By examining sodung from "stem to stern," the research seeks to offer a holistic understanding of this traditional practice. Additionally, it explores the sentiments of the Nyishi people towards sodung, addressing the contrast between cultural attachment and potential blind faith that may lack scientific validity. The study will also assess the legal status of sodung, evaluating its acceptance and integration within formal legal frameworks and judicial institutions. This approach will help bridge the gap between traditional practices and modern legal standards, providing insights into how sodung can be understood and potentially harmonized within contemporary governance structures.

Objective of study

- i. To identify the legal validity of sodung in the court of law or any governmental institution which is empowered to hear and adjudicated any disputes irrespective of both civil and criminal.
- ii. To examine the role and significance of sodung in Nyishi tribe of Arunachal Pradesh in administering justice within their local authority.
- iii. To evaluate the role of priest and governmental authority in due course of performing sodung.

Hypothesis of the study

- i. Blind faith, which is inherently problematic, should be banned, even if such practices are carried out in the name of tradition and custom.
- ii. Patronage from governmental institutions and influential members of the tribe contributes to the continued practice of sodung.
- iii. The practices of sodung cannot be considered scientifically valid.
- iv. Sodung, if it aligns with legal standards, should be legalized in a manner that respects the traditions and culture of the Nyishi tribe.

Methodology of the study

Method

This study employs a mixed-method approach, combining quantitative surveys with qualitative interviews to gather comprehensive data on the role and significance of sodung in both local institutions and the judiciary in the current scenario.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Population

The population for this study includes judicial magistrate, executive magistrate, local authority like PI HGB/GB, Intellectual public and the public, Panchayat members, eminent personality in the field of education who are well acquainted with the justice delivery system and sodung practices.

Sample

A systematic sample of over 200 individuals from various Nyishi-dominated areas, both urban and rural, will be selected for the study. These participants are primarily individuals who have experienced both the formal legal system and the local customary laws of the Nyishi tribe.

Tools Used

- i. Structured questionnaire for qualitative data collection.
- ii. Semi-structured interview guides for qualitative data collection

Statistical Technique Used For Data Analysis

Quantitative data will be analysed using description statistics, correlation analysis, and regression analysis. Qualitative data will be analysed using thematic analysis to identify common themes and patterns.

Analysis and interpretation of Data

Objective-1: To identify the legal validity of sodung within a court of law or any governmental institution empowered to adjudicate disputes, whether civil or criminal, the study will:

- i. **Examine Historical and Legal Contexts:** Review historical and legal documents, including traditional laws and modern legislation, to understand how sodung has been historically integrated into or challenged by formal legal systems.
- ii. **Assess Judicial Recognition:** Investigate cases and legal precedents where sodung has been referenced or considered in judicial proceedings to determine its acceptance and application by courts.
- iii. **Evaluate Governmental Regulations:** Analyze relevant regulations and administrative frameworks to understand how governmental institutions view and handle sodung, focusing on its legitimacy and procedural integration.
- iv. **Conduct Interviews with Legal Experts:** Engage with legal scholars, practitioners, and governmental officials to gather insights into the current status and potential legal standing of sodung within formal dispute resolution processes.
- v. **Compare with Other Traditional Practices:** Compare the legal treatment of sodung with other traditional dispute resolution methods to identify similarities, differences, and potential pathways for legal validation.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

- vi. **Survey Community Perceptions:** Collect data from members of the Nyishi tribe and other stakeholders to gauge their views on the legal recognition of sodung and its alignment with formal legal practices.

From the analysis of Objective 1, it was also found that a trust barrier exists:

Trust barriers affect the justice delivery system, as blind faith in traditional concepts has encouraged adherence to these systems over time. Historically, the Nyishi tribe in Arunachal Pradesh had no formal judiciary. It was not until the mid-19th century that government efforts aimed to bring systematic administration and streamline judicial processes to the region. In earlier times, the orthodox traditional methods were the only means of resolving disputes, whether civil or criminal, without any pecuniary limits. These resolutions were carried out with the consent of the parties involved and monitored by village authority members.

Objective-2 To examine the role and significance of sodung in administering justice within the local authority of the Nyishi tribe in Arunachal Pradesh, the study will:

- i. **Investigate Traditional Practices:** Analyze how sodung is traditionally implemented in Nyishi dispute resolution, including the rituals and procedures involved.
- ii. **Assess Community Impact:** Evaluate the impact of sodung on the Nyishi community, including how it influences social cohesion and trust within the local authority.
- iii. **Explore Historical Context:** Examine the historical development of sodung and its integration into the Nyishi tribe's justice system over time.
- iv. **Analyze Authority Roles:** Study the role of local authority members in overseeing and facilitating sodung, and how their involvement affects the practice and its outcomes.
- v. **Collect Stakeholder Perspectives:** Gather insights from various stakeholders, including community members and local leaders, to understand their views on the effectiveness and relevance of sodung.
- vi. **Compare with Other Methods:** Compare sodung with other traditional and modern dispute resolution methods to highlight its unique aspects and significance in the local justice system.

From the analysis of Objective 2, it was also found that a patronize barrier exist:

Patronage from government-established institutions is a significant factor in the continued practice of sodung. Although sodung lacks legal validity in courts, executive magistrates in the area do not prohibit it; instead, they assign government representatives to oversee and facilitate peaceful sodung. Public Interpreters (PIs) and police personnel are deployed to monitor and supervise the entire process. Based on the outcome of sodung, government authorities make decisions in favor of one party

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

or the other. Thus, this indirect support from government machinery sustains the practice of sodung despite the presence of formal judicial systems in the area.

In addition to governmental patronage, intellectuals and influential members of society also hold strong beliefs in sodung. Often, they give significant respect to the outcomes of sodung judgments, valuing them more than formal judicial pronouncements on issues.

Objective-3 To evaluate the role of priests and governmental authorities in the performance of sodung, the study will:

- i.** **Examine the Role of Priests:** Investigate the duties and responsibilities of priests in conducting sodung, including the rituals and procedures they perform. Analyze their influence on the process and the community's perception of their role.
- ii.** **Assess Governmental Involvement:** Evaluate how governmental authorities, such as public interpreters (PIs) and police personnel, are involved in overseeing and supervising the sodung process. Explore their roles in maintaining order and ensuring that the process is conducted peacefully.
- iii.** **Analyze Interaction Between Priests and Authorities:** Study how priests and governmental authorities collaborate or interact during sodung proceedings. Assess the impact of this collaboration on the effectiveness and acceptance of sodung.
- iv.** **Evaluate the Impact on Justice Delivery:** Investigate how the roles of priests and governmental authorities affect the outcomes of sodung and its integration into the broader justice system. Assess whether their involvement enhances or undermines the process.
- v.** **Collect Stakeholder Perspectives:** Gather insights from community members, priests, and government officials to understand their views on the roles and effectiveness of both priests and governmental authorities in the sodung process.

From the analysis of Objective 3, it was also found that a scientifically inconsistency exists:

When a person places their hand in hot water or holds a heated iron, it is scientifically inevitable that they will get burned due to the flammable nature of skin tissue. However, it is believed that if a person is innocent of the alleged offense, their hand will not burn, despite holding hot iron or immersing it in hot water. This belief reflects a blind trust in the traditional practices of the Nyishi tribe, which have been used in justice delivery for many years. In the past, parties involved in disputes would risk their lives based on the outcome of such tests. Over time, life betting has been completely banned and replaced with monetary or other types of penalties if parties lose their cases in sodung practices. Furthermore, this practice is now followed only in a few areas within the Nyishi tribe.

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

Finding of the study

- i. **Trust Barriers Impacting Justice Delivery:** The analysis reveals a significant trust barrier affecting the justice delivery system in the Nyishi tribe. The blind faith in traditional practices like sodung has persisted despite the introduction of formal judicial systems in the mid-19th century. Historically, sodung was the primary method for resolving disputes, with village authorities overseeing these processes. This enduring trust in traditional methods has influenced the continued practice of sodung even as formal judicial mechanisms have been established.
- ii. **Patronage and Continuation of Sodung:** Governmental patronage has played a crucial role in the continuation of sodung. Despite its lack of legal validity, executive magistrates and government representatives, including Public Interpreters (PIs) and police personnel, facilitate and supervise sodung proceedings. This indirect support from governmental institutions helps sustain sodung practices, reflecting a broader acceptance of traditional methods by influential societal members.
- iii. **Scientific Inconsistency of Sodung:** The practice of sodung, particularly tests involving hot water or heated iron, is scientifically inconsistent. The belief that an innocent person will not be harmed by these tests does not align with scientific understanding of skin tissue's response to extreme heat. This scientifically flawed premise underscores the reliance on traditional beliefs rather than empirical evidence in the administration of justice within the Nyishi tribe.

Conclusion

The analysis highlights that while sodung remains a significant cultural practice among the Nyishi tribe, it faces several challenges in terms of legal validity, scientific credibility, and governmental influence. The continued practice of sodung is heavily influenced by historical trust in traditional methods and the patronage of governmental institutions. Despite its deep-rooted cultural significance, sodung's lack of scientific validity raises concerns about its efficacy and fairness in dispute resolution. Additionally, the role of governmental authorities in facilitating sodung, along with the respect afforded to its outcomes by influential members of society, underscores a complex interplay between tradition and modern legal standards. This situation reflects the ongoing tension between maintaining cultural heritage and adhering to contemporary legal and scientific principles.

Recommendation of study

- i. **Promote Legal and Scientific Education:** It is essential to enhance awareness and education about the limitations of traditional practices like sodung from a scientific and legal

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

perspective. Governmental and educational institutions should engage with the Nyishi community to provide information on the scientific principles related to justice and the benefits of modern legal procedures.

- ii. **Integrate Traditional and Modern Practices:** Efforts should be made to integrate traditional dispute resolution methods with formal legal systems in a way that respects cultural heritage while ensuring fairness and scientific validity. This could involve developing hybrid systems where traditional practices are adapted to fit within modern legal frameworks, providing a culturally sensitive yet scientifically grounded approach to justice.
- iii. **Regulate Governmental Involvement:** The role of governmental authorities in facilitating sodung should be reassessed to ensure that their involvement does not perpetuate practices lacking legal validity. Policies should be implemented to provide oversight and guidance on how traditional practices are integrated with the formal judicial system, ensuring that they do not undermine the principles of modern justice.
- iv. **Support Cultural and Legal Research:** Encourage further research into the cultural significance of sodung and its impact on the Nyishi community. Support studies that explore how traditional practices can be harmonized with contemporary legal standards to promote both cultural preservation and justice.
- v. **Strengthen Community Dialogue:** Facilitate open dialogues between the Nyishi community, legal experts, and government officials to address concerns about traditional practices. Such dialogues should focus on finding common ground that respects cultural traditions while advancing legal and scientific understanding.
- vi. **Review and Reform Dispute Resolution Processes:** Consider reforming dispute resolution processes within the Nyishi tribe to ensure they are equitable and scientifically valid. This may involve revising or supplementing traditional practices with modern methods to improve fairness and effectiveness in resolving disputes.

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THE PARTICIPATION OF WOMEN IN PANCHAYAT RAJ WITH SPECIAL REFERENCE OF PAPUM PARE DISTRICT (RURAL), ARUNACHAL PRADESH

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Introduction

Participation and empowerment of women in all respect in the society around the globe have after special attention from both the schools and academics and policy makers in contemporary times. Unlike other political values and institutions closely associated with contemporary practice of democracy like liberal rights, human equality, representation, election and mass parties political participation among broad segments of citizen is fundamental to the practices of democracy that it is impossible to conceive democracy without it. Democracy needs widespread and regular political participation from its citizen is one of the few essential criteria that unites democracy from all times and places and distinguishes them from other form of government (Bevir, 2010, pp.1068-1069). Concept of participation has always been a subject of interest among the entire thinker. Since the time of Aristotle, sharing of responsibilities through democratic government was emphasized.

According to Aristotle, citizens consist of people who are part in the administration of justice and holds offices and the declaration of French revolution of 1789, says that all citizens have the right to take part personally or by his representative in the formation of law. More argued about universal political participation as a means and end of the manifestation of human freedom. Political participation is closely related to democracy and the theory of representation. The success of democracy depend upon the extent of participation especially at local level (Chander(Ed) 1999, p.121). Popular involvement is necessity for a democratic system participation thereby reformed a population's self-government (Zittel and Dieter(Eds) 2007, P204). Mc Closely (1968, P252) defines political participation as thus voluntary activities by which members of a society share in the selection of rulers and directly or indirectly in the formation of public policy.

In any attempt to measure the extent of democracy the degree and level of citizen's participation both directly or indirectly constituent one of the indices. Participation is the hall marks of democracy and modernization. Marile, Karl (1995, cited in Rao, 2007, P 152) pointed that participation a process of empowerment that leads to greater decision making power and the transformation of society.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

According to the United Nations human Development report (1993, P.1) participation means involvement of the people in the economic, social cultural and political process that affects their lives. A study an popular participation by UNRISD(united nations research institute for social development) in the later 1970's defined it as the organized efforts to increase control over resources and regulative institution on the part of group and movement here for seclude such control (as cited in verba and nie,1972,P.5).

Lawrance A. scaff (1975) has given a border concepts of participation he observe that participation not only means sharing Barnes etc.(1979 as cited in Conge, 1988,P.242) and their college define political participation as all voluntary activities by individual citizens intended to influence either directly or indirectly political choices at various levels of politics system. Roy (1999, P.6-8) also views the terms participation to covers all form of action by which citizens take part in the operation of state machinery.

It is an established fact that women in every nation constitute half of its population but their involvement in the politics of the decision making body is not at par with their numerical strength. As a result issues pertaining to women have overlooked. Participation of women in modern day started with granting of voting right to the women. New Zealand become the first country in the world to provide equal politics right to women by grating then right to vote in the year 1893. According to statistics data of (IPU) inter-parliament union), the average percentage of women by 1st October 2022 is 24%.earlier data by IPU in 2005 revolts that the average percentage of women in world parliament was 10 percent. The report shows that there has been a marginal increase in the representation of women number.

Table: 1.1

S/No	Gender	Total	Percentage
01	Male	5299	75.99
02	Female	1674	24.06
03	Total	6978	100

Total strength of the state assembly of Arunachal Pradesh and Gender wise break up (2021)

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Table: 1.2

S/No	Total strength of assembly	Female	Percentage	Male	Percentage
01	60	4	6.67	56	95.33

Sources: <http://www.arunachal.govt.in/itq.id=302>:

Directorate of information & public relation, Govt of Arunachal Pradesh

The 73rd amendment act of the constitution which comes to force from April 24 1993 was an incumbent upon the state government to enact Panachayat Raj regulation to fulfill the constitutional obligation on one hand and to protect the ethnic character of indigenous tribal people another. Hence keeping in pace with the 73rd constitutional amendment the government of Arunachal Pradesh suitably amends the existing NEFA Panachayat Raj 1967 by formulating an ordinance on 18th April 1992 by according the provision for the constitution of gram sabha and the reservation of seats of schedule caste in consideration of the fact that no schedule caste ever existed in the state.

Arunachal Pradesh was exempted from mandatory requirement of the reservation of ST in the panachayat bodies. Finally with effects from 30th April 2001 received the assent of president of India and formulated to Arunachal Pradesh panachayat Raj act 1997 by replacing the north east frontier Agency panachayat regulation 1967 (Regulation no 3 of 1967).

Arunachal Pradesh is exclusively a tribal inhabited state about 26 major tribes and approximately 100 sub-tribes having different culture, custom of traditions. The Nyishi tribe is one of the most population and major tribes in Arunachal Pradesh. They inhabited approximately out of 25 district i.e papum pare, lower subansiri, kara dadi kurung kumey, pakke kessang, upper subansiri, west kameng etc. every nyishi village has an indigenous political structure in form of village council called as mel.

Hence the study is an attempt to understand political participation of women in papum pare district in particular and Arunachal Pradesh in general. An effective comparison of level of participation of male and female at various level of panachayat has been carried out. The study also systematically assessed the factors that affect women's political participation and analyzed the problems comprehensively. It also takes into account this problem resulting from sex disparities and growing awareness of women in achieving equal social-political status the study would be meaningful and

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

helpful to the planners researcher and administrator who are involve in the formulation of development plans and programs for northeast India in general and Arunachal Pradesh in particular.

Overview of Arunachal Pradesh and Papum Pare District

Arunachal Pradesh is situated in the North East state of India approximately between the latitudes 26°28'E and 29°30' N and longitude 90.30'E and 97.30 E cover a large geographical area of about 83.743 sq. 's km and is bond by Assam and Nagaland in South. Bhutan in West Tibet and china in the North and Burma in the East, It has about 1630 km's long international border. Arunachal have 25 districts Pupum Pare district .

Papum pare district is situated in the North Eastern part of Arunachal Pradesh. Its mainland extended between 26.55 and 28.40 North latitude and 92.40 and 94.21 East logitudes. The papum pare district was create in the years 1992 by bifurcating lower subansiri district with its H/Q of yupia. Vide govt. notification No.GA(B)36/89 Dated 21st September 1992, H/Q selected for this District is ``Yupia'' about 18 km away from state capital. From the year 1992-2000 the temporary, Later during 2000 it was permanent H/Q. total population of papum pare including capital region is 176573 as per the population census 2011. There are total 17 sub-district in papum pare distruct i.e.

- i. Balijan
- ii. Doimukh (SDO)
- iii. Kakoi
- iv. Kimin (SDO)
- v. Leporang circle
- vi. Parang circle
- vii. Sagalee (ADC)
- viii. Banderdewa
- ix. Gumto circle
- x. Itanagar (EAC)
- xi. Naharlagun (EAC)
- xii. Sangdupota
- xiii. Mengio (EAC)
- xiv. Silsango circle
- xv. Taraso circle
- xvi. Toru circle

xvii. Borum circle

Review of Literature

There is no dearth of literature relating to political participation and status of women in tribal society. All the relevant works relating to women and participation has been reviewed to have clear understanding of the concept and in designing the study.

Chhetri D.P (2019) in his book gender power and democracy in south Asia discusses about the problem focused by women in India as well as in Nepal. The work highlights the existing relationship between gender and democracy and challenge on fronted by women in political participation. This book examines the relationship between gender and democracy in south asia. The countries with higher levels of liberal democracy exhibit more consistently gender parity then autocracies which shows more inconsistent gender gaps.

Mili S (2019) in his unpublished doctoral thesis politics participation and representation of missing women in Assam seeks to validates the hypothesis that there is correlation between the socio-economic status and political participation of Nishing women that attitudes of society towards women political activities is generally negative.

Biswas B&Kaul Ed) (2016) in this book decentralization panchayat Raj and rural development in North East India, discusses about the socio-economic changes brought in by panachayat institution and the extent of people participation in the process of decentralized planning in the Arunachal Pradesh.

Sultana a (2015) in this work gender and politics: Role perception and performance of women legislator make a study of women leadership of North West India. This work is highlight to the role and approaches of women in dealing and public issue and effective participation in politics. This work also highlights the economic background of women legislators and factors for their enter into the polices...

Raji B (2014) in this work political transition in Tagin tribe of Arunachal Pradesh makes an attempted to study the political transition in Tagin tribe of Arunachal Pradesh. This deals with impacts of frontiers village council and moderns democratic. This work deals with the modern democratic institution. The work deals with peoples and perception towards modern democratic institution and tradition institution.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Mantel A, (2012) in the book grassroots governance given an insight at ten gram panchayat of west Bengal with the help of survey data and information obtained from these Gram panchayat. This author has tried to identify the conditions that promote people participation and indicates how the political mechanization conditions decentralization and impedes the functioning of rural institution.

Panda, A.N (2012) in the book political participation of tribal has discussed about political participation of tribal people but of mainland India at the grassroots level and the people involvement in the political process of the country.

Thakur, M (2010) in her work, women empowerment through panchayat raj institution discusses about the importance of panchayat raj institution and about the hurdles of samastipur district of Bihar and about the rule and impact of panchayat raj act 1992 in women empowerment.

Ghosh B.N (2008) in women in governance in Tripura examines the role of women members of Gram panchayat in Tripura since 1993. It also probes to what extent the women members of gram panchayat are now able to make decision independently.

Sisodia, Y.S (2007) in the work experiment of direct democracy attempts to identify, documents and comprehensive the broad fronds emanating from the field based on an experience of Panchayats (2001-04) functioning in Gram Swaraj in Madhya Pradesh.

Gopal, N & Prakesh, A (Eds). (2006) in their edited book local governance in India analysis the complexities of local governance both rural and local in contemporary India it discusses about some lesser known aspects of the interface between panchayat and other institution of local governance.

Karlo, R (2005) in this book emerging pattern of tribal leadership in Arunachal Pradesh has tried to comprehensive the changing pattern of rural leadership. The work tries to explain and understands the grassroots leadership and the functioning of tribal polity in context of rapid demoralization of rural society.

Modi, M (2003) in the book indigenous system of governance in tribal society of Arunachal Pradesh discuss about the indigenous system of governance in the tribal society of Arunachal Pradesh in a systematic and comprehensive way.

Saryu, R. (Ed) (1999) in her edited book understanding the Indian women today problem and challenge make an effort towards understanding the Indian women, their contemporary problem and challenges but in sociological perspective.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

Palaniturai,G(1994) in the works empowering people for property a study in new panachayat raj system has given a comprehensive picture about the historical evolution of the institution, nature of panachayat raj system in its new form and its implication socio-economic life of rural people.

Ghash, G.K (1992) in the book tribal and their cultural has describe about different aspects of tribes of North East India and give a vivid description of their rituals, dance music song philosophy village government. However this book does not go in details about the political participation of women.

Mishra ,k (1991) in women in a tribal community has discussed about the rule of women in wishing (A major tribe of Arunachal Pradesh) society and economic. This book through a Nishing woman concentrates a traditional life of women in their community- customs norms and ritual and the influence of development and modernization in their way of life.

Srivestava, l. N (1988) in the works the Gallong reprinted and published by director of research, government of Arunachal Pradesh 1988, has discussed about the Gallong people, Elwin. V (1965) in democracy in NEFA which manages the life of tribes people and his works reflects that there is a wide measure the life indigenous democracy in the social customs and laws of tribal people of NEFA. His works however, does not deal with the institution of panchayat raj and political empowerment of women.

Verma Y.M (1986) in the works problems of tribal in india has made an attempted to evaluated the achievement and failure of the community development program doing the iv & vi five year plan periods with particular reference to palm, a backward district of choenagpur plateaus. Efforts have been made to highlight the problem of tribal and non-tribal area, various remedial measure have been suggested for the development of the area. Study has revealed bureaucratic apathy towards development programs and attitudes of the general masses towards development particularly that of the tribal people their suspicion of losing their dating the two developments

Base j.k (1980) in the book glimpse of tribal life in N.E India through comprehensives disuses the tribal of north east India focuses mainly an cultural aspects and works also focused on marriage customs and rites, kingship system of the people of tribes and barely deal with the concept of women empowerment and participation in grassroots politics.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

Objective of the study

The main objectives of the study are:-

- i. The examine impacts of 73rd amendment act on participation of women in papum pare district in particular and Arunachal Pradesh is general.
- ii. To assess the awareness of women members of panachayat in decision making process.
- iii. To identify the problem of participation of women in panchayat Raj institution in papum pare district (Rural).
- iv. Important role of women in panchayat raj, in papum pare district (Rural).
- v. To understand people's perception and opinion on participation of women in panchayat Raj institution and suggested possible remedies based on finding.
- vi. The role of village council in nyishi tribe.(indigenous council)

Research Methodology and Tools

The study adopted both historical and analytic methods information for the study has been based on both primary and secondary sources. Primary data were collected by employing partially structured Questionnaire designed in English language. The questionnaire was translated into local language for convenience, as and when necessary. Beside personal interviews were conducted with select respondents consisting of graduate/ post-graduate student, Gaon Burahs, village elders and politically active poems, which were selected purposefully. The growth and development in Arunachal Pradesh have been described historically since its inception in 1967.

The survey was design by employing the multi-stage stratified random sampling technique, which ensures representation of the social, cultural and political diversity of the population within the sample. It includes grassroots sample representation of the inverse of study.

The first stage of sampling involves the selection of Zillaa parished in papum pare district. There are 15 zpm's in papum pare i.e Balijan, Toru, Parang, Kakoi, Doimukh ,Gumto, Leporang, sangdupota etc.Zilla chairperson is Smt.Nabam Yakum (female) 2023 and more than 300 GPM's district of Arunachal Pradesh

THE SIGNIFICANCE OF LOCAL SELF-GOVERNMENT

- i. Women politician and leaders:- local governments have the poteintial to promote women role as political actors and candicates through the reservation seats.

Shaping the future of Research and its Innovative Methodologies in Various Multidisciplinary Streams

August 2024

- ii. More transparent working of center:- local government are often considered as and intermediate between defferent communities and the center government.
- iii. Shaping of future leaders:- local self-governance serves as training ground for shaping future leaders
- iv. Nursery of democracy: - the local self-government is grassroot level of government and lowest level.
- v. Economic development and social justice:- the idea behind decentralization way the wide scope of economic development and social justice from ground.
- vi. More participatory: - local bodies help citizens to directly participate in democratic decision making by allowing the constituent representatives elected at the local level.

Limitation

- i. Inadequate financial resource: - local self-government bodies often face financial constraints due to inadequate devolution of funds form higher level of government.
- ii. Dependency on state governments:- local bodies depend heavily on state governments for financial resource as they have limited revenue-raising power.
- iii. Limited autonomy: despite being constitutionally recognized, local self-governments bodies in India often lack true autonomy.
- iv. Challenges in implementing decision at the grassroots level: - local self-government bodies encounter challenges in implementing decisions and programs effectively at the grassroots level due to various factors...
- v. Lack of administrative autonomy: - despite constitutional provisions granting autonomy to local bodies they often lack sufficient administrative powers to execute their functions independently and the lack of administrative autonomy due to interference of higher authority to leading to bureaucratic involved.

Conclusion

While summing up it can be concludes that there has been a considerate change in the status of women with regard to participation in the decision making process. The traditional socio-cultural and political descriptive values of the society in the process to cope up with the new socio-economic and political environment get itself modified. This is reflected in their attitude opinion and perception a different variables of participation such as accepted of women as leader's effectiveness of women in monitory and handing the issues involvement in debate and discussion etc.

**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

The attitudes and perception with regards to some relevant to questions such as willingness to re-elected women continuation of reservation of seats the study on served some lacuna or drawback in the form of lack of exposure to official process and procedures, lack of training to the elected women member, different socio-culture hurdles etc.

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Warranties, Protection, and Ownership: A Comprehensive Review of Legal Frameworks in the Pre-Owned Car Market in Jharkhand

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Abstract

This paper aims to identify the complex laws governing the pre-owned car market in the state of Jharkhand in India. Taken as a whole, the study makes an insightful appraisal of the legal structure's antecedent to warranties, consumer laws, and ownership laws while highlighting how the provisions of these structures have impacted the market structures and relations of the used car market. This way, the paper underscores the virtues and vices of these regulations in terms of consumer confidence, market stability, and the general purchase experience. In light of this, the findings will help the consumers, dealers, and legal professionals to be informed on the rights, roles, and legal recourses available about the used car market transactions. The study utilizes data from statutory laws, regulatory policies, and cases within the Jharkhand region and contributes towards understanding ways of boosting consumers' confidence and encouraging fair trade practices in this sector.

Keywords: Pre-Owned Car Market, Warranties, Consumer Protection Laws, Ownership Regulations, Legal Frameworks.

1. Introduction

1.1 Background

The preowned automobile sector is a rich environment concerning market relations, consumer habits and tendencies, and the net of legal conditions concerning warranties, protection, and ownership status. There is a need to define and specify rules and regulations to define the rights and duties of the buyers, sellers, and other players within the market arena (Talesh, 2015). This knowledge is important to the players particularly the buyers and the sellers in the context of the used automobile industry in India. Potential consumers should ensure that there are no histories of the vehicle that they are planning to purchase such as checking for papers and warranties and getting these papers (G, & Mathew, 2021). Sellers on the other hand should disclose vehicle details properly and complete all the transfer processes to avoid complications of the law after the sale (Nerurkar, 2023). Although the laws

regarding warranties, protection, and ownership of used cars are clear in the Indian context, consulting professionals with knowledge of the specificities of used car transactions, can certainly add to a slick and completely legal process for all stakeholders (Bansal et al., 2017).

Warranties are of considerable role in ensuring the buyers' trust and protection in the used automobile market. These warranties include maker's warranties, dealer promises as well as third-party assurance, and all these warranties offer different levels of warranty and assurance of the performance and the state of the vehicle (Michael, 2006).

On the other hand, the used automobile ownership rules deal with the legal requirements and responsibilities that surround the change of ownership of the automobiles (Arini et al., 2019). These include outlining the rights which the buyer has as well as the responsibilities which the seller has, the paperwork as well as legal formalities that must be met in order to facilitate a legal transfer of title from the seller to the buyer (Alaraj, 2010). In addition, consumer protection laws are important especially where there are shields against misleading activities, for honest transactions, and where there are issues to do with product quality, the failure to disclose defects or hidden vices of the product among others. These laws give more power to the purchasers through establishing the legal means of solving disputes (Sakunaveeti, 2023).

That is why investigating the correlation between warranties, protection measures, and ownership regulations in the segment of used automobiles provides a strong foundation for appreciating numerous aspects of this actively developing market. This introduction ushers in a discussion about the law with the main objective prevailing in this section being an understanding of the parameters surrounding the sale of used cars (Chen, 2020).

1.2 The Rising Popularity of Pre-Owned Cars in India

The current trend of the growing used automobile market in India is a clear change in trend and consumer behavior. The following are some reasons why this tendency appears. For instance, there is increasing financial independence and shifts in the economic conditions that make used cars more appealing as well as affordable (Dietsche et al., 2015). The enhancement of vehicle quality and technology increases the customer's confidence in procuring a used car while increasing urbanization and traffic challenges create a market demand for a reliable, safe, and efficient vehicle to appeal to a diverse market (Talim et al., 2021). There is a vast choice of many models and brands that correspond to any preferences and pocket of consumers. Consumers are more attracted to manufactured and dealership-certified pre-owned programs since the programs entail extensive inspection in addition to

longer warranty covers (Llopis et al., 2020). Also, technological enablement entails the form of online platforms actualizing convenience in doing business transactions while pouring out full information further supporting growth (Nag & Bhattacharjee, 2022).

1.3 Research Objective

This research will evaluate the current legal requirements and legislations applying to warranties, protection plans, and ownership issues in Jharkhand's used car market. It will look at the existing laws to determine what gaps there are in the protection of consumers and also look at the efficiency of these laws in the protection the both buyers and sellers. The study seeks to examine to what extent that current legal frameworks protect and influence the used car market consumer interest. Through these aspects, the study aims at making traffic analysis on these regulations seeking to inform consumers' well-being from these regulations as well as market influences.

1.4 Significance of the study

The findings would be helpful to several stakeholders: purchasers, manufacturers, dealers, lawyers, and buyers' interest organizations, in a way that enables them to comprehend their part, and the law best. However, this research will help in making a change to consumer protection since it will expound on the flaws of the existing laws about warranties and guarantees in the pre-owned car business in Jharkhand.

2. Literature Review

Warranties, consumer protection, and clear ownership are vital elements that significantly enhance the purchasing experience for consumers looking to buy a used car. According to Mcneil, & Miller, (1980) warranties, consumer protection, and secure ownership help build consumer trust, encourage fair trading practices, and foster a more secure environment for purchasing used cars, enabling buyers to make confident and informed decisions that improve their overall buying experience and satisfaction.

2.1 Warranties and Pre-owned car market.

Warranty and the pre-owned car market are the two important sections that provide the service to guests. Warranties thus form part of the buyer-seller relationship that offers even promises, guarantees, and responsibilities. Research on warranty policies which comprises manufacturer warranties, dealer guarantees, and supplemental warranties seeks to establish their scope, constraint, and relevance in the field of purchase (Aljazea et al., 2018). Warranties are important in enhancing the confidence and satisfaction of consumers while buying a used car since they assure the buyer of the quality of the car

they are buying (Soberman,2003). Such assurances make consumers think beyond more standard, fleet-owned vehicles; perhaps even those that are slightly older with more mileage, and help them develop a sense of security.

Kelley, & Conant, 1991 believe that warranties can improve customer perception of a used car and increase customer satisfaction since the warranties prove the quality of the car.

The used car comes with many risks associated with the unknown condition, history of service, and possible future repairs while used cars have none of these issues. In the study carried out by Padmanabhan & Rao, (1993) a full warranty gives the buyer a guarantee that the car that he buys possesses certain parameters of quality and reliability. Moreover, warranties can entail the guarantee of certain parts and repairs implying that customers are protected in a case if they experience mechanical breakdowns. This safety net allows consumers to go shopping for a vehicle without being worried that they will be left with a substandard product, or have to spend a lot of money on repairs (Sun, & Wu, 2016).

2.2 Consumer protection law & pre-owned car market.

Laws on consumer protection ensure that consumers receive the right information and that they are not exploited through fraudulent methods of sales. These laws ensure proper disclosure, transparency in a transaction, and legal action against disputes or complaints arising from a particular transaction (Mcneil et al., 1979). As suggested by a study undertaken by Pratt, & Hoffer, (1985), consumer protection laws go further to empower buyers in transactions. This includes clarity on the history of the car, the need for disclosure of information on the state of the vehicle, and protection against fraud on matters like mileage or odometer tampering and misrepresentation of the condition of the vehicle. Likewise, ownership information plays a critical role in used cars (Belova, 2021).

Campbell (2023) describes consumer protection laws as the basic rights of any individual who intends to purchase a used car. According to him, these laws protect the buyer from fraud, misrepresentation of facts, and unfair trade practices. The laws give consumers the power to be confident in making the right decisions when buying used cars; hence, they will meet a safer, more trustworthy, and fair environment (Indriani, 2021).

2.3 Ownership and pre-owned car segment

when customers buy a used car, unique problems arise related to the historical record of the vehicle, the state of the vehicle, and even questions about long-term value (Vine, and Polak, 2019). Ownership

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Multidisciplinary Streams
August 2024**

would play a major role in the pre-owned car segment since the determination of this aspect would affect even consumers themselves, and most importantly, the used car market as a whole, because it would determine the nature of the purchases to be made and what kind of market it is (Huang et al., 2023).

In their work, Biradar, & Kulkarni, (2015), it is clear that efficient ownership transfer procedures boost consumer confidence since purchasers can have a valid and clean title that protects consumers from all possible legal issues. Further, smooth ownership transfer and valid documentation of vehicles will give rise to market stability in terms of instilling confidence among buyers and reducing cases of fraud as noted by Chen et al., 2020.

Also according to Tshabalala & Hans, (2011), it is ownership processes that are well-managed that guarantee not only the protection and satisfaction of consumers but also a more efficient and reliable used car market as a whole for buyers and sellers alike.

3. Research Methodology

The current review paper, therefore, contains a systematic approach to ensure that the area is comprehensively examined. A massive review of the available academic, legal, and industry sources related to warranties, consumer protection, and ownership rights in the pre-owned car market is done. This review includes statutory laws, regulatory guidelines, and case studies specific to Jharkhand. The database search began with a literature review that involved the use of several social sciences databases including but not limited to SCIENCEDOMAIN International, Endnotes, Web of Science: Such as Emerging Sources Citation Index, Scopus, Elsevier's SSRN, Wiley Online Library, Taylor & Francis online, Springer link, Proquest business collection, and Google scholar. This was done using the following keywords: "warranties", "consumer protection law", "ownership", "pre-owned car" and "Jharkhand".

Each element of the model was justified with evidence identified from the studies that were reviewed. Following this, findings from the literature were organized following the outlined structure and presented the key insights from the review while also supporting the development of the conceptual model. Throughout the process, the reviewer continued to revise the methodology with iteration to provide strength and focus on research objectives.

4. Table 1: Summary of Key Findings from Literature and References.

Warranty and pre-owned car markets are	(Bansal et al., 2017; Michael, 2006; Mcneil,
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**Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024**

<p>closely interrelated and define consumer trust and perception towards the quality of the product. Hence, right and reasonable warranty policies are significant to the sellers and the buyers of used cars, as they assure them of a secure environment for transactions. A perfect warranty gives the buyers confidence that in the event of any mechanical failure or product defect, they are shielded. This safety net ensures larger numbers of consumers think of purchasing pre-owned vehicles, thus creating a broader market for the products and may lead to improved resale prices. As the warranty length increases, longer product reliability is expected, and it can bring more customers to the pre-owned automobile market. An assurance mechanism for the buyer is warranties, especially whenever the buyer is concerned with the reliability and potential defects of the automobile being purchased, especially in the used automobile market.</p>	<p>& Miller, 1980; Aljazea et al., 2018; Soberman, 2003; Kelley, & Conant, 1991; Padmanabhan & Rao, 1993; Sun, & Wu, 2016; Arini et al., 2019)</p>
<p>Laws related to consumer protection have the responsibility of guaranteeing that all transactions within the used car industry are conducted fairly without anyone being misled. It is imperative since it will ensure that the consumers make an informed decision when buying the vehicle and will minimize instances of fraud and parting with their hard-earned money to a conman. These laws are aimed at promoting transparency,</p>	<p>(Talesh, 2015; Mcneil et al., 1979; Pratt, & Hoffer, 1985; Belova, 2021; Campbell, 2023; Indriani, 2021; Huang et al., 2023; Tshabalala & Hans, 2011; Arini et al., 2019; G, & Mathew, 2021)</p>

Shaping the future of Research and its Innovative Methodologies in Various
Multidisciplinary Streams
August 2024

<p>whereby any existing warranties and information on the general health of the car or its background will be relayed to the prospective buyer. These laws make it possible to get the best value for your money since they ensure that sellers do not defraud buyers or give them first-hand information about a particular car that they may not have. The presence of such laws may create pressure for competition since only honest dealers in cars will adhere to laws and regulations in a bid to get the business of clients who seek trust and assurance.</p>	
<p>Vehicle ownership leads to enhanced mobility and convenience, and consumers can travel across the country without the need to use a vehicle via the use of public transport or other online hailing applications. It is within the ownership of the car that one can discover essential, past data relating to the car, such as how many people have owned the car, how long the previous owners possessed the car, and even how the car was used or maintained. This paper argues that ownership in the used car market affects consumer behavior and decision-making in a way that offers customers several advantages. In the used car market, the idea of ownership is thus related to the economic consequences for consumers. From customers' perspectives, the issue provides more information and, therefore, helps to</p>	<p>(Huang et al., 2023; Biradar, & Kulkarni, (2015; Tshabalala & Hans, 2011; Chen, 2020; Vine, and Polak, 2019; Arini et al., 2019; G, & Mathew, 2021)</p>

avoid vehicles with certain undesirable previous histories. It also assists with pricing since some cars with a good ownership profile will cost a lot of money, while those with a bad profile will cost less.	
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5. Future Scope and Limitation

This research is a backdrop for the existing legal framework of the pre-owned car market in Jharkhand. Future research could build upon this research and implement trend analysis to identify the changes in legal environments and the changes they undergo over time. The scope could also be generalized to embrace the impact of blockchain technology for vehicle check history or artificial intelligence inspection gadgets on warranties and ownership affirmations.

Some of the findings may therefore quickly become outdated due to the fast-evolving nature of the automotive industry as well as the nature of laws in several jurisdictions. In addition, the research can be limited by the information available on the informal market, especially as it relates to the pre-owned car market in the region, which may distort the general perception of the market.

6. Conclusion

All these legal structures regarding warranties, consumer protection, and ownership affect the pre-owned automobile market of Jharkhand to a noticeable extent. This assessment reinforces that proper warranty policies, accurate and efficient ownership transmission, and, in general, strong standards in consumer protection call for the right market integrity. It is useful for legislators, legal entities, dealers, and customers to make alterations that are best suited for this ever-expanding market. The second layer specifies the current legislative gaps and potentials for development concerning the need for higher legal requirements concerning odometer frauds, improved and more specific regulation of car history information, and enhanced penalties for violation of consumer protection laws.

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August 2024**

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