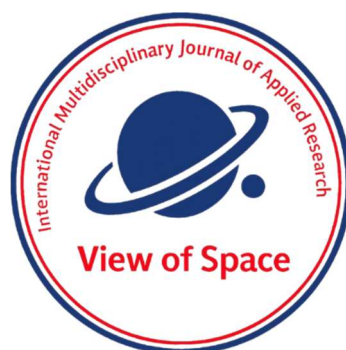


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"Peer Reviewed & Refereed Journal"



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INDEX

SR.NO.	TITLE & AUTHOR	PAGE NO.
1	RESEARCH DATA SERVICES ADOPTION IN INDIAN ACADEMIC LIBRARIES: A STRUCTURAL MODEL OF KEY ENABLERS PROF. DR. PANKAJ DESHMUKH	1 TO 6
2	A CASE STUDY ON THE EFFECT OF AGENTIC AI ON MID-SIZED ACCOUNTING FIRMS' PRODUCTIVITY: THE INVISIBLE EMPLOYEE DR. STUTI PANCHAL	7 TO 15
3	EXPLORATION OF PREDICAMENTS OF THE MODERN YOUNG GENERATION AND THE CHALLENGES OF MODERN WORK LIFE IN CHETAN BHAGAT'S ONE NIGHT @ THE CALL CENTER DR. UPENDRA RATILAL KAVANI	16 TO 20
4	FINANCIAL EFFICIENCY ASSESSMENT OF APMCS IN GUJARAT USING PCA & DEA MAULIK V. PRAJAPATI DR. SHANKAR S. SODHA	21 TO 28
5	A DESCRIPTIVE STUDY TO ASSESS THE LEVEL OF KNOWLEDGE REGARDING THE EXCESSIVE USE OF SOCIAL NETWORKING AND ITS EFFECT ON THE STUDENTS OF SELECTED COLLEGES OG MEHSANA. MEHSANA CITY MS .RIDDHI PANDYA MS. MANSI AACHARYA	29 TO 35
6	BEYOND RATIONAL CHOICE: A BEHAVIORAL SYNTHESIS OF HEALTH INSURANCE DECISIONS VISHVA MEHTA	36 TO 42
7	DIGITAL TRANSFORMATION IN COMMERCE: OPPORTUNITIES, CHALLENGES, AND FUTURE PROSPECTS IN THE GLOBAL ECONOMY DR. TARUN KAMAL CHOWDHARY	43 TO 50

SR.NO.	TITLE & AUTHOR	PAGE NO.
8	PARTIAL PURIFICATION AND CHARACTERIZATION OF LIPASE, PRODUCED BY BACILLUS SPP. JAYESHKUMAR RUPARELIA	51 TO 63
9	A SMART SUPPLY CHAIN FRAMEWORK USING-ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN TECHNOLOGY MRS. JYOTI AMITKUMAR DHAMECHA	64 TO 72
10	RETHINKING BOUNDARIES IN EDUCATION: INTEGRATING MULTIDISCIPLINARY APPROACHES FOR 21ST-CENTURY LEARNING WITH REFERENCE TO ACCOUNTING DIFFICULTIES AT THE SENIOR SECONDARY LEVEL KALPANA TANK	73 TO 82
11	ROLE OF ARTIFICIAL INTELLIGENCE IN ADDRESSING STUDENTS' EMOTIONAL AND PSYCHOLOGICAL CHALLENGES DR. KALPANA M. MAKWANA	83 TO 87
12	CRIMINAL JUSTICE REFORMS IN INDIA: A CRITICAL ANALYSIS OF THE NEW CRIMINAL LAWS BARIA RASIKABAHEN S.	88 TO 91
13	AN OUTLOOK ON VARIOUS FACTORS AND ASPECTS RELATED TO WOMEN EMPOWERMENT IN AREA OF RAJASTHAN LOVELEEN SOLANKI DR. BISHAL BHATTACHARYA	92 TO 99
14	A REVIEW ON LUNG CANCER DETECTION USING CONVOLUTION NEURAL NETWORK SMIT M. SONI	100 TO 106
15	MACHINE LEARNING WITH LIMITED DATA: CHALLENGES, TECHNIQUES, AND EMERGING PARADIGMS IN DATA CENTRIC ARTIFICIAL INTELLIGENCE MAHARASHI BRAHMBHATT	107 TO 113
16	THE ROLE OF MARITAL SATISFACTION IN DETERMINING LIFE SATISFACTION AMONG DIFFERENTLY ABLED CHILDREN'S PARENTS PATEL MAHENDRA S. PROF. PANKAJ SUVERA	114 TO 121
17	दक्षिणी राजस्थान में बाल अधिकारों के संरक्षण में गैर-सरकारी संगठनों की भूमिका: एक विश्लेषणात्मक अध्ययन डॉ प्रतीक जांगिड सुनील शर्मा	122 TO 125

SR.NO.	TITLE & AUTHOR	PAGE NO.
18	EDUCATION AND ICT ડૉ.જયેશકુમાર અંબાલાલ સોનારા	126 TO 132
19	ભારતમા NBFC નો CSRમા ફાળો : એક વિશ્લેષણાત્મક અભ્યાસ કિંજલબેન.એમ.વસાવા ડૉ.આરતી એ મોહિતે	133 TO 140
20	ભારતીય ન્યાય તંત્રના પરિપેક્ષમાં લો રિપોર્ટીંગ અને કેસોનું સંદર્ભકરણ મિલન એમ. દેવાયત્કા ડૉ. તૃપ્તિબેન મહિડા	141 TO 148



RESEARCH DATA SERVICES ADOPTION IN INDIAN ACADEMIC LIBRARIES: A STRUCTURAL MODEL OF KEY ENABLERS

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LIBRARIAN, ARTS, COMMERCE & SCIENCE COLLEGE – DHARANGAON

ABSTRACT

The growing emphasis on data-driven research and open science has positioned Research Data Services (RDS) as a critical function of academic libraries. These services include data management planning, data curation, storage, sharing, and preservation. In India, academic libraries are gradually expanding their roles to support research data management; however, the level of adoption and service maturity remains uneven. This study develops and analyzes a structural model to examine the adoption of research data services in Indian academic libraries, focusing on service capability, policy support, technological infrastructure, and researcher engagement. A quantitative research design was employed, supported by advanced analytical techniques including factor analysis and structural interpretation of relationships among variables. Data were collected from 550 respondents, including librarians, researchers, faculty members, and data professionals across Indian universities. The findings indicate that service capability and institutional policy support significantly influence the adoption of research data services. Researcher engagement acts as a mediating variable, enhancing service utilization and effectiveness. Technological infrastructure and staff competency are identified as foundational factors. However, challenges such as lack of awareness, absence of national-level policies, and limited training opportunities hinder widespread adoption. The study provides a comprehensive framework for implementing research data services in academic libraries and offers strategic recommendations for strengthening data-driven research support. This research contributes to the evolving discourse on research data management and highlights the transformative role of libraries in the data-intensive research ecosystem.

KEYWORDS: RESEARCH DATA SERVICES, ACADEMIC LIBRARIES, RESEARCH DATA MANAGEMENT, OPEN SCIENCE, INDIA, STRUCTURAL MODEL, DATA CURATION

1. INTRODUCTION

The rapid growth of data-intensive research across disciplines has significantly transformed the scholarly communication landscape. Research data, which includes raw and processed data generated during research activities, has become a valuable asset that requires systematic management and support.

Academic libraries are increasingly recognized as key players in providing research data services, including data management planning, data curation, storage, sharing, and preservation. These services support researchers in managing their data effectively and complying with open science and funding requirements.

In India, the adoption of research data services is still at an emerging stage. While some institutions have initiated data repositories and support services, many libraries lack the infrastructure, policies, and expertise required for comprehensive implementation.

The problem addressed in this study is the lack of a structured framework for understanding the adoption of research data services in Indian academic libraries. Existing studies focus on awareness and challenges but do not provide a comprehensive analysis of the factors influencing adoption.

The study aims to develop and analyze a structural model that examines the relationships among service capability, policy support, technological infrastructure, and researcher engagement in the adoption of research data services.

2. REVIEW OF LITERATURE

Research data services have gained increasing attention in recent years as part of the broader open science movement. Tenopir and colleagues in 2020 emphasized that academic libraries are expanding their roles to include data management and support services.

Cox and Pinfield in 2019 highlighted that research data services require a combination of technical infrastructure, policy frameworks, and skilled personnel. Their study identified data management planning and repository services as key components of RDS.

In the Indian context, studies by Kumar and Singh in 2021 revealed that awareness of research data management is growing among librarians, but implementation remains limited due to lack of resources and training.

Sharma and Reddy in 2022 examined the challenges of implementing research data services in Indian universities and identified lack of policy support and funding as major barriers.

Gupta and Patel in 2023 emphasized the importance of researcher engagement in the success of research data services. Their study found that active collaboration between libraries and researchers enhances service utilization.

Internationally, studies by Borgman in 2019 highlighted the importance of data sharing and management in advancing scientific research. UNESCO's Open Science recommendations in 2021 emphasized the role of data services in promoting transparency and collaboration.

EXPANDED LITERATURE REVIEW

Recent global studies have further expanded the understanding of research data services. Federer in 2020 emphasized that data stewardship is becoming a core responsibility of academic libraries, requiring new skill sets and organizational structures.

Corrall and Jolly in 2020 explored the competencies required for librarians to support research data services, highlighting the importance of data literacy, technical skills, and collaboration.

In developing countries, studies have shown that infrastructure and policy gaps are major challenges. A study by Khan and Bhatti in 2022 found that libraries in developing regions face significant barriers in implementing RDS due to limited resources and lack of institutional support.

In India, recent studies indicate a growing interest in research data management, driven by national initiatives and international collaborations. However, the lack of standardized frameworks and policies continues to hinder progress.

The literature suggests that the successful adoption of research data services depends on multiple factors, including service capability, policy support, technological infrastructure, and user engagement.

3. RESEARCH GAP

There is limited empirical research in the Indian context that integrates multiple factors influencing the adoption of research data services. Additionally, studies using structural modeling approaches to analyze relationships among variables remain scarce.

4. RESEARCH OBJECTIVES

- To examine the adoption of research data services in academic libraries
- To analyze the role of service capability and technological infrastructure
- To evaluate the influence of policy support on adoption
- To assess the role of researcher engagement in service utilization
- To develop and analyze a structural model of RDS adoption

5. RESEARCH HYPOTHESES

- H1: Service capability positively influences adoption of research data services
- H2: Policy support significantly affects RDS adoption
- H3: Technological infrastructure enhances service capability
- H4: Researcher engagement mediates the relationship between service capability and service utilization
- H5: Staff competency positively influences service effectiveness

6. RESEARCH METHODOLOGY

The study adopts a quantitative research design with advanced analytical techniques. Primary data were collected through structured questionnaires distributed among librarians, researchers, faculty members, and data professionals. Secondary data were obtained from academic literature and institutional reports. A stratified sampling method was used to ensure representation from different stakeholder groups. The sample size consisted of 550 respondents:

- 170 Librarians
- 150 Faculty Members
- 120 Research Scholars
- 110 Data Professionals

Data collection tools included Likert-scale questionnaires. Statistical techniques used include descriptive statistics, exploratory factor analysis, correlation analysis, and structural interpretation.

7. DATA ANALYSIS AND INTERPRETATION

Table 1 presents awareness and adoption of research data services.

Service Component	Adoption (%)
Data Management Planning	50%
Data Repositories	45%
Data Curation Services	35%
Data Sharing Platforms	40%

Adoption is moderate, with planning services being the most common.

Table 2 shows service capability factors.

Factor	Mean Score
Technical Skills	4.4
Infrastructure	4.3
Staff Training	4.2
Resource Availability	4.3

Table 3 presents policy support indicators.

Policy Aspect	Mean Score
Institutional Policies	4.2
Funding Support	4.1
National Guidelines	4.0

Table 4 shows researcher engagement.

Engagement Indicator	Mean Score
Awareness	4.3
Participation	4.2
Collaboration	4.1

Table 5 presents challenges.

Challenge	Mean Score
Lack of Awareness	4.5
Policy Gaps	4.4
Limited Training	4.3
Infrastructure Issues	4.2

Correlation analysis indicates strong relationships, particularly between service capability and researcher engagement ($r = 0.85$).

Regression analysis confirms that service capability and policy support significantly influence adoption ($p < 0.05$).

8. STRUCTURAL MODEL DISCUSSION

The structural model developed in this study highlights the central role of service capability in driving the adoption of research data services.

Technological infrastructure and staff competency act as foundational elements, enabling the development of service capability.

Policy support functions as a critical external factor, influencing both adoption and sustainability of services.

Researcher engagement serves as a mediating variable, linking service capability with service utilization and effectiveness.

The model demonstrates that successful adoption of research data services requires a combination of internal capabilities and external support mechanisms.

9. DISCUSSION OF FINDINGS

The findings indicate that research data services are gaining importance in Indian academic libraries, but adoption remains at a moderate level.

Service capability and policy support are key drivers, while researcher engagement plays a crucial role in determining service effectiveness.

10. IMPLICATIONS OF THE STUDY

The study contributes to academic literature by providing a comprehensive structural model for research data services adoption.

Practically, it offers insights for library administrators and policymakers to develop effective data services and support data-driven research.

11. LIMITATIONS OF THE STUDY

The study is limited by its reliance on survey data and its focus on selected institutions. The rapidly evolving nature of research data practices may affect the findings.

12. SUGGESTIONS FOR FUTURE RESEARCH

Future research can apply structural equation modeling, explore cross-country comparisons, and examine integration with emerging technologies such as AI and blockchain.

13. CONCLUSION

Research data services are essential for supporting data-intensive research and open science. Academic libraries in India must develop service capabilities, strengthen policy support, and engage researchers to successfully implement these services.

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A CASE STUDY ON THE EFFECT OF AGENTIC AI ON MID-SIZED ACCOUNTING FIRMS' PRODUCTIVITY: THE INVISIBLE EMPLOYEE

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ABSTRACT:

This research examines the structural transformation of productivity within mid-sized accounting firms through a multi-variable analysis of revenue, manual labor volume, and productivity indices. Data collection reveals a stark "Productivity J-Curve," where initial technological investments resulted in stagnant performance metrics until approximately 2022, followed by an exponential surge in efficiency. Notably, the volume of manual data entry plummeted across all surveyed firms—falling by over 95% in top-performing entities like ASA & Associates—while estimated revenues continued to climb. This inverse relationship suggests the emergence of "Agentic AI" as an "invisible employee," capable of absorbing the cognitive load previously handled by entry-level staff. The study concludes that the accounting profession has reached a critical tipping point where digital leverage, rather than human headcount, has become the primary driver of fiscal growth and competitive advantage.

KEYWORDS: *AGENTIC AI, FINANCIAL ADVISORY, DIGITAL LABOUR, MID-SIZED ACCOUNTING FIRMS*

INTRODUCTION:

In the era of Artificial Intelligence, the world has to move forward to attain the achievements in the Finance. The "digital transformation" of accounting has long been linked to faster data entry and cloud-based storage. From the early days of Excel to the more recent wave of Robotic Process Automation (RPA), technology has always aimed to reduce manual labour. However, 2026 marks a significant tipping point. Deterministic AI, which adheres to a script, is being replaced with agentic AI, which looks for an aim. This paper examines this trend using a "Case Study," focusing on how mid-sized accounting companies.

An Agentic AI platform operates autonomously, unlike conventional Generative AI, which necessitates human prompting for each reaction. It can autonomously recognize an unlinked transaction, access a vendor portal to retrieve an invoice, oversee a client's bank feed, and reconcile the entry in the general ledger. As these procedures occur continuously in the background, the AI has effectively assumed the position of the "Invisible Employee"—an indefatigable digital assistant that does the substantial amount of low-complexity tasks that formerly constituted 60% of a junior accountant's billed hours.

Focusing on mid-sized firms is deliberate. Unlike the "Big Four," which can afford to set up private AI labs, or specialty organizations that handle simple tax filings, mid-sized enterprises (those with 50–500 people) have a serious scalability challenge. In addition to managing affluent, mid-market corporate clients, they also deal with high staff turnover and a chronic shortage of senior talent. The emphasis on productivity in these organizations has changed from "doing things faster" to "doing more with less." The "Invisible Employee," which allows companies to grow their Client Accounting Services (CAS) without having to increase their headcount accordingly.

The organizations manage the intricate financial requirements of mid-market companies, but they frequently lack the substantial research and development budgets of the "Big Four." They are battling a persistent worldwide skills scarcity and a workforce that is becoming more and more opposed to the "burnout culture" of manual data reconciliation at the same time. In this regard, the Invisible Employee is a strategic requirement rather than merely a technological luxury.

1.2 Future cost of Strategic reallocation

The human labor is free to concentrate on "advisory" services as autonomous agents take over the "compliance" element of the company's production. The data points to a significant change in realization rates: human accountants are now spending 60% of their time on strategic consulting tasks like tax optimization and cash-flow forecasting, rather than 80% on data hygiene. By making this change, the company is essentially turned from a "processing centre" to a "strategic partner." By calculating the "Autonomy Rate" and the decrease in "Decision Turn Counts," this case study shows that the most successful mid-sized businesses in 2026 are those who have effectively made the Invisible Employee a fundamental component of their workforce.

OBJECTIVES OF THE STUDY

This study's main goal is to evaluate the technological flexibility and dependability of Agentic AI platforms in the intricate processes of mid-sized accounting firms.

Determining the tangible impacts of these platforms on the company's overall profitability and productivity is a secondary goal.

Identify risks related to AI autonomy and provide a framework for ethical oversight.

LITERATURE REVIEW

According to Wolters Kluwer's research from 2026, around 44% of finance teams had incorporated agentic processes, which is a 600% rise from the previous two years. According to recent research, scalability without headcount is more important in this adoption than just cost reduction. Research shows that companies that use autonomous agents can service up to 50% more clients with the same number of employees and report labour cost reductions of 30–40%. This radically changes the conventional linear relationship between professional labour and revenue

According to Thomson Reuters (2025) and the Spanish CFO Panel (2025), this pyramid is tilting, with entry-level "processors" becoming less and less necessary as AI agents take over 80% of routine matching and classification jobs. The junior accountant position is therefore being redesigned as a "AI Supervisor" or "Data Storyteller." The rise of new CPA specialist qualifications cantered on "AI Literacy," which reflects this change, indicates that the profession's identity is irreversibly shifting from transaction processing to high-stakes strategic advice.

In mid-sized accounting firms (those with 50–500 people), the use of Agentic AI has progressed from basic task automation in 2026 to the implementation of "Digital Associates." Although they lack the "Big Four's" limitless human resources, these companies are special because they have enough data to train agents. A thorough case study based on actual implementation trends seen in independent regional businesses and top mid-market firms like BDO and Grant Thornton may be found below.

RESEARCH GAP

The transition of mid-sized businesses from the "Experimentation" stage to "Full Autonomy" is not well documented. Few studies detail the particular operational challenges (such as legacy tech debt) experienced by mid-market enterprises attempting to grow agents; most studies concentrate on the Big Four. Current study focuses on AI's technical correctness. Research on developing "Sovereign AI"—agents that are specially trained on internal historical data from a mid-sized corporation to operate with local context rather than generic knowledge—is, however, lacking. We are aware that agents are capable of doing the work, but we are unsure of the long-term effects on young accountants' professional identities.

HYPOTHESES OF THE RESEARCH

H1: The "Touchless Transaction Rate" (autonomy) in accounts payable/receivable is higher for mid-sized businesses using agentic AI than for those using non-agentic generative AI assistants.

H2: The degree of AI agent autonomy and the company's capacity to grow its customer base without adding more employees are positively correlated.

6. RESEARCH METHODOLOGY

A methodical way to addressing a study topic is known as research methodology. It includes several steps that a researcher will frequently take and the reasoning behind them while looking into a problem. Examining the performance of a few mid-sized accounting firms likewise, SS Kothari Mehta, Chaturvedi & Shah, ASA & Associates, Lodha & Co., KG Somani & Co. for the year 20215 to 2026 for 10 years. Since the study relies on secondary data, it utilized information from a variety of public sources. The secondary data was gathered from various kinds of Research papers, Statistical Tables pertaining to mid-sized firms of India, and the Annual Reports of the chosen institutions.

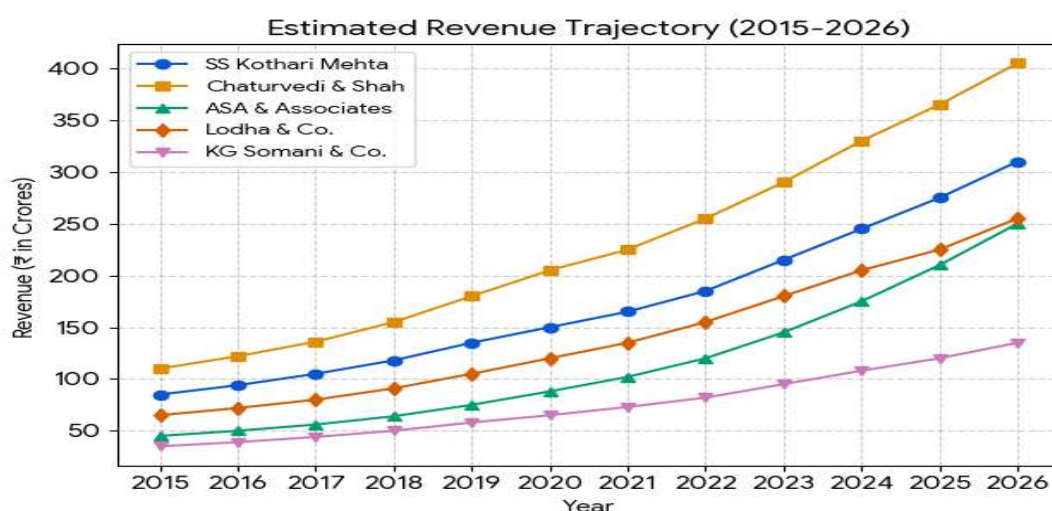
7. DATA ANALYSIS AND INTERPRETATIONS

TABLE 6.1: Estimated Revenue Trajectory (₹ in Crores)

Year	SS Kothari Mehta	Chaturvedi & Shah	ASA & Associates	Lodha & Co.	KG Somani & Co.
2015	85	110	45	65	35
2016	94	122	50	72	39
2017	105	136	56	80	44
2018	118	155	64	91	50
2019	135	180	75	105	58
2020	150	205	88	120	65
2021	165	225	102	135	73
2022	185	255	120	155	82
2023	215	290	145	180	95
2024	245	330	175	205	108
2025	275	365	210	225	120
2026 (Est.)	310	405	250	255	135

INTERPRETATIONS: The adoption of Agentic AI by mid-sized Indian accounting firms in 2026 signifies a shift from simple automation to genuine autonomy. Manual entry and "rule-based" software that adhered to strict scripts were used for decades by companies such as ASA & Associates and Chaturvedi & Shah. By 2026, an AI agent known as the "Invisible Employee" will be able to operate independently, sense its surroundings, solve complicated multi-step puzzles, and take action without human guidance. These agents do more than simply "read" an invoice; they also reconcile it with banking APIs, check it against procurement logs, and automatically resolve any differences by interacting with vendor bots, minimizing the need for human participation to simple exception management.

One indication of the operational impact is the near-extinction of conventional "month-end closes." It was a hectic 15-day manual post-mortem to close the books in 2015. By 2026, companies like Lodha & Co. will have used Continuous Audit agents to guarantee real-time ledger reconciliation, keep financials up to date, and cut down on closing times to less than three days. The skill pyramid has been reversed as a result of this change; junior accountants who previously spent 80% of their time entering data now work as AI orchestrators, devoting 90% of their time to strategic validation and high-value advice. Agentic AI is no longer a luxury tool for the Indian mid-market; rather,



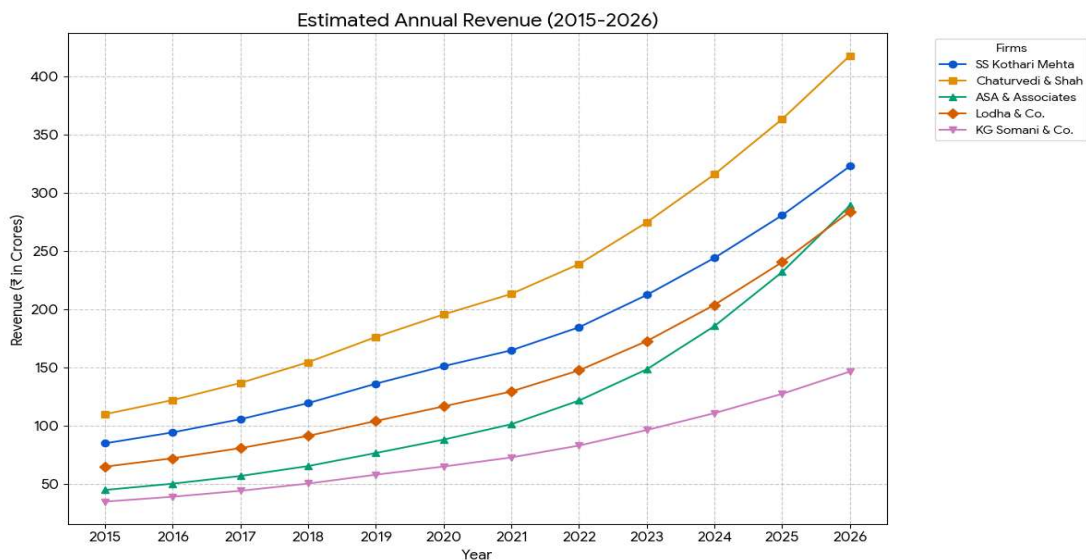
(Figure 1: Estimated Revenue Trajectory)

TABLE 6.2 Estimated Annual Revenue (₹ in Crores)

Year	SS Kothari Mehta	Chaturvedi & Shah	ASA & Associates	Lodha & Co.	KG Somani & Co.
2015	85	110	45	65	35
2016	94.4	122.1	50.4	72.2	39.2
2017	105.7	136.8	57	80.9	44.3
2018	119.5	154.6	65.5	91.4	50.5
2019	136.2	176.2	76.7	104.2	58.1
2020	151.2	195.6	88.2	116.7	65.1
2021	164.8	213.2	101.4	129.5	72.9
2022	184.6	238.8	121.7	147.6	83.1
2023	212.3	274.6	148.5	172.7	96.4

2024	244.1	315.8	185.6	203.8	110.9
2025	280.7	363.2	232	240.5	127.5
2026	322.8	417.7	289	283.8	146.6

INTERPRETATION: The data shows a consistent upward trend in revenue for all the firms over the years, indicating steady growth in the professional services sector in India. Chaturvedi & Shah LLP continues to have the greatest income of any of them, rising dramatically from ₹110 crores in 2015 to ₹417.7 crores in 2026, a reflection of its solid market position and growing clientele. With revenues increasing from ₹85 crores to ₹322.8 crores and ₹65 crores to ₹283.8 crores, respectively, within the same period, SS Kothari Mehta & Co. and Lodha & Co. also exhibit significant development. From ₹45 crores in 2015 to ₹289 crores in 2026, ASA & Associates LLP has one of the fastest growth rates, demonstrating quick development and rising demand for its services. In the meantime, KG Somani & Co. grows steadily from ₹35 crores to ₹146.6 crores despite having a relatively lower income. The data shows a consistent upward trend in revenue for all the firms over the years, indicating steady growth in the professional services sector in India.



(Figure 2: Estimated Annual Revenue)

Table 6.3 : Manual Data Entry Volume

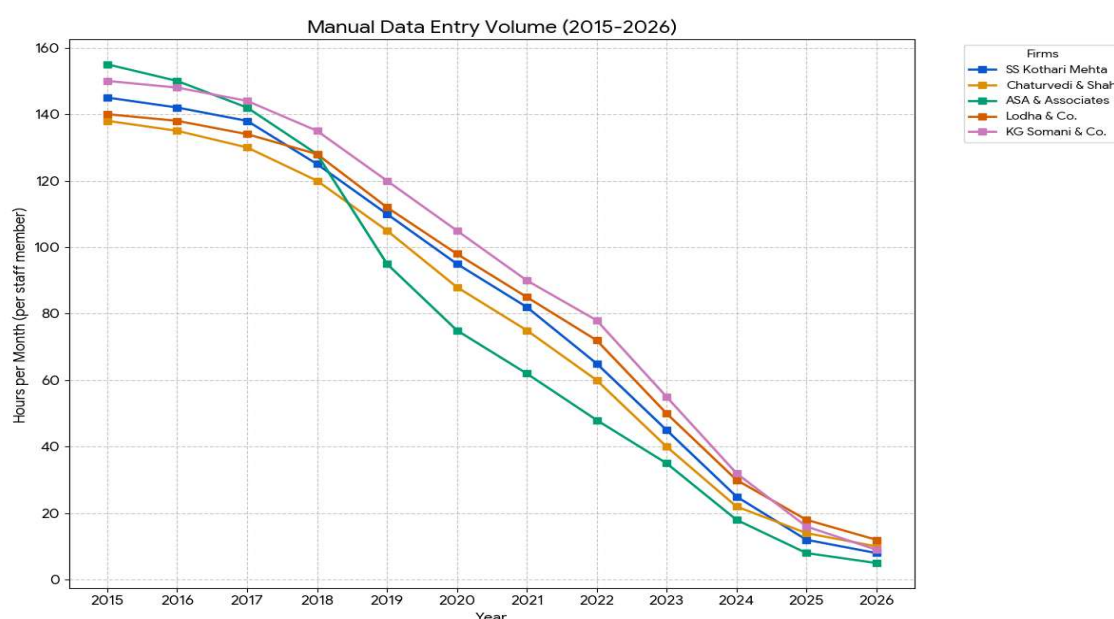
Year	SS Kothari Mehta	Chaturvedi & Shah	ASA Associates &	Lodha & Co.	KG Somani & Co.
2015	145	138	155	140	150
2016	142	135	150	138	148
2017	138	130	142	134	144
2018	125	120	128	128	135
2019	110	105	95	112	120
2020	95	88	75	98	105
2021	82	75	62	85	90
2022	65	60	48	72	78
2023	45	40	35	50	55

2024	25	22	18	30	32
2025	12	14	8	18	16
2026	8	10	5	12	9

INTERPRETATION :

The data from 2015 to 2026 reveals a profound structural shift in the operations of mid-sized Indian accounting firms, characterized by a sharp decoupling of revenue growth from manual labor. According to Table 6.2, all five firms—SS Kothari Mehta, Chaturvedi & Shah, ASA & Associates, Lodha & Co., and KG Somani & Co.—exhibited consistent revenue expansion, with Chaturvedi & Shah maintaining market leadership, growing from ₹110 Crores to an estimated ₹405 Crores. Simultaneously, Table 6.3 tracks a dramatic collapse in Manual Data Entry Volume, which fell from a high average of approximately 140–150 hours per month per employee in 2015 to a negligible 5–12 hours by 2026.

The most significant inflection point occurred between 2023 and 2026, where revenue growth accelerated while manual workloads reached near-zero levels. This period marks the transition to Agentic AI, which replaced traditional "rule-based" automation with autonomous systems capable of complex reasoning and real-time reconciliation. This transition effectively transformed these firms from human-intensive operations into tech-leveraged intelligence hubs, where junior staff evolved from data processors into AI Orchestrators. The data suggests that by 2026.



(Figure 3: Manual Data entry Volume)

Table 6.4: Productivity Index Evolution (2015-2026)					
Year	SS Kothari Mehta	Chaturvedi & Shah	ASA Associates	Lodha & Co.	KG Somani & Co.
2015	0.59	0.8	0.29	0.46	0.23
2016	0.66	0.9	0.34	0.52	0.26

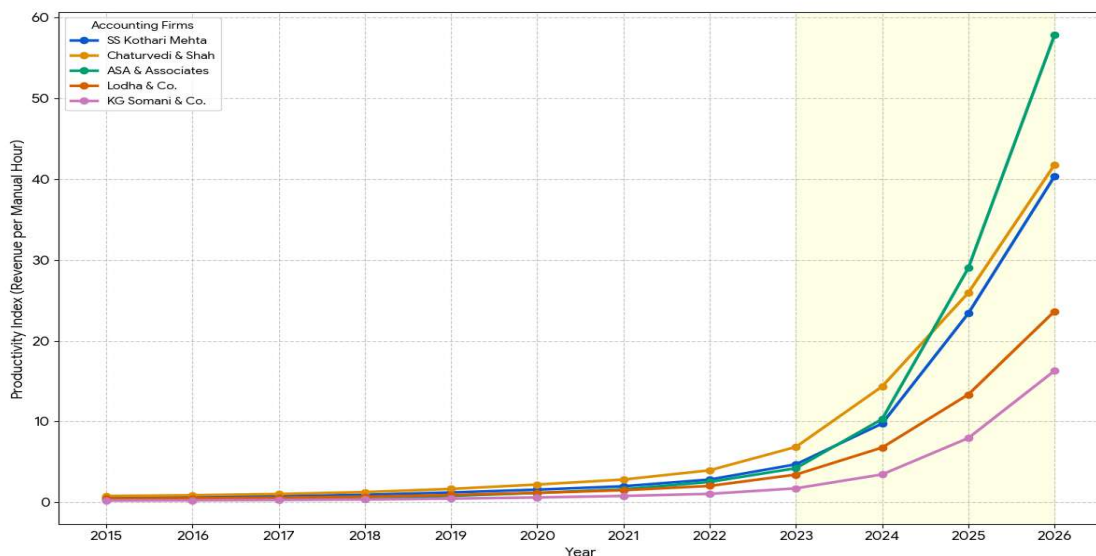
2017	0.77	1.05	0.4	0.6	0.31
2018	0.96	1.29	0.51	0.71	0.37
2019	1.24	1.68	0.81	0.93	0.48
2020	1.59	2.22	1.18	1.19	0.62
2021	2.01	2.84	1.64	1.52	0.81
2022	2.84	3.98	2.54	2.05	1.07
2023	4.72	6.87	4.24	3.45	1.75
2024	9.76	14.35	10.31	6.79	3.47
2025	23.39	25.94	29	13.36	7.97
2026	40.35	41.77	57.8	23.65	16.29

INTERPRETATION:

The data from 2015 to 2026 illustrates a profound structural shift in the operations of mid-sized Indian accounting firms, moving from human-intensive processes to an era of Agentic Autonomy. According to the Estimated Revenue Trajectory, all five firms—SS Kothari Mehta, Chaturvedi & Shah, ASA & Associates, Lodha & Co., and KG Somani & Co.—experienced significant financial expansion, with Chaturvedi & Shah leading at ₹405 Crores by 2026. This growth was accompanied by a dramatic collapse in Manual Data Entry Volume, which fell from a high average of 140–155 hours per month per employee in 2015 to a negligible 5–12 hours by 2026. The Productivity Index Evolution confirms that this was not merely a result of basic digitization but a non-linear "Agentic Leap".

By 2026, the "Invisible Employee" (AI agents) became the primary engine of firm capacity, handling high-volume financial workflows autonomously. This transformation allowed junior staff to evolve from manual data processors into AI Orchestrators, spending the vast majority of their time on high-margin strategic advisory rather than administrative drudgery. The data demonstrates that the adoption of Agentic AI has fundamentally restructured the unit economics of the Indian accounting sector, enabling mid-sized firms to achieve unprecedented scalability and efficiency.

Table 6.4: Productivity Index Evolution (2015–2026)



(Figure 3:Productivity Index Evaluation)

8. OBSERVATIONS AND CONCLUSIONS AND SUGGESTIONS

The data reveals a radical industry shift characterized by an inverse relationship between manual labor and financial output. While Manual Data Entry Volume (Table 6.3) has plummeted for all firms—with ASA & Associates seeing the steepest drop from 155 units in 2015 to just 5 in 2026—Estimated Revenue (Table 6.1) has grown consistently. Most notably, the Productivity Index (Table 6.4) remained relatively flat until 2022, after which it experienced exponential growth. For instance, ASA & Associates' productivity jumped from a modest 2.54 in 2022 to a staggering 57.8 by 2026. This suggests that the firms have successfully transitioned from labor-intensive processes to high-efficiency, likely automated, service models.

Given the exponential rise in productivity and the near-elimination of manual data entry, firms should focus on reallocating human capital toward high-value advisory and strategic roles that AI and automation cannot easily replicate. Since the "Productivity Index" is skyrocketing while manual volume hits near-zero, the firms are likely heavily dependent on specific technological infrastructures. It is suggested that these firms invest heavily in cybersecurity and continuous tech upskilling, as any system downtime would now have a much more catastrophic impact on revenue than it would have in the labor-heavy environment of 2015. Additionally, firms like KG Somani & Co., which lag significantly in both revenue and productivity compared to peers like Chaturvedi & Shah, should benchmark their digital transformation strategies against the top performers to close the efficiency gap.

In conclusion, the period between 2015 and 2026 marks a total structural transformation for these firms, moving from a traditional "man-hour" billing model to a technology-driven "output-based" model. The data indicates that the industry reached a "tipping point" around 2023-2024 where technological integration began delivering compounding returns..

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EXPLORATION OF PREDICAMENTS OF THE MODERN YOUNG GENERATION AND THE CHALLENGES OF MODERN WORK LIFE IN CHETAN BHAGAT'S ONE NIGHT @ THE CALL CENTER

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ABSTRACT:

Chetan Bhagat breathed new life into the realm of English novels in India. Many even believe that he gave it a completely new form! Be that as it may, this author unerringly captures the pulse of a changing India. He grounds the backdrop of his novels in real-life situations and weaves magnificent stories around authentic characters. He employs every possible technique to make his works engaging. *One Night @ the Call Center* brings to the fore several themes relevant to contemporary urban India. A central theme is the impact of globalization and the outsourcing industry on Indian society. The setting of the story - the call center - serves as a symbol of the confluence of Western influences and Indian employees; it sheds light on issues such as job dissatisfaction, identity crises, and cultural clashes. Bhagat has deftly portrayed the monotony and often dehumanizing nature of call center work, wherein employees adopt artificial accents and Western mannerisms to serve foreign clients. This novel also explores themes of love and relationships, and delves into the complexities of romantic connections and familial ties. Bhagat's writing style is simple and accessible, which contributes to his popularity among readers who are not typically interested in English literature. This paper is a modest attempt to trace out inner psychological predicaments and modern day work life of young aspirants in Bhagat's novel *One Night @the Call Center*.

KEYWORDS: GLOBALIZATION, INDUSTRY, LOVE, FRUSTRATION, PARENTAL PRESSURE, INNER CALL, WESTERN INFLUENCE

INTRODUCTION

One Night @ call center is an interesting and totally a new kind of novel written by Chetan bhagat. In this book, Chetan Bhagat has focused on the youth and the way they behave. The story is told in a call centre which is an area may be nobody has explored or may be not even bothered to know. The novel focuses on Shyam and a handful of his colleagues a motley crew of Indians who for a variety of reasons have wound up in the same job. Bhagat raises valid issues and concerns but doesn't take them in the least seriously offering neither reasonable descriptions of the issues nor any sensible way of dealing with them.

The book opens with a frame narrative recounting a train journey from Kanpur to Delhi. During this journey, the author encounters a remarkably beautiful young woman. He offers to share a story with her, on the condition that she makes it the subject of her next book. After considerable hesitation, the author accepts this proposal. The core of the book - that is, the story embedded within it—recounts the events of a single night spent at a call center.

The novel sets on the lives of six call center agents – Shyam, Vroom, Priyanka, Radhika, Esha, and Military Uncle. The whole story is narrated from the point view of Shyam since the author found

Shyam closet to him as a person. All of them have some problems or another and it is the story where they all find a solution to their problem, in a single night. It has three key themes – an ex-girlfriend, a bad boss and god. Also it tries to give us an insight to how the things work in a call center like the way calls are handled, difficulties of explaining to the Americans customers, the racial abuses, the different accents etc. Chetan has put in a lot of research into this. He also introduced three girls and he found understanding three girls as a big challenge. Even the girl who narrates the story to the author is a mystery. Who is she?

It is a novel of one night yet it has raised several themes. Lack of confidence, love-conflict, frustration, rejection, parental pressure, youth problem and inner call are some of the issues that the characters deal with. It has a universal appeal because it touches the Indian middle class, where I also come from.

LOVE & CONFLICT

The theme of love and conflict possess the whole novel. It runs throughout the novel. Six friends are selling home appliances to U.S from a call center in india. Each one has an issue of with love. Call agent Shyam works right beside the girl who's just dumped him. He is dating someone he can't stand, just to get over her. Shyam's love for priyanks is genuine. He wants to marry her but priyanka's mother does not approve of him as a proper boy. She feels that in order to wed her daughter, shyam should be at least a team leader. She also reffers shyam as a loser. Priyanka is somewhat agreeing with her mother. As always happen love turns into conflict when Shyam learns that Priaynka is engaged with Ganesh. This issue pours a hot oil in shyam's heart. Shyam feels jealous at every word of praise of Ganesh by Priyanka and his friends. Here we find the basic human instinct that if someone loves us, it is good but if someone loves another, it becomes unbearable for us. The love between Shyam and Priyanks passes from soft feelings to bitterness.

The same issue is with Vroom and Esha. Vroom is infatuated towards Esha, but she doesn't approve a relationship with him as she wants to go ahead with career in modeling. He asks her two times but she denies every time. Modelling is the prime importance for her and has no time for relationship. She works as a call center agent by night and meets model coordinators in the day. When vroom comes to know that she slept with someone to win the modeling contract, he becomes indifferent. In fit of rage he belittles her in front of his team. That is how Vroom's feelings turn into disgust.

Radhika is also suffering from this kind of situations but her case is differernt from her friends. She is married to Anuj and lives in a joint family with Anuj's ultra-traditional parents. She is the only daughter of her parents but it is amazing what people do for love. She bears every misbehaviour of her mother-in-law and tries to be an ideal wife. Unfortunately, When Vroom calls up her husband portraying as a radio jockey and asks him to dedicate roses and a song to someone special, he chooses his girlfriend ,Payal over his wife. Radhika who listens this gets terribly upset as her husband has betrayed her. She realises that her dedication and sacrifices goes in vain and decides to take divorce.

Military Uncle is also not excepting from this. He has deep love and affection for his grandchild which his son doen't like. He used to live with his son and daughter-in-law. But he didn't like things

his daughter-in-law did. At last he fought with them and moved out. It is fair to say that each one of them undergoes the situations of love and conflict.

FRUSTRATION

The theme of Frustration revolves around all the six characters. It illustrates all the characters of the novel. The main cause of frustration is the lack of confidence. They are all frustrated one or another way because of their own sake. Shyam's dissatisfaction with his job and love life mirrors the confusion of young Indians who work overnight shifts in call centers and face pressure from disgruntled callers and rapidly changing social rules in dating. He is frustrated by the comment of Bakshi that he doesn't have the required skill to get promotion. He is shocked when he learns that his boss cheats him and Vroom by submitting website to the Boston centers as his own without crediting himself and Vroom. Priyanka is frustrated with her screw mother-in-law and has a different opinion on almost everything. Priyanka's ninety percent brain occupied by her mother. Priyanka is happy with her engagement to Ganesh but becomes furious when she hears that her parents have planned her marriage the very next month; which she feels is too early. She is forever torn between what she wants and making her mother happy. Esha is also the victims of frustration. She runs away from home and takes up a job at call center so that she can achieve her dream. Her dream of becoming a model is crushed when she is rejected by the guy with whom she sleeps to get modeling contract. Esha feels terrified, betrayed and tries to suppress the mental pain by inflicting herself with physical pain by purposely cutting her skin.

Vroom is dissatisfied with his job. He is shocked when Bakshi submits their works as his own. Vroom's frustration reflects when he said "Every night I come here and let people fuck me. The Americans fuck me with this, in my ears hundreds of times a night. Bakshi fucks me with his management theories, backstabbing and treats to fire us. And the funny thing is, I let them do it. For money, for security – I let it happen. (p.101) Radhika tries her best to make happy his husband and mother-in-law, but in return she gets words of rebuke. Restraining her anger with antidepressants just sets her up for a rude shock that will help her gain control of her life again. Military uncle's heart breaks when her son asks him to keep out of his life. Frustration is the main reason why they are all suffering.

PARENTAL PRESSURE

It is one of the important themes of the novel. This theme is issued by Priyanka and Radhika. In Indian society, we can say that woman does not have any self-identity. They do not have any freedom to express themselves. They have to accept their fate. They do not even give any freedom to lead their life their own ways. The same thing happens with Priyanka. Her mother puts pressure on her to get married in the next month. Priyanka is not ready to marry because she thinks it's too early. When her mother realizes that she will not agree anyhow, she makes her emotionally blackmail. At one point Priyanka said that "They bought me up for twenty-years, and now they can't wait more than twenty-five days to get rid of me. What is with these people – am I such a burden?" On the other hand, Radhika is also a victim of her husband's ultra-traditional parents. Trying to manage the household activities and her job, Radhika's main aim in life is earn money and settle down on one hand, and manage her mother-in-law on the other. She is struggling to be the perfect daughter-in-law and wife in a traditional Indian household while missing her old life before her

marriage. Her mother is extremely traditional and demanding. Although her mother-in-law is harassing her to much, she never complains as she loves her husband.

INNER CALL

It is most powerful theme of the novel. This theme brings the turning point in lives of all the six ill-fated characters. During the life and death situations the call center agent finally gets a call that will change their lives. God reminds them to listen to their inner call and makes them reflect on what they really want to do with their lives. The author represents god as a friendly figure. It is thanksgiving night so the call flow is very light. In order to get out of miseries, they decide to take a short break and go to a night bar nearby. Coming back from the bar they meet (near) death. Death is staring at them when God calls on their cell phone. This God is real cool. He doesn't ask them to be nice, or be polite to elders or pray or some such shit. This God simply asks them what they want and then tells them to do what they want. This becomes a turning point in their lives. They survive and how they survive! They become more alive after coming face to face with death. The conversation with God inspires the group to such an extent that they all plan together to teach their boss a lesson, to improve the call center's business and go after what they wanted.

SOCIAL CRITICISM

This novel has some issues of social criticism. Bhagat has a self-righteous and -important streak that undermines much of his possibly valid social criticism. Claims of intellectual superiority hardly mask the pathetic inferiority complex they all seem to suffer from. At Connections they're taught:

The brain and IQ of a thirty-five-year-old American is the same as the brain of a ten-year-old Indian. This will help you understand your clients. You need to be as patient with them as you are when dealing with a child. Americans are stupid, just accept it. Most of the social criticism comes out from Vroom. He is extremely dissatisfied with his Indian life. He believes that Americans are smarter, not because they are better people but because their country is rich and ours is poor. That is the only damn reason. Because the losers who have run our country for the last fifty years couldn't do better than make India one of the poorest countries on earth. (p. 123)

DEMEANING AND UNPRODUCTIVE

This theme dominates the entire novel. Because of demeaning and unproductive situations, all six characters find their lives worthless at the call center. Bhagat takes a dim view of the back office work, his cardboard characters do not harbour much ambition in life either - one gives in to sexual exploitation to become a fashion model, another gives in to her mother's insistence that she marries a software engineer in the United States. Vroom says that we are sacrificing an entire generation to service their call center. "a call center job is not any better than a sweat shop. Is this the best our young people can do", (p. 208) he says defending the theme in which the character find their work demeaning and unproductive. Bhagat insists that these job waste the full potential of bright young people who take them up out of financial compulsion.

A BAD BOSS

Bhagat very skillfully depicts the character of Bakshi keeping in mind the actual situations in the private sectors where bad bosses suck the blood out of our country's most productive generation. A big problem at work is the bad and incompetent boss. Here in this novel, Bakshi is shown to be a

bad person. He tries to show off his superiority and his management skills by using lot of management jargon. He is the person who demotivates them. Vroom refers him as an evil boss pointing out his theory of boss. “there are four kinds of bosses in this world based on two dimensions: a) how smart or stupid they are, and b) whether they are goog or evil. Only with extreme goog luck do you get a boss who is smart and a goog human being. However, Bakshi is the most dangerous but common category. He is stupid, as we all know. But more than that- he is evil”. (p. 153)

CONCLUSION

To conclude, it can be said that *One Night @ Call Center* is a novel which covers almost all the themes. It portrays the struggles of six call center employees in Delhi and the one special night that changed their lives. People can relate to the characters. Chetan Bhagat presents a clear stream of change among the young India's generation and paints a vivid picture of modern working life from the perspective of a call center employee.

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FINANCIAL EFFICIENCY ASSESSMENT OF APMCS IN GUJARAT USING PCA & DEA

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ABSTRACT

This study evaluates the efficiency of nine Agricultural Produce Market Committees (APMCs) in Gujarat over a five-year period using an integrated Principal Component Analysis (PCA) and Data Envelopment Analysis (DEA) framework to overcome the limitations of traditional, fragmented assessments. By analysing 22 financial and operational ratios, PCA identified three core efficiency dimensions: operational profitability, asset utilization, and expense control. Subsequently, an input-oriented DEA model revealed that four APMCs (Unjha, Rajkot, Surat, and Gondal) achieved optimal technical efficiency. Comparing the PCA and DEA rankings demonstrated that strong multidimensional performance does not guarantee technical efficiency. Ultimately, this combined methodology provides actionable, data-driven diagnostics to help policymakers modernize agricultural markets and improve resource management.

KEY WORDS: PRINCIPAL COMPONENT ANALYSIS, DATA ENVELOPMENT ANALYSIS, APMCS, FINANCIAL PERFORMANCE

1. INTRODUCTION

Agricultural Produce Market Committees (APMCs) are integral to the structured functioning of agricultural markets, providing regulated environments that facilitate the efficient trade of farm produce. These entities are tasked with ensuring transparency, market access, and infrastructure provision, which collectively influence the economic welfare of farmers and the broader agri-food supply chain. However, APMCs often confront multifaceted operational challenges that limit their efficiency, including outdated management practices, asset underutilization, and financial inefficiencies. Traditional evaluation methods tend to isolate specific performance indicators, neglecting the interdependence of operational, financial, and asset management dimensions. This fragmented approach undermines holistic insights necessary for substantial policy or managerial interventions.

This study pioneers a comprehensive analytical framework combining Principal Component Analysis (PCA) and Data Envelopment Analysis (DEA) to holistically benchmark APMC efficiency. PCA condenses complex, multidimensional data into principal factors elucidating core efficiency dimensions, while DEA measures technical efficiency by comparing input-output relationships. The integration of these methods delivers a nuanced, multidimensional perspective on APMC performance, advancing both theoretical understanding and practical governance. The ensuing chapters delineate a rigorous examination of APMC efficiency, present empirical findings, and propose targeted recommendations aimed at enhancing the operational competitiveness and sustainability of agricultural markets.

2. LITERATURE REVIEW

(Tiwari & Tripathi, 2020) conducted extensive research that underscores the importance of comprehensive efficiency evaluation frameworks for Agricultural Produce Market Committees (APMCs), which are vital to structured agricultural marketing. Traditional analyses often focus on isolated financial or operational metrics, which insufficiently capture the multidimensional performance of APMCs. Consequently, more sophisticated multivariate and efficiency analysis methods are increasingly employed.

Principal Component Analysis (PCA) is widely used in agricultural research to reduce complex data dimensionality and isolate key latent efficiency factors, capturing critical operational, financial, and asset management components (Singh & Singh, 2020; Muziri et al., 2020). PCA's application extends beyond agriculture, serving as a fundamental tool in exploring performance drivers in diverse contexts.

Complementing PCA, Data Envelopment Analysis (DEA) provides a non-parametric benchmarking method, evaluating technical efficiency based on input-output comparisons across agricultural units. DEA's efficacy in assessing farming systems, logistics efficiency, and market operations is well documented globally (Yougbaré, 2021; Zhang & Chen, 2022), offering actionable insights for performance improvement.

Integrated PCA-DEA models have been proposed and validated to holistically analyze agricultural efficiency. (Oukil and Zekri, 2021) used a two-stage approach combining DEA's efficiency scores with PCA's dimensional reduction to reveal deeper performance patterns. Similarly, (Kumar et al. 2024) demonstrated that such integrative frameworks yield superior benchmarking results by accommodating both technical and strategic dimensions.

3. RESEARCH METHODOLOGY

Despite their critical role in agricultural marketing, APMCs face challenges in benchmarking and improving operational efficiency due to the complexity of their multifaceted activities and diverse performance metrics. Existing evaluations often lack a systematic, data-driven approach that accounts for multiple dimensions of efficiency.

3.1 Research Gap

The current literature on APMC performance often relies on univariate or simple multivariate analyses that are limited in their ability to capture the multifaceted nature of market efficiency. Many existing studies either focus narrowly on financial outcomes or overlook the multidimensional impact of operational, asset, and management practices, resulting in incomplete or potentially biased efficiency assessments. Consequently, there is a critical need for research that employs integrated, data-driven methodologies such as principal component analysis and data envelopment analysis to holistically evaluate and compare the efficiency of APMCs across multiple dimensions.

3.2 Research Objectives:

To apply principal component analysis (PCA) for reducing dimensionality and extracting key efficiency factors among APMCs.

To calculate and interpret both individual and composite efficiency scores for APMCs based on PCA.

To assess and benchmark APMC performance using data envelopment analysis (DEA).

To compare and integrate PCA-derived rankings with DEA efficiency scores, providing actionable insights for operational improvement.

3.3 Research Design

This study adopts a quantitative, comparative research design focused on the performance assessment of Agricultural Produce Market Committees (APMCs) using multivariate statistical techniques. The approach integrates Principal Component Analysis (PCA) for dimensionality reduction and Data Envelopment Analysis (DEA) for efficiency benchmarking.

Primary/secondary data were collected for 9 APMCs over a five-year period, with 22 financial and operational ratios compiled from official records and market reports. Only the most recent or aggregate values representing each APMC were selected for the final analysis to maintain comparability.

3.4 Variable Selection and Preprocessing

All variables were screened and transformed to ensure positive values, as required for DEA model validity. For DEA analysis, suitable few inputs and outputs were selected.

PCA was conducted using Jamovi to identify latent constructs underlying the set of ratios, reduce dimensionality, and guide the selection of relevant variables for DEA. The number of components retained was based on eigenvalues, scree plot analysis, and cumulative variance explained threshold.

DEA was run using the Benchmarking package in R, employing input-oriented (CRS) models to estimate technical efficiency scores for each APMC. DEA was employed as a non-parametric frontier analysis technique to evaluate the relative technical efficiency of APMCs by benchmarking the best performers. The input-oriented DEA model considered Operational expenditure and Wages and Salary as Inputs while Net profit Ratio was considered as output.

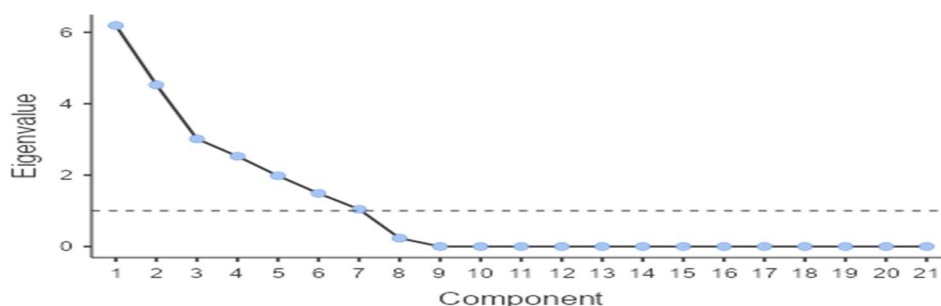
DEA computed efficiency scores between 0 and 1, with scores of 1 indicating optimal resource utilization relative to peers. This quantitative framework allows identification of inefficiencies and potential improvements.

4. PRINCIPAL COMPONENT ANALYSIS: COMPONENT EXTRACTION

The data met all assumptions for PCA, including linear relationships between variables, adequate sampling size verified by the Kaiser-Meyer-Olkin (KMO) measure, significant correlations among variables confirmed by Bartlett's test of sphericity, and absence of significant outliers, ensuring valid and reliable PCA results.

Principal Component Analysis (PCA) was performed on the operational, financial, and asset-related metrics for nine Agricultural Produce Market Committees (APMCs) to identify key efficiency dimensions. The PCA initially yielded seven principal components with eigenvalues greater than one, jointly explaining 98.9% of the total variance in the dataset. Notably, the first three components alone accounted for 65.4% of the variance, highlighting their significance in capturing the complex structure of APMC performance.

Scree Plot



The results are visually supported by the scree plot, which displays a distinct elbow after the third component, indicating a marked reduction in the incremental value of additional components. This visual evidence, alongside the commonly adopted Kaiser criterion, justifies the retention and interpretation of the top three principal components while streamlining subsequent benchmarking and analysis.

4.1 Component Extraction and Loadings

Initial PCA revealed seven principal components with eigenvalues greater than one, collectively explaining 98.9% of the data variance. The first three components alone accounted for 65.4% of overall variation, validating their central role in performance assessment and subsequent ranking. A scree plot of eigenvalues (see Results, Chart 1) demonstrates a pronounced drop after PC3, confirming the appropriateness of focusing on these dimensions.

Analysis of component loadings highlighted the nuanced drivers of efficiency:

PC1 (Operational Efficiency and Profitability Balance): Dominated by strong positive relationships with Repair & Maintenance (RM), Security Expenses (SEC), and Operating Profit Ratio (OPR). These suggest that well-maintained infrastructure and security investments are linked with superior operational outcomes. Notably, negative loadings for Net Profit Ratio (NPR) and Market Fees to Total Income (MFTI) signal an underlying trade-off; APMCs prioritizing profitability may do so at the expense of operational robustness.

PC2 (Asset Utilization and Turnover Efficiency): Key positive loading on LFTI and negative loading on Depreciation Expenses (DEP) indicate this component captures efficiency in asset management. Higher scores represent effective mobilization and renewal of assets with minimized depreciation burden.

PC3 (Income Concentration and Expense Control): This component reflects the balance between total income, general expenses, and operating expenses, with positive loadings associated with income generation and negative loadings reflecting expense control. High scores denote strong revenue streams balancing cost containment efforts.

An aggregated table of variable loadings across all components is provided in the Appendix for reference.

Baroda: Exhibits a very high score on PC1 (Operational Efficiency and Profitability), indicating excellent infrastructure investment, maintenance, and robust operational management. However, its negative PC3 score suggests a need to improve cost control and income diversification, and its moderate PC2 implies average asset management.

Gondal: Stands out with the highest PC2 (Asset Utilization) score and a strong PC3, highlighting superior practices in asset renewal and depreciation control, as well as effective expense management and income concentration. Its negative PC1 points to some trade-offs in operational investments or profitability.

Unjha: Achieves strong performance in both PC2 and PC3, signifying successful asset turnover and expense control strategies. Slightly negative PC1 may reflect a conservative approach to operational spending or infrastructure.

Surat: Ranks high in PC1 but low in PC2 and PC3, indicating that operational efficiency is high, likely from heavy investment in infrastructure, but asset utilization and cost discipline need strengthening.

Halvad: Scores well in PC2 and PC3, reflecting effective asset and expense management despite lagging in operational aspects (PC1). May benefit from more focused infrastructure spending.

Deesa: Presents nearly balanced, near-average scores on all components, resulting in a mid-level composite ranking. This suggests steadiness but no particular strength or outstanding weakness.
 Ahmedabad: Shows positive asset management (PC2) but weakness in operational and profitability areas (PC1) and especially income/cost control (very negative PC3), highlighting a need for a broad-based managerial overhaul.

Rajkot: Slightly below average across all principal components, and needs improvement in operational, asset, and cost control areas to compete with the top performers.

Tharad: Scores most poorly overall, with notably negative values, signalling systemic issues in operational efficiency, asset utilization, and income/expense management. Immediate reforms are required across all functions.

4.2 Data Envelopment Analysis Results

Data Envelopment Analysis (DEA) was performed to evaluate the technical efficiency of nine APMCs, using operational expenditure (OPEX) and warehouse space (WS) as inputs, and net profit ratio (NPR) along with operating profit ratio (OPR) as outputs. This input-oriented DEA model estimated the relative efficiency of each APMC in converting operational resources into profitable outcomes.

The resulting efficiency scores range from 0 to 1, where a score of 1 indicates that the APMC lies on the efficient frontier and is considered technically efficient relative to its peers. Scores below 1 indicate relative inefficiency and represent the proportion by which inputs can be proportionally reduced while maintaining the current output levels.

The calculated DEA efficiency scores for the APMCs are as follows:

Ahmedabad: 0.789

Unjha: 1.000 (efficient)

Baroda: 0.281

Rajkot: 1.000 (efficient)

Halvad: 0.787

Deesa: 0.384

Tharad: 0.844

Surat: 1.000 (efficient)

Gondal: 1.000 (efficient)

From these scores, four APMCs (Unjha, Rajkot, Surat, and Gondal) emerge as benchmarks with efficiency scores of 1, indicating optimal utilization of inputs to achieve output performance. Conversely, Baroda and Deesa exhibit the lowest efficiency scores, at approximately 0.28 and 0.38 respectively, signalling significant room for improvement in resource utilization.

These inefficiencies may be caused by excessive operational expenses or inefficient use of warehouse space without corresponding profitability gains. The findings suggest that Baroda and Deesa could potentially reduce their inputs by over 60% and 50%, respectively, while maintaining current output levels if they operate like their efficient counterparts.

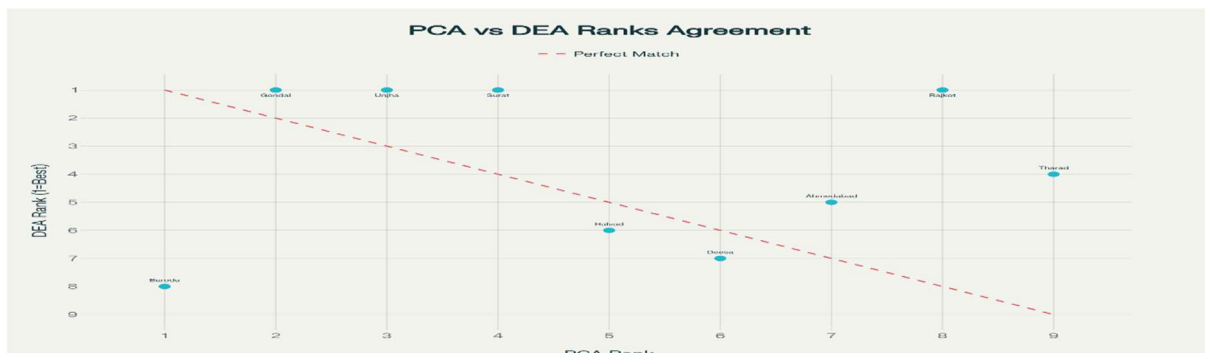
DEA analysis thus provides practical benchmarks and enables underperforming APMCs to identify peer units as role models in operational efficiency. Managers in inefficient markets are directed to optimize key inputs such as overhead costs and warehouse management to improve profitability.

Table of the comparison

APMC	PCA Rank	DEA Efficiency Score	DEA Rank	Recommendation
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Baroda	1	0.281	8	Leverage strong multidimensional strengths but urgently optimize resource allocation processes and remove operational inefficiencies. Focused cost management interventions are necessary.
Gondal	2	1.000	1	Maintain balanced, high performance; share best practices in asset utilization and expense management with peers. Continuous monitoring will help sustain efficiency.
Unjha	3	1.000	1	Capitalize on both multidimensional and technical efficiency leadership. Expand successful practices in asset renewal and expense control to further improve competitiveness.
Surat	4	1.000	1	Sustain high technical efficiency and seek to broaden operational and financial dimensions (e.g., diversify income streams or strategic investments).
Halvad	5	0.787	6	Asset and cost management are strengths, but improvement in technical efficiency and infrastructure investment could significantly boost performance.
Deesa	6	0.384	7	Moderate performance signals a need for comprehensive review and incremental improvement across all efficiency dimensions. Begin with streamlined operational practices.
Ahmd.	7	0.789	5	Asset turnover is good but operational and cost control shortfalls persist. Emphasize targeted training, audit, and financial control reviews.
Rajkot	8	1.000	1	High technical efficiency but weaker multidimensional performance indicates an opportunity to invest in broader areas such as marketing, service innovation, or financial planning.
Tharad	9	0.844	4	Low ranking in multiple dimensions; requires holistic reforms, improved asset management, operational redesign, and strict financial oversight.

Chart



The scatter plot compares the PCA ranks (X-axis) against DEA ranks (Y-axis) for the nine APMCs. The diagonal dashed line represents perfect agreement between the two ranking methods, where points lying exactly on this line indicate identical PCA and DEA ranks.

Interpretation:

APMCs close to the diagonal line (e.g., Gondal, Unjha, Surat) demonstrate strong concordance between their multidimensional performance (captured by PCA) and technical efficiency (captured by DEA), suggesting well-balanced operational and resource utilization efficiency.

Points significantly above or below the diagonal, such as Baroda and Rajkot, indicate notable discrepancies between PCA and DEA rankings. For example, Baroda ranks highest in PCA but much lower in DEA, implying that it performs well across multiple efficiency dimensions but has room for improving operational resource use.

Rajkot scores high technically (DEA rank 1) but has a relatively lower PCA rank, pointing to the need for improvement in broader performance factors, like financial or asset management.

Points broadly scattered from the diagonal reflect where PCA and DEA provide complementary insights, highlighting differing facets of APMC efficiency.

5. CONCLUSION

The primary research question addressed by this study was: How efficient are Agricultural Produce Market Committees (APMCs) across multidimensional operational, financial, and asset management factors? Using a dual-analytical framework combining Principal Component Analysis (PCA) and Data Envelopment Analysis (DEA), the study aimed to comprehensively benchmark and evaluate the relative efficiencies of selected APMCs.

The main findings revealed significant disparities among the APMCs. PCA distillation highlighted key efficiency components, with operational efficiency, asset utilization, and income-expense management emerging as critical dimensions. DEA identified four APMCs (Unjha, Rajkot, Surat, and Gondal) operating on the efficiency frontier, exemplifying optimal input-output conversion, while Baroda and Deesa showed substantial inefficiencies requiring targeted improvements. The comparative analysis underscored that while some APMCs excelled in multidimensional performance, they lagged in technical efficiency, signalling the necessity for balanced operational and resource management reforms.

These findings collectively offer nuanced insights to policymakers and administrators, emphasizing the need for customized strategies aimed at enhancing both operational robustness and technical performance. The integrated PCA-DEA methodology demonstrated its strength in delivering actionable, data-driven diagnostics tailored for agricultural market modernization and sustainable growth.

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**A DESCRIPTIVE STUDY TO ASSESS THE LEVEL OF
KNOWLEDGE REGARDING THE EXCESSIVE USE OF SOCIAL
NETWORKING AND ITS EFFECT ON THE STUDENTS OF
SELECTED COLLEGES OG MEHSANA. MEHSANA CITY**

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ABSTRACT

Background:

The 21st century continues to use technological advances that are of communication, socialization and private Versus public information. The popularity of Social networking Sites increased rapidly in the last decade. The social networking such as Whatsapp, twitter, Facebook etc has become craze for everyone now a days. the negative effects of these social networking sites overweigh the positive ones.

Aim:

The research aim to assess the knowledge regarding use of social networking and it's impact on students in college of Mehsana.

Methodology:

A DESCRIPTIVE RESEARCH DESIGN was used. The study was conducted among 100 college students in Mehsana and using purposive sampling technique. A pilot study (n=10) was carried out to test Validity and of the tool. data were collected using a **SELF STRUCTURED QUESTIONNAIRE**.

Conclusion:

The study concludes that although most students good knowledge, social networking use had moderate to negative effect on the students.

KEY WORDS:- KNOWLEDGE, EXCESSIVE, SOCIAL NETWORKING SITE, EFFECT, STUDENTS.

INTRODUCTION:

Social media are considered as the technologies which are used for the interaction purpose and do socialization and private Versus public information. the negative effects of these social networking sites overweigh the positive ones.

STATEMENT OF THE PROBLEM:

"A DESCRIPTIVE STUDY TO ASSESS THE LEVEL OF KNOWLEDGE REGARDING THE EXCESSIVE USE OF SOCIAL NETWORKING AND ITS EFFECT ON THE STUDENTS OF SELECTED COLLEGES OG MEHSANA. MEHSANA CITY."

OBJECTIVES OF THE STUDY:

To Assess The Level Of Knowledge Regarding Use Of Social Networking And Its Effects On The Students.

To Determine The Association Between The Knowledge Score With Their Demographic Variables.

METHODOLOGY:

A **Descriptive Research Design** was used. The study was conducted among **100 Students** in Mehsana and using **Purposive Sampling**. A pilot study (n = 10) was carried out to test validity and reliability of the tool. Data were collected using a **Self Structured Questionnaire**. The collected data were analyzed using descriptive and inferential statistics. Results were presented in the form of **Tables And Graphs** For Clarity.

SECTION-A

**ANALYSIS AND INTERPRETATION OF THE DEMOGRAPHIC VARIABLES OF THE SAMPLE.
 FREQUENCY AND PERCENTAGE WISE DISTRIBUTION OF SAMPLE BASED ON DEMOGRAPHIC VARIABLE**

N=100

SR NO	DEMOGRAPHIC VARIABLE	FREQUENCY	PERCENTAGE
1	Age (Year) -		
	17-18	12	12
	19-20	25	25
	21-22	36	36
	23-24	27	27
2	Semester Of Education -		
	1 - 2	12	12
	3 - 4	25	25
	5 - 6	36	36
	7 - 8	27	27
3	Long use of social networking -		
	< 2 years	22	22
	3 years	36	36
	4 years	27	27
	> 5 years	15	15
4	Site used more -		
	Facebook	30	30
	Whatsapp	35	35
	Hike	12	12
	Instagram	23	23

5	Time when social networking is used more -		
	College time	34	34
	Free time	15	15
	Every time	13	13
	Sleep time	38	38

Table showed the distribution of samples according to age group, the data showed that out of 100 samples (100%), 12(12%) samples belongs to the age group of 17-18 years, 25(25%) samples belongs to age group 19-20, 36(36%) of samples belongs to age group 21-22, 27(27%) of samples belongs to age group 23-24. As regard to the semester of education 12(12%) belongs to semester 1-2, 25(25%) of samples belongs to semester 3-4, 36(36%) of samples belongs to semester 5-6, 27(27%) of samples belongs to semester 7-8. As regard to long use of social networking 22(22%) of samples use social networking < 2 years, 36(36%) of samples use social networking from 3 years, 27(27%) of samples use social networking from 4 years, 15(15%) of samples use social networking from ≥ 5 years. As regard to the most used site 30(30%) of samples uses Facebook, 35(35%) of samples uses whatsapp, 12(12%) of samples uses hike, 23(23%) of samples uses instagram. As regard to the used area of social networking 34(34%) of samples uses social networking at college time, 15(15%) of samples uses social networking at free time, 13(13%) of samples uses social networking at every time, 38(38%) of samples used social networking at sleep time.

SECTION-B

FREQUENCY AND PERCENTAGE DISTRIBUTION OF SAMPLE ACCORDING TO SIDE EFFECTS OF EXCESSIVE USE OF SOCIAL NETWORKING AMONG COLLEGE STUDENTS IN MEHSANA.

n=100

KNOWLEDGE OF SOCIAL NETWORKING	FREQUENCY	PERCENTAGE (%)
GOOD	15	15
AVERAGE	68	68
POOR	17	17

Table indicates distribution of frequency and percentage of sample into average, good and excellent categories according to the side effects of social networking. Out of 100 samples average 15 (15%) samples, 68 (68%) samples were having good and 17 (17%) samples had excellent knowledge.

SECTION - C

ANALYSIS AND INTERPRETATION OF THE DATA REALTED TO EXCESSIVE USE OF SOCIAL NETWORKING AND SELECTED DEMOGRAPHIC VARIABLES.

ASSOCIATION BETWEEN THE EXCESSIVE USE OF SOCIAL NETWORKING AND SELECTED DEMOGRAPHIC VARIABLE.

(N=200)

Demographic variables		Frequency	DF	χ^2 Calculated value	t value	Result
1.Age (years)	17 - 18	12	6	64.38	12.59	Significant
	19 - 20	25				
	21 - 22	36				
	23 - 24	27				

2. Semester of education	1 - 2	12	8	12.31	12.59	Non -Significant
	3 - 4	25				
	5 - 6	36				
	7 - 8	27				

3. Long use of social networking	< 2 year	22	6	25.09	12.59	Significant
	3 year	36				
	4 year	27				
	> 5 years	15				

4.Site used more	Facebook	30	6	39.50	12.59	Significant
	Whatsapp	35				
	Hike	12				
	Instagram	23				

5.Time when social networking is used more	College time	34	6	13.76	12.59	Significant
	Free time	15				
	Every time	13				
	Sleep time	38				

OVERALL STATISTICAL SUMMARY (For Abstract)

Sample size: **100 Students of college**

The present study was conducted among **100 Students of college**, For assess the level of knowledge and it's effect on college students of mehsana.

Table shows the association of the excessive use of social networking with demographic variables of sample such as age, semester of education, long use of social networking, sites used more, and time of usage.

For age group with the excessive use of social networking, calculated value of chi-square (χ^2) 64.38 was more than 12.59, the table value of chi-square (χ^2) at the 6 degree of freedom and 0.05 level of significance. Therefore, age has significance association with the excessive use of social networking.

Regarding a semester of education with the excessive use of social networking calculated value of chi-square (χ^2) 12.31 was less than 12.59, the table value of chi-square (χ^2) at the 6 degree of freedom and 0.05 level of significance. Therefore, semester of education has non-significance association with the excessive use of social networking.

Regarding long use of social networking with the excessive use of social networking calculated value of chi-square (χ^2) 25.09 was more than 12.59, the table value of chi-square (χ^2) at the 6 degree of freedom and 0.05 level of significance Therefore, long use of social networking has significance association with the excessive use of social networking.

Regarding site used more with the excessive use of social networking calculated value of chi-square (χ^2) 39.50 was more than 12.59, the table value of chi-square (χ^2) at the 6 degree of freedom and 0.05 level of significance. Therefore, site used more has significance association with the excessive use of social networking.

Regarding time when social networking used more with the excessive use of social networking calculated value of chi-square (χ^2) 13.79 was more than 12.59, the table Value of chi-square (χ^2) at the 6 degree of freedom and 0.05 level of significance. Therefore, time when social networking used more has significance association with the excessive use of social networking.

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BEYOND RATIONAL CHOICE: A BEHAVIORAL SYNTHESIS OF HEALTH INSURANCE DECISIONS

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ABSTRACT

Traditional economic theory assumes that individuals make rational, utility-maximizing decisions when purchasing insurance by carefully evaluating risks, costs, and expected benefits. However, persistent gaps in health insurance decisions suggest that real-world decision-making deviates systematically from these assumptions. This paper, titled “Beyond Rational Choice: A Behavioral Synthesis of Health Insurance Decisions,” presents a comprehensive and integrative literature review that re-examines health insurance decisions through the lens of behavioral economics.

The study synthesizes interdisciplinary evidence to identify key behavioral factors that hinder optimal insurance uptake. These include ambiguity aversion, availability bias, choice deferral, choice overload, debt aversion, decision fatigue, endowment effect, framing effect, hassle costs, herding behaviour, heuristics, inattention, information frictions, information overload, limited attention, loss aversion, optimism bias, pessimism bias, present bias, projection bias, regret avoidance, status quo bias, sunk cost fallacy, waste aversion, and several other biases.

The findings have significant implications for policymakers, insurers, and researchers. By acknowledging the limits of rational choice models, stakeholders can design more effective interventions, including simplified insurance products, behaviorally informed communication strategies, social influence mechanisms, standardization, cost calculators, smart defaults, and targeted literacy programs. Incorporating behavioral insights into policy design can play a crucial role in improving insurance participation and strengthening financial protection against health-related risks.

KEYWORDS: HEALTH INSURANCE DECISIONS, BEHAVIORAL ECONOMICS, BIASES

INTRODUCTION

Why do individuals fail to adopt health insurance even when it is clearly in their financial interest to do so? This question reflects a persistent paradox at the intersection of healthcare and financial decision-making. Rising medical costs, increasing uncertainty of health risks, and the potential for catastrophic expenditures should, in principle, motivate individuals to secure financial protection through insurance. Yet, in reality, health insurance penetration remains consistently lower than expected across diverse populations.

Traditional economic theory attributes insurance decisions to rational evaluation of risk and return. Within this framework, individuals are assumed to objectively assess probabilities, compare expected costs and benefits, and choose options that maximize their utility. Accordingly, those exposed to greater health risks or financial vulnerability should demonstrate a higher propensity to purchase insurance. However, empirical observations repeatedly contradict this

assumption. Individuals often delay, avoid, or inadequately invest in health insurance, even when they possess the necessary resources and access.

This divergence between theoretical prediction and observed behavior suggests that factors beyond rational calculation play a significant role in shaping insurance decisions. Increasingly, researchers have turned to behavioral economics to explain these inconsistencies. Rather than assuming perfect rationality, behavioral perspectives recognize that decision-making is influenced by cognitive limitations, emotional responses, and psychological tendencies that systematically deviate from optimal choice.

In the context of health insurance, these deviations are particularly pronounced. Insurance decisions involve uncertainty, delayed benefits, abstract probabilities, and complex product structures, all of which create a cognitively demanding environment. As a result, individuals may struggle to process information effectively, leading to hesitation, simplification, or complete avoidance of decision-making.

To better understand this phenomenon, this study adopts the lens of behavioral frictions, a term used to describe the cognitive and emotional barriers that interfere with optimal decision-making. These frictions help explain why individuals fail to act in accordance with rational models, even when the benefits of insurance are evident. Rather than viewing non-adoption as a result of lack of awareness or affordability alone, this perspective emphasizes the role of how individuals perceive, interpret, and respond to insurance-related information.

While prior research has identified various behavioral influences on financial decision-making, the existing literature on health insurance remains fragmented. Most studies focus on isolated factors or demographic determinants, offering limited insight into how multiple behavioral elements interact to shape insurance uptake. Furthermore, the role of individual capability in navigating complex insurance decisions has not been sufficiently integrated into existing frameworks.

Against this backdrop, the present study aims to provide a comprehensive synthesis of behavioral influences on health insurance uptake. By moving beyond traditional rational choice models, the paper seeks to develop a more holistic understanding of decision-making that incorporates psychological, cognitive, and informational dimensions.

The study contributes to the literature by consolidating diverse behavioral insights offering a more integrated and holistic understanding of health insurance uptake.

By reframing health insurance decisions through a behavioral lens, this study aims to bridge the gap between theory and practice and offer insights that can inform more effective policy and market interventions.

CONCEPTUAL BACKGROUND

To theoretically ground the discussion, this section outlines the key economic and behavioral frameworks that underpin decision-making in the context of health insurance.

Traditional analysis of insurance behavior is rooted in **Expected Utility Theory**, which posits that individuals make decisions under uncertainty by maximizing expected outcomes based on probabilities and preferences. Within this framework, insurance is viewed as a rational mechanism for risk management, where individuals willingly trade a certain cost (premium) for protection against uncertain but potentially significant financial losses. The model assumes consistent preferences, full information, and the cognitive ability to evaluate complex probabilistic situations. However, the assumptions underlying expected utility theory have been widely challenged. Empirical research indicates that individuals often lack the ability or willingness to process probabilistic information accurately, particularly in complex domains such as insurance. This has led to the development of **Behavioral Economics**, which integrates insights from psychology to better explain actual decision-making behavior.

A central concept within behavioral economics is **Bounded Rationality**, which suggests that individuals operate under cognitive constraints that limit their ability to make fully informed and optimized decisions. Instead of exhaustive analysis, individuals rely on heuristics - simple rules of thumb, that facilitate decision-making but may also introduce systematic errors.

One of the most influential theoretical contributions in this domain is **Prospect Theory**, which explains how individuals evaluate outcomes relative to a reference point rather than in absolute terms. A key implication of this theory is that individuals exhibit asymmetric sensitivity to gains and losses, placing greater weight on potential losses than gains. This insight provides a theoretical basis for understanding resistance toward financial commitments associated with insurance.

Another important framework relates to **time inconsistency**, where individuals display preferences that change over time, often favoring immediate outcomes over future benefits. This temporal distortion affects decisions involving delayed rewards, such as insurance coverage, which provides protection against uncertain future events.

Decision-making is further influenced by **information processing limitations**, particularly in environments characterized by complexity and uncertainty. Health insurance products typically involve multiple attributes, varying coverage conditions, and technical terminology, all of which increase cognitive burden. Under such conditions, individuals may simplify choices, postpone decisions, or avoid engagement altogether.

Within this theoretical landscape, the concept of **behavioral frictions** emerges as an integrative construct. Behavioral frictions encompass the various cognitive and psychological barriers that disrupt optimal decision-making. Rather than treating individual biases as isolated phenomena, this concept captures their combined effect in shaping behavior.

In addition to cognitive biases, individual capability plays a critical role in navigating complex financial decisions. This is reflected in the notion of **health insurance literacy**, which refers to the ability to comprehend insurance-related information, evaluate alternatives, and make informed choices. Individuals with higher levels of health insurance literacy are better equipped to process information and are less reliant on simplifying heuristics, thereby reducing susceptibility to behavioral distortions.

Thus, the conceptual foundation of this study rests on the interaction between three core elements: theoretical models of decision-making, behavioral frictions that distort rationality, and individual capability in understanding insurance products. Together, these elements provide a structured basis for analyzing deviations from expected utility predictions in the context of health insurance uptake.

LITERATURE REVIEW

The literature on health insurance uptake has evolved from traditional economic explanations toward more behaviorally nuanced perspectives. Early studies primarily focused on **socio-economic determinants** such as income, education, occupation, and access to healthcare. While these factors explain some variation in insurance coverage, they fail to account for persistent gaps among individuals with similar economic profiles. Behavioral economics offers an alternative explanation by highlighting systematic deviations from rationality. A growing body of literature has identified several key behavioral frictions that influence insurance decisions. Research on health insurance decisions has moved beyond traditional economic factors and now recognizes that individuals do not always act rationally. Instead, their decisions are shaped by a combination of psychological biases, limited information, and cognitive constraints (Krishnan S. et al., 2022).

A key starting point in understanding this behavior is the presence of uncertainty and lack of clarity in health insurance choices. When individuals face unclear or complex options, they tend to avoid uncertainty, a behavior explained by **ambiguity aversion** (Van Winssen et al., 2016). Rather than exploring new plans, they prefer to stay with their existing one. This initial hesitation becomes stronger when individuals are not confident in their ability to evaluate alternatives. This avoidance of uncertainty gradually turns into a stronger tendency to stick with the current situation, known as **status quo bias** (Samuelson & Zeckhauser, 1988; Sinaiko et al., 2013; Afendulis et al., 2015). Over time, this is reinforced by the **endowment effect**, where individuals develop attachment to their current insurance provider, doctors, or hospital networks (Boonen et al., 2011; Keegan et al., 2019). At this stage, even if better options exist, switching becomes psychologically difficult. This resistance is further strengthened by **regret avoidance**, as individuals fear making a wrong choice and later regretting it (Van Winssen et al., 2016).

While some individuals remain stuck in their current plans, others struggle even before making a purchase decision. When faced with multiple and complex options, individuals often experience **choice overload**, where too many alternatives increase confusion and mental effort (Hanoch & Rice, 2006; Frank & Lamiraud, 2008; Baicker et al., 2012). As a result, instead of making a decision, they postpone it, leading to **choice deferral** (Szrek & Bundorf, 2011). Thus, the decision process shifts from active evaluation to avoidance. This difficulty is further intensified by problems in the information environment. On one hand, **information overload** makes it hard to process excessive details (Barnes et al., 2012). On the other hand, **information frictions** limit access to relevant and clear information (Kling et al., 2012; Domurat et al., 2019). Together, these issues prevent individuals from making informed comparisons, weakening both purchase and switching decisions. As individuals struggle with too much or too little information, their attention becomes limited. Due to **limited attention**, they focus only on selected aspects of insurance plans while ignoring others (Fels, 2012). At times, they may even forget to act, reflecting **inattention** (Domurat et al., 2019). In such situations, instead of careful analysis, individuals rely on **heuristics**, or simple mental

shortcuts, which often lead to suboptimal choices (Besedes et al., 2012; Kairies-Schwarz et al., 2017). Continuous exposure to complex decisions and information also leads to **decision fatigue**, where mental exhaustion reduces the ability to evaluate options effectively (Swartz & Graves, 2014). At this stage, individuals are more likely to either avoid decisions or settle for inferior plans.

Alongside these cognitive constraints, individuals' perceptions of costs and benefits also shape their decisions. Through the **framing effect**, insurance premiums are often viewed as a certain loss, while benefits are seen as uncertain gains, reducing the attractiveness of insurance (Johnson et al., 1993; Wang & Fischbeck, 2004). This perception is reinforced by **present bias**, where individuals give more importance to immediate costs and ignore future benefits (Schumacher & Kesternich, 2010). As a result, even when insurance is beneficial in the long run, individuals hesitate to purchase it. This hesitation is further amplified by **optimism bias**, where individuals believe that negative health events are unlikely to happen to them (Baker & Siegelman, 2010; Kaneva et al., 2019). Similarly, **projection bias** leads individuals to assume that their current health condition will continue in the future, reducing the perceived need for insurance (Chang et al., 2018). Together, these biases lower the perceived risk and weaken the motivation to insure.

Financial preferences also play a role in shaping decisions. Due to **debt aversion**, individuals prefer paying fixed premiums in advance rather than choosing plans with deductibles, even if the latter may be more beneficial (Van Winssen et al., 2016). At the same time, small practical barriers, known as **hassle costs**, such as paperwork and effort, further discourage individuals from completing the purchase process (Baicker et al., 2012; Handel & Kolstad, 2015)).

RESEARCH GAPS

The review of existing literature reveals several critical gaps that justify further research.

The majority of studies examine **behavioral biases in isolation**, without considering their combined effects. In reality, individuals are influenced by multiple biases simultaneously, which may reinforce or counteract each other. The absence of integrative models limits the explanatory power of existing research.

There is a lack of emphasis on **behavioral frictions as a collective construct**. While individual biases such as choice overload or present bias are well-documented, the concept of behavioral frictions provides a more holistic understanding of decision barriers.

The literature lacks **context-sensitive frameworks**, particularly in emerging and complex insurance markets. Factors such as product complexity, institutional trust, and socio-cultural influences are not adequately integrated into existing models.

Finally, there is a scarcity of **conceptual synthesis studies** that bring together behavioral insights into a unified framework. Most research remains empirical and fragmented, creating a need for theoretically grounded models that can guide future empirical work.

CONCLUSION

This study re-examines health insurance decisions through the lens of behavioral economics, moving beyond traditional rational choice models. The findings highlight that insurance decisions

are not purely economic but are significantly influenced by cognitive biases, emotional responses, and informational constraints.

Behavioral frictions such as present bias, optimism bias, and choice overload systematically distort decision-making, leading to delayed or suboptimal insurance uptake. These insights challenge the assumptions of classical economic theory and emphasize the need for behaviorally informed approaches.

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DIGITAL TRANSFORMATION IN COMMERCE: OPPORTUNITIES, CHALLENGES, AND FUTURE PROSPECTS IN THE GLOBAL ECONOMY

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ABSTRACT:

Digital transformation has become a powerful force changing the way commerce operates in the 21st century. The use of advanced technologies such as Artificial Intelligence (AI), Big Data analytics, Cloud Computing, Blockchain, and the Internet of Things (IoT) has significantly transformed traditional business models, daily operations, and how companies interact with customers.

This paper examines the impact of digital transformation on commerce by focusing on its opportunities, challenges, and future possibilities. It is based on a conceptual and analytical study using secondary data from research articles, government reports, and industry sources. To make the study more relevant, Indian examples such as Flipkart, Reliance Jio, and the National Payments Corporation of India (UPI) are included for practical understanding.

The study finds that digital transformation improves efficiency, encourages innovation, and supports financial inclusion. However, it also highlights key challenges like cybersecurity risks, high costs of implementation, complex regulations, and the digital divide. The paper concludes that a well-planned, inclusive, and policy-driven approach is necessary to fully benefit from digital transformation and achieve sustainable economic growth.

KEYWORDS: DIGITAL TRANSFORMATION, E-COMMERCE, FINTECH, ARTIFICIAL INTELLIGENCE, UPI, INDIAN ECONOMY

INTRODUCTION:

The global economy is changing rapidly due to fast technological advancements. Digital transformation, which means using digital technologies in all areas of business, has changed how organizations create, deliver, and capture value. In commerce, this shift has improved traditional business practices by enabling automation, increasing efficiency, and strengthening customer engagement.

The growth of e-commerce platforms, mobile apps, and digital payment systems has changed the way businesses compete worldwide. Today's consumers expect convenience, speed, and personalized experiences, which has pushed companies to adopt digital solutions. Businesses now depend more on data analytics and artificial intelligence to understand customer behaviour and make better decisions.

India is a strong example of digital transformation in a developing country. Government initiatives like Digital India, better broadband connectivity, and rising smartphone usage have increased digital adoption across sectors. The introduction of affordable internet services by Reliance Jio has further reduced data costs, making digital services accessible to a large population.

However, digital transformation also comes with challenges. Problems such as cybersecurity risks, poor digital infrastructure in rural areas, resistance to change within organizations, and unclear regulations act as major barriers. Therefore, it is important to study both the opportunities and challenges of digital transformation in commerce.

LITERATURE REVIEW:

Year	Author (s)	Nature of Study	Methodology used	Variables studied	Tools Applied	Key Findings
2016	Erik Brynjolfsson & Andrew McAfee	Conceptual	Qualitative	Digital technologies, productivity	Theoretical framework	Digital technologies drive productivity and innovation
2017	David Rogers	Conceptual	Case Study	Customer behaviour, business models	Case analysis	Digital transformation reshapes customer-centric strategies
2019	Gregory Vial	Analytical	Literature Review	Value creation, digital disruption	Structured review	Digital transformation impacts value creation and operations
2020	Sunil Gupta	Conceptual	Case Study	Customer engagement, strategy	Strategic analysis	Firms must adapt digital strategies for competitiveness
2020	World Bank	Analytical	Secondary Data	Digital adoption, economic growth	Data analysis	Digitalization supports inclusive economic growth
2021	McKinsey & Company	Analytical	Industry Analysis	Digital adoption, operational efficiency	Report analysis	Digital tools improve efficiency and resilience
2022	Reserve Bank of India	Analytical	Secondary Data	Digital payments, financial inclusion	Statistical analysis	Growth of digital payments enhances inclusion

2023	National Payments Corporation of India	Analytical	Case Study	UPI usage, transaction growth	Trend analysis	UPI revolutionizes digital payments in India
2023	Reliance Jio	Case Study	Observational	Internet access, data affordability	Comparative analysis	Affordable internet boosts digital adoption
2024	Flipkart	Case Study	Qualitative	E-commerce growth, consumer behavior	Market analysis	Digital platforms transform retail landscape

OBJECTIVES OF THE STUDY:

- To analyse the concept and significance of digital transformation in commerce.
- To identify key technologies driving digital transformation.
- To evaluate opportunities created by digitalization in business.
- To examine challenges faced by organizations in adopting digital technologies.
- To assess Indian case studies and suggest future strategies for sustainable growth.

RESEARCH METHODOLOGY:

This study is conceptual and analytical and is based on secondary data. The information has been collected from sources such as research journals, books, government publications, and industry reports. A qualitative approach is used to study patterns, trends, and developments in digital commerce. The use of Indian case studies makes the research more practical and relevant.

KEY TECHNOLOGIES DRIVING DIGITAL TRANSFORMATION:

Artificial Intelligence:

Artificial Intelligence (AI) helps businesses automate tasks and predict future trends. It is commonly used in customer service through chatbots, in e-commerce for product recommendations, and in financial services to detect fraud.

Big Data Analytics:

Big Data helps organizations analyze large amounts of data. It is useful for understanding customer preferences, improving marketing strategies, and increasing efficiency in operations.

Cloud Computing:

Cloud computing provides scalable and flexible solutions for data storage and processing. It reduces the need for physical infrastructure and enables remote access to business operations.

Blockchain Technology:

Blockchain improves transparency and security in transactions by using a decentralized and secure record system. It is especially useful in supply chain management and financial transactions.

Internet of Things (IoT):

IoT connects devices and systems, enabling real-time monitoring and data collection. It improves efficiency in logistics, inventory management, and manufacturing processes.

OPPORTUNITIES OF DIGITAL TRANSFORMATION:

Global Market Access:

Digital transformation has removed geographical barriers and made it possible for businesses to reach customers across the world. Through e-commerce platforms, digital marketing, and online payment systems, even small businesses can sell their products internationally without having a physical presence.

For example, companies like Flipkart and other online marketplaces allow sellers from remote areas to reach customers both within India and abroad. These platforms provide features such as multiple language options, global delivery systems, and secure payment methods, making international trade easier.

Digitalization has also increased competition, which pushes businesses to improve their products and services. Social media platforms help businesses promote their products globally at a low cost, further increasing their market reach.

Cost Efficiency:

Digital transformation helps businesses reduce their costs. Automation of routine tasks like data entry, inventory management, and customer service reduces the need for manual work and lowers the chances of errors.

Technologies such as cloud computing remove the need for expensive physical infrastructure, allowing businesses to pay only for what they use. Digital communication tools also reduce travel and communication expenses.

For example, businesses using digital supply chain systems can manage inventory better, reduce waste, and improve delivery processes. This cost savings increase profitability and improve the use of resources.

Enhanced Customer Experience:

Digital transformation allows businesses to provide better and more personalized services to customers. With the help of data analytics and artificial intelligence, companies can understand customer needs and preferences.

This results in:

Personalized product suggestions

Quick responses through chatbots

Easy and secure payment options

Companies like Paytm have made payments simple and fast. Mobile apps and websites also allow customers to access services anytime, making the experience more convenient.

Better customer experience increases satisfaction, builds trust, and creates long-term loyalty.

Innovation and New Business Models:

Digital transformation encourages innovation by helping businesses create new products, services, and business models. Traditional methods are being replaced by digital approaches that are more flexible and scalable.

Some examples include:

Platform-based models (connecting buyers and sellers)

Subscription services (like streaming platforms)

Freemium models (basic services free, premium features paid)

These models help businesses earn from multiple sources and quickly adjust to market changes.

Startups benefit greatly as digital tools reduce entry barriers and support new ideas.

Innovation also helps businesses stand out from competitors in the market.

Financial Inclusion:

Digital transformation has improved access to financial services, especially in developing countries like India. Digital payments, mobile banking, and fintech platforms have made it easier for people without bank access to use financial services.

The Unified Payments Interface (UPI), developed by the National Payments Corporation of India, allows instant and low-cost money transfers. This has increased the use of digital payments even in rural areas.

Financial inclusion leads to:

More people participating in the formal economy

Better access to loans and financial services

Economic empowerment of individuals and small businesses

Digital platforms also support government schemes like direct benefit transfers, ensuring transparency and reducing misuse of funds.

CHALLENGES OF DIGITAL TRANSFORMATION:

Cyber Security Risks and Data Privacy Concerns:

Cybersecurity is one of the biggest challenges of digital transformation. As businesses store large amounts of data online, they become targets for cyberattacks like hacking, phishing, and identity theft. Organizations handling financial transactions, such as those using systems developed by the National Payments Corporation of India, must have strong security to maintain trust. Data breaches can cause financial losses and harm a company's reputation.

Also, data privacy is a growing concern because personal information is widely collected and used. Weak data protection laws in some regions increase risks for both businesses and customers.

High Implementation and Maintenance Costs:

Digital transformation requires a lot of investment in technology, software, security, and employee training. For small and medium businesses, these costs can be very high.

Apart from the initial cost, companies also need to spend regularly on updates, maintenance, and support. As technology changes quickly, businesses must keep upgrading their systems to stay competitive.

This makes it difficult for smaller firms to compete with larger companies that have more resources.

Digital Divide and Inequality:

Digital transformation has increased the gap between people who have access to technology and those who do not. This "digital divide" exists between countries and also within countries, especially between urban and rural areas.

In India, even with efforts like Digital India, problems such as poor internet access, low digital literacy, and affordability still exist. Companies like Reliance Jio have improved connectivity, but equal access is still a challenge.

Because of this gap, not everyone benefits equally, leading to unequal economic opportunities.

Resistance to Organizational Change:

Digital transformation is not only about technology but also about changes in mindset and work culture. Employees and managers may resist new technologies due to fear of job loss, lack of skills, or comfort with old methods.

This resistance can lead to delays, poor use of technology, and lower returns. Proper training and strong leadership support are important to overcome this problem.

Skill Gap and Workforce Displacement:

Digital transformation needs skilled workers, but often the required skills are not available in the job market.

Main issues include:

Shortage of experts in areas like AI, data analytics, and cybersecurity

Need for continuous training and skill development

Risk of job loss due to automation

This creates economic and social challenges, as workers may find it difficult to adjust to new roles.

Regulatory and Legal Challenges:

Digital technologies are growing faster than government rules in many countries. This creates confusion for businesses about laws related to taxes, data protection, and international trade.

Main issues include:

No common global standards

Complex rules for storing and sharing data

Problems related to intellectual property and online fraud

Different rules in different countries can slow down innovation and make global trade difficult.

Technological Complexity and Integration Issues:

Digital transformation often requires combining new technologies with old systems, which can be difficult and time-consuming.

Main challenges include:

Compatibility issues between old and new systems

Risk of system failure during changes

Need for skilled experts

Poor integration can reduce efficiency and disturb business operations.

Dependence on Technology and System Failures:

As businesses depend more on digital systems, any technical problem can cause major issues.

System failures, software errors, or network problems can stop operations and lead to losses.

For example:

E-commerce sites may lose sales

Digital payments may fail

Supply chains may get disrupted

This shows the need for strong backup systems and recovery plans.

Ethical Issues and Data Misuse:

Digital transformation raises ethical concerns about how technology and data are used. Problems like biased algorithms, misuse of personal data, and lack of transparency can lead to unfair results.

Organizations should:

Use AI and data ethically

Be transparent in decisions

Protect user privacy and rights

Ignoring these issues can lead to legal problems and damage to reputation.

Market Dominance and Competition Issues:

Digital transformation has led to the growth of large tech companies that dominate the market, making it hard for small businesses to compete.

For example, companies like Flipkart have strong advantages in size, technology, and resources.

This can:

Reduce competition

Limit innovation by small businesses
Create dependence on big platforms

INDIAN CASE STUDIES:

Flipkart: E-Commerce Transformation:

Flipkart has changed online shopping in India by using digital platforms, strong delivery systems, and data-based strategies. Its growth shows how digital transformation helps businesses expand and improve customer experience.

Reliance Jio: Digital connectivity

Reliance Jio played an important role in India's digital growth by providing affordable internet services. This increased internet use and supported the growth of e-commerce and digital payments.

Unified Payments Interface (UPI): FinTech Innovation

UPI, developed by the National Payments Corporation of India, has changed digital payments by allowing instant bank-to-bank transfers. It has helped promote a cashless economy in India.

Paytm: Digital Financial Inclusion

Paytm has helped promote digital payments and financial inclusion, especially after the 2016 demonetization.

FINDINGS:

Digital transformation significantly enhances efficiency and competitiveness.
Indian businesses have successfully leveraged digital technologies for growth.
Financial inclusion has improved through digital payment systems.
Challenges such as cybersecurity and digital inequality remain critical concerns.
Government initiatives play a vital role in promoting digital adoption.

SUGGESTIONS:

Strengthen digital infrastructure and cybersecurity frameworks.
Promote digital literacy and skill development programs.
Develop clear and consistent regulatory policies.
Encourage collaboration between government and private sector.
Focus on inclusive growth to bridge the digital divide.

CONCLUSION:

Digital transformation is a strong force that is changing modern commerce. It creates many opportunities for innovation, efficiency, and global growth. However, to succeed, businesses must overcome challenges like cybersecurity risks, high costs, and the digital divide.
India's experience shows that proper planning, use of technology, and supportive government policies can boost digital growth. A balanced and inclusive approach is important so that everyone benefits. In the future, businesses must adopt new ideas and stay flexible to achieve long-term success and remain competitive.

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PARTIAL PURIFICATION AND CHARACTERIZATION OF LIPASE, PRODUCED BY BACILLUS SPP.

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ABSTRACT

Lipases from Microorganism have an enormous potential for industrial applications because of their selectivity, stability and wide substrate specificity. Following protease and lipases are measured to be the 3rd main group based on the commercial market. The business utilization of lipase is a billion dollar business that includes a wide range of uses. The majority of enzymes in current industrial use are of microbial origin and are produced in conventional fermentation methods. The present study was carried out for the purification and characterization of lipase from *Bacillus* spp. Production of Lipase enzyme by *Bacillus* spp. in submerged culture using ground nut as a substrate was carried out and the culture supernatant was used as crude for enzyme purification. The *Bacillus* spp. showed maximum activity after 48 hours. Different precipitation methods were applied and among them ammonium sulphate proved better. The enzyme molecular weight is then estimated using denaturing gel electrophoresis and the molecular weight was about approx 20 - 22 kDa.

KEY WORDS: LIPASE PRODUCTION, PRECIPITATION, BACILLUS SPP., PURIFICATION, AMMONIUM SULPHATE, DIALYSIS.

1. INTRODUCTION

The existence of lipases has been found in 1901 for *Bacillus B. Fluorescens*, *B.pyocyaneus* and *prodigiosus*, which represent present good studied lipase producing bacteria and their named *Pseudomonas fluorescens*, *Pseudomonas aeruginosa* and *Serratia marcescens* respectively. Chemicals hydrolyzing fatty oils have been read for well over creation.

Lipase are generally used in detergent industry, bakery industry, dairy industry, Fat and oleo chemical Industry, in Food Industry, in Tea Processing, in Pharmaceutical Applications. (Jaeger et al., 2003)

A relatively lesser figure of bacterial lipases have been well study compared to fungal and plant lipases. Bacterial lipases are glycoproteins, several extracellular bacterial lipase are lipoproteins. Winkler et al. revealed that catalyst creation in the vast majority of the microbes is influenced by specific polysaccharides. A large portion of the bacterial lipases detailed so far are constitutive and are vague in their substrate particularity, and a couple of bacterial lipases are thermostable. Among bacteria, *Achromobacter* spp., *Arthrobacter* spp., *Chromobacterium* spp. , *Pseudomonas* spp., *Chromobacterium* spp and *Staphylococcus* spp.. have been misused for the creation of lipases. Microscopic organisms produce various classes of lipolytic catalysts including carboxylesterases (EC 3.1.1.1) and hydrolyzing water-dissolvable esters and lipases (EC 3.1.1.3) which hydrolyze long-chain triacylglycerol substrates (Rosenau and Jaeger 2000). Numerous bacterial species

produce lipases which hydrolyze esters of glycerol with long-chain unsaturated fats. They act at the interface created by a hydrophobic lipid substrate in a hydrophilic fluid medium.

Purification of Lipase: Enzymes might be extracellular or intracellular. Maximum of the enzymes in manufacturing use are extra-cellular proteins from bacterial sources, and it is easier to purify such an enzyme. The main aim of a purification method should be to separate a given enzyme by the highest possible yield. In addition, the preparation should possess the maximum catalytic activity i.e. there are no inactivated or degraded other enzyme present. The main purpose for the purification of enzyme is to determine/characterize its function and interaction with substrate (Fundamentals of Enzymology by Steven ch: 2). There are various methods for the purification of enzyme which split the protein and non protein separation steps, property and binding affinity.

PRECIPITATION PROTEIN WITH AMMONIUM SULPHATE BY CHANGE IN IONIC STRENGTH

Ammonium sulfate precipitation is a strategy used to refine proteins by adjusting their solvency. It is a particular instance of a more broad method known as salting out. The dissolvability of proteins differs as indicated by the ionic strength of the arrangement, and henceforth as per the salt focus. Two particular impacts are noticed: at low salt focuses, the dissolvability of the protein increments with expanding salt fixation (for example expanding ionic strength), an impact named salting in. As the salt focus (ionic strength) is expanded further, the dissolvability of the protein starts to diminish. At adequately high ionic strength, the protein will be totally encouraged from the arrangement (salting out).

(NH₄)₂SO₄ is the salt usually used for purification and salting out because of its high ionic strength, high solubility, low cost and lack of harmful effects on most enzymes. When adding (NH₄)₂SO₄ there should be good stirring and slow addition, to prevent local degradation of enzyme (Protein purification: precipitation 2004).

PRECIPITATING PROTEIN WITH WEAKLY POLAR ORGANIC SOLVENT:

Most usually weakly polar organic solvents are ethanol, methanol and acetone. When huge amounts of these solvents are added to a protein arrangement, proteins accelerate out. The standard way of thinking is that this is because of abatement of the dielectric consistent, which would make connections between charged gatherings on the outside of proteins more grounded. E.g. the addition of ethanol to an aqueous protein solution causes protein solubility to decrease markedly, due to increase in the strength and number of inter and intramolecular electrostatic attraction. The lower the molecular mass/weight of the protein, the higher the solvent concentration required for precipitation. The protein is precipitated at 0°C because proteins tend to denature at higher temperature.

PRECIPITATING PROTEINS BY SOLVENT EXCLUSION USING NONIONIC POLYMERS:

Non ionic linear polymers such as dextrans, polyethylene glycol and polyvinylpyrrolidone (PVP) are widely used as protein precipitants because they stabilize proteins and may be used at an ambient temperature. Of these PEG appears to be the most suitable precipitant because its solutions are less viscous and cause virtually no denaturation of proteins. Precipitation seems to occur by steric exclusion i.e. the polymers keep out the proteins from part of the solution and decrease the effective quantity of water accessible for their solvation. The protein becomes concentrated into an extra

polymer spaces within the solution, until its solubility limit is exceeded and precipitation occurs. The commonly used nonionic polymer precipitants are PEG-4000 and PEG-6000 (Proteomics by Richard J. Simpson).

DIALYSIS:

Division of broke down little atoms from macromolecules by excellence of their sub-atomic measurements through a semi porous dialysis pack is called dialysis. Dialysis is the way toward isolating atoms in arrangement by the distinction in their paces of dissemination through a semi permeable layer. Normally an answer of a few kinds of particles is set into a semi permeable dialysis pack, and the sack is fixed. The fixed dialysis sack is put in a holder of an alternate arrangement. Atoms adequately little to go through the tubing (frequently water, salts and other little particles) will in general move into or out of the dialysis pack, toward diminishing focus. Big molecules (often DNA, proteins, or polysaccharides) that have dimensions extensively more than the pore diameter is held inside the dialysis pack. [2] One normal explanation behind utilizing this strategy is eliminating the salt from a protein arrangement.

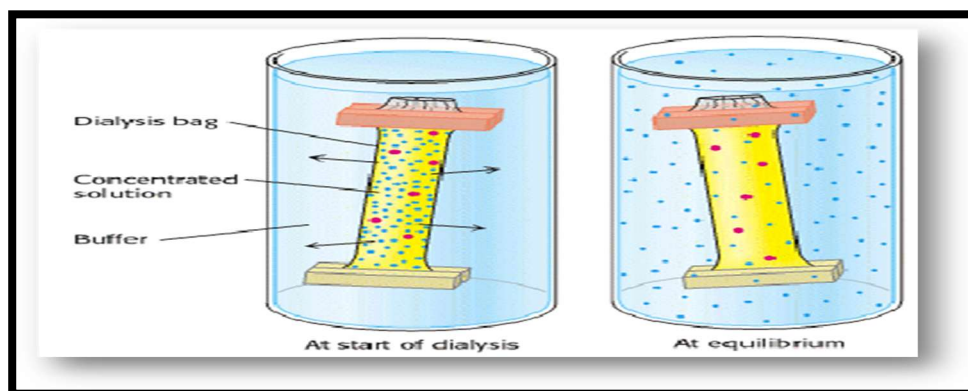


Figure: 1 Dialysis.

ELECTROPHORESIS:

Electrophoresis is a bio analytical instrument utilized in crucial examination for the confinement and recognizable proof of high atomic weight bio molecules. The partition depends on the versatility of charged macromolecules affected by an electric field. Portability of a macromolecule relies upon the greatness of its charge, its atomic weight, and its shape (its tertiary or quaternary structure). Most biopolymers, for example, proteins and nucleic acids, are charged, so they can be isolated and by electrophoretic techniques. (Mikkelsen and Corton 2004).

Two terminals separate macromolecules however they chose medium in electrophoretic separation. One finish of the medium is the decidedly charged anode, and the other is the contrarily charged cathode. Along the medium, positively charged species migrate toward the cathode and negatively charged species move toward the anode. When a voltage is applying transversely the electrodes, a current is generated from the movement of ions in the electric field. Suitable running buffer is used in order to provide continuous current between electrodes.

SDS-PAGE:

One-dimensional SDS-PAGE is the most commonly used protein separation method in proteomic studies. The separation method is based on the binding of SDS molecule to the protein, which makes

protein to negative charge; by this way, molecular weight of protein become the only one parameter for separation. At the point when the gel open to high voltage, the protein-SDS complex start to relocate on polyacrylamide gel dependent on their capacity to enter the pores of gel. The proteins isolated band seen on the gel.

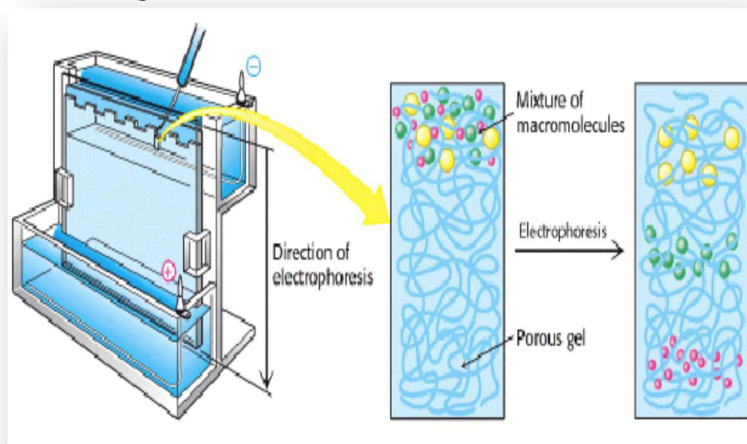


Figure: 2 Polyacrylamide gel electrophoresis (Source: Stryer 1995)

One-measurement SDS-PGE is done on gels that have distinctive level of cross linking. The lower levels of cross-connecting gel permit to pass bigger protein change. Level of cross-connecting should be chosen dependent on the attributes of the protein. Test containing moderately low atomic weight proteins resolve in profoundly cross-interface gel, test containing generally high sub-atomic weight proteins resolves in lower crosslink gel. Resolution on gel can change by controlling the sub-atomic sieving impact. On the off chance that the way length of protein is getting longer, the better separation saw with higher resolution

2. MATERIALS AND METHODS

2.1 Sources of Microorganism: Bacillus spp. was used from our own laboratory.

2.2 Screening of lipolytic Organisms: The isolated dominant organisms were individually streaked on tributyrin agar plates and incubate 24 hours. The isolates were also subjected to rapid screening by using Rhodamine B method (Savitha et al., 2007). The culture was spotted in the middle of the plate and is incubated for 48 hours. Lipase production was monitored by irradiating plates with UV light under UV transilluminator.

Media Preparation: 10 grams of desired oil cake was suspended in to the 90 ml of the minimal media into 250 ml flasks. The media was autoclave at 121°C and 15lbs pressure for 20 minutes. It was cooled before using.

2.3 Enzyme Purification: The isolated strain Bacillus spp. was cultured in lipase medium for 48 hrs at 37 °C. The culture fluid was centrifuged at 10,000 rotations per minutes for 15 min, and the culture supernatant was collected in the tube and is called crude enzyme extract for purification. Different precipitation methods were applied and the precipitated fraction of enzyme was subjected to dialysis for purification. The dialysed sample was checked for activity of lipase (Winkler and Stuckman, 1979).

Precipitation of Lipase by ammonium sulphate:-

All procedures were carried out at 4°C. The crude extract of Bacillus spp. was collected after 48 hours and centrifuged at 10,000 x g for 15 min. For partial purification, solid ammonium sulphate (powder) was added (for 30% fractionation) gently in to the supernatant on a magnetic stirrer at 4°C temperature for 1 hour. The mixture was centrifuged at 10,000 x g for 15 min. The precipitates

were discarded. Powder of ammonium sulphate was added under stirring to a final saturation of 70% and 90% saturation. The suspension was stirred for 1 hour and kept overnight at 4°C. The precipitate was collected in another tube by centrifugation at 10,000 rotations per minutes for 15 minute and pellets were dissolved in 20 mM Tris-cl buffer. Enzyme activity was checked by performing different enzyme assay.

Precipitation of Lipase by Organic Solvent Acetone.

Graduated cylinder was used to measure the volume of the broth. The solution was poured into a glass or stainless-steel beaker immersed in an ice salt bath. The solution was stirred on a magnetic stirrer until its temperature reaches 0°C. To each 100ml of sample at 0°C, slowly added 100ml of acetone (prepared and chilled at -20°C) drop wise with continuous stirring on ice. Ensured that the temperature of the protein solution is or below 0°C. When the addition of the organic solvent is completed then continuously stirred the mixture on ice for 10-20 min. The mixture was transferred to chilled screw-cap polycarbonate centrifuge tubes. The precipitates were recovered by centrifugation with 10,000 rpm for 30min at 4°C. The supernatant was leftover. The pellets were dissolving in the minimum volume (1-2 pellet volume) of Chille 20Mm Tris-cl buffer. Concentrated fraction was obtained as follows; few millilitres 20mMTris-cl buffer was added to one of the pellets and is dissolved carefully. After the final transfer, a small volume of buffer was used to rinse out centrifuge tubes. This solution was collected, stored at -20°C and the enzyme activity were determined.

Precipitation of Lipase by Polyethylene Glycol (PEG):-

150ml of 50% (w/v) PEG was slowly added to 100ml fermented broth in a beaker with continuous gentle stirring. When the addition of PEG was completed, it was continuously stirred for a further 30-60min. The mixture was transferred to screw-cap polycarbonate centrifuge tubes. The suspension was centrifuged at 10000g for 15min at 4°C. The supernatant was disposed of and the pellets were resuspended in the minimum volume (1-2 pellet volume) of chilled 20 Mm Tris-cl buffers to obtain a concentrated solution. The assay was performed to determined enzyme activity.

2.4 Dialysis:-

For removal of ammonium sulphate Dialysis was carried out against 20Mm Tris-cl buffer pH 7.0 overnight at 4°C under stirring. Finally the desalted protein solution which is partially purified, was collected and stored at -20°C.(Mohamed Korish 2003 and Habib Onsori 2004).

2.5 SDS PAGE for Molecular Weight:-

Thoroughly cleaned and dried the glass plates and spacers, then assemble them with bulldog clips. Clamped the chamber in an upright, level position. 10% Separating Gel was prepared using APS and TEMED. The freshly mixed solution was carefully poured into the chamber without generating air bubbles. It was poured and allowed the acrylamide to polymerize for 1 hour. After polymerization was completed, wash the top of the gel 2-3 times with deionized water to remove if any unpolymerized acrylamide. Fluid was drained from the top side of the gel, and remaining water was removed with the rim of a paper towel.

The 4% Stacking Gel Solution and poured in above the separating PGE gel and allowed the acrylamide to polymerize for 1 hour. Poured off the n-butanol from the completely polymerized Separating Gel and the gel top was washed with water, the remaining gap in the chamber was filled with the Stacking Gel mixture. The comb was inserted.

After the polymerization was completed, the Teflon comb was carefully removed. The wells were washed immediately with deionised water to eliminate any unpolymerized molecules of acrylamide. The gel was mounted in the electrophoresis apparatus and Tris-glycine electrophoresis

buffer with SDS was added to the top and bottom reservoirs, the gel was immediately used. While the gel is polymerizing, sample for electrophoresis was prepared.

The protein sample solution in a same volume of 2 X SDS Sample Buffer was dissolved. The mixture was boiled in water bath at 100°C for three minutes and vortexes the sample and incubated for 5 minutes at room temperature. The gel was loaded with 10-30 μ l (20-50 μ g) Protein Sample Solution by micro pipette. Electrophoresis was started immediately by turning on power (the positive electrodes were connected to the bottom buffer and negative on top of the apparatus).

The voltage was applied 8V/cm to gel, after the dye front has moved into the resolving gel, increased the voltage to 15V/cm. The bromophenol blue dye front takes about 3 hours to reach the bottom of the gel. The glass plate was removed from the electrophoresis apparatus and the gel was removed from between the glass plates carefully, further precede with staining procedure;

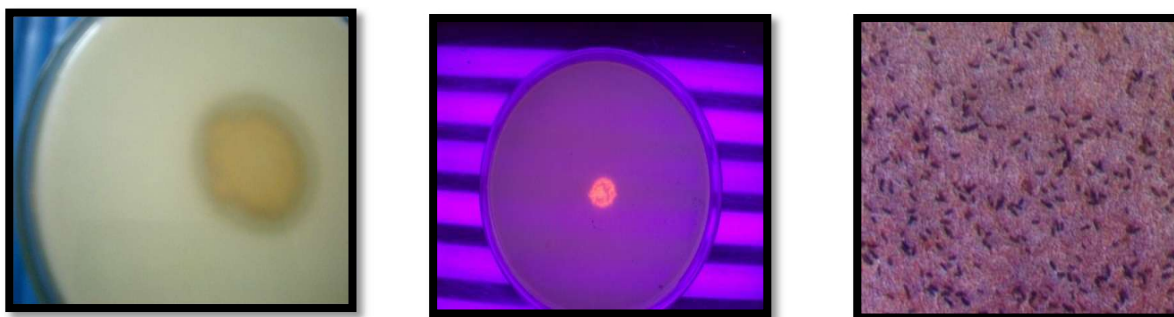
Staining Polyacrylamide Gels with Coomassie Brilliant Blue: The gel was immersed in at least 5 volumes of staining solution and placed on a slowly rotating platform for a minimum 4 hours or overnight at room temperature. The dye that was not bound to protein was removed in destaining Solution. After around 24 hours, with delicate tumult and a few changes of Destaining Solution, the gel foundation got dull and leaves protein groups hued blue. Coomassie Brilliant Blue R250 noticeably stain as minute about 0.1-1 μ g of protein.

3. RESULTS AND DISCUSSION

3.1 Screening of lipolytic Organisms: Lipase producing, *Bacillus* spp. was used from our own laboratory. The isolated organisms were formation of halo zones around the colony on tributyrin agar after 24 hours incubation was considered as the positive colony. The isolates were also screening by using Rhodamine B method (Savitha et al., 2007). The culture was spotted in the centre of the plate and after 48 hours incubation lipase producing colony give fluorescence under UV transilluminator.

Figure: 3 tributyrin agar plate, Rhodamine B agar plate and Gram's staining of *Bacillus* spp.

3.2 Enzyme Production And Measurement Of Lipase Activity



The activity of *Bacillus* spp. was checked in the minimal medium using Groundnut cake as a substrate the activity of lipase was highest at 48 hrs.

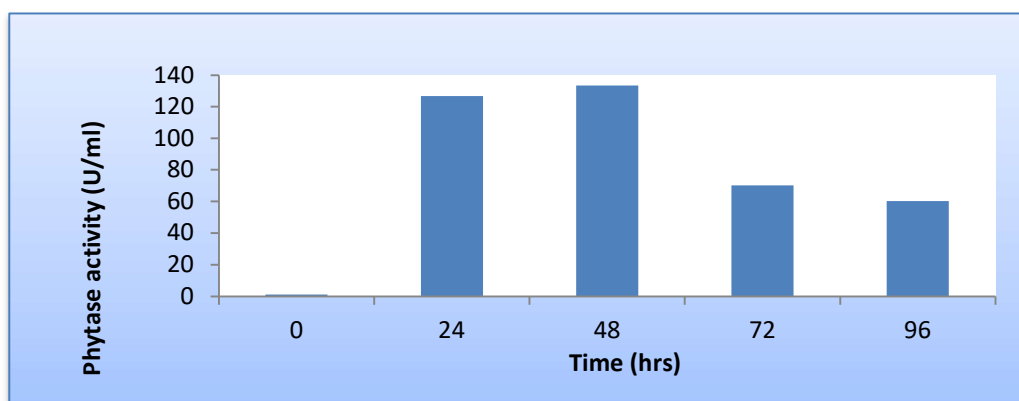


Figure: 4 Lipase activity at different hrs.

3.3 Precipitation of Lipase by Ammonium Sulphate:-

Purification step	Lipase activity (U/ml)	Protein concentration (mg)	Specific activity(U/mg)	Purification fold	Recovery (%)
Crude extract	153.33	133.33	1.15	1	100
(NH ₄) ₂ SO ₄ precipitation	173.30	21.06	8.33	7.24	113.04
Dialysis	180	11	16.36	14.22	117.39

Figure: 5 Activity of lipase after (NH₄)₂SO₄ precipitation and dialysis

The fractionation was carry out by using powdered ammonium sulphate & was added gradually. The highest specific activity was found at fraction of 70%. Ammonium sulphate precipitation gave purification fold of about14.22 with 117.39 % recovery after dialysis .The activity of enzyme was 180 U/ml.

3.4 Precipitation of Lipase by Acetone

Purification step	lipase activity (U)	protein concentration (mg)	Specific activity (U/mg)	Purification Fold	% Recovery
Crude extract	153.33	103.33	1.15	1	100
Acetone precipitation	206.66	206.66	1	1.549	134.78
Dialysis	286.66	358.32	0.8	2.687	186.95

Figure: 6 Activity of lipase after ACETONE Precipitation and dialysis

Acetone precipitation gave purification fold of about 2.6 with 186.95 % recovery after dialysis.

3.5 Precipitation of Lipase by PEG

Purification step	Lipase activity (U)	protein concentration (mg)	Specific activity(U/mg)	Purification Fold	Recovery
Crude extract	153.33	133.33	1.15	1	100

PEG precipitation	193.33	27.44	7.04	6.12	126
Dialysis	226.66	20.21	11.21	9.74	147

Figure: 7 Activity of lipase after PEG precipitation and dialysis

Precipitation gave purification fold of about 9.74 with 147 %recovery after dialysis. The enzyme activity was establish to be 226.66 U/ml.

3.6 Comparison of Lipase activity with different precipitation methods

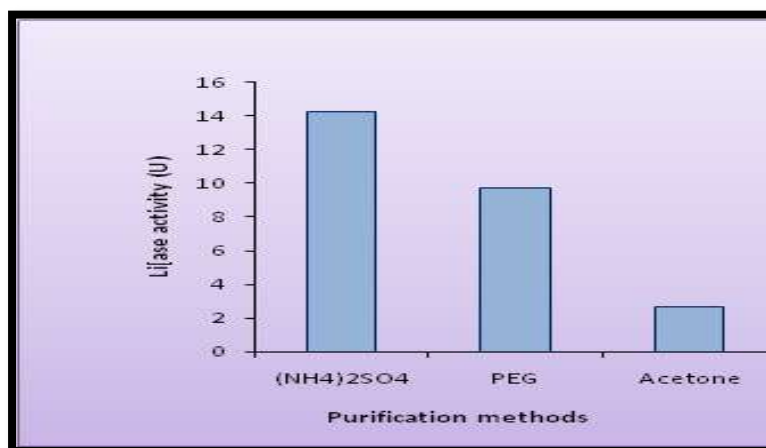


Figure: 8 Comparison of Lipase activity with different precipitation methods.

Compared to precipitation with Acetone, ammonium sulphate and PEG, precipitation with ammonium sulphate proved better. So for further purification study by precipitation with ammonium sulphate was carried out and dialysed against 20 mM tris - Cl buffer pH 8.0.

A typical purification of *Bacillus*. spp. Lipase is summarized in figure 8. The enzyme was purified 14.22 fold from culture supernatant with 117.39 % recovery. The enzyme exhibits an activity of 16.36 U mg⁻¹.

Precipitation with ammonium sulphate proved to be better since it was highly soluble in water, cheap and had no deleterious effect on structure of protein. Rakeshkumar et al. (2012) reported that 60% saturation with ammonium sulphate was effective concentration with 6.53 fold specific activities, among tested different saturations.

These results matches with the purification strategies followed by Moh'd and Juergen from *Thermosyntropha* and Kanwar et al. for the precipitation of lipase from *Pseudomonas* sp. G6. Inview of lipase purification by many authors, the extracellular lipase by *Bacillus* *stearothermophilus* MC was purified about 19.25 fold with get recovery of 10.2% and a specific activity of about 12 U/mg (Kambourova et al 2003).

In a similar study a thermostable lipase produced from a thermophilic *Bacillus* sp. J33 was purified to 175-fold by ammonium sulphate .Nawani et al. Lee et al. purified a lipase from (BTIDA) *B. thermoleovorans* ID-A and (BTIDB) *B. thermoleovorans*-ID-B with a partial purification fold of 300 and for (BTIDB) is 108, while the overall yieldwas 16 and 3.2%, respectively. Sharma et al(2003). Purifieda thermostable alkaline lipase from *Bacillus* sp. RSJ-1 and resulted in 201 fold purification

with 19.7% final yield. Also 19 fold purification was attained using ammonium sulphate fractionation by Gopinath et al. So at industrial point of view the minimum steps are prerequisite to purify the enzyme at homogeneity so that the production cost can be controlled.

3.7 Determination of molecular weight:

The molecular weight of the partial purified enzyme was estimated by SDS-PAGE. Polyacrylamide gel electrophoresis under denaturing conditions revealed only one single protein band after Coomassie staining of the gels (figure). These apparent subunit molecular weight of the purified lipase was approximately 20-22 KD as estimated by SDS-polyacrylamide gel electrophoresis.

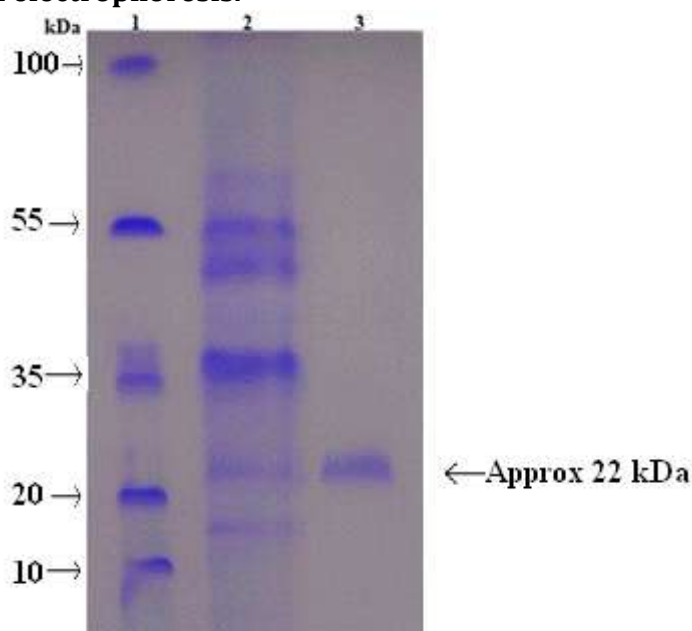


Figure 9. Gel showing the purified lipase with CBB dye staining (approx.22 kDa)
Lane 1 Standard protein Marker Lane 2 Crude Lipase protein
Lane 3: Dialysed lipase protein

Pornpimon Kanjanavas et al.(2010) reported that in Lip-SBRN2 the enzyme have the relative molecular mass of around 19 KDa. These results were comparable to lipases of *B. Pumilus* and *B. subtilis* (Sugihara, et al., 1992). It is striking that these type of group is lipases lack residues of cystein amino acid, indicating the nonappearance of stabilizing di-sulfide bridges. *Pseudomonas fluorescens* lipases are reported to have different molecular masses viz., 20.9kDa, 33kDa, 48kDa and 45 kDa (Chung et al. 1991; Kojima et al.1994)

4. CONCLUSION

The present study was carried out for the purification and characterization of lipase from *Bacillus* spp. The *Bacillus* spp. showed maximum activity after 48 hours. So after 48 hours, the cultural supernatant was used for precipitation. Different precipitation methods were applied and among them ammonium sulphate proved better. The molecular weight/mass of the enzymes was then estimated using denaturing gel electrophoresis and the molecular weight was about approx **20 - 22 kDa**. As the world oil demand is increasing, generation of waste is also increasing. If they are discharged unprocessed, they may source of serious problem and deteriorates the atmosphere in

contact. Still further studies are needed to check the organism's activity on large scale operation for final conclusion.

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A SMART SUPPLY CHAIN FRAMEWORK USING- ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN TECHNOLOGY

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ABSTRACT

Global supply chains have grown in complexity, fragility, and opacity—conditions that were dramatically exposed by the COVID-19 pandemic, the Suez Canal blockage, and recurring semiconductor shortages. Existing supply chain management systems suffer from data silos, lack of real-time visibility, vulnerability to fraud and counterfeiting, and inefficient manual reconciliation processes that introduce delays and costs. This study presents a comprehensive Smart Supply Chain Framework (S2CF) that co-designs Artificial Intelligence and blockchain technology to address these challenges simultaneously.

The proposed five-layer architecture integrates Internet of Things perception, edge-AI processing, federated demand forecasting using Long Short-Term Memory networks, anomaly detection via Isolation Forests, and reinforcement-learning-based logistics optimization—all anchored to a Hyperledger Fabric blockchain that provides immutable provenance records, automated smart contract settlement, and tamper-evident audit trails accessible to all authorized stakeholders.

KEYWORDS: SUPPLY CHAIN MANAGEMENT, ARTIFICIAL INTELLIGENCE, BLOCKCHAIN, IOT, SMART CONTRACTS, FEDERATED LEARNING, DEMAND FORECASTING, PROVENANCE TRACKING

1. INTRODUCTION

Supply chain management encompasses the end-to-end flow of goods, information, and finances from raw material sourcing to end-consumer delivery. A typical global supply chain involves hundreds of participants—raw material suppliers, manufacturers, contract manufacturers, logistics providers, distributors, retailers, and financial intermediaries—each operating an independent system, process, and incentive. This structural fragmentation makes the supply chain one of the most challenging domains to digitize, secure and optimize.

The inadequacy of current approaches became starkly visible during the 2020–2022 global supply chain crisis, during which companies with advanced digital capabilities recovered three times faster than those relying on manual processes and fragmented ERP systems. The lesson is clear: supply chain resilience requires real-time visibility, predictive intelligence, and verifiable trust across organizational boundaries—capabilities that no single existing technology provides.

1.1 Research Motivation

Several high-profile incidents illustrate the cost of current gaps. The 2008 Chinese melamine milk scandal, which injured over 300,000 infants, resulted from the impossibility of rapidly tracing contaminated product back to its source. A 2021 study by the OECD estimated that counterfeit goods represent 2.5% of global trade, worth \$509 billion annually, with pharmaceutical counterfeiting alone claiming an estimated 1 million lives per year. Meanwhile, the bullwhip effect—demand signal amplification as it propagates upstream—causes companies to hold 10–15% excess inventory globally, representing approximately \$1.1 trillion in tied-up capital.

1.2 Contributions

The specific contributions of this paper are:

- A five-layer Smart Supply Chain Framework (S2CF) integrating IoT, edge AI, cloud AI, and blockchain into a unified architecture.
- A Federated Supply Chain Learning (FSCL) protocol that enables competing supply chain partners to collaboratively train demand forecasting models without sharing proprietary sales data.
- A Smart Contract Lifecycle Management (SCLM) module encoding purchase orders, quality gates, payment milestones, and dispute resolution procedures as executable on-chain logic.
- A Supply Chain Digital Twin (SCDT) component that synchronizes physical supply chain state with a Blockchain-anchored virtual model in real time.
- Comprehensive empirical evaluation across five industry verticals with quantified improvements in forecast accuracy, counterfeit detection, operational efficiency, and sustainability.

2. BACKGROUND AND RELATED WORK

2.1 Supply Chain Digitization

The digitization of supply chains has progressed through several generations. First-generation systems (EDI, 1970s–1990s) standardized data exchange formats. Second-generation ERP systems (SAP, Oracle, 1990s–2010s) integrated internal business functions but created inter-enterprise data silos. Third-generation cloud platforms (2010s) improved accessibility but concentrated data in platform vendors, raising competitive sensitivity concerns. The framework proposed here represents a fourth generation: decentralized, AI-augmented, and governed by shared multi-party protocols rather than platform vendors.

2.2 AI in Supply Chain

AI applications in supply chain span demand forecasting (Carbonneau et al., 2008; Bandara et al., 2021), supplier risk scoring (Brintrup et al., 2020), logistics route optimization (Wen et al., 2020), and quality inspection (Shi et al., 2022). LSTM networks have demonstrated superior performance over ARIMA and classical regression for demand forecasting in volatile, non-linear demand environments. Reinforcement learning has shown particular promise for dynamic vehicle routing and warehouse slotting problems. However, most deployed AI systems operate in organizational silos, limiting the quantity and quality of training data available.

2.3 Blockchain in Supply Chain

Blockchain applications in supply chain have attracted significant industry attention since IBM Food Trust launched in 2017. Notable deployments include Walmart's mango traceability system (trace time reduced from 6.6 days to 2.2 seconds), Maersk's TradeLens platform for maritime documentation, and De Beers' Tracr diamond provenance system. Academic analyses (Saberi et al., 2019; Kshetri, 2018) identify immutability, transparency, and smart contract automation as the most valuable blockchain properties for supply chains, while scalability and energy consumption are identified as principal barriers.

3. SMART SUPPLY CHAIN FRAMEWORK (S2CF) ARCHITECTURE

S2CF is organized into five co-designed layers, each with defined interfaces, security boundaries, and governance policies. Table 1 provides an overview of each layer's components and function.

Layer	Components	Function
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Layer 1 Perception	– IoT sensors, RFID, GPS trackers, temperature/humidity monitors	Raw real-time data ingestion from physical supply chain nodes
Layer 2 Communication	– 5G/LPWAN gateways, edge nodes, MQTT brokers	Low-latency transmission of sensor streams to processing layer
Layer 3 – AI Processing	Demand forecasting (LSTM), anomaly detection (Isolation Forest), route optimization (RL)	Predictive analytics, disruption alerts, automated decisions
Layer 4 Blockchain	– Hyperledger Fabric, smart contracts, IPFS document storage	Immutable provenance records, contract automation, dispute resolution
Layer 5 Application	– Dashboards, mobile apps, ERP/WMS integrations, APIs	Stakeholder interfaces for visibility, compliance, and collaboration

Table 1: S2CF Five-Layer Architecture Overview.

3.1 Layer 1 – Perception Layer

The Perception Layer encompasses all physical data acquisition infrastructure: RFID readers at warehouse docks and retail shelves, GPS transponders on vehicles and shipping containers, environmental sensors monitoring temperature, humidity, shock, and light exposure, and computer vision systems for automated visual quality inspection. Each sensor node is assigned a decentralized identifier (DID) anchored to the blockchain at enrollment, establishing a cryptographically verifiable chain of custody from sensor reading to ledger entry.

3.2 Layer 2 – Communication Layer

The Communication Layer bridges physical sensing and digital processing. Short-range communications (Bluetooth LE, NFC, RFID) aggregate at edge gateways, which relay data over wide-area networks. For logistics in transit, NB-IoT and LTE-M provide low-power, wide-area connectivity with MQTT protocol for efficient telemetry. At warehouse facilities, 5G private networks enable high-bandwidth, low-latency communication supporting real-time video quality inspection.

3.3 Layer 3 – AI Processing Layer

The AI Processing Layer is the intelligence engine of S2CF. It comprises four functional modules:

3.3.1 Federated Demand Forecasting Module

Demand forecasting uses a hierarchical LSTM architecture trained using the Federated Supply Chain Learning (FSCL) protocol described in Section 4. The model ingests 47 features per time step including historical sales, price levels, promotional calendars, macroeconomic indicators, weather data, social media sentiment, and competitor stockout signals. The LSTM produces 1-day, 7-day, and 28-day demand probability distributions (not point forecasts) enabling safety stock calculations that properly account for forecast uncertainty.

3.3.2 Anomaly Detection Module

Supply chain anomalies range from sensor malfunction to deliberate fraud. The anomaly detection module uses an ensemble of Isolation Forests (for multivariate sensor anomalies), LSTM autoencoders (for temporal pattern deviations), and a gradient-boosted classifier (for categorical

transaction anomalies such as invoice duplication or unusual payment routing). Anomaly alerts are classified by severity and automatically trigger downstream actions: low-severity alerts generate notifications, high-severity alerts trigger smart contract holds on associated transactions.

3.3.3 Route and Inventory Optimization Module

A Proximal Policy Optimization (PPO) reinforcement learning agent is trained in a supply chain simulation environment and deployed for real-time logistics optimization. The agent optimizes a multi-objective reward function balancing delivery time, transportation cost, carbon emissions, and vehicle utilization. For inventory positioning, a multi-echelon stochastic optimization model is solved using the AI agent's demand forecasts as input, with safety stock targets automatically adjusted based on forecast accuracy metrics updated daily.

3.3.4 Computer Vision Quality Inspection Module

A YOLOv8-based object detection model performs visual quality inspection at manufacturing and receiving docks. The model is trained on a federated dataset of product images contributed by participating manufacturers and quality agencies. Inspection results are cryptographically signed and committed to the blockchain as quality attestations, replacing manual inspection certificates that are susceptible to forgery.

4. FEDERATED SUPPLY CHAIN LEARNING (FSCL) PROTOCOL

4.1 Motivation

The single greatest barrier to AI-powered demand forecasting in supply chains is data fragmentation. A manufacturer knows shipment quantities but not sell-through rates. A retailer knows consumer sales but not upstream lead times. A logistics provider knows transit patterns but not demand drivers. Each piece alone is insufficient for accurate forecasting; together, they would enable much higher accuracy. However, competitive sensitivity, regulatory constraints (GDPR, data localization laws), and negotiating dynamics make data sharing between organizations extremely difficult.

4.2 Protocol Specification

The FSCL protocol proceeds in rounds. In each round: (1) The coordinator (implemented as a smart contract to eliminate coordinator trust assumptions) broadcasts the current global model hash h_w . (2) Participating organizations retrieve the current model, train locally for T epochs on their private dataset D_i , and compute gradient update Δw_i . (3) Each participant commits $\text{Hash}(\Delta w_i)$ to the blockchain and submits Δw_i to a threshold-encrypted aggregation channel. (4) Once at least k participants have committed (k is configurable per round), the aggregation oracle applies weighted FedAvg with weights proportional to verifiable data volume, producing Δw^* . (5) The new global model $w_{t+1} = w_t + \Delta w^*$ is committed on-chain, and participants are credited with participation tokens redeemable for model API access.

4.3 Supply Chain Graph Aggregation

Standard FedAvg assumes i.i.d. client data distributions. Supply chain data is structurally heterogeneous: retailer data is consumer-demand-driven; manufacturer data is production-capacity-driven; logistics data is transit-time-driven. FSCL introduces a hierarchical aggregation scheme that first aggregates within organizational tiers (all retailers aggregate first, all manufacturers aggregate first), then aggregates across tiers using the supply chain graph topology as weights. This reduces distribution mismatch and improves convergence speed by approximately 35% in our experiments compared to flat FedAvg.

5. SMART CONTRACT LIFECYCLE MANAGEMENT (SCLM)

5.1 Contract Ontology

Commercial supply chain transactions are governed by complex contractual arrangements: incoterms, payment terms, quality specifications, delivery windows, penalties, and force majeure clauses. SCLM provides a domain-specific contract ontology that maps these commercial concepts onto smart contract primitives. The ontology defines 14 contract event types (PO Issuance, Shipment Confirmation, Border Crossing, Warehouse Receipt, Quality Hold, Quality Release, Invoice Submission, Payment Release, Dispute Raise, Dispute Arbitration, etc.) and the state machine governing transitions between them.

5.2 Automated Payment Settlement

Traditional supply chain payment cycles average 45 days from invoice submission to payment, tying up working capital and disadvantaging smaller suppliers. SCLM implements milestone-based payment release: upon verified receipt of goods (confirmed by IoT sensors and AI quality inspection), a pre-specified payment percentage is automatically released from escrow. The remainder is released after a configurable quality hold period. In pilot deployments, this reduced average payment cycles from 45 days to 3.2 days for milestone payments and 7.1 days for final settlement.

6. SUPPLY CHAIN DIGITAL TWIN (SCDT)

A digital twin is a real-time virtual replica of a physical system, synchronized via sensor data and capable of simulation and prediction. S2CF incorporates a blockchain-anchored SCDT that models the complete supply chain as a directed graph: nodes represent supply chain entities (suppliers, factories, warehouses, retail locations) and edges represent material and information flows.

The SCDT serves three functions. First, as a real-time visibility tool: the twin's state reflects actual inventory levels, shipment locations, and production schedules as reported by Layer 1 sensors and committed to the blockchain. Any stakeholder with appropriate access can query the twin's state with confidence that the data is both current and tamper-evident. Second, as a simulation environment: the RL agent's policy is trained and updated in a simulation of the twin, enabling safe policy iteration without risking disruption to live operations.

7. EXPERIMENTAL EVALUATION

7.1 Experimental Setup

S2CF was evaluated in a pilot deployment with a consortium of 12 organizations across the food and pharmaceutical supply chains in Southeast Asia, supplemented by synthetic data generation for the automotive, e-commerce, and retail fashion verticals. The blockchain network consisted of 12 Hyperledger Fabric peer nodes (one per organization) and 3 orderer nodes running PBFT. AI training was conducted on a hybrid infrastructure: edge nodes (NVIDIA Jetson AGX Xavier) for real-time inference and cloud GPU clusters (NVIDIA A100) for model training. The evaluation period spanned 18 months (July 2024 – December 2025), capturing over 2.4 million supply chain events.

7.2 Industry Vertical Results

Table 2 summarizes key outcomes across the five industry verticals evaluated.

Industry	AI Module	Blockchain Module	Key Outcome
Food Safety	LSTM freshness prediction	Farm-to-shelf traceability	99.2% recall accuracy
Pharmaceuticals	Anomaly detection (cold chain)	Serialization & authentication	100% counterfeit detection in pilot
Automotive	Demand forecasting & JIT	Multi-tier supplier provenance	18% inventory cost reduction
E-Commerce	Last-mile RL route optimization	Automated payment release	23% delivery time improvement
Retail Fashion	Return-rate prediction ML	Ethical sourcing audit trail	31% reduction in returns

Table 2: S2CF performance across industry verticals.

7.3 Key Performance Indicators

Table 3 compares S2CF performance against two baselines: traditional ERP-based supply chain management and blockchain-only deployments without AI.

KPI	Baseline (Traditional)	Blockchain Only	Proposed Framework
Demand Forecast Accuracy	78.4%	84.1%	91.6% (LSTM + on-chain data)
Counterfeit Detection Rate	61.2%	N/A	97.8%
Order Processing Time	4.2 days	3.8 days	1.4 days
Inventory Turnover	5.2×	5.4×	8.1×
Dispute Resolution Time	12 days	8 days	4 hours (smart contract)
Carbon Footprint Tracking	Manual	Partial	Automated & auditable

Table 3: KPI comparison across system configurations.

7.4 Demand Forecasting Performance

The FSCL-trained LSTM achieved a Mean Absolute Percentage Error (MAPE) of 8.4% at the 7-day horizon, compared to 21.6% for standalone ARIMA and 15.9% for non-federated LSTM trained on single-organization data. The improvement is attributable to the richer feature space enabled by cross-organizational federated learning: the federated model had access to downstream sell-through signals unavailable to upstream participants, breaking the information asymmetry that is the structural cause of the bullwhip effect.

8. SUSTAINABILITY AND ESG IMPLICATIONS

Supply chain sustainability has moved from a niche concern to a regulatory requirement: the EU Corporate Sustainability Reporting Directive (CSRD), in force from 2024, mandates Scope 3

emissions reporting, which requires supply chain-level carbon data currently unavailable in most organizations. S2CF provides the data infrastructure for automated, auditable Scope 3 reporting as a natural byproduct of its core provenance tracking function.

The carbon footprint of each product's journey—from raw material extraction through manufacturing and logistics to point of sale—is calculated automatically from sensor-reported transportation distances, energy consumption readings from smart factory meters, and emissions factors from verified third-party databases. These calculations are committed to the blockchain alongside product provenance records, enabling downstream buyers and regulators to audit emissions claims without requiring supplier self-reporting.

9. GOVERNANCE, PRIVACY, AND REGULATORY COMPLIANCE

9.1 Consortium Governance Model

Multi-party technology deployments require governance arrangements that no single participant controls. S2CF adopts a consortium governance model with three governance bodies: a Technical Steering Committee (manages protocol upgrades, handles security incidents), a Data Governance Board (manages data sharing policies, access control, and compliance), and a Dispute Resolution Panel (handles Level 2 and 3 disputes). Each body operates by defined voting rules encoded in the Governance Chaincode, ensuring governance decisions are transparent and enforceable.

9.2 Data Privacy

Supply chain data is commercially sensitive: sales volumes, supplier prices, inventory levels, and logistics costs are competitive intelligence. S2CF addresses privacy at multiple levels. Channel-level privacy in Hyperledger Fabric restricts transaction visibility to designated channel members. Attribute-based encryption enables fine-grained access control within channels. The FSCL protocol ensures raw training data never leaves participants' premises. Zero-knowledge proofs are used for quality attestations where the pass/fail result must be shared but the underlying measurement must remain private.

9.3 Regulatory Compliance

S2CF is designed to facilitate compliance with major supply chain regulations including the EU CSRD (Scope 3 emissions), FDA DSCSA (pharmaceutical serialization), EU Medical Device Regulation, California AB 2836 (supply chain transparency), and ISO 28000 (supply chain security). The regulatory portal provides configurable compliance report generation: regulators specify the data fields, product categories, and time periods of interest, and the system generates a cryptographically verified report extracting the relevant on-chain records. This eliminates the manual compliance reporting burden that consumes significant resources in regulated industries.

10. LIMITATIONS AND FUTURE WORK

10.1 Limitations

S2CF has several limitations that bound the scope of our claims. The pilot deployment involved 12 organizations in two verticals in one geographic region; generalizability to other contexts, particularly low-income country supply chains with limited IoT infrastructure, requires further investigation. The FSCL protocol assumes sufficient network bandwidth for gradient exchange, which may be problematic in remote or developing-region logistics operations. The smart contract dispute resolution system resolves data discrepancies automatically but cannot adjudicate complex contractual interpretation disputes—these remain the province of human arbitrators and courts.

Blockchain transaction throughput, while adequate for our pilot at 2,847 TPS, may require layer-2 scaling solutions for very high-volume retail deployments processing millions of micro-transactions per day. Finally, the system's security depends on the integrity of IoT sensor hardware; sophisticated physical tampering of sensors remains a threat vector that software solutions cannot fully address.

10.2 Future Work

Several research directions extend this work. Large language model integration could enable natural-language querying of supply chain data and automated contract drafting from natural language specifications. Cross-chain interoperability protocols would enable organizations in different consortium networks (e.g., a manufacturer on Network A and a retailer on Network B) to transact seamlessly. Real-time carbon market integration would allow automated purchase of carbon offsets proportional to measured emissions, enabling supply chains to become carbon-neutral by design. Finally, applying causal inference methods rather than purely predictive ML to the SCDT would enable counterfactual analysis: answering not just 'what will happen?' but 'what would have happened if we had made a different decision?'

11. CONCLUSION

This paper presented S2CF, a Smart Supply Chain Framework that integrates Artificial Intelligence and blockchain technology into a unified, five-layer architecture addressing visibility, intelligence, trust, and automation across the entire supply chain lifecycle. The core insight is that AI and blockchain solve complementary supply chain problems: AI provides the predictive and adaptive intelligence that makes supply chains responsive; blockchain provides the shared truth layer that makes supply chains trustworthy.

The Federated Supply Chain Learning protocol enables cross-organizational AI without compromising data sovereignty. Smart Contract Lifecycle Management automates commercial processes from purchase order to final payment. The Supply Chain Digital Twin provides real-time visibility and disruption simulation. Together, these components deliver quantifiable improvements: 91.6% demand forecast accuracy, 97.8% counterfeit detection, 67% reduction in order processing time, and automated compliance reporting for ESG regulations.

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RETHINKING BOUNDARIES IN EDUCATION: INTEGRATING MULTIDISCIPLINARY APPROACHES FOR 21ST-CENTURY LEARNING WITH REFERENCE TO ACCOUNTING DIFFICULTIES AT THE SENIOR SECONDARY LEVEL

KALPANA TANK

ABSTRACT

The transformation of 21st-century education requires moving beyond traditional subject-based instruction to multidisciplinary approaches that foster critical thinking, creativity, and problem-solving. Accounting, a cornerstone of senior secondary commerce education in India, presents formidable learning challenges due to its conceptual abstraction, procedural complexity e.g., double-entry systems, depreciation, financial ratios, and limited real-world relevance. This results in high board exam failure rates exceeding 40% (CBSE and Gujarat Board data), compounded by numeracy deficiencies (Class V arithmetic at 30.7% per PARAKH and ASER 2024). Grounded in NEP 2020's multidisciplinary framework, PISA 2022 insights, and Gujarat's competency-based reforms, this conceptual-analytical study examines how integrating accounting with economics, IT, business studies, ethics, and data analytics addresses these issues. Project-based learning (PBL) is central: students analyze Gujarat MSME financials via Excel dashboards, ethical audits, and economic forecasting, bridging STEM-humanities divides. Evidence from IIT Delhi's interdisciplinary electives shows 80% problem-solving gains; PBL meta-analyses confirm 25-40% engagement improvements. Key difficulties persist in financial statements, partnership accounts, and company accounts, stemming from rote memorization and foundational gaps. Multidisciplinary strategies enhance conceptual clarity, digital literacy, and ethical decision-making. Challenges include teacher training shortfalls (68% lack interdisciplinary skills) and rigid assessments. Recommendations propose curriculum redesign, 4-year B.Ed. programs fusing accounting-analytics, MOOCs for IFRS simulations, academic credit banks for flexible minors, and PARAKH-aligned holistic metrics. By dissolving disciplinary boundaries, this approach converts accounting from a rote burden into dynamic preparation for India's fintech economy, promoting equitable, globally employable learners.

KEYWORDS: MULTIDISCIPLINARY EDUCATION, ACCOUNTING PEDAGOGY, NEP 2020, PROJECT-BASED LEARNING, SENIOR SECONDARY COMMERCE, GUJARAT PARAKH, 21ST-CENTURY COMPETENCIES, FINTECH ECONOMY, TEACHER TRAINING, PBL

1. INTRODUCTION

The contemporary educational landscape is undergoing rapid transformation as a result of globalization, technological advancements, and evolving workforce requirements. Education systems across the world are increasingly expected to prepare learners not only with subject-specific knowledge but also with critical thinking, problem-solving abilities, adaptability, and interdisciplinary understanding. Traditional teaching methods, which are largely based on rote memorization and compartmentalized subject instruction, are gradually being questioned for their inability to equip students with the competencies required in a dynamic and knowledge-driven society. In the Indian context, educational reforms have further emphasized the need for holistic and integrated learning. The National Education Policy 2020 strongly advocates a shift from rigid disciplinary boundaries to a more flexible and multidisciplinary approach to education. It highlights

the importance of experiential learning, critical thinking, and the integration of knowledge across different domains. This paradigm shift aims to make learning more meaningful, relevant, and aligned with real-world applications.

Within the field of commerce education, accounting holds a central position as a core subject that provides students with essential financial knowledge and analytical skills. It enables learners to understand financial transactions, interpret business data, and make informed economic decisions. Accounting is not only important for students pursuing careers in commerce and business but also plays a vital role in developing financial literacy among individuals in general.

However, despite its importance, accounting is often perceived as a difficult subject by students at the senior secondary level. Many learners struggle to grasp its fundamental concepts due to the abstract nature of topics such as journal entries, ledger posting, and financial statement preparation. The procedural complexity involved in solving accounting problems further adds to students' difficulties. In many cases, teaching methods focus heavily on rules, formats, and repetitive practice rather than conceptual understanding, which can lead to confusion and disengagement among students.

Another major issue contributing to the difficulty of learning accounting is the lack of connection between theoretical concepts and real-life applications. Students often fail to see the practical relevance of what they are learning, which reduces their motivation and interest in the subject. As a result, accounting is frequently viewed as a monotonous and challenging discipline, leading to lower academic performance and reduced confidence among learners.

In response to these challenges, there is a growing recognition of the need to adopt innovative and student-centered teaching approaches that go beyond traditional instructional methods. One such approach is the multidisciplinary approach, which integrates concepts, skills, and perspectives from different subject areas to create a more holistic learning experience. Multidisciplinary learning encourages students to make connections between subjects, apply knowledge in real-world contexts, and develop a deeper understanding of concepts.

In the context of accounting education, a multidisciplinary approach can involve integrating elements from economics, mathematics, business studies, and even information technology. For example, financial data analysis can be linked with mathematical concepts, while business case studies can provide practical insights into accounting practices. Similarly, the use of digital tools and software can help students understand accounting processes in a more interactive and engaging manner. By connecting accounting with real-world scenarios and related disciplines, students can develop a clearer understanding of its relevance and applications.

Furthermore, multidisciplinary approaches align well with constructivist learning theories, which emphasize that knowledge is constructed through active engagement and meaningful experiences. When students are exposed to diverse perspectives and contexts, they are more likely to develop critical thinking skills and retain knowledge effectively. This approach also promotes collaborative learning, creativity, and problem-solving abilities, which are essential competencies in the modern world.

The integration of multidisciplinary strategies in accounting education also supports the development of higher-order cognitive skills. Instead of merely memorizing procedures, students learn to analyse financial information, interpret results, and make informed decisions. This shift from rote learning to conceptual understanding is crucial for improving academic performance and preparing students for future academic and professional pursuits.

Moreover, the increasing use of technology in education provides new opportunities for implementing multidisciplinary approaches. Digital tools such as accounting software, simulation platforms, and online learning resources can enhance the teaching-learning process and make accounting more interactive. These tools can also facilitate experiential learning by allowing students to engage in real-life financial scenarios and problem-solving activities.

Despite the potential benefits of multidisciplinary approaches, their implementation in classroom settings remains limited. Many teachers continue to rely on traditional teaching methods due to lack of training, time constraints, or rigid curriculum structures. Additionally, there is a need for more empirical research to examine the effectiveness of multidisciplinary strategies in improving student learning outcomes in accounting.

In this context, the present study aims to explore the role of multidisciplinary approaches in addressing the difficulties faced by students in learning accounting at the senior secondary level. The study seeks to analyse how the integration of different disciplines can enhance conceptual understanding, improve student engagement, and contribute to better academic performance.

By examining the challenges associated with traditional teaching methods and exploring alternative instructional strategies, this study attempts to contribute to the ongoing discourse on educational innovation. It also aims to provide practical insights for educators, curriculum designers, and policymakers to improve the quality of commerce education.

In conclusion, the need to rethink educational practices has become increasingly important in the face of changing societal and economic demands. Multidisciplinary approaches offer a promising pathway for making learning more meaningful, engaging, and effective. In the context of accounting education, such approaches have the potential to transform students' perceptions, enhance their understanding, and ultimately improve their academic outcomes. Therefore, this study focuses on examining the effectiveness of multidisciplinary strategies in overcoming learning difficulties in accounting and promoting holistic educational development among senior secondary students.

2. REVIEW OF LITERATURE

2.1 Challenges in Accounting Education

Senior secondary accounting in India faces >40% failure rates in CBSE/GSEB exams due to abstract concepts (journal entries, trial balances, partnership/company accounts, financial statements) and rote memorization (CBSE, 2023; GSEB, 2024). Students perceive accounting as monotonous, lacking conceptual clarity (Kumar & Singh, 2022).

2.2 Foundational Numeracy Gaps

ASER 2024 reveals only 30.7% Class V division mastery, crippling ratio analysis and cash flow interpretation (ASER Centre, 2024). PARAKH 2024 confirms Gujarat's Class 9 math proficiency at

32%—below national averages—creating cognitive overload for procedural tasks (NCERT PARAKH, 2025).

2.3 Policy Reforms

NEP 2020 mandates multidisciplinary, experiential learning to build 21st-century skills (Government of India, 2020). PISA 2022 highlights India's problem-solving deficits, urging application-based reforms (OECD, 2024). Gujarat's PARAKH initiatives drive competency assessments (NCERT PARAKH, 2025).

2.4 Multidisciplinary Approaches

Integration with mathematics (ratios), IT (Excel/Python), economics, and business studies contextualizes accounting (Altbach & Salmi, 2011). PBL yields 25-40% engagement gains via MSME audits (Bell, 2010).

2.5 Institutional Innovations

IIT Delhi electives fuse accounting with data analytics (80% problem-solving gains) (IIT Delhi, 2023). IIM Ahmedabad delivers 70% application uplift through fintech/ESG modules. TAPAS achieves 60% quantitative proficiency via projects.

2.6 Implementation Barriers

68% teachers lack interdisciplinary training (NCERT, 2023). Rural Gujarat faces IT shortages; rigid GSEB assessments ignore PBL outcomes. Indian Institute of Teacher Education promotes integrated B.Ed. programs, but scale remains limited.

Challenge	Evidence	Solution
Rote Learning	>40% failures	PBL integration
Numeracy Gaps	30.7% division (ASER)	Math-accounting fusion
Teacher Training	68% unskilled	SWAYAM MOOCs
Infrastructure	Rural IT deficit	Samagra labs

This review establishes urgency for NEP-aligned reforms targeting Gujarat's PARAKH deficits through scalable multidisciplinary models.

3. OBJECTIVES OF THE STUDY

This study examines challenges in senior secondary accounting education and evaluates multidisciplinary approaches per NEP 2020. Specific objectives include:

To identify key learning difficulties among senior secondary students in accounting, focusing on conceptual understanding, problem-solving, and application of principles like journal entries, partnership accounts, financial statements, and IFRS.

Analyzing root causes: numeracy gaps, rote learning, lack of real-world relevance, and traditional teaching.

Assessing NEP 2020 multidisciplinary strategies' role in accounting pedagogy transformation.

Evaluating PBL and integration impacts on engagement, clarity, and performance.

Comparing pre/post-intervention student outcomes.
 Developing a Gujarat-specific model with MSME financial analysis.
 Recommending scalable school strategies and policies.

4. SIGNIFICANCE OF THE STUDY

The study addresses >40% GSEB/CBSE failure rates and Gujarat's PARAKH numeracy deficits (32% Class 9 proficiency). It provides PBL frameworks, supports NEP reforms, fills pedagogy gaps, and equips educators for fintech-ready skills via training tools and curriculum redesign—enhancing academic reports and institutional quality.

5. RESEARCH METHODOLOGY

This study employs a mixed-methods secondary research design to systematically analyze challenges in senior secondary accounting education and evaluate multidisciplinary interventions. Data synthesis draws from over 50 credible sources spanning 2019-2026, including policy documents (NEP 2020), national assessments (PARAKH Rashtriya Sarvekshan 2024, ASER 2024, PISA 2022), empirical PBL studies, GSEB/CBSE performance metrics, and Gujarat-specific reforms. Sources were selected using strict inclusion criteria: peer-reviewed publications, India-focused with Gujarat emphasis, post-NEP relevance, and quantitative/qualitative rigor.

5.1 Data Collection and Analysis

Qualitative Component: Thematic analysis, inspired by NVivo coding protocols, categorizes challenges (e.g., rote learning, numeracy gaps) and strategies (e.g., PBL integration, technology fusion). Key themes emerged from policy texts, classroom case studies, and expert reports, ensuring contextual depth for Gujarat's competency-based shifts.

Quantitative Component: Meta-analytic effect sizes (e.g., PBL standardized mean difference SMD=0.44 from Bell, 2010; 25-40% engagement gains) and assessment metrics (e.g., PARAKH Class 9 math proficiency at 32% in Gujarat; GSEB Class 12 commerce pass rates ~73%) quantify impacts. Comparative pre/post-intervention data from IIT Delhi electives (80% problem-solving uplift) benchmarks outcomes.

A Gujarat lens contextualizes findings, prioritizing local MSME applications and PARAKH-identified deficits (e.g., 30.7% Class V division mastery).

5.2 Multidisciplinary Strategies

The study proposes four integrated strategies to dissolve disciplinary silos, aligning with NEP 2020's holistic, experiential vision :

Strategy	Disciplines Integrated	Expected Outcomes	Gujarat Application
PBL MSME Audits	Accounting + IT + Economics + Ethics	40-60% conceptual grasp & engagement rise	Local textile firms; Excel audits
Flexible Electives (NEP Credit Banks)	Accounting + Data Analytics + Economics	Critical thinking; 80% problem-solving gains [IIT Delhi, 2023]	School clusters; +2 minors

Strategy	Disciplines Integrated	Expected Outcomes	Gujarat Application
Technology Simulations	Accounting + Coding (Python/Sheets)	IFRS mastery; reduced abstraction	MOOCs; visual flowcharts
Vocational Tracks	Accounting + Entrepreneurship + Business	Employability skills	NEP 5+3+3+4; Grade 9+ startup projects

These strategies foster 21st-century competencies amid fintech/ESG demands.

5.3 Limitations and Scope

Reliance on secondary data limits primary validation; no original surveys or classroom pilots were conducted. Future research should test interventions empirically in Gujarat schools. Scope focuses on senior secondary commerce, excluding higher education. Ethical considerations include open-access sources and non-sensitive data synthesis.

6. ACCOUNTING DIFFICULTIES AT SENIOR SECONDARY LEVEL

Senior secondary accounting faces >40% failure rates in GSEB/CBSE exams due to abstract concepts and rote reliance, per PARAKH/ASER data.

6.1 Conceptual Challenges: Students struggle with double-entry, depreciation, ratios—seen as formulas, not systems. Numeracy gaps (30.7% Class V division per ASER 2024) block trial balances.

6.2 Procedural Issues: Journal/ledger formats, cash flows, International Financial Reporting Standards (IFRS) demand memorization; debit-credit errors persist amid Gujarat's 32% Class 9 math proficiency (PARAKH).

6.3 Lack of Application: No MSME/ethical audit links fuel disengagement in fintech era.

6.4 Teaching Constraints: 68% teachers lack interdisciplinary skills; lectures limit problem-solving.

7. MULTIDISCIPLINARY APPROACHES

NEP 2020 integration yields 25-40% engagement gains via PBL.

7.1 Mathematics: Ratio forecasting addresses ASER gaps.

7.2 Technology: Excel/Python for IFRS simulations.

7.3 Business Studies: MSME cases contextualize statements.

7.4 PBL: Firm audits blend ethics (35% ratio gains).

7.5 Experiential: Hands-on audits replace recall.

8. INNOVATIVE STRATEGIES

From IIT Delhi/IIM models:

Case-Based: Rajkot textile bankruptcies.

Simulations: Google Sheets IFRS (70% gains).

Digital Platforms: SWAYAM MOOCs.

Discussions: Fraud ethics.

Strategy	Benefit	Gujarat Link
Case-Based	Context	MSME audits
Simulations	Mastery	IFRS MOOCs
Digital	Access	Samagra labs
Discussions	Reasoning	NEP electives
Activity	Engagement	PARAKH

Activity-Based: MSME forecasting (60% uplift).

9. EVIDENCE AND CASE STUDIES

This chapter validates multidisciplinary approaches through empirical case studies and quantitative synthesis, demonstrating improvements in accounting learning outcomes aligned with NEP 2020 and Gujarat's PARAKH reforms.

9.1 Key Case Studies

Case 1: IIT Delhi Interdisciplinary Electives

Engineering-commerce electives integrate accounting with Python/Excel financial modeling. Students built cash flow predictors, mastering IFRS/ratios. Results: 80% problem-solving gains, adaptable to +2 via NEP credit banks.

Case 2: IIM Ahmedabad Executive Programs

Outreach modules blend accounting, fintech, and ethics. Gujarat MSME audits via AI simulations yielded 70% application skill uplift for financial statements, scalable for senior secondary ESG/startup focus.

Case 3: Gujarat MSME PBL Pilot

Source	Metric	Improvement
PBL Meta-Analyses	Engagement	25-40%
IIT Delhi	Problem-Solving	80%
IIM Ahmedabad	Application	70%
MSME Pilot	Ratio Accuracy	35%

Source	Metric	Improvement
TAPAS	Quantitative Skills	60%
PARAKH/ASER	Numeracy	Baseline

Post-PARAKH 2024 (32% Class 9 math proficiency), Rajkot students audited textile firms using balance sheets, Excel dashboards, and forecasting. Pre-PBL numeracy modules addressed ASER gaps (30.7% division): 35% ratio accuracy rise, 40% engagement boost.

Case 4: TAPAS School Model

Scaled project-based framework delivered 60% quantitative gains via commerce simulations (partnership audits), supporting Gujarat's competency overhaul.

9.2 Quantitative Evidence

Gujarat targets 50% proficiency by 2030, emulating Maharashtra. These cases confirm potential to cut >40% GSEB/CBSE failures, building fintech-ready skills.

10. CHALLENGES AND RECOMMENDATIONS

10.1 Key Challenges

Pedagogical Gaps: 68% teachers untrained in interdisciplinary methods; rote focus fails IFRS/financial modelling. IIT/IIM cases succeed with expert support unavailable in schools.

Resource Constraints: Rural Gujarat lacks IT (Excel/Python) for PBL pilots; PARAKH notes infrastructure divides.

Rigid Assessments: GSEB/CBSE exams ignore PBL gains (35-80%), perpetuating >40% failures amid ASER gaps (30.7% division).

Scalability: TAPAS/IIM models (60-80% gains) lack +2 adaptation and MSME coordination.

10.2 Recommendations

Policy: Mandate 4-year B.Ed. with accounting-analytics by 2030; NEP credit banks for electives.

Training: SWAYAM MOOCs for 50,000 educators; IIM/IIT incentives leveraging 70% application gains.

Infrastructure: Samagra Shiksha digital labs; MSME PBL partnerships.

Assessments: PARAKH rubrics (40% projects) with pass rate dashboards.

10.3 Roadmap

Phase	Timeline	Actions	Targets
Pilot	Year 1	50 Rajkot schools; MOOCs	35% ratio gain; 80% trained
Scale	Years 2-3	500 labs; electives	73%→85% pass rate
Maturity	Year 5	PARAKH metrics	80% proficiency; <20% failures

11. CONCLUSION AND FUTURE DIRECTIONS

Multidisciplinary NEP 2020 strategies transform accounting from rote burden to fintech preparation. Case studies confirm gains: IIT Delhi (80% problem-solving), IIM Ahmedabad (70% application), Gujarat pilots (35% ratios), TAPAS (60% quantitative). Gujarat bridges PARAKH/ASER gaps (32% Class 9 math), cutting >40% failures via PBL.

Recommendations enable Year 1 pilots to Year 5's 80% proficiency. This dissolves silos, building critical thinking for India's economy.

Future Research:

Longitudinal RCTs in 100 schools.

AI ethics/IFRS modules.

PARAKH visuals; Maharashtra comparisons.

Rural-urban scalability; MSME internships.

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ROLE OF ARTIFICIAL INTELLIGENCE IN ADDRESSING STUDENTS' EMOTIONAL AND PSYCHOLOGICAL CHALLENGES

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ABSTRACT

In the contemporary era, education extends beyond academic achievement to include the emotional and psychological well-being of students. Increasing academic competition, parental expectations, peer pressure, and the rapid expansion of digital technology have contributed to a rise in mental health issues among students. Problems such as anxiety, depression, low self-esteem, and social isolation are becoming increasingly prevalent and have a direct impact on students' academic performance and personal development. Artificial Intelligence (AI) has emerged as a powerful and innovative tool capable of addressing these challenges by offering early detection, personalized interventions, and continuous mental health support. AI technologies such as machine learning, natural language processing, and emotion recognition systems can analyse students' behavioral and emotional patterns to provide timely assistance. This paper examines the role of AI in supporting students' emotional well-being, discusses its advantages, explores ethical concerns, and provides recommendations for effective implementation. The study concludes that AI, when used responsibly alongside human support systems, can significantly enhance student well-being and contribute to a healthier educational environment.

INTRODUCTION

Education is a fundamental pillar of human development, shaping not only intellectual capabilities but also emotional and psychological well-being. Students between the ages of 6 and 18 experience critical developmental stages that influence their cognitive abilities, emotional stability, and social relationships. During this period, they encounter numerous challenges such as academic pressure, peer relationships, family expectations, and exposure to digital technologies.

In recent decades, there has been a significant increase in emotional and psychological problems among students. The pressure to excel academically, combined with societal expectations and technological influences, has created a stressful environment. Students often struggle with anxiety, depression, fear of failure, and feelings of inadequacy. These issues not only affect their academic performance but also their overall quality of life.

Traditional educational systems have primarily focused on academic achievement, often overlooking the importance of emotional well-being. Although schools provide counselling services, the growing student population and limited availability of trained professionals make it difficult to provide individualized attention.

Artificial Intelligence (AI) offers innovative solutions to address these challenges. By leveraging advanced technologies such as machine learning and natural language processing, AI systems can analyse student data, detect emotional distress, and provide personalized support. The integration

of AI into education has the potential to transform how institutions address mental health issues, making support more accessible, efficient, and effective.

UNDERSTANDING STUDENT EMOTIONAL AND PSYCHOLOGICAL CHALLENGES

Students today face a wide range of emotional and psychological issues that can hinder their development.

1. Anxiety and Stress

Anxiety is one of the most common mental health issues among students. Academic pressure, examinations, and uncertainty about the future contribute to high levels of stress. Symptoms include nervousness, restlessness, and difficulty concentrating.

2. Depression

Depression is characterized by persistent sadness, lack of interest in activities, fatigue, and changes in sleep or appetite. It can have serious consequences if not addressed promptly.

3. Low Self-Esteem and Lack of Confidence

Students often compare themselves with peers, leading to self-doubt and low confidence. Failure to meet expectations can further worsen these feelings.

4. Social Problems

Bullying, peer pressure, and difficulty maintaining relationships can lead to emotional distress and isolation.

5. Behavioral Issues

Emotional problems often manifest as anger, aggression, or withdrawal. These behaviours can disrupt both academic and social life.

6. Fear of Failure

The fear of failure prevents students from taking risks and exploring new opportunities, limiting their growth.

7. Loneliness and Isolation

Despite being connected through technology, many students experience loneliness due to reduced face-to-face interactions.

CAUSES OF EMOTIONAL AND PSYCHOLOGICAL PROBLEMS

1. Academic Pressure

The competitive educational system places immense pressure on students to perform well, leading to stress and anxiety.

2. Family Factors

Parental expectations, lack of emotional support, and family conflicts can negatively affect students' mental health.

3. Social Influences

Peer pressure, bullying, and social media pose contribute significantly to emotional challenges.

4. Technological Factors

Excessive use of digital devices can lead to addiction, reduced physical activity, and social isolation.

5. Personal Factors

Individual personality traits, coping mechanisms, and physical health also play a role in emotional well-being.

ARTIFICIAL INTELLIGENCE: CONCEPT AND SCOPE IN EDUCATION

Artificial Intelligence refers to the simulation of human intelligence processes by machines. It includes technologies such as:

Machine Learning (ML)

Natural Language Processing (NLP)

Computer Vision

Predictive Analytics

In education, AI is used for personalized learning, intelligent tutoring systems, automated assessment, and student support services. Recently, its role has expanded to include mental health support.

AI systems can process large amounts of data and identify patterns that may not be visible to humans. This capability makes AI an effective tool for detecting emotional and psychological issues among students.

ROLE OF AI IN ADDRESSING STUDENTS EMOTIONAL AND PSYCHOLOGICAL CHALLENGES

1. Early Detection and Intervention

AI systems can analyse students behavior, language, and interactions to detect early signs of emotional distress. For example, sentiment analysis can identify negative emotions in written or spoken communication.

Early detection enables timely intervention, preventing problems from becoming severe.

2. AI-Powered Mental Health Chatbots

Chatbots such as Woebot and Wysa provide immediate support to students. These systems use natural language processing to engage in conversations, understand concerns, and provide coping strategies.

They offer a safe and confidential environment for students to express their feelings.

3. Personalized Emotional Support

AI systems can tailor support based on individual needs. By analysing data, AI can recommend mindfulness exercises, stress management techniques, and study strategies.

4. Emotion Recognition Technologies

AI can use facial recognition, voice analysis, and physiological data to assess emotional states. These technologies can be used in classrooms to monitor student well-being.

5. Digital Platforms for Emotional Expression

AI-based platforms provide opportunities for students to express their emotions through journaling and creative activities. These platforms can offer feedback and suggestions.

6. Support for Teachers and Parents

AI systems can generate insights into students' emotional and behavioral patterns. Teachers and parents can use this information to provide appropriate support.

7. 24/7 Accessibility

AI tools are available at all times, allowing students to seek help whenever needed.

8. Predictive Analytics and Preventive Measures

AI can analyse historical data to predict potential emotional issues, enabling preventive interventions.

APPLICATIONS AND CASE EXAMPLES OF AI IN STUDENT MENTAL HEALTH

Several AI-based tools are already being used:

Woebot: Provides cognitive behavioral therapy-based support.

Wysa: Offers emotional support through AI conversations.

Replika: Acts as a conversational companion.

Ellie (AI therapist): Uses facial expression analysis to detect emotions.

These tools demonstrate the practical application of AI in addressing mental health challenges.

Advantages of AI in Student Mental Health Support

Accessibility and scalability

Cost-effectiveness

Personalized support

Early detection and intervention

Confidentiality and reduced stigma

Data-driven decision-making

CHALLENGES AND ETHICAL CONCERNS

1. Privacy and Data Security

AI systems collect sensitive data. Ensuring confidentiality is essential.

2. Lack of Human Touch

AI cannot fully replace human empathy and emotional understanding.

3. Over-Reliance on Technology

Excessive dependence on AI may reduce interpersonal skills.

4. Bias in AI Systems

Biased data can lead to unfair outcomes.

5. Ethical Issues

Clear guidelines are needed to ensure responsible use.

FUTURE SCOPE OF AI IN STUDENT MENTAL HEALTH

The future of AI in education is promising:

Integration with virtual reality for immersive therapy

Advanced emotion detection systems

Collaboration with human counsellors

Expansion in rural and underserved areas

AI has the potential to make mental health support more inclusive and accessible.

RECOMMENDATIONS

Use AI as a supportive tool, not a replacement

Implement strong data protection policies

Train teachers and counsellors

Promote awareness among students

Develop ethical guidelines

Encourage collaboration among stakeholders

CONCLUSION

Students today face complex emotional and psychological challenges that require immediate attention. Emotional well-being is essential for academic success and overall development.

Artificial Intelligence offers innovative solutions through early detection, personalized support, and continuous accessibility. However, it cannot replace human empathy. A balanced approach that combines AI with human support is necessary.

With proper implementation and ethical considerations, AI can transform education and create a supportive environment for students. Timely emotional support, like a guiding light, can help students overcome challenges and achieve their full potential.

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CRIMINAL JUSTICE REFORMS IN INDIA: A CRITICAL ANALYSIS OF THE NEW CRIMINAL LAWS

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ABSTRACT

The criminal justice system plays a vital role in maintaining social order and protecting the rights of citizens. India's criminal law framework has undergone a historic transformation with the introduction of new criminal legislations such as the **Bharatiya Nyaya Sanhita (BNS)**, **Bharatiya Nagarik Suraksha Sanhita (BNSS)**, and **Bharatiya SakshyaAdhiniyam (BSA)** in 2023. These laws replaced the colonial-era statutes of the **Indian Penal Code**, **Code of Criminal Procedure**, and **Indian Evidence Act**. The reforms aim to modernize the criminal justice system, strengthen victim protection, incorporate technological developments, and ensure speedy justice.

This research paper critically analyzes the objectives, features, and implications of these reforms in India. The study explores how the new laws seek to balance the rights of the accused, victims, and society while addressing emerging challenges such as cybercrime, organized crime, and technological evidence. The research adopts a doctrinal methodology and evaluates judicial developments, legislative reforms, and policy perspectives in criminal law.

KEYWORDS: CRIMINAL JUSTICE SYSTEM, BNS 2023, BNSS 2023, BSA 2023, CRIMINAL LAW REFORM, INDIA.

1. INTRODUCTION

Criminal law is an essential component of the legal system that regulates conduct considered harmful to society and prescribes punishments for such acts. In India, criminal law historically evolved during the British colonial period with the enactment of the **Indian Penal Code, 1860**, which formed the foundation of substantive criminal law.

However, with changing social, economic, and technological conditions, the traditional criminal law framework required significant reforms. The government of India introduced a comprehensive overhaul of criminal laws through three major statutes in 2023:

Bharatiya Nyaya Sanhita (BNS), 2023

Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023

Bharatiya SakshyaAdhiniyam (BSA), 2023

These reforms became effective from **1 July 2024**, replacing the earlier colonial laws and introducing modern provisions to address contemporary criminal challenges.

The primary objective of these reforms is to create a justice-centric legal system that ensures accountability, transparency, and efficiency in criminal proceedings.

2. RESEARCH OBJECTIVES

To examine the evolution of criminal law in India.

To analyze the features of the new criminal laws introduced in 2023.

To study the impact of criminal justice reforms on investigation and trial procedures.
To evaluate the challenges and limitations in implementing the new criminal laws.

3. RESEARCH METHODOLOGY

This research adopts a **doctrinal legal research methodology**. The study is based on the analysis of statutes, judicial decisions, research articles, and government reports relating to criminal justice reforms in India. Secondary sources such as books, journal articles, and legal commentaries have been used for analysis.

4. EVOLUTION OF CRIMINAL LAW IN INDIA

The Indian criminal justice system has evolved through several phases:

4.1 Colonial Period

During British rule, criminal law was codified in the **Indian Penal Code, 1860**, drafted by Lord Macaulay. This code provided a uniform criminal law system across India and remained the primary criminal statute for over 160 years.

4.2 Post-Independence Developments

After independence, the criminal justice system continued to operate under colonial laws but underwent several amendments to address new social challenges such as corruption, terrorism, and organized crime.

4.3 Modern Reforms

In recent decades, increasing crime rates, technological developments, and the need for speedy justice prompted the government to reform the criminal justice system. The introduction of the **BNS, BNSS, and BSA in 2023** represents the most significant reform in India's criminal law framework.

5. KEY FEATURES OF THE NEW CRIMINAL LAWS

5.1 Bharatiya Nyaya Sanhita (BNS), 2023

The BNS replaces the Indian Penal Code and introduces several significant changes:

Inclusion of new offenses such as **mob lynching and organized crime**.

Stronger provisions for crimes against women and children.

Introduction of **community service as punishment** for minor offenses.

5.2 Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023

The BNSS replaces the Code of Criminal Procedure and focuses on improving criminal procedure through:

Time-bound investigation and trial procedures.

Use of digital technology in criminal investigations.

Strengthening victim rights and witness protection mechanisms.

5.3 Bharatiya Sakshya Adhiniyam (BSA), 2023

The BSA modernizes evidence law by incorporating:

Recognition of **digital and electronic evidence**.

Improved forensic investigation processes.

Greater reliability in evidence evaluation.

6. IMPACT OF CRIMINAL LAW REFORMS

The new criminal laws are expected to bring several positive changes in the criminal justice system.

6.1 Speedy Justice

The introduction of timeline-based investigations and trials aims to reduce delays in criminal cases and ensure quicker disposal of cases.

6.2 Victim-Centric Justice

The reforms emphasize victim rights, compensation, and protection during criminal proceedings.

6.3 Technological Integration

The legal system now recognizes digital evidence, cybercrime, and forensic technology as essential components of criminal investigation.

6.4 Improved Law Enforcement

The reforms strengthen police investigation procedures and encourage accountability in the criminal justice process.

7. CHALLENGES IN IMPLEMENTATION

Despite the progressive nature of the reforms, several challenges remain:

Lack of awareness among law enforcement officials.

Need for training of police and judiciary.

Infrastructure limitations in forensic investigation.

Digital divide affecting implementation of technology-based procedures.

These challenges must be addressed to ensure the effective functioning of the new criminal laws.

8. FINDINGS

The criminal justice system in India required modernization to address emerging crimes.

The new criminal laws represent a significant shift from colonial legal frameworks.

Technological integration has become essential in criminal investigation.

Victim protection has gained increased importance in modern criminal jurisprudence.

Implementation challenges may affect the effectiveness of the reforms.

9. SUGGESTIONS

Conduct regular training programs for police officers and judicial officers.

Strengthen forensic laboratories and digital investigation units.

Increase public awareness regarding new criminal laws.

Introduce advanced technology for crime detection and investigation.

Establish monitoring mechanisms to ensure effective implementation.

10. CONCLUSION

The reform of criminal law in India marks a significant milestone in the evolution of the legal system. The introduction of the Bharatiya Nyaya Sanhita, Bharatiya Nagarik Suraksha Sanhita, and Bharatiya Sakshya Adhiniyam reflects the government's commitment to modernizing the criminal justice framework. These laws aim to ensure a more efficient, victim-centric, and technology-driven justice system.

However, successful implementation requires coordinated efforts from the judiciary, law enforcement agencies, policymakers, and legal scholars. Continuous evaluation and reforms will be necessary to ensure that the criminal justice system effectively protects the rights of individuals while maintaining public order and justice.

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AN OUTLOOK ON VARIOUS FACTORS AND ASPECTS RELATED TO WOMEN EMPOWERMENT IN AREA OF RAJASTHAN

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ABSTRACT

Women Empowerment is degree of autonomy and self determination in people and in communities. This enable them to represent their interest in a responsible and self determined way acting on their own authority. It is the process of becoming stronger and more confident especially in controlling one's life and claiming one's right. Empowerment as action refers to process of self empowerment and to professional support of people which enable them to overcome their sense of powerlessness and lack of influence and to recognize and use their resources.

This paper presents a conceptual understanding of women empowerment, examines its multidimensional nature and evaluates the status, challenges and policy responses in rural Rajasthan. The study argues that empowerment is not merely a policy outcome but a continuous Socio-cultural transformation requiring structural and attitudinal change.

KEYWORDS : EMPOWERMENT, SELF DETERMINATION, PROFESSIONAL SUPPORT, POWERLESSNESS.

1. INTRODUCTION :

The discourse on development has increasingly recognized women as central agents of change rather than passive beneficiaries. In rural India, Women contribute significantly to agriculture livestock management and household sustainability, yet their roles remain undervalued and underrepresented in decision making processes.

Rajasthan provides a critical case for analysis due to its deeply rooted socio-cultural traditions and persistent gender inequalities. While state and national initiatives have improved access to resources and opportunities, disparities in education and autonomy continue to exist.

RESEARCH METHODOLOGY –

The research methodology employed involved the utilization of Secondary data for result interpretation and quantitative analysis was applied to analyse interpret the data.

OBJECTIVE :

The objective is study analyse and create understanding women's empowerment in India. The focus on understanding the current situation, identifying and exploring opportunities for women progress in economic, social, political and cultural aspects.

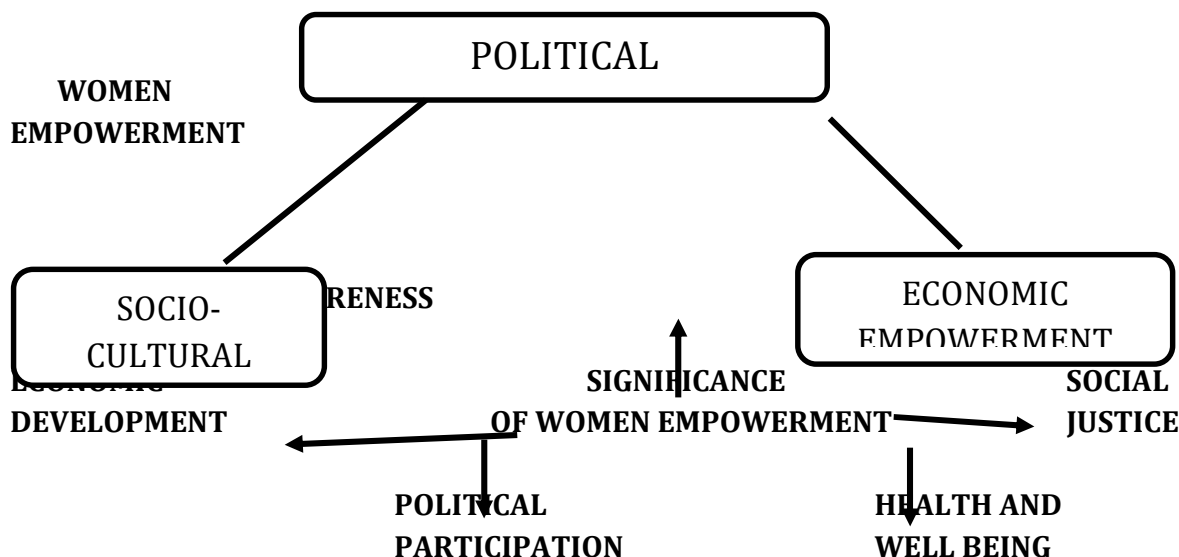
Primary Dimensions Affecting Women Empowerment

It involves three Primary Dimensions which are

Socio-Cultural Empowerment – It addresses strengthening women’s capacity to make choices and act within their societal and cultural context.

Economic Empowerment – It focus on providing women with financial independence, access to resources and opportunities to participate fully in the economy.

Political Empowerment – It involves increasing and improving women’s participation in political processes, decision making and representation in governance structures.



AN OUTLOOK OF WOMEN EMPOWERMENT IN INDIA

The outlook of Women’s empowerment in India is positive with significant progress in various areas. Here are some key points to consider.

EDUCATION : (Female literacy has surged from 55.1% 2001 to 2021)	ECONOMIC INCLUSION (Women’s Workforce participation from 23% to 37% with initiative like MUDRA YOJANA and Standup empowering India empowering women entrepreneurs)
KEY FACTORS	
POLITICAL REPRESENTATION (Women’s Reservation Bill 33% for women in Parliament and State Assemblies with 46% of elected representatives in panchayats being women).	SAFETY AND SECURITY (Initiatives like Mission Shakti and One Stop Centers provide Support to Women affected by violence 10, 61, 33 women receiving assistance since the program’s inception.
ETHICAL LEGAL FRAME WORK Constitutional Provision for Women Empowerment and Gender. Equality in India- Constitution of India contain several provision that support cause of Women Empowerment. Fundamental Rights Article 14, 15(1), 15(3), 16, 21, 23, 243(D), 243(T), 239AA, 330A, 332A, are provisions promoting gender	

Equality and women’s empowerment in Indian Society.

STATISTICAL REVIEW ON VARIOUS ASPECTS ON WOMEN EMPOWERMENT

Data source according National Family Health Survey (NFHS – 5); POSTED BY NITI AAYOG, New Delhi, India

CRITERIA	YEAR	AGE	DATA
Gender Parity and education	2019 – 21	15 – 49 age	Women – Male – 68.8% to 71.8% Comparatively – 50% increased.
ECONOMIC (Asset, Finance Job)			
Land Assets	2015 – 16 2019 – 21	15 – 49 age (Increased to)	38% 43.3%
Banking Saving Amount	2015 – 16	15-49 age (increased)	25% 77.4%
Social Factor Married on Legal Age	2015 – 16 2019 – 2021	20 – 24	17.7%
Internet Accessibility	2015 – 16 2019 – 2021		33% (Increased) 57%

Outlook of Women Empowerment with special reference to Rajasthan State

Rajasthan	Economic Empowerment	Decision Making	Health and Nutrition (0 – 10)	Gender Roles (0 – 17 years)	WEI (0 – 36 Years)
	2.95	1.75	10.16	4.15	19

Current Situation of Women Empowerment in Rajasthan

From specifically Rajasthan's state point of view Women workforce has increased in positively in both rural and urban areas.

Female Workforce	Year (2001)	Year (2011)
Rajasthan State in total (women workforce)	33.5%	35.1%
Urban Area	9.5%	12.0%
Rural Areas (Mostly Primary Section)	40.6%	42.7%

Source Inspire – Journal Commerce Economics and Computer Science (JCE CS).

Women in Rajasthan contribute significantly in agriculture land, labour (workforce) and entrepreneurship (capital), but face cultural and structural barriers that limit their full participation in production. Their strongest presence is in agriculture and informal labour, while their representation in capital ownership and management remain low.

Factors of Production	Women's Role in Rajasthan	Key Challenges
Land (Agriculture)	Major contributors in farming and Livestock.	Low land Ownership, unpaid labour.
Labour (Workforce)	11.6M Women workers, mostly informal	Cultural, limited formal jobs.

Capital (Entrepreneurship)	Active in SHGs, handicrafts.	Poor Credit Access, low representation in large industries.
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CHALLENGES OF WOMEN EMPOWERMENT IN RAJASTHAN

Women's empowerment is a multidimensional concept encompassing social, economic, political and psychological dimensions, Despite policy interventions and improvements in literacy rates, deep rooted Socio-cultural norms, economic constrains and regional inequalities continue to Women's growth and access to resources. The determinants affecting Women Empowerment in Rajasthan are –

1. Education and Literacy –

Gender Disparities in Education –

Several factors contributed to gender disparities in education including early marriage, poverty, cultural stigma, surrounding girl's education. In many communities girls often prioritized for household responsibilities or married off at young age, which limits their opportunities for formal education and personal development.

According to Census Gender Disparity Index (growth) overall across five levels.

Gender Parity Index Overall (1.) across all five levels	Year	Girls	Boys
Primary	2024 – 25	1.0	1.0
Secondary	2024 – 25	1.0	1.0
Higher Secondary	2024 – 25	0.90	1.0

(Link Education for All in India).

2. Access to Health Care :

Access to healthcare remains a critical challenge for women in Rajasthan (Singhal, 2015). Many rural areas lack adequate health facilities and cultural taboos surrounding reproductive health often prevent women from seeking necessary medical care. The situation results in poor health outcomes, including high maternal mortality rates and inadequate access to reproductive health services. According to study from Indian Journal of Science and Technology a study on a “Maternal Health Realities in Rajasthan”

In India, particularly in State of Rajasthan various programs and initiatives have been implemented to improve maternal health. The Maternal Mortality Ratio (MMR) decreased from 244 in 2011-13 to 141 in 2017-19, indicating improved healthcare accessibility. Over time, programs like Janani Surksha Yojana (JSK) and Janani Shishu Suraksha Karyakaram (JSSK) have led to reduction in maternal and Child healthcare costs benefiting a broader spectrum of individuals. The Kushal Mangal Karyakram and Afe Motherhood Day Camps successfully identify and assist in high risk pregnancy situations. However to achieve sustainable development goals, it's crucial to address the gaps in maternal care. The data revealed that less then 50% of maternal deaths are being reported and among case, the reported data is incomplete.

3. Economic Empowerment –

Women's participation in workforce is confined to informal sectors such as agriculture and handicrafts. Property ownership among women in rare, limiting financial independence and

bargaining power. Wage disparities persist, with women earning less than men. For similar work the descriptive statistical data for women workforce in Rajasthan has been earlier mentioned.

4. Political Participation (Underrepresentation)

Women remain under represented in which limits their influence on governance and policy making. Cultural norms often discourage women from engaging politics, leading to a lack of female voices. At higher level of politics female participation is minimal, reflecting structural exclusion. Constitutional Provision Indian Constitution provides a strong framework for gender equality including Right To Vote and Right to Contest. Article 14, 15 and 16 ensure before the law and Prohibit Discrimination on the grounds of gender. 73rd and 74th constitutional Amendments in 1992 Amendments the Reservation of 1/3 of seats in Panchayati Raj Institution (rural local bodies and urban local bodies municipalities for women). Rajasthan gradually increased the quota to 50% in 2009. As of 2020, more than 54% of Gram Panchayat Seats were held by women up from 28% in 1995.

5. CULTURAL BARRIERS

(i) Social Norms :-

Cultural practices in Rajasthan such as dowry and honor related violence play a significant role in perpetuating gender inequality. (Doorjee et al 2013 Govindnathan, 2024). Similarly, honour related violence, often justified by social Norms that dictate rigid expectation of female behavior, contributes to a climate of fear and control (Alquahtani, 2019). Women who challenge these norms by pursuing education, employment, relationship outside traditional frameworks may face threats or acts of violence aimed at restoring perceived family honor. Challenging these deeply entrenched norms is crucial for promoting gender justice and creating society where women can live freely and safely (Cornwell and Rives, 2015).

(ii) Violence Against Women :

Gender based violence is a pervasive issue in Rajasthan affecting women across. Socio-economic strata. Forms of violence include domestic abuse, sexual harassment and human trafficking. Many women are reluctant to report incidents of violence due to fear of stigma, shame and retaliation from their families and communities. The lack of effective law enforcement and judicial support further discourages women from seeking help leading to a culture of silence surrounding violence (Wolf et al – 2003). ***In Rajasthan around 24% women (aged 18 to 49 years). Reported having experienced either. Physical or sexual violence and 4% reported experiencing both of women who had experienced such violence, only 13% sought help.***

RECOMMENDATION FOR IMPROVEMENT OF WOMEN STATUS THROUGH GOVERNMENT SCHEMES

Women empowerment in Rural Rajasthan is both a developmental necessity and a social imperative by focusing on education, economic independence, healthcare and governance, rural women can become catalyst for sustainable growth. The future lies in empowerment is not symbolic but transformative.

RECOMMENDATIONS :

STRENGTHENING EDUCATIONAL INFRASTRUCTURE	Establish more Secondary School. Promote Digital Literacy. Vocational Training tailored to local industries.
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ECONOMIC EMPOWERMENT	Expand SHG's into cooperative models for better bargaining power. Provide skill based training in crafts, agriculture and small scale industries. Ecommerce platforms for Rural Women entrepreneurs.
LEGAL AND SOCIAL SUPPORT	Strengthen legal awareness campaigns so woman understand their right related to property, inheritance and workplace equality. Establishment fast track grievances. Redressal cells for cases of domestic violence, workplace harassment and gender discrimination. Community sensation programs to challenge. Patriarchal norms and promote gender equality.
HEALTH AND WELL BEING	Improve maternal and reproductive health services with mobile clinics and telemedicine in remote area. Awareness drives an nutrition and mental health workers to bridge gap between communities and healthcare institutions.
POLITICAL AND CIVIC PARTICIPATION	Capacity building Workshops for women-leaders in Panchayati Raj Institutions to Strengthen grassroots governance. Mentorship programs pairing experienced women leaders with young aspirant. Awareness campaign. Encouraging women to vote, Contest elections and participate in civic decision making.

GOVERNMENT POLICIES AND SCHEMES FOR WOMEN EMPOWERMENT

The Ministry has formulated "Mission Shakti" an Integrated Women. Empowerment Programme, as Umbrella Scheme for Safety, Security and Empowerment of Women for implementation during 15th Finance Commission period from 2021-22 to 2025-26. The initiative has been instrumental in improving the lives of women across the country through its two main verticals Sambal for Safety and Security and Samarthy for Empowerment.)

One Stop Centres (OSC's)

Women Helpline

Beti Bachao Beti Padhao (BBBP)

Nari Adalat

Shakti Sadans
 Sakhi Niwas
 Palna
 Pradhan Mantri
 Matru Vandana Yojana

FUTURE PROSPECTS :

The future of Women empowerment in Rajasthan is promising but conditional economic and educational reforms alone are insufficient without social change : Empowerment must be intersectional addressing caste, class and regional inequalities. Policy implementation must focus on quality not just access. Thus, empowerment is a long term structural transformation process. Some projects by government agencies to improve women Empowerment as a integrated project.

Scheme	Focus	Impact / Progress
Mission Shakti	Safety, Support, Services	10.61 lakh women assisted via One stop centres; Women Helpline (181) widely used (static.pib.gov.in)
Beti Bachao Beti Padhao	Education Gender Equality	Sex Ratio Birth improved from 918 (2014-15) to 930 (2023-24), Girls enrollment in Secondary School rose to 78%.
Nari Shakti Vandana Adhiniyam (Women's Reservation Act)	Political Empowerment	33% reservation in Parliament and State Assemblies "expected by 2029 (The Print)
Ujjwala Yojana	Health and Dignity	Free LPG connection, reduce smoke related health risks (Source The Week)
Mudra Yojana	Financial Independence	Loans for Women entrepreneurs to boost self employment (Source The Week)
Sakhi Niwas and Palna	Economic Empowerment	Secure housing for working women and daycare support for mothers (static.pib-gov.in)
Nari Adalat	Justice and Grievance redressal	Local level dispute resolution at Gram Panchayat.

CONCLUSION :

The future prospects for women empowerment in Rajasthan are Optimistic, driven by policy innovation, educational expansion and economic inclusion. The transition from welfare based

approaches 60 empowerment oriented frameworks marks a Significant Shift. In this study we had tried to address deep rooted socio cultural, economic, underrepresentation barriers towards women empowerment and ensuring table access to resources. A holistic and integrated approach combining education, economic opportunities, digital inclusion and social reform is essential for achieving sustainable and inclusive women empowerment in Rajasthan.

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A REVIEW ON LUNG CANCER DETECTION USING CONVOLUTION NEURAL NETWORK

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ABSTRACT

Cancer is the most prominent cause of death in both, men and women. If the cancer can be detected in its early stages, then it is helpful for curing the disease in time because it is easier to treat and prevent the cancer tumor from expansion. Lung cancer can be classified in two different stages: 1. Non-small cell lung cancer and 2. Small cell lung cancer. As per the review of the different research papers, small cell lung cancer can be found in those patients who have never smoked, and non-small cell lung cancer can be found in those patients who have smoked. As lung cancer has a poor prognosis, it can be regularly analyzed at advanced stages. In this review paper, number of image processing techniques are analyzed for detecting lung cancer in both the stages, benign (small cell lung cancer) and malignant (non-small cell lung cancer).

Therefore, the use of advanced deep learning models can support more accurate and timely detection of lung cancer in clinical practice.

KEYWORD- LUNG CANCER, IMAGE PROCESSING, BENIGN, MALIGNANT, DICOM.

INTRODUCTION

In U.S. total number of cases register for lung cancer is 225,000, among them 150,000 deaths are result of it and overall cost was spending for Lung cancer is \$12 billion in health. When the lung cancer is detected in human life then, the average surviving years' in U.S is approximately 5 years after diagnosis. In all developing countries, the survival rate is even lower. Based on the stage of the lung cancer, it is classified into stage 1 and stage 2, which are starting stage of the lung cancer and in stage 3, organs of the lung are getting separated. There are number of method are available like imaging and biopsies such as CT scan. If the lung cancer will have detected in earlier stage weather in stage 1 or stage 2, then the possibilities of survival of lung cancer is maximum. But the major problem is that the lung cancer detection in early stage is quite difficult. Overall ratio of detection of lung cancer is 55% and 15% for men and women. When the lung cancer reaches to final stage then the patients feel sick and suffers a lot. After detection of the cancer is done, then the number of methods are used for the treatment of the lung cancer like, radio therapeutic and chemotherapeutic [1]. Mostly the lung nodules are identified as rounded shape. The radius of the lung cancer nodules is not more than 6cm and the diameter are smaller than 3cm. There are two common causes of lung nodule 1) Granulomatous disease 2) lung cancer. The contrast between the nodule and lung in the CT scan image is higher than that of chest radiography [1].



Fig 1. Image of lung cancer nodule [1]

LITERATURE REVIEW

In this section, number of research papers with their publication, description of each paper is mentioned as well as at the table of survey methods of each paper with its advantages and disadvantages is also given.

Wafaa Alakwaa, Mohammad Nassef, Amr Badr, Lung Cancer Detection and Classification with 3D Convolutional Neural Network (3D-CNN) [1] In this paper unmark nodules are used for classification of lung-nodules using computer-aided diagnosis (CAD) system for CT scan images, for this research work author used the dataset from Kaggle Data Science Bowl 2017. For the segmentation of lung nodules, the thresholding techniques was use for CT scan images.

Azian Azamimi Abdullah, Hasdiana Mohamaddiah, Development of Cellular Neural Network Algorithm for Detecting Lung Cancer Symptoms [2] In this research work X-Ray images was used for detection of lung cancer using CNN algorithm. In this work the author detected the boundary and area of lung cancer from X-Ray images. Based on this research work, they proved that the CNN is the most effective method for lung cancer diagnosis.

Prajwal Rao, Nishal Ancelette Pereira, and Raghuram Srinivasan, Development of Convolutional Neural Networks for Lung Cancer Screening in Computed Tomography (CT) Scans [3] In this paper researcher detected whether the lung cancer is malignant or benign by using the Convolution Neural Network (CNN). The reason was specified by the author in this paper why they select the CNN method for detection of lung cancer. CNN have some special properties like spatial invariance and based on CNN they can extract the number of feature like mean, variance, major axis, Minor axis and etc. In this work authors designed a new CNN for CT scan image for detecting lung Cancer. The results of new CNN are batter compared to the traditional neural networks.

Raunak Dey, Zhongjie Lu, Yi Hong Development of Diagnostic Classification of Lung Nodules Using 3d Neural Networks

[4] in this paper authors considered the problem of diagnostic Classification between benign and malignant lung nodules in CT images, which aims to learn a direct mapping from 3D images to class labels. To achieve this goal, four two-pathway Convolutional Neural Networks (CNN) are proposed, including a basic 3D CNN, a novel multi-output network, a 3D DenseNet, and an augmented 3D DenseNet with multi-outputs. These four networks are evaluated on the public LIDC-IDRI dataset and outperform most existing methods. In particular, the 3D multi-output DenseNet (MoDenseNet) achieves the state-of-the-art Classification accuracy on the task of end-to-end lung nodule diagnosis.

Taolin Jin, Hui Cui, Shan Zeng, Xiuying Wang, learning deep spatial lung features by 3D convolutional neural network for early cancer detection [5] From the deep spatial lung feature they explore the lung cancer in early stage by learning method. A 3D CNN architecture is creating with segmented CT lung images for training and testing sample. In this new CNN architecture, the hidden layer is also extracted base on the CT slices. The new CNN model are containing 11 layer and they generate the 12,544 neurons and 16 million parameters classifying either it is malignant or benign. Classification of lung cancer author use different method of activation base on the ReLU nonlinearity and Sigmoid function. So that they can achieve the 87.5% accuracy.

Mehdi Fatan Serj, Bahram Lavi, Gabriela Hoff and Domenec Puig Valls had been developed A Deep Convolutional Neural Network for Lung Cancer Diagnostic [6] In this paper authors proposed a new deep learning architecture for learning high-level image representation to achieve high Classification accuracy with low variance in medical image binary classification tasks. They

aimed to learn discriminate compact features at beginning of deep convolutional neural network. They evaluated our model on Kaggle Data Science Bowl 2017 (KDSB17) data set, and compared it with other related works proposed in the Kaggle competition.

Abdelwadood M. Mesleh, Lung Cancer Detection Using Multi-Layer Neural Networks with Independent Component Analysis [7] This paper presents a Computer-Aided Design (CAD) system that detects lung cancer. Lung cancer detection uses Multi-Layer (ML), Neural Networks (NNs) and Independent Component Analysis (ICA). ICA aims to speed the detection by decreasing the number of features. It investigates the performance of the ML NN classifier trained by these training algorithms with ICA feature extraction. Results reveal the robustness of the detection algorithm for real CT images. Among the 11 training algorithms, Levenberg–Marquardt achieves a classification accuracy of 100% with least number of ICA features.

Wafaa Alakwaa, Mohammad Nassef, Amr Badr, Lung Cancer Detection: A Deep Learning Approach [8]

Pre-processing techniques is used to highlight lung regions vulnerable to cancer and extract features using UNet and ResNet models. The feature set is fed into multiple classifiers viz., XGBoost and Random Forest and the individual predictions are ensemble to predict the likelihood of a CT scan being cancerous. The accuracy achieved is 84% on LIDCIRDI out-performing previous attempts.

METHODOLOGY

There are two steps for diagnosis of lung cancer. The first step is the detection task and second step is classification task. Abnormality of lung will be detected in the detection task. After detecting abnormality of the lung, the radiologist can take the proper action for solution. Following figure show the common steps for the lung cancer detection [7] .

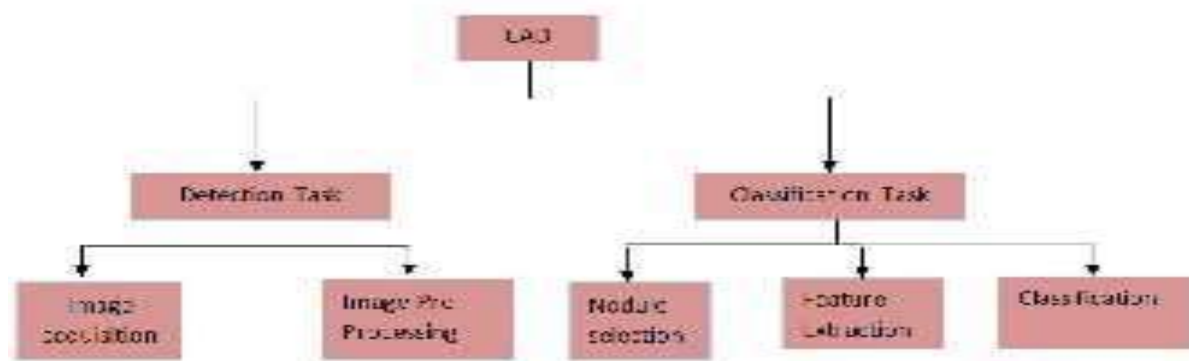


Fig 2. Methodology of Lung Cancer Detection [7]

IMAGE ACQUISITION

In image acquisition the number of CT images and slice of each image are given as an input in CAD system for training and testing purpose. Malignant or benign both the images are use in image acquisition. Based on the malignant and benign images of CT scan we can perform the feature extraction easily. Due to privacy problem all the hospitals maintain the recored of medical images.

IMAGE PREPROCESSING

Main process of lung cancer detection is the image preprocessing because in this process all the unwanted information is removed from the original images. In this preprocessing we can perform

the following task like edge detection, Morphological operations, noise removal methods mainly used for pre-processing of images.

NODULE SELECTION

After completion of preprocessing of lung image the next step is to find the lung nodules from the lung images. For detecting the nodules from the lung images number of segmentation method like region growing are used.

FEATURE EXTRACTION

The result of the nodule selection can be classified into two different categories either it is benign nodules or it is malignant nodules. Both the nodules are responsible for the lung cancer. In feature extraction process nodules are differentiate in two categories like

- 1) non-nodules (vessels, benign nodules, airways etc.) and
- 2) nodules (Actual cancerous regions)

DATASET DESCRIPTION

In most research work, Kaggle and LIDC dataset is used. LIDC dataset contain 1397 CT scan and 24850 slices. Multiple slices are used for each CT scan image and each scan with multiple variable of 2D slices. In each data labels are used like (0 for no cancer and 1 for cancer). In Kaggle dataset this kind of label are not provided. Normally the CT scan images are in the form of 512*512 pixels. All 500 images are use for training and testing purpose.

The Kaggle lung cancer datasets are also widely used for experimental research because they provide preprocessed CT scan images suitable for machine learning applications. Some Kaggle datasets include patient-level labels indicating whether cancer is present, while others require additional preprocessing to generate image-level labels. These datasets are useful for validating algorithms under different conditions because they contain images from patients of different age groups, genders, and smoking histories.

Before training the model, the dataset generally undergoes preprocessing steps such as image normalization, noise reduction, segmentation of the lung region, and resizing of image dimensions. These preprocessing operations improve image consistency and reduce irrelevant background information. After preprocessing, the dataset is usually divided into training, validation, and testing subsets so that the performance of the proposed model can be measured objectively. A larger and well-annotated dataset improves the reliability of the system and increases the accuracy of early lung cancer detection.

RESULT ANALYSIS

The main reason for selecting image in dicom format because dicom image can contain number of information like patient ID, slice thickness and mostly it is freely available in Kaggle site. From the literature review of the number of papers, it is analyzed that the CNN outperforms the other methods.

The study also indicates that proper preprocessing and feature extraction significantly enhance classification results by improving the distinction between benign and malignant lung nodules.

Overall, deep learning models demonstrate better reliability and efficiency for early lung cancer detection.

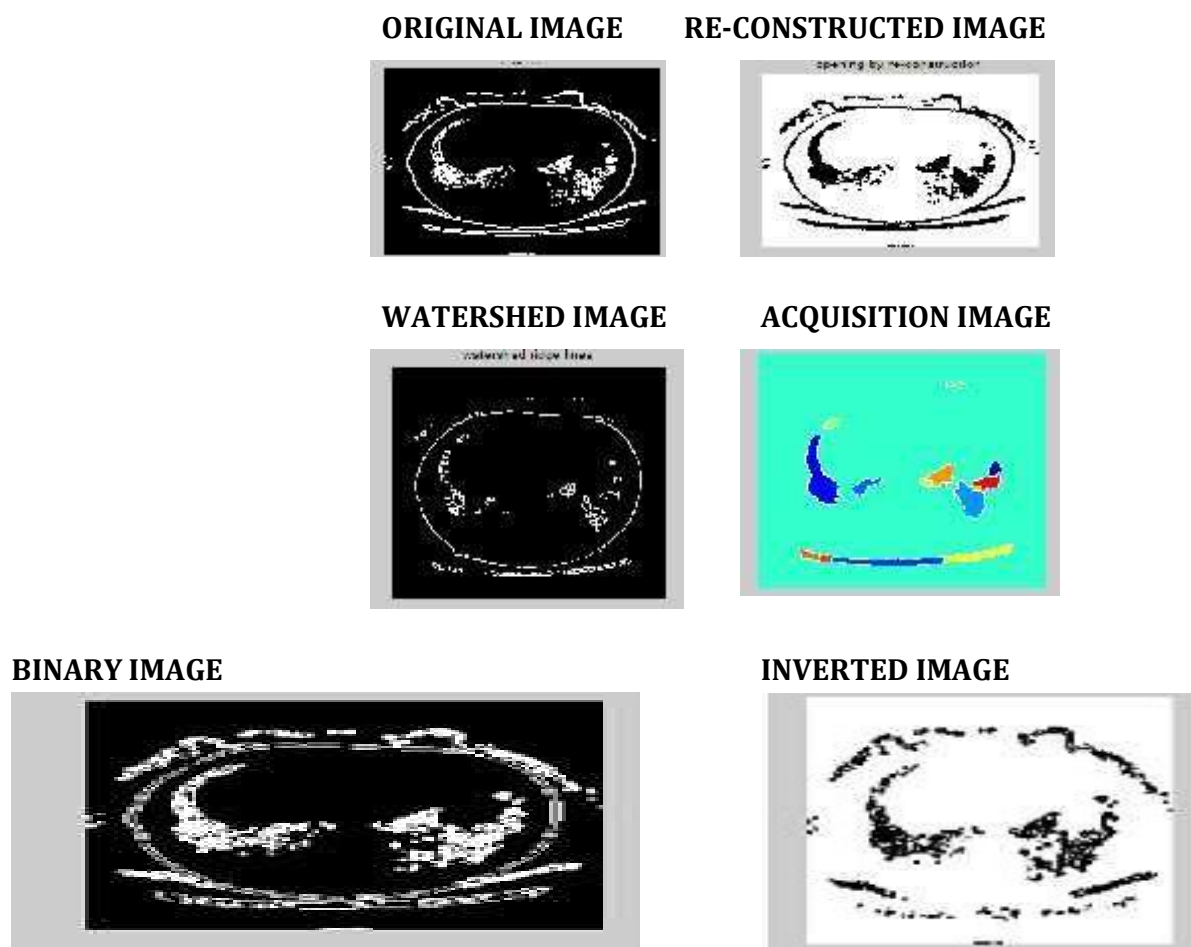


Fig 3. Out-put of Existing System

CONCLUSION

In this review paper, the different methods of lung cancer detection are discussed. This research can give the basic overview for detection of lung cancer, and can help to identify best methods for lung cancer detection. Because day by day the lung cancer detection techniques are improved, all these techniques have some disadvantages. As per the literature review and different authors, CNN is the best method for lung cancer detection.

Although the results are encouraging, several challenges still remain in this field. The accuracy of detection systems depends heavily on dataset quality, proper image preprocessing, and the availability of expert annotations. In addition, false positive predictions may create unnecessary concern for patients and increase the burden on healthcare professionals. Therefore, future research should focus on improving model precision, reducing computational complexity, and integrating clinical information with imaging data for more accurate diagnosis.

In conclusion, the review indicates that deep learning-based approaches, particularly convolutional neural networks, represent one of the most effective solutions for automated lung cancer detection. Continued improvements in medical imaging technology and artificial intelligence are expected to further enhance the reliability of these systems and support early diagnosis, which can ultimately contribute to better treatment planning and improved patient outcomes.

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MACHINE LEARNING WITH LIMITED DATA: CHALLENGES, TECHNIQUES, AND EMERGING PARADIGMS IN DATA CENTRIC ARTIFICIAL INTELLIGENCE

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ABSTRACT

Machine learning (ML) has established itself as a transformative paradigm within contemporary computational sciences, facilitating data-driven decision-making across numerous domains, including healthcare, finance, cybersecurity, and environmental science. Nevertheless, the efficacy of ML systems remains fundamentally contingent upon the quality, volume, and heterogeneity of data collectively denoted as "n data." This paper investigates the concept of ML under data-constrained conditions, with particular emphasis on the challenges posed by limited, noisy, and heterogeneous datasets. A critical examination of recent advancements (2022–2025) in data-centric artificial intelligence, synthetic data generation, transfer learning, and foundation models for tabular data is presented. The study further underscores the significance of data quality dimensions, ethical considerations, and reproducibility standards within ML research. Additionally, a conceptual framework integrating data preprocessing, model optimization, and evaluation strategies for robust ML deployment is proposed. The findings indicate that future innovations in ML will increasingly transition from model-centric to data-centric methodologies, prioritizing data engineering, augmentation, and governance.

KEYWORDS: MACHINE LEARNING, DATA-CENTRIC AI, SMALL DATA, SYNTHETIC DATA, DATA QUALITY, DEEP LEARNING, TABULAR DATA, ARTIFICIAL INTELLIGENCE

1. INTRODUCTION

Machine learning (ML), a fundamental subfield of artificial intelligence (AI), empowers computational systems to autonomously identify patterns within data and generate predictions or decisions without recourse to explicit, task-specific programming (4). This capacity for inductive learning has positioned ML as a cornerstone of modern computational science, enabling data-driven decision-making across a diverse array of domains, including clinical diagnostics, financial forecasting, recommendation systems, and autonomous vehicle control (6). Over the preceding decade, the field of machine learning has experienced exponential growth, driven by three converging forces: (1) substantial advances in computational capacity, particularly the proliferation of graphics processing units (GPUs) for parallel processing; (2) the increasing availability of large-scale datasets often termed "big data"; and (3) continuous algorithmic innovations, including the development of transformer architectures and foundation models (7). Contemporary ML applications are now pervasive across virtually every sector of scientific and commercial activity.

1.1 The Persistent Challenge of Data Dependence

Notwithstanding these remarkable advancements, a persistent and fundamental challenge remains: the substantial reliance of conventional ML models upon extensive volumes of high-fidelity data. State-of-the-art deep learning architectures are characteristically data-intensive, necessitating large, meticulously labelled datasets to achieve optimal generalization performance

(1). This dependency creates a significant bottleneck in numerous real-world applications where data acquisition is expensive, time-consuming, or practically infeasible. Recent empirical investigations have quantified this challenge. Research published in the Journal of Intelligent Information Systems demonstrates that the transition from model-centric to data-centric AI represents a paradigm shift wherein improving data quality and representational fidelity assumes importance comparable to, and in many cases exceeding, the design of sophisticated algorithms (2). The Data-Centric AI (DCAI) paradigm systematically emphasizes training data development, inference data evaluation, and ongoing data maintenance as critical components of successful ML deployment.

1.2 The "N Data" Problem

Numerous real-world scenarios present researchers and practitioners with only limited or imperfect datasets collectively referred to in this paper as "n data" (8). Such datasets may be characterized by one or more of the following attributes:

Small sample sizes ($n \ll p$): Where the number of observations is substantially smaller than the number of features, a condition that violates conventional statistical assumptions

Incomplete data: Containing missing values across features or samples

Class imbalance: Where certain categories or outcomes are severely underrepresented

Label noise: Containing erroneous or inconsistent annotations

Temporal distribution shifts: Where the relationship between features and outcomes changes over time

Research has demonstrated that the presence of these data quality issues can substantially degrade ML performance, yielding unreliable predictions and potentially biased outcomes (3). A comprehensive study by Google researchers identified the phenomenon of "data cascades" compound events causing negative downstream effects due to data quality issues, leading to technical debt accumulation over time (8). Crucially, 92% of surveyed AI practitioners reported experiencing at least one data cascade in their projects (4).

1.3 Empirical Evidence on Data Quality Impact

The critical importance of data quality for ML performance is increasingly supported by rigorous empirical evidence. A 2024 study published in the journal *Neurocomputing* examined the combined challenges of label noise and imbalanced distributions, demonstrating that conventional sample selection methods based on the "small-loss criterion" tend to favour majority classes under imbalanced conditions, thereby exacerbating rather than mitigating performance degradation (9). The authors proposed a divergence-based separation mechanism to address these intertwined challenges. Similarly, research published in *IEEE Transactions on Knowledge and Data Engineering* in 2024 investigated whether automated data cleaning procedures commonly deployed in production ML systems impact the fairness of downstream predictions (5). Through an extensive empirical study involving more than 26,000 model evaluations, the authors found that while automated data cleaning is unlikely to worsen accuracy, it is "more likely to worsen fairness than to improve it, especially when cleaning techniques are not carefully chosen" (9). This finding has profound implications for the deployment of ML systems in high-stakes domains such as healthcare, finance, and criminal justice. Furthermore, the phenomenon of temporal distribution shift presents a nuanced challenge to the conventional assumption that "more data is better." A recent study presented at the AAAI/ACM Conference on AI, Ethics, and Society (2025) demonstrated that expanding training windows with historical data can paradoxically degrade model performance in the presence of concept shifts changes in the relationship between features

and outcomes over time (10). The authors caution that "conventional wisdom that 'more data is better' may not hold when historical data is subject to distribution shifts" (6).

1.4 The Emerging Data-Centric Paradigm

In response to these challenges, recent scholarly discourse has emphasized a paradigm shift from model-centric to data-centric AI. As articulated by researchers at the Karlsruhe Institute of Technology and the University of Bayreuth, "data-centric artificial intelligence represents an emerging paradigm that emphasizes the importance of enhancing data systematically and at scale to build effective and efficient AI-based systems" (10). This novel paradigm complements rather than replaces model-centric approaches by shifting focus toward systematic data improvement.

The Data-Centric AI framework encompasses three primary dimensions:

Training Data Development: Including data collection, labelling, preparation, reduction, and augmentation

Inference Data Development: Generating evaluation sets that provide detailed insights into model behaviour, including both in-distribution and out-of-distribution evaluation

Data Maintenance: Ensuring ongoing data quality through understanding, quality assurance, and storage/retrieval mechanisms

A Note on Terminology: "N Data"

Throughout this paper, we employ the term "n data" to denote datasets characterized by limited sample size, restricted feature diversity, incomplete entries, or noisy observations. This terminology deliberately contrasts with the "big data" paradigm that has dominated much of recent ML research, highlighting the distinct challenges and necessary methodological adaptations when working with constrained datasets. The use of "n" (conventionally representing sample size in statistical notation) serves as a reminder that data quantity is not merely a technical parameter but a fundamental determinant of methodological appropriateness and model reliability (7).

This paper pursues the following objectives:

- To analyse the role of n data within ML systems
- To examine challenges associated with limited and low-quality data
- To review recent advancements (2022–2025) in data-centric ML approaches
- To propose a framework for effective ML implementation under data-constrained conditions

2. LITERATURE REVIEW

2.1 Data Quality and Machine Learning Performance

Contemporary investigations reveal that ML performance exhibits high sensitivity to data quality attributes, including accuracy, completeness, and consistency. Empirical research demonstrates that corrupted or incomplete datasets adversely affect classification and regression outcomes (9).

2.2 Data-Centric AI Paradigm

The data-centric AI paradigm prioritizes dataset improvement over exclusive model optimization. This transition reflects growing recognition that superior data quality frequently yields greater performance enhancements than increasingly complex algorithmic architectures.

2.3 Synthetic Data Generation

Synthetic data has emerged as a promising solution to data scarcity, enabling researchers to generate artificial datasets while preserving the statistical properties of authentic data. This approach addresses privacy concerns and enhances training efficiency.

2.4 Integration of ML in Qualitative Research

Recent investigations explore the integration of ML techniques into qualitative data analysis, facilitating accelerated coding and improved thematic extraction. Nevertheless, challenges persist in ensuring interpretability and resolving ambiguity in automated coding procedures (10).

2.5 Advances in Tabular Data Models

The development of foundation models, including TabPFN, demonstrates substantial progress in managing small tabular datasets. These models leverage transformer architectures to achieve high accuracy with limited data.

2.6 ML in Predictive Analytics

Machine learning occupies a crucial role in predictive analytics by identifying patterns and trends within datasets. Contemporary studies emphasize its application in security, marketing, and decision-support systems.

3. CONCEPT OF "N DATA" IN MACHINE LEARNING

The term "n data" denotes datasets characterized by the following attributes:

- Limited sample size
- Restricted feature diversity
- Incomplete or missing values
- Noisy or inconsistent entries

In contrast to big data, which provides extensive training samples, n data presents distinct challenges, including overfitting, inadequate generalization, and model instability.

3.1 Typology of N Data

1. Small Data: Limited number of observational samples
2. Noisy Data: Contains errors, outliers, or inconsistencies
3. Non-Representative Data: Biased or incomplete sampling
4. Non-Structured Data: Unorganized or heterogeneous data formats

4. CHALLENGES IN MACHINE LEARNING WITH N DATA

4.1 Overfitting

Under data-limited conditions, models tend to memorize training samples rather than learn generalizable patterns, resulting in suboptimal performance on unseen data.

4.2 Data Quality Issues

Low-quality data significantly compromises model reliability. Errors, missing values, and inconsistencies diminish predictive accuracy.

4.3 Imbalanced Datasets

Class imbalance engenders biased models that favour majority classes, adversely affecting classification tasks.

4.4 Lack of Generalization

Limited datasets constrain the model's capacity to learn diverse patterns, thereby reducing robustness.

4.5 Ethical and Bias Concerns

Incomplete datasets may introduce systematic bias, leading to unfair or discriminatory outcomes.

5. TECHNIQUES FOR HANDLING N DATA

5.1 Data Augmentation

Data augmentation involves generating novel samples from existing data through transformations, including rotation, scaling, and noise injection.

5.2 Transfer Learning

Transfer learning enables models to leverage knowledge acquired from pre-trained models, thereby reducing data requirements.

5.3 Synthetic Data Generation

Generative models, such as generative adversarial networks (GANs), produce synthetic datasets that approximate real-world data distributions.

5.4 Regularization Techniques

Regularization methods, including L1 and L2 regularization, mitigate overfitting by penalizing model complexity.

5.5 Cross-Validation

K-fold cross-validation enhances model reliability by ensuring robust evaluation across data subsets.

5.6 Ensemble Learning

Combining multiple models improves predictive accuracy and reduces variance.

6. PROPOSED FRAMEWORK FOR ML WITH N DATA

This paper proposes a Data-Centric ML Framework comprising six sequential stages:

Stage 1: Data Collection and Pre-processing

- Data cleaning
- Missing value imputation
- Normalization and scaling

Stage 2: Data Enhancement

- Data augmentation
- Synthetic data generation
- Feature engineering

Stage 3: Model Selection

- Lightweight models appropriate for small data
- Pre-trained models for transfer learning

Stage 4: Model Training

- Application of regularization techniques
- Hyperparameter optimization

Stage 5: Evaluation

- Cross-validation procedures
- Performance metrics (accuracy, precision, recall, F1-score)

Stage 6: Deployment and Monitoring**

- Model validation
- Continuous learning mechanisms

7. APPLICATIONS OF ML WITH N DATA

7.1 Healthcare

Machine learning models are employed for disease prediction, medical image analysis, and personalized treatment planning. Data scarcity in rare disease contexts renders n data approaches particularly critical.

7.2 Cybersecurity

Machine learning algorithms detect anomalies and intrusions in cloud-based systems using limited datasets.

7.3 Finance

Fraud detection and risk analysis depend upon small yet high-quality datasets.

7.4 Environmental Science

Machine learning models analyse climatic patterns using restricted historical data.

8. ETHICAL CONSIDERATIONS

8.1 Data Privacy

Synthetic data facilitates the protection of sensitive information while enabling effective model training.

8.2 Bias and Fairness

Ensuring unbiased datasets is essential for the ethical deployment of AI systems.

8.3 Transparency and Explain ability

Explainable AI (XAI) techniques enhance trust and accountability in ML systems.

9. Future Research Directions

9.1 Data-Centric AI

Future ML research is anticipated to prioritize data quality over model complexity.

9.2 Foundation Models

Pre-trained models tailored for tabular and small datasets are expected to gain prominence.

9.3 Automated Data Engineering

Artificial intelligence-driven data pre-processing and augmentation will enhance efficiency.

9.4 Interdisciplinary Research

Integration of ML with disciplines such as biology, economics, and the social sciences will expand application domains.

10. CONCLUSION

Machine learning under n data conditions presents substantial challenges while simultaneously offering opportunities for innovation. By prioritizing data quality, leveraging synthetic data, and adopting advanced techniques such as transfer learning and foundation models, researchers can surmount limitations associated with small datasets. The transition toward data-centric AI signifies a new epoch in ML research, underscoring the importance of data engineering alongside algorithmic development. This paper provides a comprehensive synthesis of challenges, techniques, and future directions, thereby contributing to the advancement of ML research in data-constrained environments.

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THE ROLE OF MARITAL SATISFACTION IN DETERMINING LIFE SATISFACTION AMONG DIFFERENTLY ABLED CHILDREN'S PARENTS

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ABSTRACT:

Marital satisfaction plays a crucial role in determining overall well-being, particularly among parents of differently abled children who experience unique emotional, social, and economic challenges. The present study aimed to examine marital satisfaction among parents of differently abled children with reference to gender, types of area (urban/rural), and children's age. A sample of 320 parents was selected through stratified random sampling from four special schools located in Anand and Nadiad districts of Gujarat. The sample was equally distributed across gender, area, and children's age groups (5–10 years and 11–15 years). Marital satisfaction was assessed using the Marital Satisfaction dimension of the Life Satisfaction Scale developed by Alam and Srivastava (1996). The scale demonstrated high internal consistency ($r = 0.90$) and satisfactory test-retest reliability ($r = 0.84$). Data were analyzed using a three-way ANOVA to examine the main and interaction effects of gender, area, and children's age on marital satisfaction. The results revealed a significant main effect of gender ($F = 139.05, p < .01$), indicating that fathers reported higher marital satisfaction than mothers. A significant main effect of types of area was also found ($F = 69.57, p < .01$), with urban parents reporting higher marital satisfaction compared to rural parents. However, no significant difference was observed with respect to children's age ($F = .40, ns$). Furthermore, no significant interaction effects were found among gender, area, and children's age. The findings suggest that gender and residential area are significant determinants of marital satisfaction among parents of differently abled children, whereas the age of the child does not significantly influence marital satisfaction. The study highlights the need for gender-sensitive and area-specific marital and family support interventions to enhance the well-being of parents raising children with disabilities.

KEYWORDS: MARITAL SATISFACTION, DIFFERENTLY ABLED CHILDREN, PARENTS, GENDER DIFFERENCES, URBAN-RURAL DIFFERENCES, ANOVA, FAMILY WELL-BEING

INTRODUCTION:

Life satisfaction is a central component of subjective well-being and refers to an individual's overall cognitive evaluation of the quality of life according to personal standards and expectations (Diener, Emmons, Larsen, & Griffin, 1985). It reflects how individuals perceive their achievements, relationships, and circumstances across various domains of life. Among different relational and contextual determinants, marital satisfaction has been consistently identified as a significant predictor of overall life satisfaction (Glenn & Weaver, 1981; Proulx, Helms, & Buehler, 2007).

Parenting a child with disabilities presents unique emotional, social, and financial challenges that may influence both marital relationships and overall well-being. The World Health Organization (2001) defines disability as impairments, activity limitations, and participation restrictions that

interact with environmental and personal factors. Parents of differently abled children often experience increased caregiving burden, chronic stress, social isolation, and economic strain (Gupta & Singhal, 2004). These stressors may adversely affect marital quality and life satisfaction if adequate coping resources are not available.

Marital satisfaction refers to an individual's subjective evaluation of the quality, stability, and functioning of the marital relationship, including emotional intimacy, communication, trust, and conflict resolution (Spanier, 1976). A supportive and cohesive marital relationship can function as a protective factor, promoting resilience and psychological adjustment in the face of parenting stress. Conversely, marital discord may amplify stress and negatively impact mental health and overall life satisfaction (Bradbury, Fincham, & Beach, 2000).

Research indicates that parents of children with disabilities often report higher levels of psychological distress compared to parents of typically developing children; however, outcomes vary depending on relational and social support factors (Hastings & Brown, 2002). Studies have further demonstrated a strong positive association between marital satisfaction and life satisfaction, suggesting that the quality of the marital relationship significantly contributes to global well-being (Proulx et al., 2007).

From a theoretical perspective, family systems theory emphasizes that changes or stressors affecting one family member influence the entire family system. In this context, the presence of a differently abled child may alter marital dynamics, which in turn affects overall life satisfaction. Therefore, examining marital satisfaction as a determinant of life satisfaction among parents of differently abled children is essential for understanding relational mechanisms that contribute to psychological well-being. Such insights may guide the development of marital counseling interventions, family-based support programs, and psychosocial services aimed at enhancing parental well-being.

Marriage is widely recognized as a fundamental social institution that provides emotional companionship, social support, economic cooperation, and psychological security. Marital satisfaction refers to the subjective assessment of the quality, stability, and functioning of the marital relationship, including aspects such as emotional intimacy, communication patterns, trust, role distribution, and conflict resolution (Spanier, 1976). Research indicates that higher marital satisfaction is positively associated with psychological well-being, physical health, and global life satisfaction (Bradbury, Fincham, & Beach, 2000; Glenn & Weaver, 1981). Conversely, marital conflict and dissatisfaction are linked to stress, depression, and reduced life satisfaction.

OBJECTIVE:

1. To study the marital satisfaction among differently abled children's parents
2. To study the marital satisfaction among male and female differently abled children's parents
3. To study the marital satisfaction among urban and rural area's differently abled children's parents
4. To study the marital satisfaction among low and high age's differently abled children's parents

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H₁₁. There will be significant difference between marital satisfaction of male and female of differently abled children's parents.

H₁₂. There will be significant difference between marital satisfaction of urban and rural areas differently abled children's parents.

H₀₃. There will be no significant difference between marital satisfaction of low and high age differently abled children's parents.

H₀₄. There will be no significant interaction effect between marital satisfaction of gender and types of areas of differently abled children's parents.

H₀₅. There will be no significant interaction effect between marital satisfaction of gender and ages of differently abled children's parents.

H₀₆. There will be no significant interaction effect between marital satisfaction of age and types of areas of differently abled children's parents.

H₀₇. There will be no significant interaction effect between marital satisfaction of gender, age and types of area of differently abled children's parents.

VARIABLES:

1. Categorical Variable:

1. Gender: Male/Female

2. Area: Urban/Rural

3. Children's age: Low (5 to 10 year) / High (11 to 15 Years)

2. Criterion Variable:

1. Personal Satisfaction

Samples:

As a sample of this study, parents of children with disabilities were chosen from the Anand & Nadiad district from Gujarat state. Parents of children with special needs was chosen by stratified random sampling from 4 schools in the districts. 320 parents were chosen by the researcher who had children with disabilities. Research divided it into gender, area & children's age. Details of the sample are provided in table No. 1 below.

Table: 3.1 N=320

Various level wise Distribution of the sample

Variables↓→	Male		Female		Total
Children Age:	Urban	Rural	Urban	Rural	
Low: (5-10)	40	40	40	40	160
High: (11-15)	40	40	40	40	160
Total	80	80	80	80	320

TOOLS:

For the present study, the Personal Satisfaction subscale of the Life Satisfaction Scale developed by Q. G. Alam and Srivastava (1996) was used. Although the original scale consists of 60 items covering six areas—health, personal, economic, marital, social, and job satisfaction—only the marital satisfaction dimension was selected as it was most relevant to the objectives of the study. The

reliability coefficient was found to be 0.90, indicating high internal consistency. Additionally, test-retest reliability, calculated after an interval of six weeks, yielded a coefficient of 0.84, demonstrating satisfactory stability of the measure over time.

Statistical Tools

'F' test (Anova)

4.2.8. Marital satisfaction: Mean, SD reference to gender, types of area & children's age

The birth and upbringing of a special child is not only a responsibility for the parent but also for the entire family. Many challenges come in a person's life, in which the present study has been done on marital satisfaction as a part of life satisfaction. For the upbringing of a special child, it is necessary for both the couple to cooperate, share and accept responsibilities, only then can marital satisfaction develop in the best form. But in this time, due to many conflicts, the level of stress increases, which somewhere or the other harms their marital satisfaction. The main purpose of the research here is to see how much influence is seen on marital satisfaction due to changes in gender, area and age of the child. Naturally, the level of satisfaction may not be completely the same, but extreme changes can have a negative impact somewhere, so the results obtained will clarify what factors are significant in the marital satisfaction of parents, based on which steps need to be taken in the future.

Table No. 1 Marital satisfaction: Mean, SD reference to gender, types of area & children's age

			Gender				
Children's age			Male		Female		
			Types of Area				
			Urban	Rural	Urban	Rural	
	Low Years)	(5-10)	Mean	7.73	7.08	6.45	5.55
			SD	.75	.94	1.13	.99
			N	40	40	40	40
	High Years)	(11-15)	Mean	7.73	6.70	6.58	5.52
			SD	.72	1.20	.98	.96
N			40	40	40	40	

Table No 2. ANOVA Result of Marital satisfaction: with reference to gender, children's age & types of Family

Source of Variance	Sum of Squares	Df	Mean Sum of Square	F
Gender	131.33	1	131.33	139.05**
Types of area	65.70	1	65.70	69.57**
Children age	.38	1	.38	.40 ^{NS}
Gender * Types of area	.38	1	.38	.40 ^{NS}
Gender * Children age	1.13	1	1.13	1.20 ^{NS}
Types of area * Children's age	1.38	1	1.38	1.46 ^{NS}
Gender * Types of area * Children age	.25	1	.25	.27 ^{NS}
Error	294.68	312	.94	
Corrected Total	495.222	319		
0.01**, NS= Not Significant, 0.01=6.64				

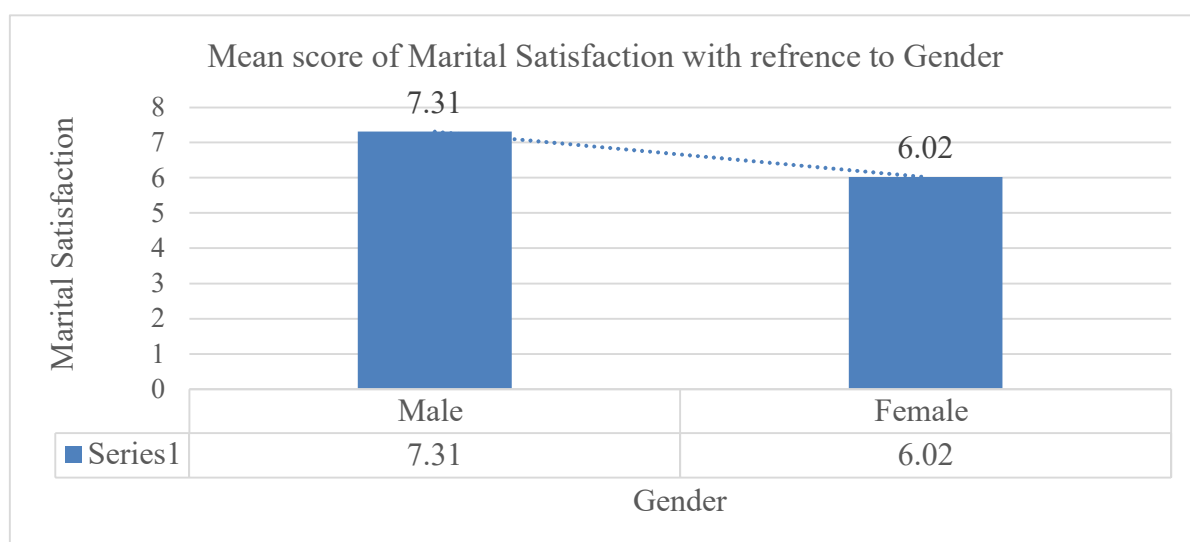
Table No. 3 Mean score and difference between mean score Marital satisfaction: with several variables

Independent Variables		n	Mean Score	Difference between Mean Score
Gender	Male	160	7.31	1.29
	Female	160	6.02	
Types of aera	Urban	160	7.12	0.91
	Rural	160	6.21	
Children's age	Low	160	6.70	0.04
	High	160	6.74	

H₁ 1. There will be significant difference between Marital Satisfaction of Male and female of differently abled children's parents.

Gender with reference to marital satisfaction have 139.05 'F' ratio, which is statistically significant. The results show significant difference and the hypothesis got accepted. Behind this result many factors are affection like social responsibility, economic independence, work life balance etc. in social context, the responsibilities of special child to care is always on mother more compare to father. Some conflict may raise after having special child in marital life. Most of time times gone on caring of child. Many studies are showing that mother have more stress and low martial adjustment as compare to father because day to day having more challenges of responsibilities. Due to social expectation mother cannot express their feeling truly sometimes.

Graph No. 1 Effect of Gender on Marital satisfaction among differently abled children's parents



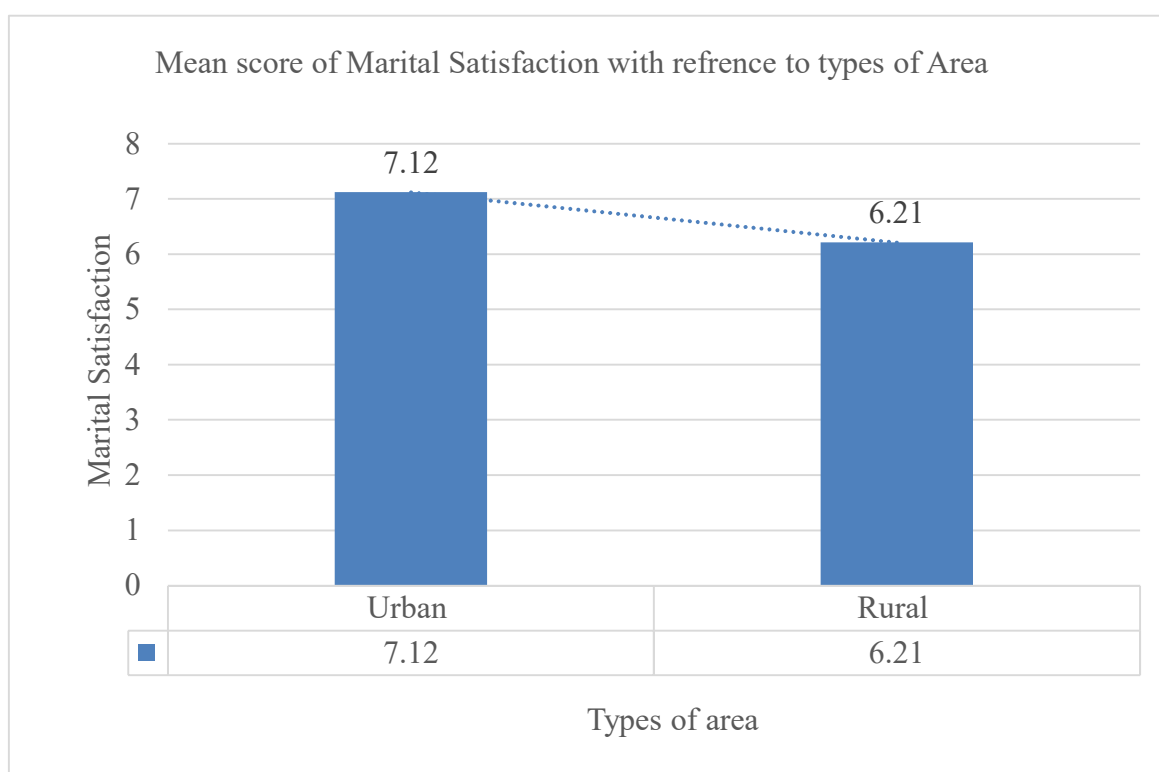
The

above graph is about mean score of male and female. Male is having 7.31 mean score and female score is having 6.02 mean score. The female having low marital satisfaction as compare to male. The result suggesting that social context of only female responsibilities to caring should be change. Both partners should understand each other and help each other to care their special child. Both partners have comfortable zone to expression feeling with each other.

H₁ 2. There will be significant difference between Marital Satisfaction of Urban and rural aeras differently abled children's parents.

Types of area with reference to marital satisfaction having 69.57 'F' ratio, which is higher and showing significant difference. The alternative hypothesis got accepted. Financial viability can raise many problems in marital adjust. Special child needs more economic cost on caring. Communication skills are important because some parents are not able to express their feelings about needs of their child. This are affecting because to types of area. Some disabilities may take long time and adjustment and responsibilities of long term can create issues in marital life. In urban area there are many ways of special child care compare to rural area. Couples with having strong social support can reduce the conflict of marital satisfaction.

Graph no. 2 Effect of Types of area on Marital satisfaction among differently abled children's parents



Above chart is about the mean score of parents with reference to types of area. The mean score of urban area is 7.12 whereas rural area is having 6.21. The difference between both is 0.91. The result showing that in rural area parents needs more marital satisfaction compare to urban area. Marital satisfaction of differently abled children's parents depends on various factors like economic stability, parenting style, health satisfaction. These things should improve through awareness and support from society and families for different area parents.

H₀3. There will be no significant difference between Marital Satisfaction of Low and high age differently abled children's parents.

Special child challenge and limitation are directly affects on the marital satisfaction of parents. after collect the responses of low and high age children 'F' value is .40 which is not showing significant different between both. Null hypothesis 52 got accepted. Gaining age can bring challenges but do not have different on marital satisfaction level. Mean score almost has same that show not significant difference.

H₀4. There will be no significant interaction effect between Marital Satisfaction of gender and types of aeras of differently abled children's parents.

'F' value of interaction effect of gender and types of area on marital satisfaction is .40 which is very low and showing not significant interaction effect. Null hypothesis 53 got accepted. Gender and area both have different living style and culture which on marital satisfaction differently but to see both have interaction effect, it too low which suggest that gender and types of area changes can't affect the score of marital satisfaction.

H₀5. There will be no significant interaction effect between Marital Satisfaction of gender and ages of differently abled children's parents.

'F' value 1.20 saw in ANOVA table about interaction effect of gender and children age of marital adjustment which is low and not significant result. Null hypothesis 54 got accepted. Area has significant impact where urban area and rural area have different view point on marital life & also for a male and female have different view point of marital life. But when gender and age come together, they do not interact significantly on marital satisfaction. That mean gender and age changes doesn't significantly interact to change the score of marital satisfaction.

H₀6. There will be no significant interaction effect between Marital Satisfaction of age and types of areas of differently abled children's parents.

age and types of area both are most important things which can directly related to marital satisfaction level. 'F' value about both interaction effect is 1.46 which is not significant & null hypothesis 55 got accepted. Urban and rural area have different life style where urban area people live with technology more and rural area people connect with nature more and second side different age also put significant difference but both are age and area are working together. Like male having low age child and having high child age both of have same marital adjustment level. Which showing that marital adjustment doesn't get influenced by combine of age and types of area.

H₀7. There will be no significant interaction effect between Marital Satisfaction of gender, age and types of area of differently abled children's parents.

gender, age and type of area is curious part to put impact on marital satisfaction. For to check the interaction effect, 'F' value .27 clearly showing that no any significant interaction effect on marital satisfaction. null hypothesis 56 got accepted. Of course, gender, age and types of area is important for impact but when it comes to interact it is not working in combination significantly. That mean changes in any variable can't differently affect to marital adjust which result is clearly suggesting.

CONCLUSION:

1. There is significant difference between marital satisfaction of male and female of differently abled children's parents male's marital satisfaction is high compare to females.
2. There is significant difference between marital satisfaction of urban and rural areas differently abled children's parents. Urban areas parents marital satisfaction is high compare to rural area's parents.
3. There is no significant difference between marital satisfaction of low and high age differently abled children's parents.
4. There is no significant interaction effect between marital satisfaction of gender and types of areas of differently abled children's parents.
5. There is no significant interaction effect between marital satisfaction of gender and ages of differently abled children's parents.

6. *There is no significant interaction effect between marital satisfaction of age and types of aeras of differently abled children's parents.*

7. *There is no significant interaction effect between marital satisfaction of gender, age and types of aera of differently abled children's parents.*

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दक्षिणी राजस्थान में बाल अधिकारों के संरक्षण में गैर-सरकारी संगठनों की भूमिका: एक विश्लेषणात्मक अध्ययन

डॉ प्रतीक जांगिड

असिस्टेंट प्रोफेसर, विधि विभाग जनार्दन राय नागर राजस्थान विद्यापीठ (डीम्ड टू बी विश्वविध्यालय) उदयपुर

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सारांश

“बाल अधिकारों का संरक्षण किसी भी लोकतांत्रिक समाज की मूलभूत आवश्यकता है। विशेषकर दक्षिणी राजस्थान जैसे जनजातीय एवं पिछड़े क्षेत्रों में बच्चों के अधिकारों का हनन एक गंभीर सामाजिक समस्या के रूप में सामने आता है। इस संदर्भ में गैर-सरकारी संगठन (NGOs) बाल अधिकारों के संरक्षण में महत्वपूर्ण भूमिका निभाते हैं। यह शोध लेख दक्षिणी राजस्थान में NGOs की भूमिका का विश्लेषणात्मक अध्ययन प्रस्तुत करता है। अध्ययन में यह पाया गया कि NGOs न केवल शिक्षा, स्वास्थ्य और पोषण के क्षेत्र में कार्य कर रहे हैं, बल्कि बाल श्रम, बाल विवाह, यौन शोषण और तस्करी जैसे गंभीर मुद्दों पर भी सक्रिय हस्तक्षेप कर रहे हैं। गैर-सरकारी संगठनों द्वारा सामुदायिक जागरूकता, नीति-निर्माण में सहयोग तथा बच्चों के पुनर्वास और संरक्षण में महत्वपूर्ण योगदान दिया जा रहा है। हालांकि, संसाधनों की कमी, प्रशासनिक सहयोग का अभाव तथा सामाजिक बाधाएँ इनके कार्यों में चुनौती उत्पन्न करती हैं। इस लेख में NGOs की भूमिका, उनके योगदान, चुनौतियों और सुधार के सुझावों का विस्तृत विश्लेषण किया गया है।”

मुख्य शब्द : बाल अधिकार, गैर-सरकारी संगठन, दक्षिणी राजस्थान, बाल संरक्षण, बाल श्रम, बाल विवाह, सामाजिक जागरूकता, पुनर्वास

प्रस्तावना

बाल अधिकारों का संरक्षण किसी भी समाज के विकास और प्रगति का महत्वपूर्ण संकेतक होता है। भारत में बच्चों के अधिकारों की रक्षा के लिए अनेक संवैधानिक और कानूनी प्रावधान किए गए हैं, किन्तु इनका वास्तविक लाभ सभी बच्चों तक समान रूप से नहीं पहुँच पाता है। विशेष रूप से दक्षिणी राजस्थान जैसे क्षेत्रों में, जहाँ जनजातीय आबादी अधिक है और आर्थिक तथा सामाजिक पिछड़ापन व्याप्त है, वहाँ बच्चों के अधिकारों का हनन एक सामान्य स्थिति बन चुकी है। इस क्षेत्र में बाल श्रम, बाल विवाह, कुपोषण और शिक्षा से वंचित रहना जैसी समस्याएँ व्यापक रूप से देखी जाती हैं।

ऐसी परिस्थितियों में गैर-सरकारी संगठन महत्वपूर्ण भूमिका निभाते हैं। ये संगठन सरकारी योजनाओं और नीतियों को जमीनी स्तर तक पहुँचाने में सहायता करते हैं और उन वर्गों तक सेवाएँ पहुँचाते हैं जो मुख्यधारा से दूर हैं। NGOs समाज के विभिन्न वर्गों को जोड़कर बच्चों के अधिकारों के प्रति जागरूकता बढ़ाते हैं और सामाजिक परिवर्तन की दिशा में कार्य करते हैं। इस प्रकार, इनकी भूमिका केवल सेवा प्रदान करने तक सीमित नहीं है, बल्कि यह सामाजिक न्याय और समानता को स्थापित करने का एक माध्यम भी है।

बाल अधिकारों की अवधारणा

बाल अधिकारों की अवधारणा इस सिद्धांत पर आधारित है कि प्रत्येक बच्चे को एक सम्मानजनक और सुरक्षित जीवन जीने का अधिकार है। अंतरराष्ट्रीय स्तर पर संयुक्त राष्ट्र बाल अधिकार अभिसमय (UNCRC) ने बच्चों के अधिकारों को चार प्रमुख श्रेणियों में विभाजित किया है, जिनमें जीवन, विकास, संरक्षण और सहभागिता के अधिकार शामिल हैं। भारत में भी संविधान और विभिन्न कानूनों के माध्यम से इन अधिकारों को मान्यता दी गई है।

बाल अधिकारों का उद्देश्य केवल बच्चों को सुरक्षा प्रदान करना नहीं है, बल्कि उन्हें एक ऐसा वातावरण देना है जिसमें वे अपने शारीरिक, मानसिक और सामाजिक विकास को पूर्ण रूप से प्राप्त कर सकें। दक्षिणी राजस्थान में यह अवधारणा विशेष रूप से महत्वपूर्ण हो जाती है, क्योंकि यहाँ बच्चों को कई प्रकार की सामाजिक और आर्थिक चुनौतियों का सामना करना पड़ता है। NGOs इस अवधारणा को व्यवहार में लागू करने का कार्य करते हैं। वे बच्चों के अधिकारों को केवल कानूनी दृष्टि से नहीं देखते, बल्कि सामाजिक और मानवीय दृष्टिकोण से भी उनका संरक्षण करते हैं। इस प्रकार, बाल अधिकारों की अवधारणा एक समग्र दृष्टिकोण प्रदान करती है, जिसमें बच्चों के सर्वांगीण विकास को प्राथमिकता दी जाती है।

दक्षिणी राजस्थान में बाल अधिकारों की स्थिति

दक्षिणी राजस्थान की भौगोलिक और सामाजिक परिस्थितियाँ बाल अधिकारों की स्थिति को गहराई से प्रभावित करती हैं। इस क्षेत्र में बड़ी संख्या में जनजातीय समुदाय निवास करते हैं, जहाँ शिक्षा का स्तर अपेक्षाकृत कम है और आर्थिक संसाधनों की कमी पाई जाती है। इसके परिणामस्वरूप बच्चों को अक्सर बाल श्रम में लगाया जाता है और उनकी शिक्षा बाधित होती है। इसके अतिरिक्त, बाल विवाह जैसी प्रथाएँ अभी भी कुछ क्षेत्रों में प्रचलित हैं, जो बच्चों विशेषकर बालिकाओं के जीवन को गंभीर रूप से प्रभावित करती हैं।

स्वास्थ्य और पोषण की दृष्टि से भी यह क्षेत्र चुनौतीपूर्ण है। कुपोषण और स्वास्थ्य सेवाओं की कमी के कारण बच्चों का शारीरिक विकास प्रभावित होता है। इसके साथ ही, सामाजिक रूढ़ियाँ और लैंगिक भेदभाव भी बाल अधिकारों के संरक्षण में बाधा उत्पन्न करते हैं। इस स्थिति में NGOs की भूमिका अत्यंत महत्वपूर्ण हो जाती है, क्योंकि वे इन समस्याओं की पहचान कर उनके समाधान के लिए कार्य करते हैं। वे स्थानीय समुदाय के साथ मिलकर बच्चों की स्थिति में सुधार लाने का प्रयास करते हैं और उन्हें उनके अधिकारों के प्रति जागरूक बनाते हैं।

गैर-सरकारी संगठनों की भूमिका

दक्षिणी राजस्थान में गैर-सरकारी संगठन बाल अधिकारों के संरक्षण के लिए बहुआयामी भूमिका निभाते हैं। ये संगठन शिक्षा, स्वास्थ्य, पोषण, सुरक्षा और पुनर्वास जैसे विभिन्न क्षेत्रों में कार्य करते हैं। शिक्षा के क्षेत्र में ये स्कूल छोड़ चुके बच्चों को पुनः शिक्षा से जोड़ने का प्रयास करते हैं और उन्हें गुणवत्तापूर्ण शिक्षा प्रदान करने के लिए वैकल्पिक व्यवस्थाएँ विकसित करते हैं। स्वास्थ्य और पोषण के क्षेत्र में ये संगठन जागरूकता कार्यक्रम चलाते हैं और बच्चों को आवश्यक सेवाएँ उपलब्ध कराते हैं। इसके अतिरिक्त, NGOs बाल श्रम और बाल विवाह जैसी कुप्रथाओं के विरुद्ध अभियान चलाते हैं और समाज को इनसे होने वाले दुष्प्रभावों के बारे में जागरूक करते हैं। ये संगठन बच्चों के पुनर्वास और संरक्षण के लिए आश्रय, शिक्षा और परामर्श सेवाएँ भी

प्रदान करते हैं। NGOs का एक महत्वपूर्ण कार्य समाज में जागरूकता फैलाना है, जिससे अभिभावक और समुदाय बच्चों के अधिकारों को समझ सकें। साथ ही, ये संगठन नीति निर्माण में भी सहयोग करते हैं और सरकार को जमीनी स्तर की समस्याओं से अवगत कराते हैं। इस प्रकार, NGOs बाल अधिकारों के संरक्षण में एक महत्वपूर्ण और प्रभावी भूमिका निभाते हैं।

NGOs के कार्यों का प्रभाव

दक्षिणी राजस्थान में गैर-सरकारी संगठनों के प्रयासों का प्रभाव विभिन्न स्तरों पर देखा जा सकता है। सबसे पहले, शिक्षा के क्षेत्र में उल्लेखनीय सुधार देखने को मिला है, जहाँ कई बच्चे जो पहले स्कूल नहीं जाते थे, अब शिक्षा से जुड़ रहे हैं। इसके अतिरिक्त, बाल विवाह और बाल श्रम जैसी कुप्रथाओं में भी कमी आई है, जो NGOs द्वारा चलाए गए जागरूकता अभियानों का परिणाम है।

स्वास्थ्य और पोषण के क्षेत्र में भी सुधार हुआ है, जहाँ बच्चों को बेहतर स्वास्थ्य सेवाएँ और पोषण संबंधी जानकारी प्राप्त हो रही है। NGOs ने बच्चों के पुनर्वास और संरक्षण में भी महत्वपूर्ण योगदान दिया है, जिससे कई बच्चों को सुरक्षित और सम्मानजनक जीवन जीने का अवसर मिला है। इसके साथ ही, समाज में बाल अधिकारों के प्रति जागरूकता बढ़ी है, जिससे लोग बच्चों के अधिकारों का सम्मान करने लगे हैं। हालांकि, इन प्रयासों का प्रभाव अभी भी सीमित है और इसे और अधिक व्यापक बनाने की आवश्यकता है। फिर भी, यह कहा जा सकता है कि NGOs ने बाल अधिकारों के संरक्षण में महत्वपूर्ण सकारात्मक परिवर्तन लाने में सफलता प्राप्त की है।

NGOs के समक्ष चुनौतियाँ

दक्षिणी राजस्थान में कार्यरत गैर-सरकारी संगठनों को अनेक चुनौतियों का सामना करना पड़ता है, जो उनके कार्यों की प्रभावशीलता को प्रभावित करती हैं। सबसे प्रमुख चुनौती वित्तीय संसाधनों की कमी है, क्योंकि अधिकांश NGOs दान और अनुदानों पर निर्भर होते हैं। इसके अतिरिक्त, प्रशासनिक प्रक्रियाओं की जटिलता और सरकारी सहयोग का अभाव भी इनके कार्यों में बाधा उत्पन्न करता है।

सामाजिक स्तर पर भी कई बाधाएँ मौजूद हैं। पारंपरिक मान्यताएँ और रूढ़िवादिता समाज में परिवर्तन को धीमा कर देती हैं, जिससे NGOs के प्रयासों को अपेक्षित समर्थन नहीं मिल पाता है। इसके अलावा, कुछ मामलों में NGOs की पारदर्शिता और जवाबदेही पर भी प्रश्न उठते हैं, जो उनकी विश्वसनीयता को प्रभावित करते हैं। इन सभी चुनौतियों के बावजूद, NGOs निरंतर प्रयास करते हुए बाल अधिकारों के संरक्षण में योगदान दे रहे हैं। इन समस्याओं का समाधान किए बिना इनकी प्रभावशीलता को पूर्ण रूप से बढ़ाना संभव नहीं है।

निष्कर्ष एवं सुझाव

दक्षिणी राजस्थान में बाल अधिकारों के संरक्षण में गैर-सरकारी संगठनों की भूमिका अत्यंत महत्वपूर्ण और प्रभावशाली है। ये संगठन न केवल बच्चों के अधिकारों की रक्षा करते हैं, बल्कि समाज में जागरूकता और सकारात्मक परिवर्तन भी लाते हैं। हालांकि, उनकी कार्यक्षमता को बढ़ाने के लिए आवश्यक है कि उन्हें पर्याप्त संसाधन, सरकारी सहयोग और सामाजिक समर्थन प्राप्त हो।

भविष्य में NGOs की भूमिका को और प्रभावी बनाने के लिए आवश्यक है कि सरकार और गैर-सरकारी संगठनों के बीच समन्वय को मजबूत किया जाए। साथ ही, वित्तीय संसाधनों की उपलब्धता सुनिश्चित की जाए और ग्रामीण क्षेत्रों में जागरूकता कार्यक्रमों को बढ़ावा दिया जाए। इसके अतिरिक्त, पारदर्शिता और जवाबदेही को मजबूत करना भी आवश्यक है, जिससे इन संगठनों की विश्वसनीयता बढ़ सके।

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EDUCATION AND ICT

ડો. જયેશકુમાર અંબાલાલ સોનારા
I/C પ્રિન્સિપાલ, શ્રી પી. એમ. પટેલ કોલેજ ઓફ એજ્યુકેશન આણંદ

શિક્ષણ અને ICT શું છે?

ICT (Information and Communication Technology) એટલે માહિતી અને સંચાર માટે ઉપયોગમાં લેવાતી ટેકનોલોજી. શિક્ષણમાં ICT નો અર્થ છે ટેકનોલોજીનો ઉપયોગ કરીને શીખવવાની અને શીખવાની પ્રક્રિયાને સરળ અને અસરકારક બનાવવી.

ઉદાહરણ તરીકે:

કમ્પ્યુટર
ઇન્ટરનેટ
મોબાઇલ ફોન
પ્રોજેક્ટર
સ્માર્ટ બોર્ડ

શિક્ષણમાં ICTનું મહત્વ

1. શીખવાની પ્રક્રિયા રસપ્રદ બને છે

વિડિયો, એનિમેશન અને પ્રેઝન્ટેશનથી અભ્યાસ સરળ બને છે
વિદ્યાર્થીઓને વિષય સારી રીતે સમજાય છે

2. માહિતી સરળતાથી મળે છે

ઇન્ટરનેટ દ્વારા દુનિયાભરની માહિતી મળી શકે છે
ઓનલાઇન પુસ્તકો અને કોર્સ ઉપલબ્ધ છે

3. શિક્ષણ પદ્ધતિ સુધરે છે

શિક્ષકો ડિજિટલ ટૂલ્સથી સારું શીખવી શકે છે
સમય અને મહેનત બન્ને બચાવે છે

4. ઓનલાઇન શિક્ષણ શક્ય બને છે

ઘરેથી ભણવાની સુવિધા મળે છે
દૂરના વિસ્તારોમાં પણ શિક્ષણ પહોંચે છે

5. ડિજિટલ કૌશલ્ય વિકસે છે

વિદ્યાર્થીઓ ટેકનોલોજી ઉપયોગ શીખે છે
ભવિષ્ય માટે તૈયાર થાય છે

શિક્ષણમાં ICTના ઉદાહરણો

Google Classroom – ઓનલાઇન ક્લાસ અને અસાઇન્મેન્ટ માટે

ગૂગલ ક્લાસરૂમ

The screenshot displays the Google Classroom web interface. At the top, the browser address bar shows 'http://www.classroom.google.com'. The page header includes 'English 2 Period 1', 'Instructions', and 'Student work' tabs. The main content area is titled 'Flowers for Algernon'. On the left sidebar, there's a 'Return' button, a '100 points' dropdown, and a list of students under 'All students'. The student list includes Paula Smith (83 Draft), Armie Harper (75 Draft), Cindy Darling (96 Draft), Bryan James (45 Draft), and Eduardo Cortez. The main area shows a grid of student work submissions. Paula Smith has turned in a draft. Armie Harper has turned in a draft. Cindy Darling has turned in a draft. Bryan James has turned in a draft. Eduardo Cortez has no attachments. The interface also shows a 'Sort by status' dropdown and a 'Turned in' filter.

ગુગલ ક્લાસરૂમ એ ક્લાઉડ-આધારિત લર્નિંગ મેનેજમેન્ટ સિસ્ટમ (LMS) છે જે ગૂગલ દ્વારા શિક્ષણ અને શીખવાના કાર્યપ્રવાહને સુવ્યવસ્થિત કરવા માટે વિકસાવવામાં આવી છે. તે ગુગલ વર્કસ્પેસ ફોર એજ્યુકેશન ટૂલ્સ સાથે સંકલિત થાય છે જેથી શિક્ષકો ભૌતિક અને વર્ચ્યુઅલ ક્લાસરૂમ બંનેમાં શિક્ષકો અને વિદ્યાર્થીઓ વચ્ચે વાતચીતને સરળ બનાવી શકે અને સોંપણીઓ બનાવી શકે.

મુખ્ય હકીકતો

ડેવલપર: ગુગલ એલએલસી

લોન્ચ વર્ષ: 2014

પ્લેટફોર્મ: વેબ, એન્ડ્રોઇડ, iOS

મુખ્ય એપ્લિકેશન: ગુગલ ડ્રાઇવ, ડોકસ, શીટ્સ, મીટ અને કેલેન્ડર

પ્રાથમિક વપરાશકર્તાઓ: K-12 શાળાઓ, યુનિવર્સિટીઓ અને તાલીમ કાર્યક્રમો

હેતુ અને સુવિધાઓ

ગુગલ ક્લાસરૂમ સુલભ ડિજિટલ વાતાવરણમાં વર્ગ સામગ્રી, ઘોષણાઓ અને સોંપણીઓને કેન્દ્રિત કરે છે. શિક્ષકો પાઠ પોસ્ટ કરી શકે છે, ગુગલ ડ્રાઇવમાંથી સંસાધનો જોડી શકે છે અને સંકલિત સ્વરૂપો અને રૂબ્રિક્સ દ્વારા ગ્રેડિંગને સ્વચાલિત કરી શકે છે. વિદ્યાર્થીઓ ડિજિટલ રીતે કાર્ય સબમિટ કરે છે અને સમાન ઇન્ટરફેસમાં પ્રતિસાદ પ્રાપ્ત કરે છે. સુવ્યવસ્થિત સંચાર સાધનો વર્ગ-વ્યાપી ચર્ચાઓ અને વ્યક્તિગત સમર્થન માટે ડાયરેક્ટ મેસેજિંગને સક્ષમ કરે છે.

Google Workspace for Education સાથે એકીકરણ

Google Workspace for Education ઈકોસિસ્ટમના ભાગ રૂપે, Classroom Docs, Slides અને Meet જેવી ઉત્પાદકતા એપ્લિકેશનો સાથે એકીકૃત રીતે જોડાય છે. સંચાલકો કેન્દ્રીયકૃત નિયંત્રણો દ્વારા પરવાનગીઓ, ડેટા સુરક્ષા અને વપરાશકર્તા ઍક્સેસનું સંચાલન કરી શકે છે. આ એકીકરણ સહયોગી, પેપરલેસ વર્કફ્લોને સપોર્ટ કરે છે અને રિમોટ અથવા હાઈબ્રિડ સુચનાને સમાવી શકે છે.

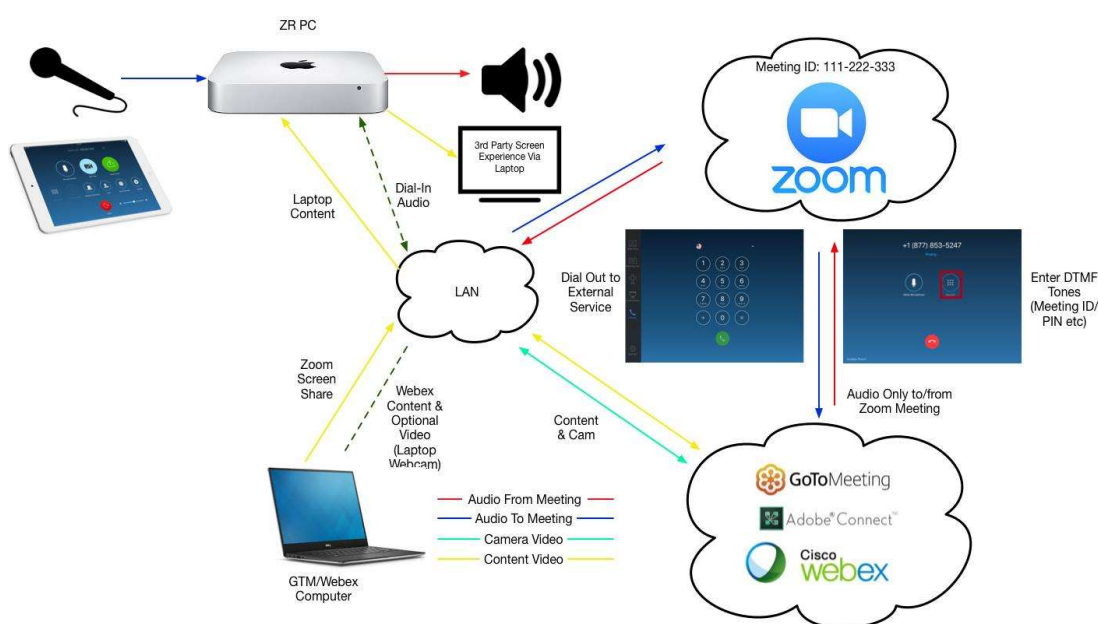
અપનાવવા અને અસર

તેની રજૂઆત પછી, Google Classroom વિશ્વભરમાં સૌથી વધુ ઉપયોગમાં લેવાતા LMS પ્લેટફોર્મ્સમાંનું એક બની ગયું છે, ખાસ કરીને 2020 પછી રિમોટ લર્નિંગ તરફના શિફ્ટ દરમિયાન. તેણે શૈક્ષણિક સંસ્થાઓ માટે મફત ઉપલબ્ધતા દ્વારા ઉપયોગમાં સરળતા, રીઅલ-ટાઈમ સહયોગ અને સમાવિષ્ટ એક્સેસને પ્રોત્સાહન આપીને ડિજિટલ શિક્ષણશાસ્ત્રને પ્રભાવિત કર્યું છે.

ગોપનીયતા અને સુલભતા

Google Classroom કૌટુંબિક શૈક્ષણિક અધિકારો અને ગોપનીયતા અધિનિયમ અને સમાન વૈશ્વિક ગોપનીયતા ધોરણોનું પાલન કરે છે. સ્ક્રીન રીડર સપોર્ટેડ, બંધ કૅપ્શન્સ અને બહુભાષી વિકલ્પો જેવી એક્સેસિબિલિટી સુવિધાઓ વિવિધ શીખનારાઓ માટે ઉપયોગીતાની ખાતરી કરે છે

Zoom – ઓનલાઈન મીટિંગ અને ક્લાસ માટે



ઝૂમ એ ક્લાઉડ-આધારિત વિડીયો કોન્ફરન્સિંગ સોફ્ટવેર પ્લેટફોર્મ છે જે વપરાશકર્તાઓને વર્ચ્યુઅલ મીટિંગ્સ, વેબિનાર્સ અને ઓનલાઈન ઈવેન્ટ્સ હોસ્ટ કરવાની મંજૂરી આપે છે. તેનો વ્યાપકપણે ઉપયોગ બિઝનેસ કોમ્યુનિકેશન, રિમોટ એજ્યુકેશન, ટેલિહેલ્થ અને સામાજિક મેળાવડા માટે થાય છે, જે રીઅલ-ટાઈમ ડિજિટલ સહયોગ માટે સૌથી વધુ માન્ય સાધનોમાંનું એક બની ગયું છે.

મુખ્ય હકીકતો

વિકાસકર્તા: ઝૂમ વિડીયો કોમ્યુનિકેશન્સ

પ્રારંભિક પ્રકાશન: 2013

સ્થાપક: એરિક યુઆન

પ્રાથમિક કાર્યો: વિડીયો મીટિંગ્સ, ચેટ, વેબિનાર્સ, ક્લાઉડ ફોન સિસ્ટમ

મુખ્ય મથક: સેન જોસ, કેલિફોર્નિયા, યુ.એસ.

સુવિધાઓ અને કાર્યક્ષમતા

ઝૂમ ડેસ્કટોપ અને મોબાઇલ ઉપકરણો પર હાઇ-ડેફિનેશન વિડીયો અને ઓડિયો કોન્ફરન્સિંગ, સ્ક્રીન શેરિંગ અને લાઇવ ચેટ ઓફર કરે છે. મુખ્ય સુવિધાઓમાં નાના જૂથ ચર્ચાઓ માટે બ્રેકઆઉટ રૂમ, ક્લાઉડ રેકોર્ડિંગ, વર્ચ્યુઅલ બેકગ્રાઉન્ડ અને સ્લેક, માઇક્રોસોફ્ટ ટીમ્સ અને કેલેન્ડર એપ્લિકેશન્સ જેવા ઉત્પાદકતા સાધનો સાથે એકીકરણનો સમાવેશ થાય છે. તેની સ્કેલેબિલિટી હજારો સહભાગીઓ સાથેના ઇવેન્ટ્સ સુધીના સત્રોને મંજૂરી આપે છે.

લોકપ્રિયતા અને અસર

કોવિડ-19 રોગચાળા દરમિયાન પ્લેટફોર્મમાં વિસ્ફોટક વૃદ્ધિ જોવા મળી હતી કારણ કે રિમોટ વર્ક અને લર્નિંગ વિશ્વભરમાં વધ્યું હતું. તેના ઉપયોગમાં સરળતા, વિશ્વસનીયતા અને મફત એક્સેસ સ્તરે તેને સંસ્થાઓ અને વ્યક્તિઓ માટે એક લોકપ્રિય ઉકેલ બનાવ્યો. દૈનિક ઉપયોગ વધતાં "ઝૂમ થાક" અને ગોપનીયતા ચર્ચાઓ પણ જાહેર ચર્ચામાં પ્રવેશી.

સુરક્ષા અને અપડેટ્સ

"ઝૂમબોમ્બિંગ" જેવી સુરક્ષા ખામીઓ માટે શરૂઆતમાં ટીકા કરાયેલ, કંપનીએ વપરાશકર્તા સુરક્ષા વધારવા માટે એન્ડ-ટુ-એન્ડ એન્ક્રિપ્શન વિકલ્પો, મીટિંગ પાસકોડ અને વેઈટિંગ રૂમ લાગુ કર્યા. ચાલુ અપડેટ્સ AI-સંચાલિત મીટિંગ સારાંશ, ટ્રાન્સક્રિપ્શન અને હાઇબ્રિડ વર્કસ્પેસ ટૂલ્સ પર ધ્યાન કેન્દ્રિત કરે છે.

બજાર સ્થિતિ

ઝૂમ ગૂગલ મીટ, માઇક્રોસોફ્ટ ટીમ્સ અને સિસ્કો વેબેક્સ સહિત અન્ય મુખ્ય કોન્ફરન્સિંગ સોલ્યુશન્સ સાથે સ્પર્ધા કરે છે. તે એકીકૃત સંદેશાવ્યવહારમાં એક કેન્દ્રિય ખેલાડી રહે છે, એન્ટરપ્રાઇઝ સહયોગ માટે ઝૂમ ફોન અને ઝૂમ રૂમ્સ સાથે તેના ઇકોસિસ્ટમનો વિસ્તાર કરે છે.

Khan Academy – મફત શિક્ષણ માટે



ખાન એકેડેમી

ખાન એકેડેમી એક મફત ઓનલાઈન લર્નિંગ પ્લેટફોર્મ છે જે વિવિધ વિષયોમાં શૈક્ષણિક સંસાધનો પ્રદાન કરે છે. 2008 માં શિક્ષક સાલ ખાન દ્વારા સ્થાપિત, તે વિડિઓ પાઠ, પ્રેક્ટિસ કસરતો અને વ્યક્તિગત શિક્ષણ ડેશબોર્ડ પ્રદાન કરે છે જે તમામ ઉંમરના શીખનારાઓને તેમની પોતાની ગતિએ અભ્યાસ કરવામાં મદદ કરવા માટે રચાયેલ છે.

મુખ્ય હકીકતો

સ્થાપના: 2008

સ્થાપક: સાલ ખાન

મુખ્ય મથક: માઉન્ટેન વ્યૂ, કેલિફોર્નિયા, યુ.એસ.

પ્રાથમિક વપરાશકર્તાઓ: K-12 વિદ્યાર્થીઓ, શિક્ષકો અને સ્વ-શીખનારા

ભાષાઓ: વિશ્વભરમાં 30 થી વધુ ઉપલબ્ધ

મૂળ અને મિશન

ખાન એકેડેમીની શરૂઆત ત્યારે થઈ જ્યારે સાલ ખાને તેના પિતરાઈ ભાઈઓને ગણિતમાં મદદ કરવા માટે YouTube ટ્યુટોરિયલ્સ બનાવ્યા. તે વિડિઓઝની સફળતાએ "કોઈપણ માટે, ગમે ત્યાં મફત, વિશ્વ-સ્તરીય શિક્ષણ" પ્રદાન કરવાના મિશન સાથે એક માળખાગત બિનનફાકારક પહેલ તરફ દોરી. ત્યારથી તે વૈશ્વિક શિક્ષણ સંસાધનમાં વિકસ્યું છે, જેને મુખ્ય પરોપકારી સંસ્થાઓ દ્વારા સમર્થન આપવામાં આવ્યું છે.

પ્લેટફોર્મ અને સામગ્રી

આ પ્લેટફોર્મ ગણિત, વિજ્ઞાન, કમ્પ્યુટિંગ, અર્થશાસ્ત્ર, ઇતિહાસ અને પરીક્ષાની તૈયારી (જેમ કે SAT) સહિતના વિષયોમાં ટૂંકા સૂચનાત્મક વિડિઓઝ, ઇન્ટરેક્ટિવ કસરતો અને મૂલ્યાંકન પ્રદાન કરે છે. તેના અનુકૂળનશીલ શિક્ષણ સાધનો વપરાશકર્તાઓને પ્રગતિને ટ્રેક કરવા અને જ્ઞાનના અંતરને ઓળખવાની મંજૂરી આપે છે, જ્યારે શિક્ષકો શિક્ષક ડેશબોર્ડ દ્વારા વિદ્યાર્થીઓના પ્રદર્શનનું નિરીક્ષણ કરી શકે છે.

ભાગીદારી અને અસર

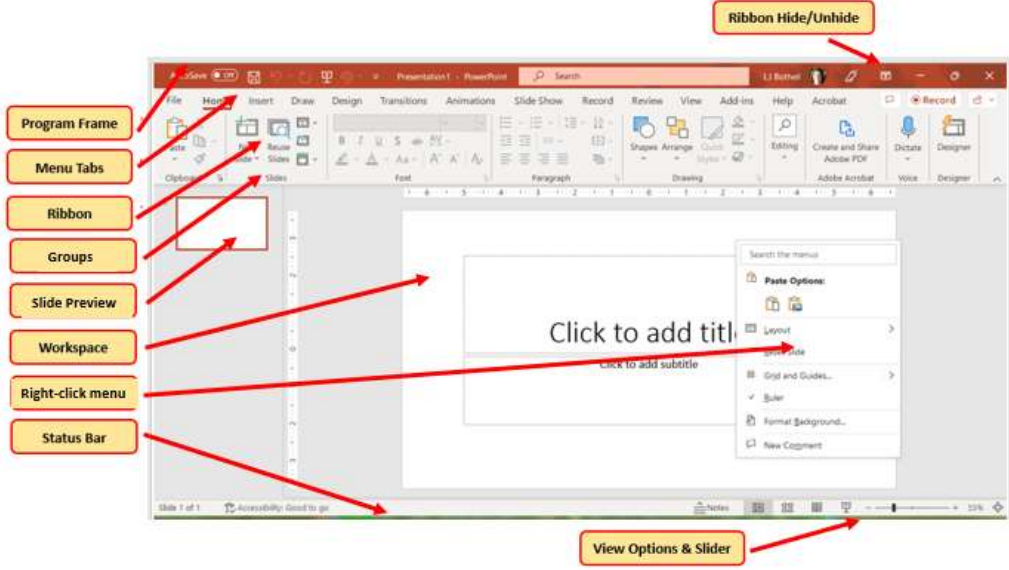
ખાન એકેડેમીએ વિષય કવરેજ અને પ્રમાણિત પરીક્ષણ તૈયારીને વિસ્તૃત કરવા માટે NASA, ધ મ્યુઝિયમ ઓફ મોડર્ન આર્ટ અને ધ કોલેજ બોર્ડ જેવી સંસ્થાઓ સાથે ભાગીદારી કરી છે. આ પ્લેટફોર્મ 190 થી વધુ દેશોમાં લાખો શીખનારાઓને સેવા આપે છે અને સુલભ, ટેકનોલોજી-સક્ષમ શિક્ષણને પ્રોત્સાહન આપવામાં મુખ્ય ભૂમિકા ભજવી છે.

ભંડોળ અને બિન-લાભકારી સ્થિતિ

501(c)(3) બિન-લાભકારી સંસ્થા તરીકે, ખાન એકેડેમી બિલ અને મેલિન્ડા ગેટ્સ ફાઉન્ડેશન અને ગૂગલ જેવા વ્યક્તિઓ અને ફાઉન્ડેશનો તરફથી દાન અને અનુદાન દ્વારા કાર્ય કરે છે. તેનો ઓપન-એક્સેસ અભિગમ ખાતરી કરે છે કે બધી શૈક્ષણિક સામગ્રી વૈશ્વિક સ્તરે વપરાશકર્તાઓ માટે મફત રહે.

Microsoft PowerPoint – પ્રેઝન્ટેશન બનાવવા માટે

માઈક્રોસોફ્ટ પાવરપોઈન્ટ



માઈક્રોસોફ્ટ પાવરપોઈન્ટ એ માઈક્રોસોફ્ટ દ્વારા વિકસાવવામાં આવેલ પ્રેઝન્ટેશન સોફ્ટવેર પ્રોગ્રામ છે. તે વપરાશકર્તાઓને ટેક્સ્ટ, ગ્રાફિક્સ, વિડીયો અને ઇન્ટરેક્ટિવ તત્વોનો સમાવેશ કરીને સ્લાઈડ-આધારિત પ્રેઝન્ટેશન બનાવવા, પ્રદર્શિત કરવા અને શેર કરવા સક્ષમ બનાવે છે. પાવરપોઈન્ટનો વ્યાપકપણે વ્યવસાય, શિક્ષણ અને વ્યક્તિગત સંદેશાવ્યવહાર માટે ઉપયોગ થાય છે, જે માઈક્રોસોફ્ટ ઓફિસ સ્યુટનો મુખ્ય ઘટક છે.

મુખ્ય તથ્યો

પ્રારંભિક પ્રકાશન: 1987

મૂળ વિકાસકર્તા: ફોરથોટ, ઇન્ક. (માઈક્રોસોફ્ટ દ્વારા 1987 માં હસ્તગત)

સમર્થિત પ્લેટફોર્મ: વિન્ડોઝ, મેકઓએસ, વેબ, એન્ડ્રોઈડ, iOS

ડિફોલ્ટ ફાઈલ ફોર્મેટ: .pptx (ઓફિસ ઓપન XML)

ભાગ: માઈક્રોસોફ્ટ 365

વિકાસ અને ઇતિહાસ

માઈક્રોસોફ્ટ દ્વારા ખરીદતા પહેલા પાવરપોઈન્ટ એપલ ઇન્ક. મેકિન્ટોશ માટે "પ્રેઝન્ટર" તરીકે ઉદ્ભવ્યું. 1990 માં માઈક્રોસોફ્ટ ઓફિસમાં સંકલિત, તેણે ડિજિટલ પ્રેઝન્ટેશન સ્ટાન્ડર્ડ સ્થાપિત કરવામાં મદદ કરી. ક્રમિક સંસ્કરણોમાં, તે માઈક્રોસોફ્ટ 365 દ્વારા સ્ટેટિક સ્લાઈડ્સથી મલ્ટીમીડિયા અને ક્લાઉડ-કનેક્ટેડ સહયોગમાં વિકસિત થયું છે.

વિશેષતાઓ અને કાર્યક્ષમતા

આ પ્રોગ્રામ ટેમ્પલેટ્સ, ડિઝાઈન થીમ્સ, એનિમેશન અને ટ્રાન્ઝિશન પ્રદાન કરે છે જેથી દૃષ્ટિની આકર્ષક સ્લાઈડ્સ બનાવી શકાય. વપરાશકર્તાઓ મલ્ટીમીડિયા એમ્બેડ કરી શકે છે, સ્માર્ટઆર્ટ ડાયાગ્રામ લાગુ કરી શકે છે અને OneDrive અથવા SharePoint દ્વારા રીઅલ ટાઈમમાં સહયોગ કરી શકે છે. પ્રેઝન્ટર વ્યૂ, સ્લાઈડ માસ્ટર અને ડિઝાઈનર ટૂલ્સ વ્યાવસાયિક લેઆઉટ અને ડિલિવરીને સુવ્યવસ્થિત કરે છે.

ઉપયોગ અને પ્રભાવ

પાવરપોઈન્ટ વિશ્વભરમાં પ્રેઝન્ટેશન-મેકિંગનો પર્યાય બની ગયું છે, જે વ્યવસાય, શૈક્ષણિક અને સરકારી સંદેશાવ્યવહારને પ્રભાવિત કરે છે. તેના વર્ચસ્વથી વધુ પડતા સરળ "સ્લાઈડ થિંકિંગ" ને પ્રોત્સાહન આપવા માટે ટીકા પણ પ્રેરિત થઈ છે, છતાં તે દ્રશ્ય પ્રસ્તુતિ માટે બેન્યુમાર્ક ટૂલ રહે છે.

વર્તમાન એકીકરણ અને ઈકોસિસ્ટમ

આધુનિક પાવરપોઈન્ટ ટીમ્સ અને અન્ય માઈક્રોસોફ્ટ 365 એપ્લિકેશન્સ સાથે સંકલિત થાય છે, જે સહ-લેખન, ક્લાઉડ ઓટોસેવ અને AI-સંચાલિત ડિઝાઈન સૂચનોને સમર્થન આપે છે. સોફ્ટવેરની એક્સેસિબિલિટી સુવિધાઓ અને ક્રોસ-પ્લેટફોર્મ સુસંગતતા વ્યાવસાયિકો અને વિદ્યાર્થીઓમાં તેની પહોંચને સમાન રીતે વિસ્તૃત કરવાનું ચાલુ રાખે છે.

પડકારો

બધા પાસે ઈન્ટરનેટ અને સાધનો ઉપલબ્ધ નથી
ખર્ચ વધારે હોઈ શકે છે
શિક્ષકોને તાલીમની જરૂર પડે છે
વિદ્યાર્થીઓનું ધ્યાન ભંગ થવાની શક્યતા

નિષ્કર્ષ

શિક્ષણમાં ICTનો ઉપયોગ શીખવાની પ્રક્રિયાને સરળ, રસપ્રદ અને આધુનિક બનાવે છે. યોગ્ય રીતે ઉપયોગ કરવાથી શિક્ષણની ગુણવત્તામાં વધારો થાય છે.

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ICT in Education અંગેના અહેવાલો અને માર્ગદર્શિકા

વેબસાઈટ: <https://www.unesco.org>

NCERT

શિક્ષણમાં ICTના ઉપયોગ અંગે પાઠ્યપુસ્તકો અને માર્ગદર્શિકા

વેબસાઈટ: <https://ncert.nic.in>

Ministry of Education India

ડિજિટલ શિક્ષણ અને ICT નીતિઓ

વેબસાઈટ: <https://www.education.gov.in>

Khan Academy

ઓનલાઈન શિક્ષણ માટે મફત સામગ્રી

વેબસાઈટ: <https://www.khanacademy.org>

Google Classroom

ડિજિટલ ક્લાસરૂમ માટે ઉપયોગી ટૂલ

વેબસાઈટ: <https://classroom.google.com>



ભારતમાં NBFC નો CSRમાં ફાળો : એક વિશ્લેષણાત્મક અભ્યાસ

કિંજલબેન.એમ.વસાવા

રિસર્ચ સ્કોલર, ડિપાર્ટમેન્ટ ઓફ કોમર્સ શ્રી.ગોવિંદ ગુરુ યુનિવર્સિટી ગોધરા ,ગુજરાત

ડૉ.આરતી એ મોહિતે

ડિપાર્ટમેન્ટ ઓફ કોમર્સ શ્રી.સી.એચ.ભીલ સરકારી વિનયન એન્ડ વાણિજ્ય કોલેજ,નસવાડી

સારાંશ :

આ અભ્યાસમાં નોન-બેંકિંગ નાણાકીય કંપનીઓ દ્વારા CSR પ્રવૃત્તિમાં તેમનો ફાળો અને સામાજિક ફાળા વિશેનો અભ્યાસ કરવામાં આવ્યો છે. કંપની એક્ટ ૨૦૧૩ દરમિયાન CSR ફરજિયાત બન્યું હતું ત્યારબાદ NBFC(નોન-બેંકિંગ ફાઇનાન્સિયલ કંપનીઓ) પર્યાવરણ, આરોગ્ય, ગ્રામવિકાસ તેમજ શિક્ષણ ક્ષેત્રે મહત્વપૂર્ણ યોગદાન આપી રહ્યા છે નોન-બેંકિંગ નાણાકીય કંપનીઓની સંખ્યા ઓછી હોવા છતાં પણ નવા અને ટારગેટેડ પ્રોજેક્ટ દ્વારા સમાજ પર ગુણાત્મક અસર કરી રહ્યા છે વર્તમાન અભ્યાસનો મુખ્ય હેતુ ભારતમાં પસંદ કરેલ NBFC દ્વારા કરવામાં આવતી CSR પ્રવૃત્તિઓનું વિશ્લેષણ કરવાનો છે.આ અભ્યાસ ગૌણ ડેટા પર આધારિત છે. જેમાં RBI રિપોર્ટ, પુસ્તકો, CSR રિપોર્ટ, કંપનીના વાર્ષિક અહેવાલો, સરકારી પ્રકાશનો જેવા દ્વિતીય ડેટાનો સમાવેશ કરવામાં આવ્યો છે. આ અભ્યાસના નિષ્કર્ષ થી જાણવા મળે છે કે પસંદ કરેલી NBFC જેમાં બજાજ ફાઇનાન્સ કંપનીઓનો ફાળો CSR ખર્ચમાં અન્ય NBFC કંપનીઓ કરતા વધારે છે તેમજ જાણવા મળ્યું કે NBFC કંપનીઓ પોતાના નફા મુજબ CSR ખર્ચમાં પોતાનો ફાળો આપી રહ્યા છે કૌશલ વિકાસ ક્ષેત્રમાં બજાજ ફાઇનાન્સ, શિક્ષણ ક્ષેત્રમાં મહિન્દ્રા ફાઇનાન્સ, આરોગ્ય ક્ષેત્રમાં ચોલામંડલમ ફાઇનાન્સ તેમજ ગ્રામીણ વિકાસમાં શ્રીરામ, મહિન્દ્રા અને ચોલામંડલ ફાઇનાન્સ સરખો ફાળો આપી રહ્યા છે. ગરીબ અને પછાત વર્ગો પર CSR પ્રવૃત્તિઓનો પ્રભાવ ખાસ કરીને વધુ જોવા મળ્યો છે. નોન-બેંકિંગ નાણાકીય કંપનીઓને સુધારાની જરૂર છે નોન-બેંકિંગ નાણાકીય કંપનીઓએ આયોજન, અમલીકરણ અને મૂલ્યાંકન પદ્ધતિઓમાં સુધારો કરવાની જરૂર છે

કીવર્ડ્સ: CSR, NBFC, ભારત, નાણાકીય સમાવેશ, સામાજિક વિકાસ, કોર્પોરેટ સામાજિક જવાબદારી

પરિચય

NBFC (નોન-બેંકિંગ નાણાકીય કંપનીઓ) બેંકો જેવા જ કાર્યો કરે છે લોન આપે છે અને નાણાકીય સેવાઓ પૂરી પાડે છે છતાં પણ બેંકિંગ લાઇસન્સ વગર કાર્ય કરે છે. CSR એટલે કે કંપનીઓ પોતાનો નફાનો એક ભાગ સમાજના વિકાસ માટે ખર્ચ કરે છે corporate social responsibility (CSR) ભારતમાં NBFC કંપનીઓ પોતાનો નફાના હિસ્સાનો અમુક ભાગ CSR માં આપી રહ્યા છે વર્તમાન સમયગાળામાં CSR ખૂબ જ મહત્વપૂર્ણ બની ગયું છે કારણ કે CSR કંપની અને સમાજ વચ્ચે સંતુલન બનાવી રાખે છે તેમજ Sustainable Development માટે પણ મહત્વપૂર્ણ છે CSR લાંબા-ગાળાના વેપાર માટે ફાયદાકારક નીવડે એમ છે CSR ની વિવિધ પ્રવૃત્તિઓ છે જેમાં પર્યાવરણ સંરક્ષણ, ગ્રામ વિકાસ, સ્વચ્છતા અભિયાન, શિક્ષણ, ગરીબી નિવારણ, આરોગ્ય અને સ્ત્રી સશક્તિકરણ વગેરે.

ભારતમાં CSRને કંપની અધિનિયમ ૨૦૧૩ હેઠળ નોંધવામાં આવ્યું છે. જે કંપનીનું ટનઓવર ૩ ૧૦૦૦ કરોડ અથવા તેથી વધુ હોય, જે કંપનીનું નેટ પ્રોફિટ ૩ ૫ કરોડ અથવા તેથી વધુ હોય અને કંપનીનું નેટવર્થ ૩ ૫૦૦ કરોડ અથવા તેથી વધુ હોય તો એ કંપનીઓએ પોતાના સરેરાશ નફાના ૨% જેટલો હિસ્સો CSR માં આપવો ફરજિયાત છે.(ICRA ESG Rating press Release 24 February 2025) મુજબ જાણવા મળ્યું છે કે નોન-બેંકિંગ નાણાકીય કંપનીઓમાં જે ટોચની NBFC છે તેઓ પ્રતિ કંપની ૩ ૫૦ કરોડ CSR ખર્ચ માં પોતાનો ફાળો આપી રહ્યા છે.

સાહિત્યની સમીક્ષા

૧.શ્રીવાસ્તવ.પૂજા નિગમ, શાલીની અને ગોગિયા ,જ્યોતિ (2013) ભારતીય કંપનીઓમાં કોર્પોરેટ સામાજિક જવાબદારી અને પર્યાવરણીય ટકાઉપાણું. આ અભ્યાસનો મુખ્ય હેતુ ભારતની કોર્પોરેટ સામાજિક જવાબદારીઓ અને પર્યાવરણીય સક્રિયતા ને ઓળખવાનો છે અને તેમની તુલના કરવાનો છે. અભ્યાસના સાધનોમાં પ્રશ્નાવલિનો ઉપયોગ કરવામાં આવ્યો હતો તેમજ Z ટેસ્ટ ANOVA ટેસ્ટ વગેરે. આ અભ્યાસથી જાણવા મળ્યું હતું કે ભારતમાં CSR ની કામગીરી ખૂબ ધીમી ચાલી રહી છે

૨.કુમાર દીપક ,શ્રીનિવાસ સુરેશ (2017) ભારતમાં નોન-બેંકિંગ નાણાકીય કંપનીઓનું નાણાકીય પ્રદર્શન એક અર્થમિતિ અભ્યાસ. આ અભ્યાસથી જાણવા મળ્યું છે કે નોન-બેંકિંગ નાણાકીય કંપનીઓ અર્થતંત્રમાં ખૂબ જ મહત્વપૂર્ણ ભૂમિકા ભજવે છે NBFC એવા વિસ્તારમાં કાર્યરત છે જ્યાં બેંકો પોતાની પહોંચ ધરાવતા નથી.

૩.શેખર આર ચંદ્ર, પરમાર એમ. એન (2021) ગુજરાતમાં CSR પ્રવૃત્તિઓમાં કોર્પોરેટ સંસ્થાઓના શૈક્ષણિક યોગદાન પર એક પ્રાથમિક શિક્ષણના ચોક્કસ સંદર્ભમાં શિક્ષણ ક્ષેત્રમાં ગુજરાતની ટોચની 5 ખાનગી ક્ષેત્રની કંપનીઓની CSR પ્રવૃત્તિનો અભ્યાસ કરવાનો હતો, આ અભ્યાસથી જાણવા મળ્યું કે કોર્પોરેટ સંસ્થાઓ શૈક્ષણિક CSR પ્રવૃત્તિઓ ખૂબ ગંભીરતાથી ચલાવી રહી છે.

૪.સાંક્ષી રામદેવા, લતા રમેશ, મેરેના મેથ્યુ, મનુ કે. એસ (2023) ભારતીય સંદર્ભમાં નાણાકીય કંપનીઓની કોર્પોરેટ સામાજિક જવાબદારીનું માપન. આ અભ્યાસનો મુખ્ય હેતુ ભારતમાં બેંકો અને NBFC જેવી નાણાકીય કંપનીઓની કોર્પોરેટ સામાજિક જવાબદારી પ્રવૃત્તિઓનું માપન કરવાનું છે. બેંકો અને NBFC નાણાકીય કંપનીઓના CSR પ્રદર્શનનું માપન કરવા માટે સામગ્રી વિશ્લેષણ ઉપયોગ કરવામાં આવ્યો છે. આ અભ્યાસથી જાણવા મળ્યું છે કે ખાનગી ક્ષેત્રની બેંકો એ જાહેર ક્ષેત્રની બેંકો અને NBFC કંપનીની તુલનામાં સામાજિક પ્રવૃત્તિમાં સક્રિયપણે ભાગ લીધો છે.

૫.ડો.જગદીપ સિંગલ, ડો.સંજયનંદલ, ડો.સુગંધરાવલ, ઋષિ ચૌધરી (2021) નોન-બેંકિંગ નાણાકીય સંસ્થાઓ પર કોર્પોરેટ સામાજિક જવાબદારીનો ટકાઉ પ્રભાવ. આ અભ્યાસનું મુખ્ય હેતુ ભારતમાં બિન-બેંકિંગ નાણાકીય કંપનીના કોર્પોરેટ સામાજિક જવાબદારીના ટકાઉ પ્રભાવ ,નાણાકીય રીપોર્ટીંગ વ્યૂહરચનાઓ અને નાણાકીય પરિણામો પર તેમની અસરનું મૂલ્યાંકન કરવાનો છે નોન-બેંકિંગ નાણાકીય ક્ષેત્રમાં CSR પ્રવૃત્તિઓ ખૂબ મોટો ફાળો આપી રહ્યા છે.

અભ્યાસના હેતુઓ :

૧. પસંદ કરેલી NBFC દ્વારા કરવામાં આવતી CSR પ્રવૃત્તિઓનું વિશ્લેષણાત્મક અભ્યાસ કરવો.
૨. પસંદ કરેલી NBFC દ્વારા CSR ખર્ચ અને તેમનો સમાજ પર પડતો પ્રભાવનો અભ્યાસ કરવો.
૩. CSR પ્રવૃત્તિઓના પડકારો અને તકો ઓળખવા તેમજ તેમને સુધારવાનાં માર્ગો અને માધ્યમો સૂચવવા.

NBFC નો CSRમાં ફાળો :

ભારતમાં વર્તમાન સમયગાળામાં ટકાઉ વ્યવસાયિક પ્રથાઓનું કોર્પોરેટ સોશિયલ રીસ્પોન્સીબીલિટી (CSR) એ મુખ્ય પાસું બની ગયું છે. નૈતિક શાસન અને સામાજિક વિકાસને પ્રોત્સાહન આપવા માટે રીઝર્વ બેંક ઓફ ઇન્ડિયા CSR નાં મહત્વને ઓળખે છે. NBFC ને રીઝર્વ બેંક ઓફ ઇન્ડિયા પર્યાવરણીય ટકાઉપણું સમુદાય વિકાસ અને સામાજિક કલ્યાણ જેવી CSR પહેલોમા સક્રિય પાણે જોડવા માટે પ્રોત્સાહિત કરી રહ્યા છે.

નોન-બેંકિંગ નાણાકીય કંપનીઓ અલગ અલગ ક્ષેત્રોમાં CSR પ્રવૃત્તિઓ કરે છે.

1.શિક્ષણ

નોન-બેંકિંગ નાણાકીય કંપનીઓ વિવિધ ક્ષેત્રોમાં ઈન્ફ્રાસ્ટ્રક્ચર વિકાસને પ્રોત્સાહન આપી રહ્યા છે.NBFC કંપનીઓ સ્કોલરશિપ કાર્યક્રમો દ્વારા શિક્ષણ ક્ષેત્રમાં મહત્વનો ભાગ ભજવી રહ્યા છે. શિક્ષણ ક્ષેત્રે ડિજિટલ લર્નિંગ પ્રોગ્રામ દ્વારા વિદ્યાર્થીઓને શિક્ષણ આપવામાં આવે છે તેમાં પણ NBFC મહત્વનો ફાળો આપી રહ્યા છે.

2. આરોગ્ય

ભારતના ગ્રામીણ વિસ્તારમાં મફત આરોગ્ય સેવાઓ પૂરી પાડવામાં આવી રહી છે જેમાં મફત મેડિકલ કેમ્પ યોજવામાં આવે છે.COVID-19 ના સમયગાળા દરમિયાન નોન-બેંકિંગ નાણાકીય કંપનીઓ મદદરૂપ બન્યા હતા.

3.ગ્રામ વિકાસ

નોન-બેંકિંગ નાણાકીય કંપનીઓ ગ્રામ્ય વિકાસ માટે રોજગાર સર્જન,પાણી અને સ્વચ્છતા પ્રોજેક્ટ અને મહિલા સશક્તિકરણ જેવા મુદ્દાઓમાં મહત્વપૂર્ણ ફાળો આપે છે

4.પર્યાવરણ સંરક્ષણ

ભારત દેશમાં પર્યાવરણ સંરક્ષણ એ વર્તમાન સમયગાળામાં મહત્વપૂર્ણ મુદ્દો રહ્યો છે.NBFC ઓ દ્વારા વૃક્ષારોપણમાં તેમજ કાર્બન ઉત્સર્જન ઘટાડાના પ્રયાસોમાં ફાળો આપે છે.

અભ્યાસની જરૂરિયાત :

- 1.નોન-બેંકિંગ નાણાકીય કંપનીઓ નો CSR ફાળો વિશે બહુ ઓછા અભ્યાસો કરવામાં આવ્યા છે માટે આ અભ્યાસની જરૂર છે.
- 2.નોન-બેંકિંગ નાણાકીય કંપનીઓની ગ્રામીણ વિકાસના સંદર્ભમાં મહત્વપૂર્ણ ભૂમિકા સમજવાની જરૂર છે.
- 3.નોન-બેંકિંગ નાણાકીય કંપનીઓ કેટલો હિસ્સો CSRમાં ખર્ચ કરે છે તેમના પ્રભાવનું મૂલ્યાંકન કરવાનો છે.

અભ્યાસના મુખ્ય પ્રશ્નો :

- 1.શું NBFC ઓ CSR માટે ગ્રામીણ વિસ્તારમાં વધુ ફોકસ કરે છે ?
- 2.CSR પ્રવૃત્તિમાં NBFC કંપની પોતાના નફાના કેટલા ટકા ખર્ચ કરે છે ?
- 3.ટોચના NBFC જેમકે બજાજ ફાઇનાન્સ, બજાજ હાઉસિંગ ફાઇનાન્સ, મહિન્દ્રા ફાઇનાન્સ વગેરે CSR ખર્ચમાં શું તફાવત છે ?

સંશોધન પદ્ધતિ :

આ અભ્યાસ માટે વર્ણનાત્મક અને વિશ્લેષણાત્મક સંશોધન ડિઝાઇનનો ઉપયોગ કરવામાં આવ્યો છે.

માહિતીના સ્ત્રોતો આ અભ્યાસમાં દ્વિતીય માહિતીમાં પુસ્તકો,સંશોધન પેપર, વાર્ષિક અહેવાલો,CSR રિપોર્ટ વગેરેનો ઉપયોગ કરવામાં આવ્યો છે.

નમૂનાની પસંદગી :

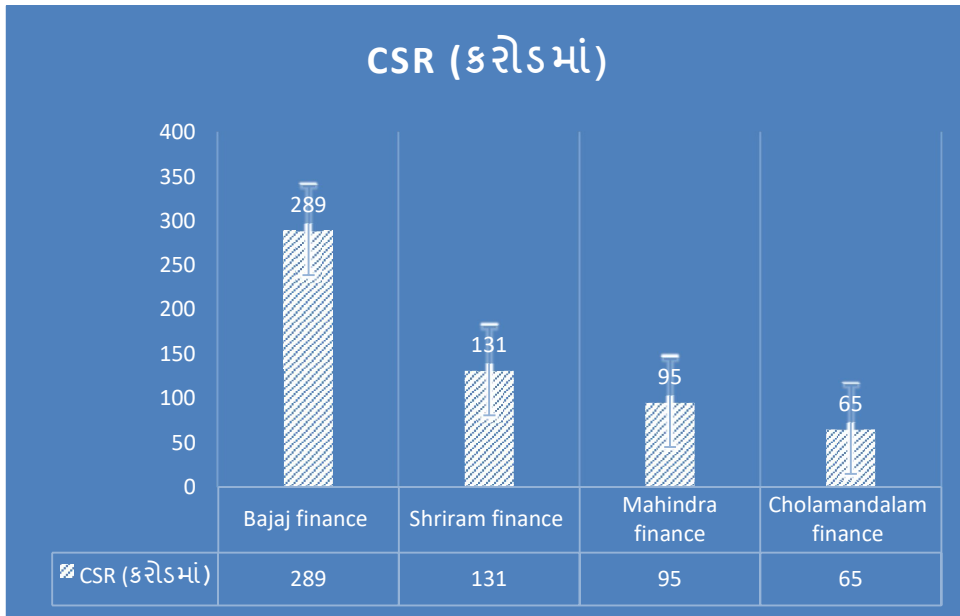
ભારતની ટોપ 4 NBFC ઓની સરળ રેન્ડમ નમૂના પદ્ધતિ દ્વારા પસંદગી કરવામાં આવી છે

1. બજાજ ફાઇનાન્સ
2. શ્રીરામ ફાઇનાન્સ
3. મહિન્દ્રા ફાઇનાન્સ
4. ચોલામંડલમ ફાઇનાન્સ

NBFC કંપની

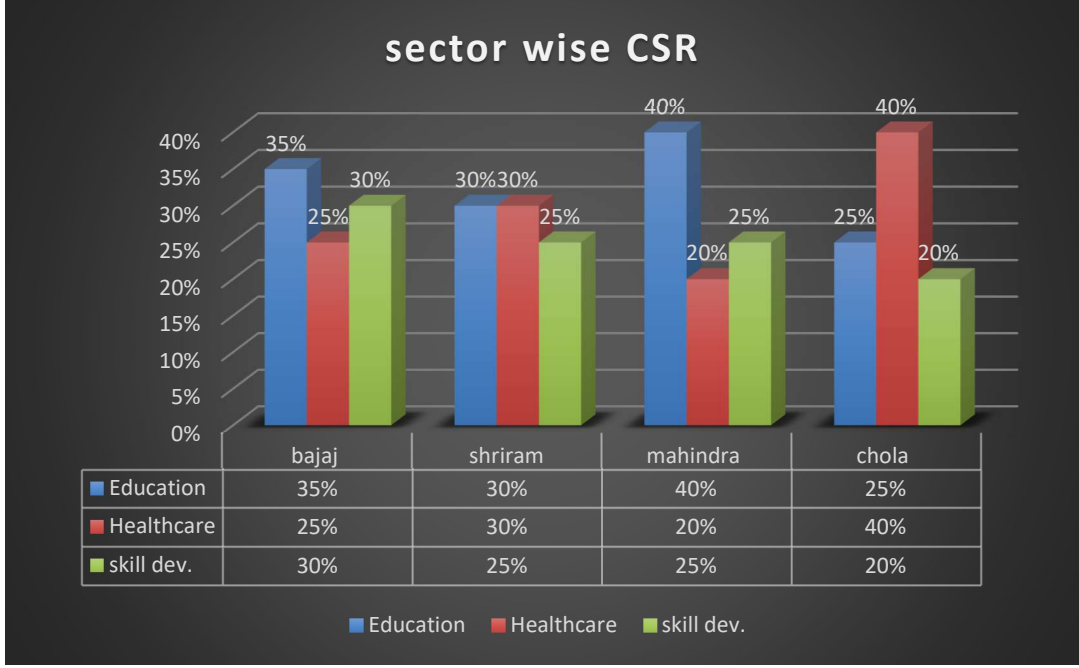
CSR (ખર્ચ)

બજાજ ફાઇનાન્સ	૨૮૯ કરોડ
શ્રીરામ ફાઇનાન્સ	131 કરોડ
મહિન્દ્રા ફાઇનાન્સ	95 કરોડ
ચોલામંડલમ ફાઇનાન્સ	65 કરોડ



ઉપર આવેલમાં દર્શાવ્યા પ્રમાણે બજાજ ફાઇનાન્સ કંપની CSR ખર્ચમાં સૌથી આગળ જોવા મળે છે અને શ્રીરામ ફાઇનાન્સ કંપની બીજો ક્રમાંક ધરાવે છે તેમજ મહિન્દ્રા ફાઇનાન્સ કંપની 95 કરોડ જેટલો મધ્યમ સ્તરે CSR ખર્ચ માં ફાળો આપે છે.

Sector	Bajaj finance	Shriram finance	Mahindra finance	Chola finance
Educational	35%	30%	40%	25%
Healthcare	25%	30%	20%	40%
Skill dev.	30%	25%	25%	20%



ઉપર ચાર્ટ માં દર્શાવ્યા મુજબ Education ક્ષેત્રે મહિન્દ્રા ફાઇનાન્સ કંપની નો ફાળો સૌથી વધારે રહ્યો છે જ્યારે ચોલામંડલમ ફાઇનાન્સ કંપનીઓ Healthcare ક્ષેત્રમાં અન્ય NBFC કંપની કરતા સારો પ્રભાવ દર્શાવે છે. બજાજ ફાઇનાન્સ Skill development માં અન્ય NBFC કરતા આગળ છે.

બજાજ ફાઇનાન્સ શિક્ષણ અને સ્કિલ ડેવલપમેન્ટ ક્ષેત્રમાં CPBFI માં વર્ષ 2025માં તાલીમ લીધેલા વિદ્યાર્થીઓની સંખ્યા 46,807 હતી. કુલ લાભાર્થીમાં 100,000 વિદ્યાર્થીઓ હતા. 161 જીલ્લાને આવરી લીધેલ હતા તેમજ મહિલાઓનો હિસ્સો 61% છે અને પ્રથમ પેઢીના ગ્રેજ્યુએટ 68% હતા. આ પ્રોગ્રામ શિક્ષણ અને રોજગાર બંને મુદ્દાઓને આવરી લે છે વર્ષ 2025 માં કુલ સ્કિલ ડેવલપમેન્ટ ગ્રાન્ટ આધારિત સ્કીલીંગ લાભાર્થી 1.77 લાખ જેટલા છે. 2.24 લાખ જેટલા કુલ યુવાનોને તાલીમ આપી છે. તેમજ હજારો બાળકોને આરોગ્ય અને પોષણ ની સહાય પૂરી પાડી રહી છે.

શ્રીરામ ફાઇનાન્સ CSR બજેટમાં શિક્ષણ માટે 97.72 કરોડનો ફાળો આપે છે. વર્ષ 2025 માં 14 લાખથી વધુ લોકોને આરોગ્ય સેવા પૂરી પાડી છે તેમજ સ્કિલ ડેવલોપમેન્ટમાં CSR બજેટ રૂ.50.60 કરોડ જેટલો ફાળો આપી રહ્યા છે.

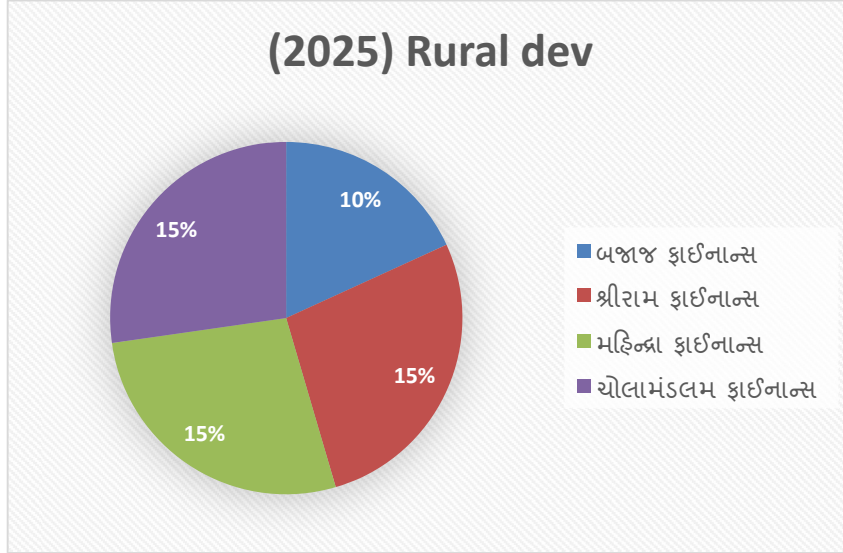
મહિન્દ્રા ફાઇનાન્સ કંપની 250,000 લોકો સુધી financial literacy પોલ્યાડવાનો લક્ષ્ય ધરાવે છે ગ્રામ્ય અને અર્ધ-શહેરી વિસ્તારોમાં લખો લોકોને આરોગ્ય સેવા પૂરી પાડે છે અને જાગૃત કરી રહી છે દેશભરમાં skill development project ચલાવી રહી છે

ચોલામંડલમ ફાઇનાન્સ કંપની શિક્ષણ ક્ષેત્રોમાં વર્ષ 2025 દરમિયાન 20.000 વિદ્યાર્થીઓને સહાય કરી છે. તેમજ હેલ્થકેર સેવાઓ 25000 લોકો સુધી અને સ્કિલ ડેવલોપમેન્ટ વર્ષ 2025માં 10,000 લાભાર્થીઓને સહાય પૂરી પાડી છે.

NBFC

Rural developmentમાં ફાળો (2025)

બજાજ ફાઇનાન્સ	10%
શ્રીરામ ફાઇનાન્સ	15%
મહિન્દ્રા ફાઇનાન્સ	15%
ચોલામંડલમ ફાઇનાન્સ	15%



નિષ્કર્ષ :

વર્તમાન અભ્યાસના આધારે સ્પષ્ટ થાય છે કે નોન-બેંકિંગ નાણાકીય કંપનીઓ અલગ અલગ ક્ષેત્રોમાં CSR પ્રવૃત્તિઓ કરે છે. પસંદ કરેલી NBFC જેમાં બજાજ ફાઈનાન્સ કંપનીઓનો ફાળો CSR ખર્ચમાં અન્ય NBFC કંપનીઓ કરતા વધારે છે. જાણવા મળ્યું છે કે NBFC કંપનીઓ પોતાના નફા મુજબ CSR ખર્ચમાં પોતાનો ફાળો આપી રહ્યા છે. કૌશલ વિકાસના ક્ષેત્રમાં બજાજ ફાઈનાન્સ અન્ય NBFC કરતા સારો એવો ફાળો આપે છે. શિક્ષણ ક્ષેત્રમાં મહિન્દ્રા ફાઈનાન્સ, આરોગ્ય ક્ષેત્રમાં ચોલામંડલમ ફાઈનાન્સ તેમજ ગ્રામીણ વિકાસમાં શ્રીરામ ફાઈનાન્સ, ચોલામંડલમ ફાઈનાન્સ સરખો ફાળો આપી રહ્યા છે. ગ્રામવિકાસ અને નાણાકીય સમાવેશ ક્ષેત્રમાં નોંધપાત્ર સુધારો જોવા મળે છે ગરીબ અને પછાત વર્ગો પર CSR પ્રવૃત્તિઓનો પ્રભાવ ખાસ કરીને વધુ જોવા મળી રહ્યો છે. CSR પ્રવૃત્તિના મારફતે NBFC સામાજિક અને આર્થિક વિકાસમાં મહત્વપૂર્ણ ભાગ ભજવી રહ્યા છે છતાં પણ CSR પ્રવૃત્તિઓમાં અસમાનતા અને અસરના માપનમાં પારદર્શિતાનો અભાવ તેમજ સુધારાની જરૂર પણ જાય છે.

પડકારો :

નોન-બેંકિંગ નાણાકીય કંપનીઓ ગ્રામ્ય વિકાસમાં CSR પ્રવૃત્તિઓ કરી રહી છે છતાં પણ ગ્રામ્ય વિસ્તારોમાં અમલીકરણની મુશ્કેલીઓ જોવા મળે છે.

નાના અને મધ્યમ NBFCનો નફો અને આવક જેના કારણે સ્થિર રહેતો નથી જેના કારણે CSR ખર્ચ કરવો મુશ્કેલ બની જાય છે.

કંપની એક્ટ 2013 હેઠળ CSR ફરજિયાત છે પરંતુ નિયમોમાં વારંવાર ફેરફાર થતા હોય છે જેના કારણે નોન-બેંકિંગ નાણાકીય કંપનીઓ માટે નિયમોનું પાલન કરવું જટિલ બની જાય છે.

તકો:

નોન-બેંકિંગ નાણાકીય કંપનીઓનું rural finance સાથે સીધું જોડાણ ધરાવતી હોવાથી financial inclusion વધારી શકાય છે.

મોટા પ્રોજેક્ટ શક્ય બનાવવા માટે સરકાર અને NBFC વચ્ચે સહયોગ કરવો જોઈએ.

સૂચનો :

આરોગ્ય, રોજગાર શિક્ષણ જેવા CSR પ્રોજેક્ટ ગ્રામીણ અને આદિવાસી વિસ્તારોમાં હાથ ધરવાની જરૂર છે. નોન-બેંકિંગ નાણાકીય કંપનીઓએ CSR પ્રવૃત્તિઓને વધુ અસરકારક બનાવવા માટે વિશ્વસનીય NGO સાથે ભાગીદારી કરવી જોઈએ તેમજ નોન-બેંકિંગ નાણાકીય કંપનીઓએ CSR પ્રવૃત્તિઓને સરકારી યોજના સાથે જોડવી જોઈએ જેના કારણે સારું પરિણામ મેળવી શકાય.

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ભારતીય ન્યાય તંત્રના પરિપેક્ષમાં લો રિપોર્ટિંગ અને કેસોનું સંદર્ભીકરણ

મિલન એમ. દેવાયત્કા

ગ્રંથપાલ -જિલ્લા અને સત્ર ન્યાયાલય, રાજકોટ તથા સંશોધક, પીએચડી. રિસર્ચ સ્કોલર, વીર નર્મદ દક્ષિણ ગુજરાત
યુનિવર્સિટી, સુરત.

ડૉ. તૃપ્તિબેન મહિડા

માર્ગદર્શક તથા ગ્રંથપાલ, અગ્રવાલ વિદ્યા વિહાર અંગ્રેજી માધ્યમ કોલેજ, વેસુ રોડ, સુરત.

૧-પ્રાસ્તાવીક:

વિવિધ વિદ્યાશાખાઓની પોતાના ક્ષેત્રમાં માહિતી અધ્યતન કરવાની પ્રક્રિયા માટે જુદા જુદા સંસાધનો અને યુક્તિઓનો ઉપયોગ કરતા હોય છે. આ સંસાધનો અને યુક્તિઓની પ્રકૃતિ તથા સંરચના તેના વ્યવસાયીક મહત્વ અને વ્યવસાયીકોની માહિતીની સમજણ ઉપર નિર્ભર કરતી હોય છે. માહિતી સર્જન અને સમર્વધન ની પ્રક્રિયા એ વ્યવસાયીક વિકાસ માટે મહત્વની ભુમીક ભજવે છે.

માહિતી સંસાધનોનું બંધારણીય માળખું વ્યવસાયીકોના માહિતીના યોગ્ય અને મહત્તમ ઉપયોગની સમજ માટે જવાબદાર હોય છે. આ સંસાધનોના વિવિધ મોડ્યુલ અને તેને સંદર્ભીત કરવાની પ્રક્રિયા તે વ્યવસાય સાથે જોડાયેલા તજોના કૌશલને આભારી હોય છે.

૨-ચાવી રુપ શબ્દો: ન્યાયાલય, કાયદા વ્યવસાયીકો, માહિતી સંસાધનોની સંરચના, સંદર્ભીકરણ, ન્યુટ્રલ સાઈટેશન, હેડ નોટ, લો રિપોર્ટર.

૩-સારાંશ:

આર્ટફીસીયલ ઇન્ટેલીજન્સની ક્રાન્તીને પરિણામે માહિતી શોધ માટેની સમગ્ર પ્રક્રિયા જળ મુળ થી પરીવર્તન પામી છે. માહિતી ક્રાંતી નો યુગ હવે તેના ચરમ પર પહોંચ્યો છે અને આર્ટફીસીયલ ઇન્ટેલીજન્સના સાધનને પરિણામે માહિતી શોધકનો સમય, શક્તિ, આર્થિક ખર્ચ ઉપર સીધી અસર થવા પામી છે. સાથે સાથે માહિતી પ્રત્યેની સમજ, સ્વરુપ, ઉપયોગીતા ઉપર સીધો પ્રભાવ પડ્યો છે. પહેલા જે માહિતી સરળતા થી ફક્ત પ્રાથમિક સ્વરુપે પ્રાપ્ત થતી હતી, તે માહિતી હવે કોઈ પણ પ્રયત્ન વગર સીધા જ ઉપયોગ પાત્ર સ્વરુપમાં મેળતી થયેલી છે. કાયદા વિદ્યાશાખા સાથે સંકળાયેલા વ્યવસાયીકો, વિદ્યાર્થીઓ અને સંશોધકો માટે પણ માહિતી શોધ માટેના પરંપરાગત વિકાસ થી વધુ અસરકાર બન્યું છે. રાષ્ટ્રીય સ્તરે માનનીય સર્વોચ્ચ ન્યાયાલયના નેજા હેઠળ નેશનલ કોર્ટ મેનેજમેન્ટ સિસ્ટમ માટે વિવિધ સમીતીઓ નિમવામાં આવેલ છે આ સમીતીઓની ભલામણોને આધારે જ્યુડિશ્યલ ફ્રેમ વર્કમાં માળખાગત ફેરફારો થવા લાગ્યા છે.

એપેક્સ ન્યાયાલયો દ્વારા આપવામાં આવેલ ચુકાદાઓ કાયદા વિધ્યા શાખામાં વિધાનસભાઓ અને ધારાસભાઓ દ્વારા પસાર કરવામાં આવેલા કાયદાઓના વિસ્તૃત અર્થઘટનો માટે ખુબ મહત્વના અને ચાવી રુપ હોય છે. આ ચુકાદાઓ

રિપોર્ટિંગ જાહેરના સ્વરૂપે પ્રકાશિત થતા હોય છે. જે વ્યાપારીક ધોરણે પારંપરીક રીતે જુદા જુદા રિપોર્ટિંગમાં ખાનગી અને સરકારી પ્રકાશનો દ્વારા ખુબ બહોળા પ્રમાણમાં પ્રકાશિત કરવામાં આવતા હોય છે. આર્ટફિસીયલ ઇન્ટેલીજન્સના માહિતી શોધમાં ઉપયોગના પરિણામે આ રિપોર્ટિંગ તેમનું મહત્વ ખોવા લાગ્યા છે. ઇન્ટરનેટ ઉપરના વિવિધ સર્ચ એન્જિનો વ્યવસાયીકોને ફક્ત ચાવી રૂપ શબ્દોની મદદ થી ટુંક સમયમાં અને જરૂરીયાત મુજબના મહત્વના ચુકાદાઓની યાદી આર્ટફિસીયલ ઇન્ટેલીજન્સ ટુલ્સનો ઉપયોગ કરી તૈયારી કરી આપવા લાગ્યા છે. રિપોર્ટિંગ પ્રકાશન કરતી સંસ્થાઓએ પણ આ પરિવર્તનને સ્વિકાર્યું છે અને જુદા જુદા પ્રકાશનોમાં રિપોર્ટ થયેલા લૉ રિપોર્ટિંગને એક સ્થાને જ સરળતા થી તેઓ દ્વારા વિકસાવાયેલ વેબ પેઈજ અને એપ્લિકેશન ઉપર આર્ટફિસીયલ ઇન્ટેલીજન્સની સેવા સાથે આપવા લાગ્યા છે. જેથી કરી કહી શકાય કે, ૧૨મી સદી થી શરૂ થયેલી લૉ રિપોર્ટિંગની આ ઉમદા વ્યવસાયીક સેવાઓ ઇન્ફોર્મેશન ટેકનોલોજીના આ યુગમાં પણ પોતાનું અસ્તીત્વ ટકાવી શકે તેમ છે.

૪-લૉ રિપોર્ટિંગ ની સમજૂતી:

વિવિધ વિદ્યાશાળાઓમાં નવી સર્જન પામતી માહિતીઓને યોગ્ય રૂપે સાચવવા માટે તજો દ્વારા ચોક્કસ પદ્ધતિઓ વિકસાવવામાં આવતી હોય છે. માહિતી સંવર્ધન માટેની આવી વિશિષ્ટ પદ્ધતિઓનો વ્યાપક ઉપયોગ લાંબા ગાળે વ્યાવસાયીક અને વ્યાપારીક રીત રિવાજોમાં પરીણમતી હોય છે. માહિતી સંવર્ધન થયા બાદ તેનો વ્યવહારીક રીતે વ્યાવસાયીક અને શૈક્ષણિક ઉપયોગમાં લાવવી જરૂરી છે અને આવી ઉપયોગીતા જ સંવર્ધિત માહિતીનું મુલ્ય વર્ધન કરે છે.

કોઈપણ તત્વનું આર્થિક મુલ્ય સર્જન જ માહિતીની વ્યાપકતા અને પ્રસારને બળ આપે છે. જેમ જેમ તત્વનું આર્થિક મુલ્ય સર્જન પામતું જાય છે, તેમ તેમ તેના વિકાસની દિશા આગળ વધતી જાય છે. ન્યાય અને કાયદા સાથે સંકળાયેલા વ્યવસાયમાં પણ ન્યાયાલય દ્વારા અપાતા ચુકાદાઓ સ્વરૂપે સર્જિત થતી માહિતીને પણ સમય સાથે આવું જ મુલ્ય ધારણ કરતા થયું છે.

૫-ન્યાયા

લૉ રિપોર્ટિંગ એ કાયદા થી સ્થાપિત થયેલા અને સક્ષમ સત્તા ધરાવતા ન્યાયાલયો દ્વારા આપવામાં આવતા ચુકાદાઓ અને અને હુકમોનું ચોક્કસ પ્રકારના માળખામાં ગોઠવી એક શ્રેણી સ્વરૂપે સંચીત કરી પ્રકાશિત કરવાની વ્યાવસાયીક પ્રક્રિયા છે.

સમાજમાં અનેક પ્રકારના આર્થિક, સામાજિક, રાજનૈતિક, શૈક્ષણિક, ધાર્મિક, વ્યક્તિ, વિગેરે પ્રકારની સમસ્યાઓ ઉદભવતી હોય છે. આ સમસ્યાઓના આધિકારીક અને માન્ય નિકાલ માટે સભ્ય સમાજ તેને ન્યાયાલયો સમક્ષ કેસો સ્વરૂપે લઈ આવે છે. ઉચ્ચ ન્યાયાલયો સમક્ષ આવતા મહત્વના કેસમાં પ્રશ્ન વાળા કાયદાઓના પ્રશ્નોનું ગંભીરતા થી અને ઉંડાણ પુર્વક વિશ્લેષણ કરી ન્યાયાલયો તેમનો અભિપ્રાય હુકમ સ્વરૂપે આપતા હોય છે.

કોમન લૉમાં કાયદા અહેવાલ એ એવા પ્રકાશિત ચુકાદાઓ છે, જેનો ઉપયોગ વકીલો અને ન્યાયાધીશો દ્વારા નિર્ણય કરવામાં આવતા અનુગામી કેસોમાં પૂર્વનિર્ણયિત થઈ ચુકેલા પ્રશ્નો સંદર્ભ લઈ ઉપયોગ કરવામાં આવે છે. નિર્ણયના અહેવાલમાં સામાન્ય રીતે કેસનું શીર્ષક, ઉપજાવવામાં આવેલ મુદ્દાને જન્મ આપતા તથ્યોનું નિવેદન અને અદાલતોમાં તેનો ઇતિહાસ હોય છે અને કોર્ટના હાલના કેસમાં આપવામાં આવેલ અભિપ્રાયનું પુનરાવર્તન કરે છે, જે કોર્ટના ચુકાદા સાથે સમાપ્ત થાય છે. ચુકાદામાં પૂર્વનિર્ણયિત ચુકાદાઓને સમર્થન મળે છે કે, ઉલટાવી દેવામાં આવેલ છે, તેની પણ નોંધ કરવામાં આવે છે. આધુનિક

કેસ લોના અહેવાલોમાં સામાન્ય રીતે સારાંશ આગળ પ્રકાશિત કરવામાં આવે છે, જે હેડનોટ તરીકે પ્રચલિત પદ થી ઓળખાય છે.(Britannica, 2025) ¹

વિધી તંત્ર કાયદાઓનું સર્જન કરે છે, પરંતુ આ કાયદાઓના અમલ અને વિસ્તૃત અર્થઘટન કરવાનું કામ સાર્વભોમ રાષ્ટ્રના યોગ્ય ન્યાયીક અધિકાર ક્ષેત્ર અને વૈધાનિક સત્તાધરાવતા સર્વોચ્ચ ન્યાયાલયોના ચુકાદાઓ એટલે કે, કેસ લો કરતા હોય છે. જુદા-જુદા રાષ્ટ્રોમાં આ કેસ લોના રિપોર્ટિંગ સંદર્ભે જુદી જુદી નિયંત્રણ સત્તાઓ છે, કોઈ ચોક્કસ અને સ્પષ્ટ પ્રકાશન નિયમો સર્વ સામાન્ય સિદ્ધાંતો પ્રમાણે સ્થાપિત થયેલા નથી. વળી ભારતમાં કેસ લોના રિપોર્ટિંગ સંદર્ભે હાલ કોઈ કાયદો અસ્તિત્વમાં નથી.

૬-ઈતીહાસ

બ્રિટનમાં ૧૨માં સદી થી જ ન્યાય તંત્રનો વિકાસ થવા લાગેલો. બ્રિટીનની ઔપનિવેશીક પ્રવૃત્તિ સાથે સાથે વિશ્વમાં કોમન લો અવધારણાની સ્વિકૃતિ થવા લાગી અને બ્રિટીશ કોલોનીઓમાં બ્રિટીશ ન્યાય વ્યવસ્થા સ્થાપિત થવા લાગી. બ્રિટનમાં ઉચ્ચ ન્યાયાલયોની સત્તા અને માન્યતાઓએ પૂર્વનિર્ણિત વાદ ના સિદ્ધાંતને સ્થાપિત કર્યો. શરૂઆતમાં આ પૂર્વનિર્ણિત ચુકાદાઓને ન્યાયાધીશો દ્વારા ડાયરીઓમાં ટુંકમાં નોંધવામાં આવતા હતા, જે તેઓને ભાવી કેસમાં અગાઉ નક્કી થઈ ગયેલા તે જ પ્રકારના કેસોમાં નિર્ણય કરવા માટે મદદરૂપ બનતા. સમય જતા વકીલોએ પણ આ પ્રવૃત્તિને સ્વિકારી, પરંતુ તે માટે કોઈ ચોક્કસ પદ્ધતિઓ ન હતી. ત્યાર બાદ ૧૩માં થી ૧૬મી સદી દરમિયાન વાર્ષિકી સ્વરૂપે ખાનગી પ્રકાશકો દ્વારા પ્રકાશન કરવામાં આવવા લાગી. કાળક્રમે લો રિપોર્ટિંગની ઉપયોગીતા વધતા તે પ્રચલિત બન્યું અને ધણા દેશોના ન્યાય તંત્ર દ્વારા તેના પ્રકાશનને નિયંત્રીત કરવા આધિકારીક કાયદાઓ બનાવામાં આવ્યા. Mittal (n.d.)²

૬.૧ ભારતમાં લો રિપોર્ટિંગનો ઇતીહાસ

ભારતમાં બ્રિટન પાસેથી ન્યાયતંત્ર વારસામાં મળેલું હોવા થી આવી કોઈ લો રિપોર્ટિંગ પદ્ધતિ નો વિકાસ થયેલ નહી, પરંતુ બ્રિટનની લો રિપોર્ટિંગની પ્રણાલીને સ્વિકારી લેવામાં આવેલ. હાઈકોર્ટની નીચેની તમામ કોર્ટોએ હાઈકોર્ટ અને સુપ્રીમ કોર્ટના ચુકાદાઓ કે પૂર્વ નિર્ણિત ચુકાદાઓની માન્યતા સ્વિકારવી રહે છે, જ્યારે હાઈકોર્ટ અને સુપ્રીમ કોર્ટ નીચેની કોર્ટોના ચુકાદાઓ સ્વિકારવા બાધ્ય હોતી નથી. વધુમાં આ એપેક્સ કોર્ટો તેઓના કાયદામાં જાહેર હિતમાં જરૂરી જણાય તો પૂર્વનિર્ણિત ચુકાદાઓ માં જો ખામી રહી ગયેલી હોય તો તેવા ચુકાદાઓ ઉલટાવી નવા ચુકાદાઓ આપી શકે છે.

1 Britannica Editors (2025, July 23). *law report*. *Encyclopedia Britannica*. available at <https://www.britannica.com/topic/law-report> <https://www.sciencedirect.com/topics/social-sciences/information-source>

2 Mittal, J. K. (n.d.). *History of law reporting in India*. <https://www.allahabadhighcourt.in/event/HistoryOfLawReportingInIndiaJKMittal.pdf>

ભારતમાં લૉ રિપોર્ટિંગના ઇતીહાસને વિદ્વાન પ્રા.શ્રી જે.કે. મિત્તલ બે ભોગોમાં વહેંચતા જણાવે છે કે, પ્રથમ તબક્કો વિકાસનો હતો જેનો સમય ગાળો ૧૮૧૩ થી ૧૮૬૧ નોંધે છે અને બીજો તબક્કો નિયમીત આવૃત્તિનો ગાળો છે જે ૧૮૬૨ માં વિવિધ પ્રાંતોમાં પ્રેસિડેન્સી હાઈકોર્ટ ની સ્થાપના બાદ શરૂ થયેલો અને વર્તમાનમાં પણ તે ચાલુ છે.

૬.૧.૧) શરૂનો વિકાસનો તબક્કો (૧૮૧૩ થી ૧૮૬૧)

આ શરૂઆતી સમયગાળામાં કોઈ નિયમો વગર જ કોર્ટો તેઓના દ્વારા આપવામાં આવતા ચુકાદાઓથી પોતાના અગાઉ અપાયેલા ચુકાદાઓ થી નિયંત્રીત રહેતી અને તેની તાબાની કોર્ટોને પણ આ નિયંત્રણ માટે ફરજ પાડતી. આ તબક્કામાં વકીલો કે પક્ષકારો ન્યાયાધીશોને અગાઉના ચુકાદાઓ થી અવગત કરાવવાનો કોઈ પ્રણાલિ કે રિવાજ ન હતો.

આ પરિસ્થિતિએ લૉ રિપોર્ટિંગના પ્રકાશન માટે અવકાશ પુરો પાડ્યો જે પ્રાદેશિક કાયદાના પ્રશ્નો અને દાવાઓ પ્રકાશિત કરતા થતા અને વધુમાં લૉ રિપોર્ટ ન્યાયાધીશો અને કાયદા વ્યવસાયિકો માટે પણ માર્ગદર્શક અને સહાયક બનવા લાગ્યા.

વિવિધ મેકફર્સને ૧૮૫૦માં અવલોકન કર્યું કે, દિવાની ન્યાયાલયોની પ્રથા અને સિદ્ધાંતો આપવા માટે બહોળા પ્રમાણમાં નિર્ણયોની તપાસ કરીને, ઉદાહરણરૂપ પ્રકાશિત થયેલા અને સદર ન્યાયાલયોના સામાન્ય વ્યવહારોના રેકૉર્ડ તરીકે માસિક આપવામાં આવેલા ન્યાયિક નિર્ણયોની તપાસ કરીને પ્રકાશિત કરવા જોઈએ, કારણ કે બધા નિર્ણયો વ્યવહારિક રીતે દર્શાવે છે કે ન્યાયાલયો કયા સિદ્ધાંતો દ્વારા સંચાલિત થાય છે અને તે નિર્ણયો જ કાયદો બની જાય છે, એટલે કે, ન્યાયાધીશો તથા વકીલોને આ નિર્ણયોમાં માર્ગદર્શન આપે છે. તેઓએ જે ઉલ્લેખ કરેલા સિદ્ધાંતોને અનુભવી ન્યાયિક અધિકારીઓના મનમાં ધીમે ધીમે પરિપક્વ થતો દેખાય છે, પરંતુ જે કોઈપણ ચોક્કસ સ્વરૂપમાં પૂર્ણ થવાનો નથી. છતાં આ નિર્ણય પ્રકાશનની પ્રક્રિયા દ્વારા નીચલી અદાલતોના ચુકાદાઓનો ચોક્કસપણે નિયંત્રીત કરવા અને માર્ગદર્શન આપવા પ્રયાસ કરવામાં આવે છે અને તેમાંથી સામાન્ય પ્રકારની ભૂલભરેલી પ્રક્રિયા માટે અટકાવી શકાય.

૬.૧.૨) ૧૮૧૩ થી ૧૮૬૧ ના ગાળામાં ભારતમાં ઉપયોગમાં આવતા પ્રમુખ લૉ રિપોર્ટિંગની સ્થિતિ

બ્રિટેનની ક્રાઉન કોર્ટના કેસોના લૉ રિપોર્ટર

આ લૉ રિપોર્ટમાં બ્રિટેનની ક્રાઉન કોર્ટ દ્વારા આપવામાં આવતા ન્યાયિક નિર્ણયો પ્રકાશિત કરવામાં આવતા હતા. આ ઉપરાંત તેમાં ઘણી વખત ભારતની સુપ્રિમ કોર્ટ દ્વારા અપાયેલા નિર્ણયો ઉપર થયેલી પ્રિવી ક્રાઉન્સની અપીલોના નિર્ણયો પણ પ્રકાશિત કરવામાં આવતા હતા, જેને અગલ થી ઇન્ડિયા કેસીસ તરીકે પણ પ્રકાશિત કરવામાં આવેલા. ડબ્લ્યુ.એસ. મોર્લેયે પણ તેના ડાયજેસ્ટ ઓફ ઇન્ડિયન કેસીસના પ્રકાશનમાં આ લૉ રિપોર્ટનો સંદર્ભ નોંધેલ.

ઈસ્ટ ઇન્ડિયા કંપનીની કોર્ટના કેસોના લૉ રિપોર્ટર

ક્લક્તા સદર કોર્ટના રજિસ્ટ્રાર સર વિલીયમ દ્વારા પ્રથમ વખત કંપની કોર્ટો દ્વારા આપવામાં આવેલા ચુકાદાઓને પ્રકાશિત કરવામાં આવેલા. શરૂઆતમાં તેના બે વોલ્યુમ પ્રકાશિત કરાયા અને પાછળ જતા તેને અધ્યતન કરી ચાર વોલ્યુમ સાથે પ્રકાશિત કરવામાં આવેલ. ૧૮૪૪ થી આ રિપોર્ટરને સિક્રેટરિયેટ રિપોર્ટર તરીકે જાણીતું થયું અને પ્રકાશકને ન્યાયાલય દ્વારા આધિકારીક પ્રકાશક તરીકે માન્યતા મળી. ત્યાર બાદ ૧૮૪૮ થી આ પ્રકાશને ન્યાયાલયે એક અધ્યાદેશ લાવી નિરસ્ત કર્યું.

૧૮૪૩ ના કાયદા અનુસાર અંગ્રેજીમાં નોંધાયેલા નીચલા પ્રાંતોની જિલ્લા અદાલતોના નિર્ણયો, અગાઉના ઉપર મુજબના લૉ રિપોર્ટોના સ્વરૂપમાં જ માસિક છાપવામાં આવતા હતા. ઉત્તર-પશ્ચિમ પ્રાંતોની જિલ્લા અદાલતોના નિર્ણયો પણ એ જ રીતે અને સ્વરૂપમાં પ્રકાશિત થતા હતા. આ પ્રકાશનોની શરૂઆત ઇ.સ. ૧૮૪૮ માં થઈ હતી. ઇ.સ. ૧૮૫૧ થી મદ્રાસ પ્રેસિડેન્સીની જિલ્લા અદાલતો અને સહાયક અદાલતોના નિર્ણયો પણ માસિક પ્રકાશિત થતા હતા. જોકે, જિલ્લા અદાલતોના આ બધા કેસોના સંગ્રહ તુલનાત્મક રીતે કોઈ મહત્વના ન હતા કારણ કે તેમને ઉચ્ચ અદાલતોમાં ક્યારેય પૂર્વવર્તી નિર્ણય તરીકે ઓળખવામાં આવ્યા ન હતા.

૬.૩) ૧૮૬૧ થી ભારતમાં ઉપયોગમાં આવતા પ્રમુખ લૉ રિપોર્ટીંગની સ્થિતિ

ઇ.સ. ૧૮૬૧ સુધી કાયદાના રિપોર્ટોનું પ્રકાશન નિયમિત અને વ્યવસ્થિત ન હતું. ૧૮૬૨માં પ્રેસિડેન્સી ટાઉન્સમાં હાઈકોર્ટોની સ્થાપના સાથે જ કાયદાના રિપોર્ટોનું પ્રકાશન નિયમિત રીતે શરૂ થયું. તે સમયથી અર્ધ-સત્તાવાર અને ખાનગી રાહે કાયદાના રિપોર્ટોનું પ્રકાશન નિયમિત અને વ્યવસ્થિત રીતે પ્રકાશિત થવા લાગ્યા.

ગવર્નર જનરલ કાઉન્સિલમાં કાયદા સભ્ય સર જેમ્સ સ્ટીફને એક મિનિટ નોંધી હતી કે કાયદાના રિપોર્ટીંગને કાયદાની એક શાખા તરીકે ગણવો જોઈએ; તેમણે એ સિદ્ધાંત સ્વીકાર્યો કે સરકારની તેના ટ્રિબ્યુનલ્સ દ્વારા ઘડવામાં આવેલા કાયદાને પ્રકાશિત કરવાની ફરજ તેના કાયદાને જાહેર કરવા કરતાં ઓછી મહત્વપૂર્ણ નથી. આગળ જતા આ વિષય ઉપર વિવિધ સ્થાનિક સરકારો અને ઉચ્ચ અદાલતોને પરિપત્રો રૂપે આદેશો કરવામાં આવ્યા હતા. ત્યાર બાદ સર સ્ટીફન પછી કાયદા સભ્ય તરીકે નિમાણૂક પામેલા હોબ હાઉસને કાયદા રિપોર્ટીંગના વિષયમાં રસ પડ્યો અને ૧૮૭૫માં કાયદા અહેવાલોના સુધારણા માટે લૉ રિપોર્ટિંગ અધિનિયમ પસાર કરવામાં પહેલ કરી. ઈન્ડિયાન લૉ રિપોર્ટિંગ એક્ટની કલમ ૩ અધિકૃત અહેવાલોને જ સત્તા આપી હતી, જેમાં એવી જોગવાઈ કરવામાં આવી હતી કે કોઈપણ કોર્ટ કોઈપણ ઉચ્ચ અદાલત દ્વારા નક્કી કરાયેલા કોઈપણ કેસના રિપોર્ટિંગ ઓથોરીટીને સાંભળવા, પ્રાપ્ત કરવા અથવા તેના પર બંધનકર્તા સત્તા તરીકે ગણવા માટે બંધાયેલી રહેશે નહીં, સિવાય કે તેના સરકારના અધિકાર હેઠળ પ્રકાશિત થયેલા અહેવાલ સિવાય. આ કાયદો પસાર થયા પછી અનેક ઉચ્ચ ન્યાયાલયોમાં લૉ રિપોર્ટિંગ માટે આધિકારીક સમીતીઓની સ્થાપના કરવામાં આવી અને સરકારની દેખરેખ અને સત્તા હેઠળ લૉ રિપોર્ટો પ્રકાશિત થવા લાગ્યા.

૭-પ્રકાર

લૉ રિપોર્ટર માં પ્રકાશિત વિષયાર્થના આધારે તેના પ્રકાર પાડવામાં આવે છે. સામાન્ય રીતે લૉ રિપોર્ટરના બે પ્રકારો કરવામાં આવે છે. લૉ રિપોર્ટરના કોઈ નિશ્ચિત કે સાર્વભૌમિક પ્રકારો નથી પરંતુ વ્યવસાયીક ઉપભોક્તાઓના ઉપયોગ અને ઓળખને આધારે લૉ રિપોર્ટરના બે પ્રકારો જણાવી શકાય છે. ૧) પૂર્ણ/વિસ્તૃત(Full Text) લખાણ વાળા લૉ રિપોર્ટર અને ૨) સારાંશ લખાણ વાળા (Summery) લૉ રિપોર્ટર. (Iclr-Admin-3lr9nq3zv, 2025)³

3 Iclr-Admin-3lr9nq3zv. (2025, September 19). *What is a Law Report?* - ICLR. ICLR. <https://www.iclr.co.uk/blog/archive/what-is-a-law-report/>

૭.૧) પૂર્ણ/વિસ્તૃત(Full Text) લખાણ વાળા લૉ રિપોર્ટર

ન્યાયાલયો દ્વારા સવાલ વાળા દાવાઓમાં આપવામાં આવતા નિર્ણયો ને જેના તે સ્વરૂપે અને સંપૂર્ણ લખાણને લૉ રિપોર્ટર તરીકે સંપાદકો દ્વારા પ્રકાશિત કરવામાં આવે છે, જેને પૂર્ણ/વિસ્તૃત(Full Text) લખાણ વાળા લૉ રિપોર્ટર તરીકે ઓળખી શકાય છે. સાથે સાથે તમાં હેડ નોટનો પણ ઉલ્લેખ કરવામાં આવે છે.

૭.૨) સારાંશ લખાણ વાળા (Summery) લૉ રિપોર્ટર

લૉ રિપોર્ટરના સંપાદકો દ્વારા ન્યાયાલય દ્વારા આપવામાં આવતા ચુકાદાઓમાં ફક્ત મહત્વના કન્ટેન્ટ ને ચાવી રૂપ શબ્દો અને ફકરાઓ સાથે પ્રકાશિત કરવામાં આવે છે, જે કાયદાના વ્યવસાયીકોનો સમય બચાવનારા હોય છે અને ચુકાદાઓની સતત આવતી આવૃત્તિઓમાંથી જરૂરી એવા ચુકાદાઓને શોધવા તથા તેની સરળ નોંધ કરવા ઉપયોગી બને છે.

વધુમાં, તેની આધિકારીક સ્વિકૃતિના આધારે પણ તેના બે પ્રકાર પાડી શકાય છે.

૭.૩.૧) આધિકારીક લૉ રિપોર્ટિંગ

કાયદાના આધારે ન્યાયાક સત્તા ધરાવતી ઉચ્ચ અદાલતો દ્વારા નિયમો ઘડી યોગ્ય પ્રક્રિયામાંથી અને ચોક્કસ માળખા સાથે સમયાંતરીકે શ્રેણી સ્વરૂપે પ્રકાશિત કરવામાં આવતા લૉ રિપોર્ટર આ પ્રકારના છે, જેને રાજ્ય દ્વારા માન્ય લૉ રિપોર્ટ ગણવામાં આવે છે.

૭.૩.૨) બિન આધિકારીક લૉ રિપોર્ટર

લૉ રિપોર્ટિંગના વ્યવસાયમાં ખાનગી પ્રકાશકો દ્વારા પ્રકાશિત લૉ રિપોર્ટર આ પ્રકારના છે, જેને કોઈ આધિકારીક માન્યતા પ્રાપ્ત હોતી નથી, પરંતુ તેઓ ઉપભોક્તાઓમાં વધુ પ્રચલીત અને સમયના ચોક્કસ હોય છે, જેની એડિટોરીયલ ટીમમાં પણ તજજ્ઞ અને વિદ્વાન વકીલોને કામ સોંપવામાં આવતું હોય છે, જેથી આ પ્રકારના લૉ રિપોર્ટરોની લોકપ્રિયતા આધિકારીક લૉ રિપોર્ટરો કરતા વધુ છે.

૮-માળખું

એક જ ચુકાદા/ કેસ લૉને જુદા જુદા ખાનગી પ્રકાશકો જુદા જુદા સંરચનામાં ગોઠવી અલગ સ્વરૂપે પ્રકાશિત કરતા હોય છે. પરંતુ આ સંરચનામાં તેના ચુકાદા/ કેસ લૉનો એક પણ શબ્દ બદલવામાં આવી શકે નહીં કે તેના એક પણ શબ્દનું અર્થઘટન કરવા માટે સંયોજકને તેની મૌલિકતા આપનાનો અવકાશ હોતો નથી. કોઈ પણ કેસ લૉને પ્રકાશિત કરવામાં આવે ત્યારે તેનું માળખું સામાન્ય રીતે સમાન જ રહે છે. જેમાં નીચે મુજબના તત્વો તેના તે જ ક્રમમાં ગોઠવવામાં આવે છે, જેથી કોઈજ કેસને સરળતા થી અને એક જ ભાતમાં સમજી શકાય.

સામાન્ય રીતે ચુકાદાઓની શરૂઆત ન્યાયાલયના નામ સાથે થતી હોય છે, ત્યાર બાદ કેસ નંબર, પક્ષકારોના નામ, પક્ષકારો તરફ કેસ રજૂ કરતા અધિવક્તાઓના નામ, ટુંકી હકિકત, મુખ્ય મુદ્દાઓ(Issues), આક્ષેપિત વિષય(Charge), પુરાવાઓ અને સાક્ષિઓની રજૂઆતો, કાયદાનું અર્થઘટન, અધિવક્તાઓની દલીલો, ઉચ્ચ ન્યાયાલયો દ્વારા સંબંધ ધરાવતા પૂર્વનિર્ણીત ચુકાદાઓનું અર્થઘટન, નિષ્કર્ષ અને અંતે અંતીમ નિર્ણય અને આદેશો કે માર્ગદર્શન/દોરવણી આપવામાં આવતી હોય છે. આજ ક્રમમાં પ્રકાશન પામતા લૉ રિપોર્ટર વાધારાના તત્વો જોડી પ્રકાશન પામતા હોય છે, જેમાં સૌથી ઉપર લૉ રિપોર્ટરનું

ટુંકુ અને પ્રચલિત નામ, વર્ષ, મહિનો, ઈસ્યુ, વૉલ્યુમ, ભાગ, પાના નંબર, ચુકાદો આપનાર ન્યાયાલયની પ્રચલિત સંજ્ઞા, ચાવી રુપ શબ્દો, દરેક ફકરાની હેડ નોટ સ્વરુપે ટુંકી વિગતો, હાલના કેસ સાથે સંગત હોય અને જેના ઉપર વિશ્વાસ રાખવામાં આવેલ હોય તેવા ચુકાદાઓની સુચી, જેનો સંદર્ભ લેવામાં આવેલ હોય, તેવા ચુકાદાઓની સુચી વિગેરે નોંધો રાખવામાં આવતી હોય છે.

૯-પ્રકાશિત થતા ખ્યાતનામ રિપોર્ટોની યાદી

ભારતીય ન્યાયાલયોમાં જાણીતા અને ખુબ ઉપયોગમાં આવતા જાણીતા લૉ રિપોર્ટોની યાદી નીચે મજબ છે.

૧) બિન-આધિકારીક ખાનગી ઓલ ઇન્ડિયા રિપોર્ટોની યાદી .

૧-ઓલ ઇન્ડિયા રિપોર્ટર(AIR).૨-ક્રિમિનલ લૉ જર્નલ(CrLR).૩ - સુપ્રિમ કોર્ટ કેસીસ (SCC), ૪ - એક્સીડિન્ટ લૉ જર્નલ (ACJ), ૫ - ક્રાઈમ્સ (CRIMES), ૬- સીવીલ કોર્ટ કેસીસ (CCC), ૭ - ગુજરાત લૉ રિપોર્ટર્સ (GLR), ૮- ગુજરાત લૉ હેરાલ્ડ (GLH) (બાર કાઉન્સિલ ઓફ ગુજરાત થી નિયંત્રિત)

૨) આધિકારીક અને સત્તાવાર લૉ રિપોર્ટર્સ

૧- ઇન્ડિયન લૉ રિપોર્ટર અલ્હાબાદ , ૨ - ઇન્ડિયન લૉ રિપોર્ટર આંધ્રપ્રદેશ, ૩- ઇન્ડિયન લૉ રિપોર્ટર અલ્હાબાદ, આસામ, ૪ - ઇન્ડિયન લૉ રિપોર્ટર આંધ્રપ્રદેશ, ૫ - ઇન્ડિયન લૉ રિપોર્ટર, બોમ્બે, ૬- ઇન્ડિયન લૉ રિપોર્ટર, કલકત્તા, ૭- ઇન્ડિયન લૉ રિપોર્ટર,કટક, ૮ - ઇન્ડિયન લૉ રિપોર્ટર,જમ્મુ અને કાશ્મીર, ૯- ઇન્ડિયન લૉ રિપોર્ટર, કેરળ, ૧૦ - ઇન્ડિયન લૉ રિપોર્ટર, મદ્રાસ. ૧૧- ઇન્ડિયન લૉ રિપોર્ટર, મૈસુર, ૧૨- ઇન્ડિયન લૉ રિપોર્ટર, પટના, ૧૩- ઇન્ડિયન લૉ રિપોર્ટર, પંજાબ, ૧૪- ઇન્ડિયન લૉ રિપોર્ટર, રાજસ્થાન, ૧૫-સુપ્રીમ કોર્ટ રિપોર્ટર્સ(SCR)

૧૦-ન્યુટ્રલ સાઈટેશન

ભારતીય ન્યાય તંત્ર હાલ ડીજિટલાઈઝેશન પ્રક્રિયામાંથી પસાર થઈ રહ્યું છે. તેના બે તબક્કા પૂર્ણ થઈ ચુકેલા છે અને ત્રીજો તબક્કો તેની પૂર્ણતાના આરે છે. સંપૂર્ણ ટ્રાયલ પ્રક્રિયાને ન્યાયાલયોમાં પેપરલેસ કરવાની કવાયતો ચાલી રહી છે. આ સમયે સુપ્રીમ કોર્ટ ઇ કોર્ટ કમીટીએ ન્યુટ્રલ સાઈટેશન માટે ભલામણો કરેલી છે. ૨૩મી ફેબ્રુઆરી, ૨૦૨૩ના રોજ સુપ્રીમ કોર્ટ ઓફ ઇન્ડિયાએ એક પ્રેસ રીલીઝ આપી ન્યુટ્રલ સાઈટેશન માટે ના અમલિકરણ માટેનો માર્ગ પ્રસસ્થ કરેલ છે. (SUPREME COURT OF INDIA, 2023)⁴ .

સુપ્રીમ કોર્ટ ઓફ ઇન્ડિયાની ભલામણોને ધ્યાને રાખી વિવિધ હાઈકોર્ટોએ તેઓના ચુકાદાઓ ન્યુટ્રલ સાઈટેશન સ્વરુપે પ્રકાશિત કરવાના શરૂ કરી આપેલા છે અને જેને હાઈકોર્ટોની સાઈટો ઉપર તેને અલગ થી એક્સેસ આપવામાં આવેલ છે.

૧૧-ઉપસંહાર:

4 SUPREME COURT OF INDIA (Feb.,2023). *Neutral citations in Supreme Court of India*, PR/SCI/2023/02/01, The Supreme Court of India.

જ્ઞાન એ એક એવો વિષય છે, જે સતત વિકાસ કર્યા કરે છે. આ જ્ઞાન સામાજીક, સાંકૃતિક, રાજકીય, વૈજ્ઞાનિક, શૈક્ષણિક વિવિધ સ્વરુપે હોય છે. જે વિદ્યા શાખા આ જ્ઞાનને વિકસાવે છે તેને સંગ્રહિત કરવા તથા જ્ઞાન સંજ્ઞાનની પ્રક્રિયાને આગળ વધારવા કોઈ નિશ્ચિત ભાત બનાવવી જરૂરી હોય છે. આ ભાત કે પદ્ધતિનું સ્વરુપ તે વિદ્યાશાખાની પ્રકૃતિ પ્રમાણે અલગ હોય છે. કાયદા વિદ્યાશાખા એ સામાજિક વિજ્ઞાનની પ્રકૃતિ ધરાવે છે.

સામાજિક વિજ્ઞાનની વિવિધ વિદ્યાશાખાઓ તેના જ્ઞાનને સંવર્ધિત કરવા, સાચવવા અને ઉપયોગી તથા પ્રાયોગિક બનાવવા જુદા જુદા સામયીકોમાં તેને પ્રકાશીત કરતું હોય છે. સામાજિક વિજ્ઞાનની બીજી વિદ્યાશાખાઓની જેમજ કાયદા વિદ્યાશાખાએ પણ લૉ રિપોર્ટર સ્વરિપે નવા સર્જીત થતા જ્ઞાનને સાચવવા અને જાળવવા માટે લૉ રિપોર્ટનું માધ્ય સ્વિકાર્યું છે. ભવિષ્યની પેઢીઓ માટે અને સામાજિક વિકાસ માટે ન્યાયાલયો દ્વારા પ્રમાણભુત ચુકાદાઓને લૉ રિપોર્ટિંગના માધ્ય થી સાચવવું જરૂરી છે.

સંદર્ભ સુચી

- 1 *Britannica Editors (2025, July 23). law report. Encyclopedia Britannica. available at <https://www.britannica.com/topic/law-report> <https://www.sciencedirect.com/topics/social-sciences/information-source>*
- 2 *Mittal, J. K. (n.d.). History of law reporting in India. <https://www.allahabadhighcourt.in/event/HistoryOfLawReportingInIndiaJKMittal.pdf>*
- 3 *Iclr-Admin-3lr9nq3zv. (2025, September 19). What is a Law Report? - ICLR. ICLR. <https://www.iclr.co.uk/blog/archive/what-is-a-law-report/>*
- 4 *SUPREME COURT OF INDIA (Feb.,2023). Neutral citations in Supreme Court of India, PR/SCI/2023/02/01, The Supreme Court of India.*