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About the Journal

The BIITM Business Review is an academic platform dedicated to the promotion, compilation, and dissemination of research on various aspects of management and business practices. It features original empirical studies, along with theoretical and conceptual papers on management. The journal also includes case studies, critical assessments of existing business models and theories, and reviews of the latest books relevant to the corporate world. This issue presents a carefully curated selection of articles from diverse fields. The editorial committee has played a vital role in selecting papers that present cutting-edge research and offer valuable insights into managerial excellence and sustainable growth.

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BIITM

Vision:

To achieve excellence in management education, as a nationally acclaimed Business School for developing leaders, who can contribute meaningfully to the society.

Mission:

M1: To provide excellent academic ambience and adequate exposure to the business world, in order to develop successful business leader.

M2: To consistently endeavor to achieve holistic development of the students in terms of knowledge, skill and attitude.

M3: To Provide supportive ecosystem for developing innovative mindset and encouraging entrepreneurship.

M4: To inculcate professional values, ethics an concern for environmental sustainability and society at large.

Executive Director's Message

"Research is seeing what everybody else has seen and thinking what nobody else has thought."- Albert Szent-Györgyi

At BIITM, we take profound pride in embodying this idea in our practices, consistently striving to equip our students with the knowledge and skills essential for navigating the ever-evolving landscape of management. Our institution has forged a distinctive reputation in the realm of management education, cultivating a cadre of competitive managers attuned to the exigencies of the dynamic industry milieu. Central to this ethos is the pivotal role of research in augmenting the learning experience. Here at BIITM, we are privileged to foster an environment where students are not merely confined within the boundaries of classrooms and textbooks but are encouraged to delve deeper into the realms of inquiry and exploration.

Designed as a platform for both students and faculty to push the boundaries of knowledge, BIITM Business Review serves as a catalyst for intellectual exploration and advancement. Tailored for management practitioners, researchers, and academics alike, this journal rigorously engages with contemporary practices, concepts, and ideas in the management domain, with a steadfast focus on delivering actionable managerial insights.

The articles and papers featured in this journal aspire to catalyze transformative change within the field of management, empowering managers to make informed decisions and navigate complex challenges with acumen and foresight. Through our collective efforts, we endeavor to create a ripple effect, empirically shaping the landscape of management and fostering a community of leaders equipped with the power of to drive meaningful changes in their professional domains.

I cherish the hope that this issue of the journal will be another milestone in the institute's contribution to the advancement of knowledge in the field of management.

Mr. Pratap Balabantaray
Executive Director

Principal's Message

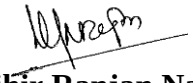
It is with immense pleasure that I introduce to you this issue of the BIITM Business Review, peer-reviewed bi-annual journal; our mission is to serve as a beacon for groundbreaking research across various domains of management, thereby fulfilling the Institute's vision of fostering intellectual excellence.

The BIITM Business Review stands at the forefront of the new frontier of research, acting as a catalyst for bridging the gap between academia and the corporate world through the dissemination of high-quality, research-based articles. In doing so, we endeavor to cultivate a vibrant culture of inquiry and exploration among both our esteemed authors and the students of BIITM.

I extend my heartfelt gratitude to the distinguished members of our newly constituted Board of Reviewers for their invaluable contribution. Their guidance and expertise will undoubtedly propel us toward greater heights of achievement in the field of research.

Featuring five meticulously crafted research articles spanning a diverse array of topics, from empirically researched finance articles to conceptual review articles on facility management, this edition promises to captivate and inspire our readers.

To our esteemed reviewers, authors, and readers, I express my deepest appreciation for their unwavering support and patronage over the years. It is their dedication and enthusiasm that drive us forward, and we look forward to their continued partnership as we embark on this journey toward excellence.



Prof. (Dr.) Mihir Ranjan Nayak
Principal

From the Chief Editor's Desk

Dear Esteemed Readers, Contributors, and Partners,

As the Chief Editor of the BIITM Business Review, I am pleased to welcome you to this latest *issue, filled with cutting-edge research, insightful perspectives, and thought-provoking analyses* from the world of management and business studies.

Our journal continues to strive for excellence, serving as a bridge between academia and practice, and promoting interdisciplinary research that challenges conventional thinking while driving innovation in the field. With contributions from esteemed academics, industry professionals, and emerging scholars, we aim to create a platform where diverse ideas flourish, fostering both intellectual growth and practical solutions to the challenges faced by businesses today.

In this issue, readers will explore insightful papers such as *"Post-Pandemic Dynamics of Mutual Fund Investments: A Technological Perspective"*, and *"Application, Opportunities, and Benefits of Virtual Reality Technology"* across diverse sectors. Environmental concerns are addressed in *"A Study on Ground Water Quality in the Industrial Belts of Jharsuguda District, Odisha,"* while *"The Impact of Artificial Intelligence on the Business Landscape"* examines AI's growing influence on business operations. These contributions reflect the depth and rigor of our authors' research, offering valuable perspectives to spark meaningful dialogue and practical innovation.

I would like to extend my heartfelt gratitude to our peer reviewers, editorial board, and contributors for their unwavering commitment to maintaining the high standards of academic rigor. We also deeply appreciate the support of our readers, whose engagement fuels our mission to continue advancing management scholarship.

Thank you for your continued support of the BIITM, Business Review.
Warm regards,

Prof. (Dr.) Chinmaya Kumar Dash
Chief Editor, BIITM Business Review.

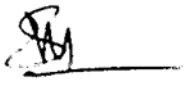
Editor's Message

We are pleased to present the latest edition of the *BIITM Business Review*, a publication dedicated to advancing knowledge and fostering intellectual dialogue in the ever-evolving business landscape. This issue showcases a rich and diverse array of research papers that delve into contemporary topics, offering valuable insights for both academia and industry.

We express our sincere gratitude to all the contributing authors for their thoughtful and impactful research. Our deep appreciation also goes to the Editorial Committee and the Printing & Publishing Committee for their unwavering commitment and collaborative efforts in bringing this edition to life.

A special note of thanks is extended to our esteemed reviewers, whose expertise and meticulous evaluations have upheld the quality, integrity, and academic rigor of every paper published. We are equally thankful to the wider academic community for its continued support and encouragement, which remain vital to the growth and success of this journal.

We hope this edition not only informs but also inspires further exploration, dialogue, and innovation across academic and professional spheres.



Dr. Sasmita Mohapatra
Editor
BIITM Business Review

CONTENTS

Post-Pandemic Dynamics of Mutual Fund Investments: A Technological Perspective

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Abstract:

The Indian Financial System encompasses dynamic financial markets, with the FinTech movement gaining momentum in recent decades. This growth is evident in various financial products offered by Financial Institutions, driven by the fundamental need to adapt to evolving consumer demands. The mutual fund industry in India has adeptly adjusted to the changing financial landscape, launching the first online mutual funds investment platform in Indonesia in 2016 to attract more investors. This study aims to assess the impact of technology on mutual fund investment growth in the post-COVID-19 era. The literature review indicates that FinTech has positively influenced financial institutions involved in mutual fund services in India. The mutual fund sector has experienced remarkable growth attributed to digitization, as customers increasingly recognize the importance of investing in humanity. Asset Under Management (AUM) has surged significantly in recent months, with improved customer satisfaction facilitated by better access to the back office, even from remote locations.

Particularly, mutual funds emerged as a safe investment during the COVID-19 pandemic, influencing their results. In conclusion, this article contributes to our understanding of financial technologies, exploring their effects on the financial sector, addressing challenges, and highlighting their potential.

Keywords: Financial Market, Capital Market, Mutual Fund Investment, FinTech, Pandemic

I. Introduction:

A mutual fund is a popular investment vehicle that pools money from multiple investors and uses it to invest in a diversified portfolio of securities such as stocks, bonds, and short-term debt instruments. The combined holdings of the mutual fund are known as its portfolio. Investors buy shares in the mutual fund, which represent their ownership in the fund and entitle them to a portion of the income generated by the fund. Mutual funds are typically structured as companies or trusts, with a board of directors or trustees overseeing the fund's operations. The fund is managed by professional fund managers who are responsible for selecting the securities and making investment decisions on behalf of the investors.

Mutual funds have become a popular investment choice for individuals and institutional investors alike. The reasons for investing in mutual funds can be attributed to several key factors:

Professional Management: One of the primary reasons individuals invest in mutual funds is to gain access to professional investment management. Mutual funds are managed by experienced fund managers who have the expertise and resources to conduct thorough research and make informed investment decisions. The fund managers analyze market trends, evaluate securities, and determine the optimal allocation of the fund's assets. This professional management helps investors save time and effort while benefiting from the expertise of seasoned professionals.

Diversification: Diversification is a crucial aspect of any investment strategy, and mutual funds are an effective tool for achieving diversification. Mutual funds pool money from multiple investors and invest in a diversified portfolio of securities. By spreading investments across different asset classes, sectors, and geographies, mutual funds help reduce the risk associated with investing in a single security or a concentrated portfolio. Diversification can help mitigate potential losses if one investment performs poorly, as the positive performance of other holdings within the fund can offset those losses.

Affordability: Mutual funds offer affordability, allowing investors to start investing with a relatively low amount of money. Most mutual funds have a minimum investment requirement that is significantly lower than investing directly in individual securities. This accessibility enables individuals with limited capital to participate in the financial markets and benefit from professional management. Additionally, mutual funds offer the option of systematic investment plans (SIPs), which allow investors to make regular contributions to the fund at fixed intervals, further enhancing affordability.

Liquidity: Mutual funds provide investors with liquidity, allowing them to buy or sell their shares at any time. The fund will redeem the shares at the current net asset value (NAV), which represents the value of the fund's assets minus its liabilities. This liquidity feature provides investors with the flexibility to access their investments and convert them into cash whenever needed. Unlike certain other investments, mutual funds do not impose strict lock-in periods or withdrawal restrictions, allowing investors to manage their liquidity needs effectively.

In conclusion, mutual funds offer investors a convenient and diversified investment option. By pooling money from multiple investors, mutual funds provide access to professional management, diversification, affordability, and liquidity. However, it is crucial to consider the potential risks and understand the fees associated with mutual funds. By conducting thorough research, making informed investment decisions, and staying vigilant against fraud, investors can maximize the benefits of investing in mutual funds and achieve their financial goals.

II. Literature Review:

Garg (2011) A study was conducted to evaluate the performance of the top ten mutual funds, which were chosen based on their returns from the previous year. The study examined the performance of these funds using various measures such as return, standard deviation, and beta, as well as the Treynor, Jensen, and Sharpe indexes. Additionally, the study utilized Carhart's four-factor model to analyze the performance of the mutual funds. The findings indicated that the Reliance Regular Saving Scheme Fund (RRSSF) attained the highest overall score, while the Canara Robeco Infra fund received the lowest score in the one-year category.

Agarwal (2011) believed that mutual funds play a significant role in the globalization of financial markets and are a major source of capital formation in emerging economies. The pricing mechanism of the Indian mutual fund industry was analyzed by the individual, considering data from both the fund manager and fund-investor levels. In recent years, the mutual fund industry in India has experienced remarkable growth and has attracted significant investments from both domestic and foreign investors. The increasing number of asset management companies (AMCs) has created ample opportunities for investors, offering safety, hedging, arbitrage, and limited risk with the potential for better returns compared to other long-term securities. As a result, more investors are being drawn toward mutual fund investments.

Yadav and Yadav (2012) In their article titled "A Comparative Study of Mutual Funds and Foreign Institutional Investors in the Indian Stock Market", they conducted an analysis comparing the investment activities of mutual funds and Foreign Institutional Investors (FIIs). The study revealed that, despite India being an appealing investment destination for FIIs, mutual funds actually made

larger investments than FIIs. During the recession, the mutual fund industry played a crucial role in boosting the economy, as FIIs withdrew their investments. This highlights the significance of mutual funds in the Indian economy.

According to Alekhya (2012), The study aimed to assess and compare the performance of mutual fund schemes in the public and private sectors. Specifically, the paper focused on the performance of equity schemes within mutual funds over a three-year period from 2009 to 2011. The performance of the funds was evaluated and ranked based on measures such as Sharpe ratio, Treynor ratio, and Jensen's alpha.

Rekha (2012) has undertaken a study titled "Growth of Indian Mutual Fund Industry-A Review" where they explore the history of mutual funds in India. The mutual fund industry was initiated with the establishment of the Unit Trust of India (UTI) in 1964, which held a monopoly until 1987. In 1987, public sector banks were authorized to establish mutual funds. Subsequently, from 1993 onwards, the private sector and foreign institutions were permitted to set up mutual funds. As of March 2011, there were a total of 41 fund houses offering 1,131 schemes, with assets under management valued at Rs. 5,92,250 crores. Her conclusion was that the Indian mutual fund industry is expected to experience a significant growth in assets under management (AUM) in the coming years. To facilitate this growth, fund houses should focus on introducing innovative products, delivering efficient customer service, and utilizing supportive technologies. Additionally, there is a need for the mutual fund industry to create products that meet the specific needs of customers, while also educating them on how these products can serve their needs.

The Indian Chamber of Commerce and Ernst and Young (2014) conducted the Indian Asset Management Outlook Survey 2014. The report titled "Indian Mutual Fund Industry Vision 2015" provides insights from asset managers regarding the Indian market. The report includes an assessment of the current state of the mutual fund industry and explores future developments. Key findings from the report indicate that the retail and institutional segments have been equally

responsible for the robust growth of the Indian mutual fund industry. The industry has witnessed significant growth due to a thriving economy and a favorable regulatory environment. From 2003-08, mutual fund Assets Under Management (AUM) witnessed a rapid Compound Annual Growth Rate (CAGR) of 47%, reaching a high of INR 6 trillion or USD 150 billion.

According to Das and Ali (2020) conducted a study to assess how India's financial services sector is affected by the swift advancements in financial technologies. The application of financial technologies in the contemporary financial services industries has been the subject of a descriptive research. We've talked about how financial technologies are affecting India's current financial system as well as the difficulties and risks regulators confront when trying to control new, disruptive technologies. The Asset Under Management, or AUM, has increased dramatically in the last few months. Better access to the back office, even from remote locations, has improved customer satisfaction. Furthermore, the article has addressed the difficulties that regulators have since they still do not completely comprehend the implications of the rapidly evolving technology environment.

III. Objectives of the study:

From the literature reviewed this study is focused on the given objectives:

1. To understand the current status of Mutual Funds.
2. To study the impact of technology on the growth of mutual funds.
3. To study the future trends of the Financial Market.

IV. Research Methodology:

In this research data is collected from secondary sources. It will be collected from the websites, published research papers, conference proceedings, journals, magazines, government publications, reports of committees and commissions, and publications of the Reserve Bank of India, websites of the Indian Banking Association, National Informatics Centre, bank circulars, etc. an exploratory research has been done to find the results.

V. Analysis and Interpretation:

A. The Evolution of Technology in the Financial Market: The financial market has undergone a significant transformation in recent years, thanks to the rapid advancements in technology. From artificial intelligence (AI) and big data to robo-advisory platforms and digital payment options, technology has revolutionized the way investors manage their portfolios and interact with the

financial services industry. In this article, we will explore the impact of technology on the financial market, particularly in the context of mutual fund investments.

B. Technology Reshaping the Financial Services Industry: The financial services industry has witnessed a wave of technological innovation, leading to a fundamental shift in the way financial transactions are conducted. This transformation has been driven by various factors, including the increasing adoption of digital platforms, the availability of real-time market data, and the development of sophisticated algorithms.

1. **The Rise of FinTech:** The emergence of FinTech companies has played a pivotal role in reshaping the financial services industry. These companies leverage technology to provide convenient, user-friendly, and cost-effective solutions for investors. From robo-advisory platforms that use AI algorithms to provide personalized investment advice to data analytics tools that offer valuable insights for informed decision-making, FinTech has revolutionized the way investors interact with the financial market.
2. **Enhanced Access and Convenience:** Technology has made the financial market more accessible than ever before. Online trading platforms and mobile applications have made it convenient for investors to buy and sell stocks, bonds, and other assets from the comfort of their homes. The introduction of e-payment options in mutual funds has simplified the investment process, allowing investors to transact and manage their mutual fund investments with just a few clicks.
3. **Automation and Efficiency:** The automation of trading processes through algorithmic trading systems has improved the efficiency of the financial market. These systems can analyse vast amounts of data and generate trading signals, enabling investors to make informed decisions quickly. Additionally, technology has streamlined back-office operations, reducing paperwork and manual effort for mutual fund companies.
4. **Data-Driven Insights:** The availability of big data and advanced analytics has empowered investors with valuable insights into market trends, investment opportunities, and portfolio performance. Data analytics tools can analyze historical data, market trends, and investor behaviour to offer personalized investment recommendations. Investors can access real-time updates, track their investments, and make informed decisions based on data-driven insights.

C. The Impact of Technology on Mutual Fund Investments: Mutual fund investments have experienced a significant impact from technological advancements. The integration of technology has revolutionized various aspects of mutual fund investments, including payment options, customer experience, and product innovation.

1. **E-Payments and Convenience:** The introduction of e-payment options in mutual funds has transformed the way investors transact and manage their investments. E-payments allow for the electronic transfer of funds from an investor's bank account to the mutual fund company, eliminating the need for physical instruments like cheques. This convenience has made it easier for investors to initiate transactions instantly, without the need to visit a branch or send documents through mail.
2. **Robo-Advisory and Personalized Investment Advice:** Robo-advisory platforms have gained popularity in the mutual fund industry, providing investors with personalized investment advice and portfolio management. These platforms leverage algorithms and automation to analyze investor preferences, risk tolerance, and financial goals, suggesting suitable mutual fund investment options. Robo-advisors offer streamlined and customized investment recommendations, making it easier for investors to enter the mutual fund market.
3. **Transparency and Efficiency:** Technology has brought transparency and efficiency to mutual fund investments. Investors can access their transaction history, account statements, and portfolio details online, providing real-time updates and insights into their mutual fund holdings. This transparency promotes better financial planning and decision-making, empowering investors with timely information.
4. **Product Innovation and Customization:** Technology has enabled mutual fund managers to innovate and tailor investment products to meet changing investor expectations. Investors today, particularly millennials, are looking for products that align with their values, offer higher returns, and provide a tech-enabled experience. Mutual fund managers are leveraging technology to develop products that cater to these demands, including socially conscious funds, active ETFs, and low-cost index funds.

D. The Future of the Financial Market:

As technology continues to evolve, the financial market is poised for further transformation. The future of the financial market will be shaped by advancements in blockchain, the Internet of Things (IoT), and AI, among other technologies. These advancements hold the potential to drive even greater efficiency, transparency, and accessibility in the financial market.

1. **Blockchain and Distributed Ledger Technology:** Blockchain technology has the potential to revolutionize various aspects of the financial market, including transaction settlement, identity verification, and record-keeping. Its decentralized and secure nature can enhance transparency and trust in financial transactions.
2. **Personalization and Customization:** The financial market of the future will focus on personalized and customized solutions for investors. AI algorithms and machine learning will enable the development of tailored investment recommendations, portfolio management strategies, and risk assessment models.
3. **Regulatory Considerations:** As technology continues to reshape the financial market, regulators will need to adapt and develop frameworks to address emerging challenges. Regulatory bodies will play a crucial role in ensuring investor protection, data privacy, and the fair and transparent operation of the financial market.
4. **Investor Education and Awareness:** With the increasing complexity of investment products and the rapid pace of technological advancements, investor education and awareness will become more critical than ever. Investors need to stay informed about new technologies, understand the risks and opportunities they present, and make informed investment decisions.

VI. Conclusion:

Technology has revolutionized the financial market and transformed the way investors manage their portfolios. The integration of AI, big data, robo-advisory platforms, and e-payment options has enhanced convenience, transparency, and efficiency in mutual fund investments. As technology continues to advance, the financial market of the future will be characterized by personalization, customization, and regulatory considerations. Investors who embrace these technological advancements and stay informed will be well-positioned to navigate the evolving financial landscape and capitalize on new opportunities.

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Application, Opportunities and Benefits of Virtual Reality Technology in Sports, Healthcare, Entertainment, Tourism, Education and Retail Sectors

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Abstract:

Virtual reality, an Immersive technology is giving a great cross industry experience due to the development of innovative technology. In current days' visual reality has changed dramatically and has been used in different activities like gaming, entertainment, training programs, advertising, tourism, retail sectors. Virtual reality giving a great consumer experience in the area of gaming and entertainment industries. There is a great potential and contribution in different business activities. This immersive Technologies can be used by different business houses to create a good consumer base by giving a great engagement experience. This study seeks to explore the use and application of virtual reality in various industries like Sports, education, retail, entertainment, tourism, Healthcare industries.

Keywords: Virtual reality, education, healthcare, retail sector, entertainment, sports Industries and virtual reality.

Introduction:

Virtual reality which one of the emerging field of interest in the area of technology and commerce for which many major IT companies has shown their interest and investment in the area of development of hardware and software which is projected to be the value of Euro 80 billion by 2025.

Now virtual technology is a well-accepted technology by most of the people and this is due to the increase in affordability of virtual technology and availability of hardware in affordable price nearer to the people. Virtual reality one of the advanced human computer interface which creates a realistic and invites the participants who can move around the world in a virtual way. The participants

can see it on a different angle, reach to it, they can reshape it, they can grab. It does not require commands or option for manipulation or need of giving commands to get a computer to do something.

The phrase visual reality is coined by the French playwright Antonin Artaud in 1930's visual reality is defined as artificially generated and managed by the computer which allows the user to interact with various stimuli (Limniou et al. 2008), and creates an understanding of scenery objects with sound effects in a virtual mode to create a feeling of "Being There". A rapid exploration in the area of visual reality by the programmers and inventors for new potential in emotion media with the help of technologies that create a perception that how we can experience, observe, even what we can hear. Virtual reality headsets are increasingly used by users who have established a strong base in the digital ecosystem.

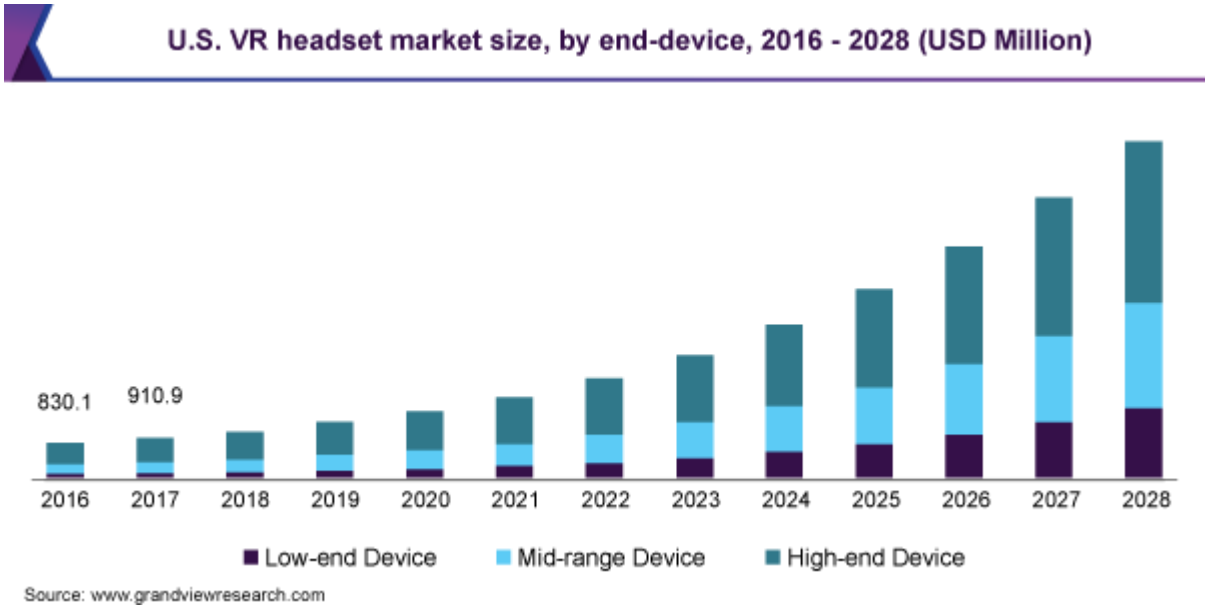
Due to presence of interactivity audio-visual features along with the virtual world content which creates experience of real presence. Visual reality is suitable for various fields. It has been treated as a separate discipline but not as a whole new branch of Technology.

The proposed definition of virtual reality is the use of a computer-generated 3D environment that can be navigated and potentially interacted with, resulting in a real-time simulation of one or more of the Users' five senses. Virtual reality Technology allows the getting off virtual experience which creates a feeling of real world circumstances with on realistic components similar to those found in different activities and allows for safe involvement in different scenarios and diversity of settings.

Some research suggests that an audience can make himself or herself more get involved in in virtual reality advertisement are likely to show the more interest towards advertised product. Many studies examine the experience of adopting a virtual environment, which can influence the impact of a virtual reality experience. Now the virtual reality gadgets users are having the experience of distinct word with the help of headset or virtual reality helmet. During the experiment, it was found that if the users are presented with different versions of virtual reality then It will create a sense of feeling of a new existence of reality (Sherman and Craig, 2003).

In the current scenario, the global virtual reality headset market size is valued at USD 7.81 billion in 2020 and is expected to grow at a compound annual growth rate (CAGR) of 28.2% between 2021 and 2028. Virtual reality offers experience using it in various fields such as education, healthcare, tourism, entertainment and others. Taking the example of the use of virtual reality in news content, it affects the audience's understanding of news articles by creating the feeling of being in a real place with

journalists (John 2016). Virtual reality technology has many uses from entertainment to communication to scientific and medical research.



Industries and Virtual Reality:

Entertainment industry:

The role of entertainment industry is increasing day by day. People are spending a lot of time and money on different type of activities like video games, cinema, amusement parks, sports, music concerts etc. Virtual reality is trying to replace these entertainments in some extent but not fully to make more inclusive and immersive (Kodama et al., 2017). Earlier virtual reality was used in an experimental form of entertainment. Now the virtual reality entertainment market already entered into commercial stage and generating profits and also helping the investors to have an option for proper investment decision in in virtual reality entertainment. The entertainment business includes film industry, sports, gaming, amusement park, music concerts etc. and all the categories finds unique method to use virtual reality for their target audience to cater. In live performance situation the consumer may prefer to see the performance taking place in another place by using the virtual reality and can get the option to play and watch it at their leisure time.

The entertainment industry has changed a lot with the introduction of virtual reality. Now the virtual reality amusement park is expecting to provide more entertainment and thrilling experience to their consumers. Due to the simplicity of use of virtual reality they are able to impress their audience by integrating the virtual reality and entertainment. It is able to create a better experience for both consumers and the industry. Virtual reality provides a novel method to provide a classic entertainment for their amusement park. (Bialkova and Van Gisbergen, 2017). Virtual reality is used in conjunction to display each user's personal information. It enriches the broadcast of sporting events, concerts and other events by promoting or embedding information by attracting and maintaining the interest and attention of viewers. (Parekh et al., 2020).

Even if there is a popularity of computer games still then virtual reality gaming makes some amount of physical movement and social interactions by which the there is an increase in Gamma experience. There is also emerging of new trends in creating serious games that are computer games and are known for entertainment and educational purposes, that are different from traditional games and have simulations in various fields such as medical, military, operational and educational, thus connecting between entertainment and work Magerkurth et al., 2005).

There are different types of virtual reality systems such as CAVE systems, augmented reality systems, simulators, and 3D viewing platforms for public entertainment. Now a day, the musicians and the bands are up to date with technologies. Virtual reality provides a simplest way to make their music available to their audience in a simplest way. It creates something different type of experience related to the live musical performance. Virtual reality provides a unique type of experience not only for the performers but also for audience and host. This is only possible through virtual reality, thanks to which the event is completely created, showing 3D visuals with the musicians and their surroundings. (Kodama et al., 2017).

Healthcare industry:

Virtual reality technology has improved the approaches society towards health and fitness. Today customers are with virtual technology to make healthcare more convenient and affordable due to the availability of wearable devices such as fitness tracks, fit bands, rings, headset, goggles and many more which explains the information related to the fitness. According to the study on virtual reality, the healthcare market size was valued at USD 2.89 billion in 2021 and is expected to reach USD 57.42 billion by 2030, growing at a CAGR of 39.36% between 2022 and 2030.The advancement of virtual

reality technology provides different types of devices in healthcare. According to geographical scope and the forecast size of virtual reality in healthcare market is 2.89 billion USD in 2021 and is expected to reach 57.4 USD by 2030 with a CAGR of 39. 36 from 2022 to 2030.

Virtual reality has created a safe environment to learn and to apply. There is certain situation in which the doctors are getting a lot of problem to handle the situation like dementia and mental illness. But, with virtual reality which plays a major role to put a control on it to cure the mental illness. Virtual reality is used for effectiveness and usefulness in several fields as a research tool. Even virtual reality can be used to treat the patient with phobias and anxiety disorders and also to put a control on pain (Rothbaum et al., 1995), to control pain (Hoffman et al., 2001), and to teach skills (Padgett et al. 2005). Due to increased use of virtual reality technology many Healthcare providers today playing it and has proved to be a powerful tool for Complex situations in a risk free environment. Virtual reality Technology as a tool by which it helps the patients to recover from very complex syndrome due to the facility available in it like online interactive learning sessions.

Healthcare sector unlike other business requires a continuous and systematic development to provide better services to the customers by providing appropriate training for serving the patients in a better way. Due to the availability of virtual technology, healthcare industry is able to get so many types of solutions to reserve different type of issues that they are facing during the treatment of the patient. Now they are very much confident on deploying virtual reality in their profession. Medical students and the new health care worker are getting a huge benefit due to the use of the virtual Technology there learning process. (Von Mammen et al., 2019). Virtual reality helping medical professionals and the learners by giving a hands-on experience in a risk-free environment. It provides medical models in such a way that can see many times which cannot be replicated like physical model and having the features of adjustment based on learning goals.

Virtual reality helps health workers in various difficult situations in the easiest way to serve, which may be impossible or difficult and dangerous in real life (Lyn et al., 2018). Using virtual reality, MRI and CT scans are possible. It provides the patient with pain-free and worry-free treatment. (Keswani et al., 2020). It also helps as a powerful diagnostic tool to diagnose or make a correct diagnosis for the doctor. Some forms of mental illness can also be treated with exposure therapy. As a common treatment method, virtual reality helps people suffering from mental illness with an affordable, flexible

and low-risk treatment option. Patient treatment has become easier with lower costs, flexibility and lower risk (Beemster et al., 2019).

Physicians were using cognitive destruction approaches to manage different forms of pain for last few years. Now virtual reality helps them by giving proper distraction strategies to provide variety of interactive activities to cure the pain. Virtual reality provides best way with the use of therapeutic. Virtual reality for born patients can help substantially to enhance the effective limb pain. As a drug-free pain treatment option, Virtual reality can be used even in the absence of a clinical care environment (Greenleaf, 2016). The fitness industry got a significant shift with the use of virtual reality. Many industries are using virtual reality to make a change in the way of working in organisation (Hsieh and Lee, 2018). Virtual reality is also playing in physical rehabilitation by providing different type of activity programs rather than giving medicines for in invasive operation (Shaheen, 2021b).

For different type of human relation approaches, virtual reality is very useful which allow doctors and other medical professionals to interact with each other for treatment procedure. It is possible to interact virtually and interact with patient during training programs which is possible only in 3D. For this interactive experience they are going to use a set of sensors to understand and assess the patient's emotions (Shaheen, 2021a). Medical professionals are able to detect diagnose and treat health issues easily. Its tools are being extensively used by psychiatrists for the treatment of patients.

Tourism industry:

Now days virtual reality became one of the most important and well known technologies (Barnes 2016). Due to the development of virtual reality technology tourism sector will get a great opportunity in the area of marketing and promotion (Guttentag 2010). To fulfil the need of the out millennials for their research for foods on tourism sector basically about e-tourism (Kim et al. 2008; Liang et al.2016). In this technically growing era require the information to be experimental by implementing virtual reality in in promotional activities and destination management organisation to help choosing a particular destination (Stamboulis and Skayannis 2003).

Virtual reality is becoming an increasingly popular consumer marketing tool. Business analysts suggest that the growth of virtual reality is comparable to the importance of social media (Morris 2016) and that virtual reality is likely to become an important medium for consumer marketing as it begins a new phase of development. Virtual reality so having the importance like social media to

market and to create a new platform for promotion which will give a new direction of development (Barnes 2016).

User-cantered design that incorporates different factors like cognitive psychology, social psychology, behavioural economics, neuroscience with emerging technology. Virtual reality which may become a game changer to make the user more comfortable to use. (Huang et al., 2016, Tussyadiah, Wang and Jia, 2017). There will be influence by reality on travelling. Due to use of virtual reality the experience of physical exploration has become very close to the traveller and gives the option of travel. Technology is helping travel and tourism business in such a way that booking trip, booking movie tickets getting travel photography in an easiest way (Guerra, Pinto and Beato, 2015).

By using virtual reality in marketing to attract the tourist towards tourism destinations and acts as a best way to promote over traditional promotional tools like brochure. The travellers are mostly depending upon different types of digital tools and materials for different type of information about the location (Huang et al., 2016) (Merkx and Nawijn, 2021).

Virtual reality is expected to become an important tool in advertising, especially in the travel industry. Based on current growth on technology we have to take that virtual reality will act as one of the most important tool in advertising for travel industry (Kabrovski 2017). It is found that tourism professionals and researchers are using much more on the application of virtual reality technology in tourism sector. (Cheong1995; Sussmann and Vanhegan 2000; Williams and Hobson 1995). Interest can be generated within the tourist through visual reality by giving tourism advertisements to potential consumers whenever wherever they are locating to provide a realistic preview of travel experience. Due to the availability of interactivity, visualisation and immersion functions in virtual reality technology, the consumers can experience simulated tourism environment which will help them to plan their trip (William and Hobson 1995).

Currently hotels, restaurants, travel agents and others are using virtual reality to create commercial activities as a component of promotional mix (Guerra et al. 2015). Due to the use of virtual reality in advertisement tourists are becoming much more interested about the destinations which lead to use much more virtual reality in tourism marketing activities as marketing tool (Huang et al. 2012, 2016, Yung and Khoo-Lattimore 2019). By using the 360-degree virtual reality video platform helps to deliver news content to the target audience due to a high degree of immersion and high level of visibility with a reasonable cost (Watson, 2017). Different type of stages during the construction of

tourist product by the tourist candle light free experience activity engagement in the experience true value sources and the post experience outcomes (Wiltshier and Clarke 2015, p. 4). Tourists attitude towards destinations and the level of enjoyment can be enhanced by the use of virtual tour of a particular city of interest (Tussyadiah et al. 2017, 2018).

By using virtual reality Wild Atlantic Way got a great success of likelihood for visiting the destinations. It also offers great prospects for destination marketing. It is advised by Wan et al. (2007) that that using virtual reality to target the audience to promote will give different result. So one size fits all approach can be avoided in it.

Retail industry:

A shift in consumers spending and buying behaviour is due to advancement of technological expect in in a retail sector. Due to the huge use of mobile handset and social media has created a revolutionary change by declining brick-and-mortar footfall by affecting the age old form of retailing on High Street. Virtual reality market expected to reach 20.9 billion by 2025 which will lead to create a virtual shopping experience for both the retailer and consumers. This will lead to reduce the overall operational cost and other expenses by providing customised product to the consumer before they want to buy. This customization of product will help then to find out the suitability as per their wishes to get their exact wants and need which may not be replicated in a physical Store. Companies are also combining virtual reality in retail with social media to get the sharing of the experience.

During COVID-19 the growth of virtual reality industry has raised by 50% as compared to previous year. It shows the acceptance of virtual reality in retailing sector to increase the marketing activities as customers are able to interact with the product which encourages to get a great shopping experience in a comfortable way.

By using virtual reality retail sector is able to connect the customers and brands in a stronger way. Any company trying to understand the acceptance of their product before launching it by using virtual technology. Retailer can test their new collections by the customers through virtual technology before bringing it to the store. The importance of virtual reality is much more due to its low acquisition cost and increasing in in virtual and management quality. (Olszewski et al., 2016; Boletsis, 2017; Boletsis and Karahasanovic, 2018). For last 20 years' retail world has seen a great change due to the advancement of technology and integrated with the shopping experience for customers. Today consumers are seeking simplified life bit more productivity with the use of technology. Thus, the

importance of real time data increased with the improvement of cost efficiency selection of product identification of customer need and clarity of making choice.

Retail giants like Amazon, Alibaba, e-Bay, IKEA putting more effort on virtual reality into their E-Commerce service and making a great change in supporting ecosystem bye by integrating virtual reality technology to create a future shopping and smart retailing (Zhang et al., 2014; Margetis et al., 2019). In addition to increasing the overall cost-effectiveness of shopping, virtual reality is increasingly used due to the belief that it can enhance the shopping experience beyond brick-and-mortar shopping. Because it is believed to provide a more immersive experience that can be added to similar information retrieval systems seen in online shopping. It is clear that virtual reality technology is shaping the relationship between the consumer and the store and therefore creating enormous brand value in retail and marketing. Virtual reality technology has been found to create a relationship between the consumer and the company and create a very large brand value in the marketing and retail sector (Muller Queiroz et al., 2018).

A prominent aspect of recent development in in virtual reality technology is that are sum of three dimensional experience to create a feeling of being there within the consumers. Instead of doing screen virtual reality is able to create interactive mode to create a feeling of actual sense in an imaginary environment. (Greenbaum, 1992; Krueger, 1991; Steuer, 1992), which have made leaps in the affordance of feeling "being there" (Piera´nski & Strykowski, 2017). to maintain consumers' practical performance expectations such as convenience, sentimental currency, and social values in a retail store such as the online shopping experience.

Scholz and Smith (2016) identified that the adoption of virtual reality will create a value for consumers with a different type of experience and making consumer engagement. There is a challenge for adopting virtual reality by several retailers to provide the shopping experience to their target audience with an expectation of more profit which may create a risk on investment (Piotrowicz and Cuthbertson, 2014). Fashion brands like tommy Hilfiger Topshop and others are using virtual rail reality in their retail store to create shoppers experience of three dimensional view. (Johns 2016; Tabuchi 2015). The most useful thing of virtual reality is to identify that whether the suggested idea of displaying the product may become effective or not before introducing in actual shop. (Sainsbury, 1995).

Education sector:

Education is changing day by day and has shifted from conventional to contemporary with a change in strategies tools, learning method of teaching (Helsel, 1992). Education is becoming more interactive cost effective. Candy chocolate with the help of virtual reality animations and other technology to make the learning process better (Freina and Ott, 2015). Now learning is not totally based on text book rather than using the modern technology like virtual reality in a pleasurable way. Students can learn from any part of the world and can gain the experience of relocation like recreation of historical places along with historical characters (Weinlich, 2018). It is good to you which virtual reality for the transformation of education even if in the costing aspect of the instrument is much more but can create it changed over the traditional classroom and can be a game changer in teaching methodology as it creates an enjoyable safe and engaging and management for study (Chen,2019). In medical education it has a great role particularly with reference to surgical activities and rehabilitation. medical professional can learn by using the virtual reality technology in application oriented enhancement (Falah et al., 2014). Virtual reality can be used in many different areas of education like history, architecture, science, archaeology in which this virtual reality technology create an advantage over conventional method of description and creates an opportunity to experience about the subject matter in a described manner over the conventional method.

The visual system also uses so-called "visual cues" such as occlusion, shading, perspective, etc. to obtain information about shape and relative depth. Normally, all of these visual cues are combined to help us navigate and understand the world. 2018). Getting information regarding shape and relative death using the visual systems which is known called ‘pictorial cues' like shading, occlusion and prospective (Gregory, 1974). Virtual reality training provides a safe environment to learn which may not be feasible or maybe a dangerous to perform in different situations off real life. It allows the students to have the experience in a wide range of scenario which may not be feasible in physical way inside the classroom. Virtual reality makes students more engaged and provides active and constructive learning experience and enables the students providing more creativity for better learning process. There is certain situation in which students not able to understand or it may be impossible to describe in a conventional Method can be described through virtual reality.

Chen (2006) stated that although virtual reality is recognized as a powerful learning tool, there are still many issues that require further research, including identifying appropriate theories and/or models to

guide its design and development, exploring how they can its properties to promote learning. To see if its use can improve intended production and understanding, and to explore ways to achieve more effective learning when using this technology, and to examine its impact on students with different abilities.

Virtual reality stimulates the learning and comprehension due to its symbolique and experimental information (Bowman, Hodges, Allison, & Wineman, 1998). Virtual reality technology gained prominence as one of the court feature of modern hi tech application including education (Virvou & Katsionis, 2008). The knowledge gained today cannot solve the problems we will face in the future. "Creativity" is an important ability for people now and in the future, and also the main reason for success in education and teaching in school. It is essential to have the creativity which able to make the people to get success in learning and teaching (Baena-Extremera et al., 2012).

Winn concludes that " virtual reality promotes the best and probably the only strategy that allows students to learn from a non-symbolic first-person experience. Because many students fail in school because they lack the symbolic systems of the fields they don't know how to study, even though they are fully capable master the concepts at the heart of the disciplines, they can conclude that virtual reality offers a path to success for children who may be failing in our education system as currently defined".

Sports Industry:

Sports is one of the best area where the technology like virtual reality can be utilised in a very effective and aggressive way. The sports experience had been increased with the utilisation of technology from content to training and selecting the athletes. It has been said that virtual reality is one technology which may disrupt and transform the sports value in future. sportsman, coaches, weavers', gamers, corporations, all are going to get benefit out of it. Use of technology has created a great change during onset of the COVID-19 pandemic has a humongous impact on sports world. It has created smart stadiums, wearables to create an immersive experience for the fan.

If we will see the Global Sports Technology market is USD 17.9 in 2021 and is going to rich USD 40.2 by 2026.Virtual reality innovation is having a significant role in different part of the games like gathering physiology and records of assessment for athlete's preparation. Now mentors are looking for much more advancement technology to implement in sports in terms of improvement in procedures. By the use of virtual reality, the framing of strategy in a virtual condition based on the strategy and

stamina of the sportsman. By utilising the preparation can be done in a genuine way which may create less hard during worm ups and furthermore speculation decreases. This technology allows the players to interact with the virtual and Management with high ecological validity and experimental control (McMenemy & Ferguson, 2007). Today, virtual reality technology is used in competitive sports for better evaluation and scientific selection of athletes. It can be used to create a virtual training ground and virtual opponents for better performance.

It is very difficult to assess each and every player very minutely so there is a need of technology like virtual reality which can help to asses each and every player, so that training program can be given to the player to develop their performance (Newell, 1986). Sports men are using the virtual conditions like 3D strong protective cap information garments and other associated materials to compete with the competitors by gaining some information. It is essential for the sportsman to prepare in terms of gaining strategy, physical and mental preparation, so that, they can make better preparation.

The coaches inside the virtual reality is able to analyse the sports men's performance the moment so that they can give the advice individually (Stefan et al., 2016). Sportsmen are very much interested to stay at home and can practice with the technology by creating the preferred creation of the situation as per the interest to practice. The acceptance of the technology is increasing day by day. In future, it will create a huge benefit in the sports world by associating technology and sports. Athletes can visit the stadiums the locker rooms waiting rooms and other places with the immense experience of virtual reality without living their home.

Conclusion:

Improvement of technology has created improved people's lives all over the world. By using virtual reality, the potential of tourism increased in the form of virtual tourism. The learning process also changed by adopting the modern technology in the form of 3D which help the practitioner and the learner to make their practice and learning in a best way. Virtual reality has created a platform of learning and experimentation for different category of learners. Retailers are getting the idea to demonstrate their product which will benefit them to implement in physical store. Consumers are trying to see the product in the form of convenient and efficient by using virtual reality. Virtual reality enables to access from any part of the world to make learning more pleasurable. It has a potential to make a revolutionary change traditional to modern technology in different sectors. In today's competitive sports world virtual reality technology is very much useful for the better evaluation and scientific selection it can be utilised for virtual training program as a virtual component for the improvement of sports performance.

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A Study on Ground Water Quality in the Industrial Belts of Jharsuguda District, Odisha.

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Keywords: Surface Water Management, Water Quality, Stormwater Management Systems, Hydrological Assessments & Jharsuguda District.

1. Introduction:

Surface water is water located on top of land, forming terrestrial (surrounding by land on all sides) water bodies, and may also be referred to as blue water, opposed to the seawater and water bodies like the ocean. The vast majority of surface water is produced by precipitation. As the climate warms in the spring, snowmelt runs off towards nearby streams and rivers contributing towards a large portion of human drinking water. There are three major types of surface water. Permanent (perennial) surface waters are present year round, and includes lakes, rivers and wetlands (marshes and swamps). Semi-permanent (ephemeral) surface water refers to bodies of water that are only present at certain times of the year including seasonally dry channels such as creeks, lagoons and waterholes. Surface water management is a multidisciplinary field focused on the sustainable use, conservation, and protection of surface water resources such as rivers, lakes, wetlands, and oceans. It encompasses various practices, policies, and technologies aimed at effectively managing surface water quantity and quality to meet societal, environmental, and economic needs.

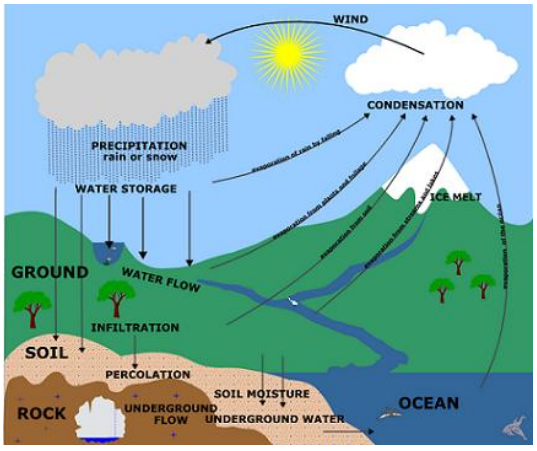

Fig. 1 - Surface Water Example

1.1. Surface Water Management: Overviews:

Surface water management involves the planning, implementation, and monitoring of strategies to effectively control, utilize, and protect surface water resources. It encompasses a range of activities aimed at maintaining water quality, mitigating flooding, ensuring sustainable use, and protecting ecosystems. Here are some key aspects of surface water management:

- Water Quality Management
- Pollution Prevention and Control
- Stormwater Management
- Flood Management
- Water Conservation
- Ecosystem Protection
- Integrated Water Resource Management (IWRM)
- Policy and Regulatory Frameworks
- Adaptive Management and Resilience Building

Overall, effective surface water management requires a holistic approach that integrates science, policy, technology, and stakeholder engagement to sustainably manage and protect valuable surface water resources for current and future generations.

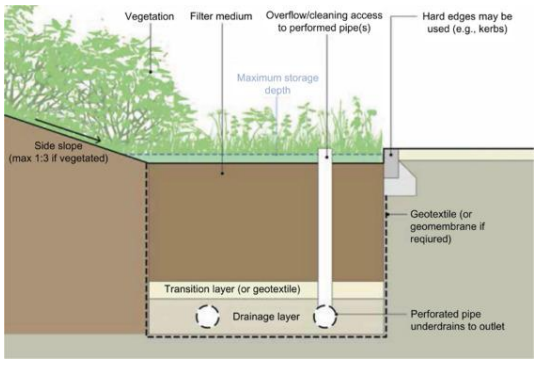

Fig. 2 - Surface Water Management

1.2. Key Water Security Issues in Mining:

Files Surface water management in mining operations is critical for both environmental protection and operational efficiency. Mines can significantly impact surrounding water bodies through activities such as dewatering, runoff, and wastewater discharge. Effective surface water management strategies aim to minimize these impacts while ensuring regulatory compliance and sustainable water use. Here are some key components of surface water management in mines:

- Water Monitoring and Modeling
- Stormwater Management
- Dewatering
- Water Recycling and Reuse
- Sediment and Erosion Control
- Wastewater Treatment:
- Community Engagement and Stakeholder Consultation
- Regulatory Compliance
- Emergency Preparedness
- Closure and Reclamation

Overall, effective surface water management in mining operations requires a combination of proactive planning, technology implementation, regulatory compliance, and stakeholder engagement to minimize environmental impacts and ensure the sustainable use of water resources.

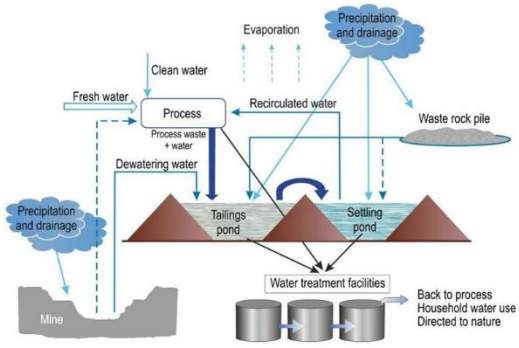

Fig. 3 - Example of different mine water sources and streams

1.3. Water Quality in Odisha:

Water quality in India, including in regions like Odisha, is a significant concern due to various factors such as industrial pollution, agricultural runoff, urban sewage, and contamination from human activities. While Odisha has abundant water resources, ensuring their quality is crucial for human health, ecosystems, and sustainable development. Water quality in Odisha, like in many parts of India, faces significant challenges due to various factors such as industrial pollution, agricultural runoff, urban sewage, and natural processes. While Odisha is endowed with abundant water resources, ensuring their quality is crucial for human health, ecosystems, and sustainable development in the state.

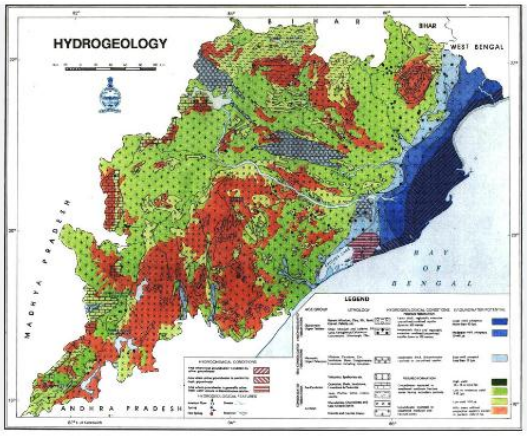

Fig. 4 - Example of different mine water sources and streams

Here are some key aspects related to water quality in Odisha:

- Industrial Pollution: Odisha is home to a range of industries, including mining, metallurgy, power generation, and manufacturing. Effluents from these industries can contain heavy metals, toxic chemicals, and other pollutants that can contaminate water bodies.
- Agricultural Runoff: In Odisha, where agriculture is a significant economic activity, measures such as promoting organic farming, adopting precision irrigation techniques, and implementing soil conservation practices can help reduce agricultural runoff and improve water quality.
- Urban Sewage: Rapid urbanization and inadequate sanitation infrastructure in cities and towns can result in untreated sewage being discharged into water bodies. Improving sewage treatment facilities, constructing sewage treatment plants, and promoting proper sanitation practices are essential for addressing urban sewage-related water quality issues in Odisha.
- Natural Factors: Natural processes such as erosion, sedimentation, and weathering can also influence water quality in Odisha.
- Contamination from Human Activities: Public awareness campaigns and community engagement efforts can help address these issues and promote responsible behavior towards water resources.
- Monitoring and Regulation: Government agencies, environmental organizations, and research institutions play a vital role in conducting water quality assessments and implementing regulatory measures.

Efforts to address water quality issues in Odisha require a multi-pronged approach involving government agencies, industries, agricultural stakeholders, urban planners, civil society organizations, and local communities. Collaborative initiatives focusing on pollution prevention, sustainable development, watershed management, and ecosystem conservation are essential for ensuring clean and safe water for the residents of Odisha. Regular monitoring, enforcement of regulations, public awareness campaigns, and capacity-building programs are also critical components of water quality management strategies in the state. Efforts to address water quality issues in Odisha require a multi-sectorial approach involving government agencies, industries, civil society organizations, and local communities. Collaborative initiatives focusing on pollution prevention, sustainable development, and ecosystem conservation are essential for ensuring clean and safe water for present and future generations.

1.4. Social Impacts of Mining and Water:

Mining activities can have significant social impacts, particularly concerning water resources. Here's an overview of the social impacts of mining on water:

- Access to Water: Mining operations may compete with local communities for access to water resources, leading to conflicts over water rights and allocation.
- Water Pollution: Mining activities can result in water pollution through the release of contaminants such as heavy metals, acids, and sedimentation into surface water bodies and groundwater, affecting drinking water sources and aquatic ecosystems.
- Health Impacts: Contaminated water from mining activities can pose health risks to local communities through exposure to pollutants, leading to waterborne diseases, and other health problems.
- Livelihoods and Social Displacement: Mining projects may result in the displacement of communities and disruption of livelihoods, particularly in areas where water resources are affected, leading to social tensions and economic challenges.
- Social Conflicts: Disputes over water use and pollution between mining companies, local communities, and indigenous peoples can lead to social conflicts and tensions, affecting community cohesion and well-being.
- Community Engagement and Participation: Effective engagement of local communities in decision-making processes regarding water management and mining activities is crucial for addressing social concerns and ensuring sustainable development.[4,5,6,7,8 &9]

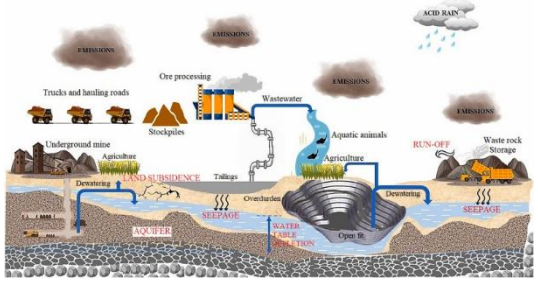

Fig. 5 - Environmental, hydrological, and social impacts of mining operations on Surface Water

2. Literature Reviews:

Research work cannot be completed without the in-depth study of the earlier researches. Prior research work not only provides guidance but also throws light on the direction in which any new research must proceed. The following literatures are reviewed in the context of the study undertaken.

Smith, J., Johnson, A., & Brown, C., "in his text identifies common strategies, such as sediment control ponds, diversion channels, and runoff collection systems, and discusses their effectiveness in mitigating water-related impacts on the environment and highlights key challenges faced by mining companies in managing surface water, including regulatory compliance, community relations, and climate change adaptation"[17].Wang, L., Zhang, Y., & Li, H., "review also discusses emerging technologies and management approaches aimed at minimizing these impacts and promoting sustainable water management in the mining sector"[18].Garcia, M., Smith, R., & Jones, K., "This literature review assesses the importance of stakeholder engagement and adaptive management in ensuring the effectiveness and sustainability of surface water management strategies"[19]. Zhao Zhang et.al., "Surface water quality and its natural and anthropogenic controls in the Xiangjiang River were investigated using multivariate statistical approaches and a comprehensive observation dataset collected from 2004 to 2008. Finally, suggested regarding water management were put forward based on the current status and future trends of surface water quality in the Xiangjiang River" [20]. Da'u Abba Umar et. al., The current review has unveiled the spatial disparity of the surface water resources availability between the upstream and downstream of the Hadejia River Basin (HRB). To address the problem of water pollution, floods, and droughts, the current review recommends the use of riverbank filtration (RBF), aquifer recharge and recovery (ARR) and rainwater harvesting" [21].

Mukesh Kumar et. al., "the research paper describes the availability and demand of water resources in India as well as the various issues and water conservation management strategies for developing a holistic approach for sustainable development and management of the water resources of the country"[22].M M Mahbubul Syeed et. al., "Surface water is heavily exposed to contamination as this is the ubiquitous source for most of the water needs. This situation is exaggerated by the excessive population, heavy industrialization, rapid urbanization, and improper sanitation. Water pollution in the form of industrial effluents, agricultural runoffs, and domestic sewage. For profiling the water quality, around 23 Water Quality Index (WQI) models, and 10 Pollution Index (PI) models are used in research"[23]. Atanu Bhattacharyya et. al., "Water is a prime natural stockpile, a basic human need

and a treasured national asset. Planning, development and management of water manoeuvre need to be governed by national perspectives. In the research text an ideal water management technique and awareness of people could help to save the life on earth"[24].Marat Ongayev et. al., "analyze the hydrochemical indicators of water sources used for watering pastures in the West Kazakhstan region to improve water quality"[25]. C. P. Kumar, " Water is one of the most essential natural resources for sustaining life. Its development and management play a vital role in agriculture production. The article presents an overview of relevant issues pertaining to development and management of water resources in India"[26]. Sharad Kumar Jain, "Management of water resources in India has been a challenge whose magnitude has risen manifolds over the past 50 years due to a variety of reasons, notably the rising demands and growing environmental degradation discussed in the text"[27]. Rishabh Gupta, Pramod Kumar Sharma, "Worldwide, highly populated countries are experiencing an imbalance between the supply and demand of water. The research text covers the interaction in natural and artificially-constructed environments, methods for exchange flux quantification, conceptual applications, and challenges in accomplishing these investigations"[28]. Schoumans, O.F. (Ed.) et al., "The Water Framework Directive (WFD) requires improvement to the quality of surface water and ground water report an overview is given of different categories of mitigation options and the individual measures has been described in terms of the mechanism, applicability, effectiveness, time frame, environmental side effects and cost in order to help policy makers, watershed managers and farmers to select the most relevant measures for their conditions"[29].

3. Research Methodology:

Research methodology for surface water management in mines operations typically involves a systematic approach to quantify and analyze various factors contributing to water quality and water conservation. Here's a structured outline of the research methodology:

3.1. Literature Review:

Conducted a comprehensive literature review to understand existing research and knowledge related to surface water management in mines operations, which includes such as Water Quantity Management, Water Quality Management, Ecosystem Protection and Restoration, Integrated Water Resources Management (IWRM), Climate Change Adaptation, Policy and Governance and Technological Innovations. For systematic literature reviews last 10 years articles, journal are reviewed around 30 journals literature reviews had been done.

3.2. Research Objectives:

The objective of study includes;

- To understand basic of surface water system in mines operations of state Odisha
- To observe the water quantity management and water quality management of state of Odisha
- To study the surface water management and their eco system and restoration
- To study the Integrated Water Resources Management (IWRM) in various mines of Odisha
- To study the Typical Climate Change Adaptation specially focuses on mines operations
- To understand the Policy and Governance of state and center for surface water conservation.
- To understand the Technological innovation for reuse of mines surface water management for better livelihood of people.

3.3. Data Collection:

Collected data from one of the famous miner area near Jharsuguda District of Odisha on Surface water management in mines operation which includes the following objectives for the study such as Water Quantity Management, Water Quality Management, Ecosystem Protection and Restoration, Integrated Water Resources Management (IWRM), Climate Change Adaptation, Policy and Governance and Technological Innovations. With taking prior approval form the competing authority collected various form data. The primary data set is to be collected from Samaleswari OCP- Coal Mines (MCL), Near Jharsuguda, Odisha. The secondary data are to be collected from different journals, periodicals, company websites etc.

3.4. Analysis and Interpretation:

Analyze the collected data to quantify the Surface water management in mines operation. Identify the main contributors to Water Quantity Management, Water Quality Management, Ecosystem Protection and Restoration, Integrated Water Resources Management (IWRM), Climate Change Adaptation, Policy and Governance and Technological Innovations. Interpret the results in the context of the research objectives and existing knowledge, drawing conclusions and implications for Surface water management in mines operation.

3.5. Validation and Verification:

Validate experimental results by comparing them with theoretical predictions or existing empirical study of Surface water management in mines operation had been done. Verify the accuracy and reliability of Surface water conditions through physical and chemical analyses and benchmarking against known data.

3.6. Recommendations and Future Directions:

Provide recommendations for optimizing furnace design, insulation materials, process parameters, and operational practices to maintain surface water quality and conservations. Identify areas for further research and development, such as advanced technology, initial by local and state competent authority for surface water management in mines area

4. Data Interpretation & Analysis

4.1 Overviews of Jharsuguda Districts:

Jharsuguda was formed on 1st January 1994 is an industrially developed and Mineral rich District of Odisha. It was created by amalgamation of the erstwhile Jamindars of Rampur, Kolabira, Padampur and Kudabaga. It is popularly known as the "Powerhouse of Odisha" due to its Mega Steel, Aluminum & Power Projects. Its First Industrialist in SSI Steel Sector of the Region was Jayprakash Badhan. Jharsuguda has often been referred as "Little India" as well because of its diverse demography, language and culture.

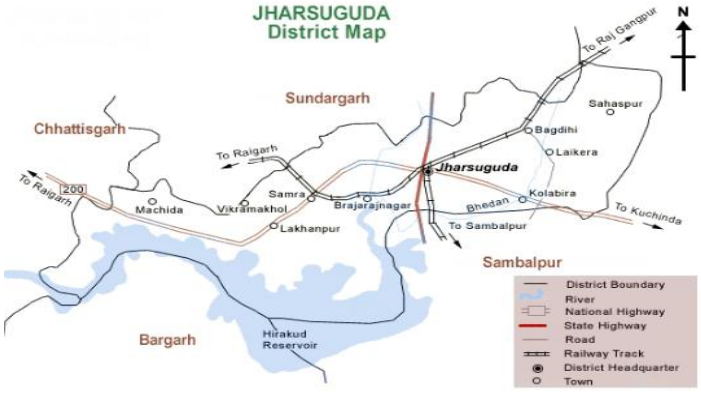

Fig. 6 - Map of Jharsuguda District, Odisha

Jharsuguda, located in the Indian state of Odisha, is known for its coal mines, which play a significant role in the region's economy. Some of the notable coal mines in Jharsuguda include:

- Mahanadi Coalfields Limited (MCL): MCL operates several coal mines in the Jharsuguda region. It is a subsidiary of Coal India Limited (CIL) and one of the major coal producers in India.

- Talabira Coalfield: This coalfield is located in the vicinity of Jharsuguda and contains significant reserves of coal. It is operated by various companies, including Neyveli Lignite Corporation (NLC) and others.

- IB Valley Coalfield: IB Valley Coalfield is another significant coal mining area near Jharsuguda. It is known for its high-quality coal reserves and is operated by different mining companies.

- Jharsuguda Coal Washery: Apart from the mining sites, there are also coal washery units in Jharsuguda that process raw coal to improve its quality and remove impurities before it is transported to various industries.

4.2 Water Quality Management:

Monitoring and maintaining the quality of surface water bodies such as rivers, lakes, and reservoirs is crucial for supporting aquatic life, human consumption, and recreational activities. This involves regular sampling and analysis of water quality parameters such as pH, Dissolved Oxygen, Total Dissolved Solids and Hardness etc.

Fig. 7 - River Map of Jharsuguda Districts (Source: www.mapsofindia.com)

pH: The pH values of the samples ranged from 5.0-9.0, where most of the water samples different location tested in the study were found to be in the permissible range of pH value recommended by several health and pollution control organizations e.g. WHO,CPCB, BIS i.e. 6.5-8.5. The pH of surface water was showing alkaline character throughout the study period at all four sites. The pH value (Figure 15) ranged between 7.63 to 7.88. pH value of Four Location:

- Location-1 = 7.63
- Location-2 = 7.64
- Location-3 = 7.85
- Location-4 = 7.88

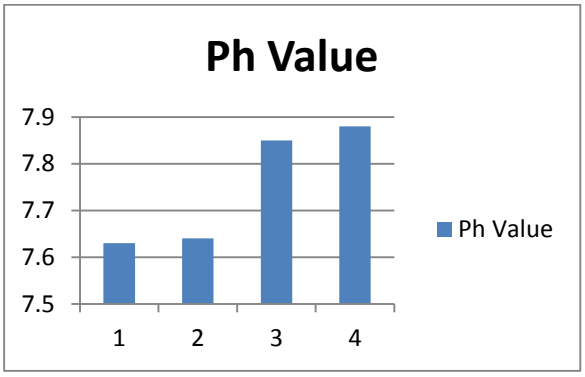

Fig. 8 - Variation of the pH of water samples at different locations

Dissolved oxygen (DO): The dissolved oxygen content is one of the most important factors in stream health. Its deficiency directly affects the ecosystem of a river due to bioaccumulation and biomagnifications. The oxygen content in water samples depends on a number of physical, chemical, biological and microbiological processes. DO values also show lateral, spatial and seasonal changes depending on industrial, human and thermal activity. In the present study, the value of DO ranged from;

- Location-1 = 5.04 mg/l

- Location-2 = 5.42 mg/l
- Location-3 = 5.45 mg/l
- Location-4 = 5.59 mg/l

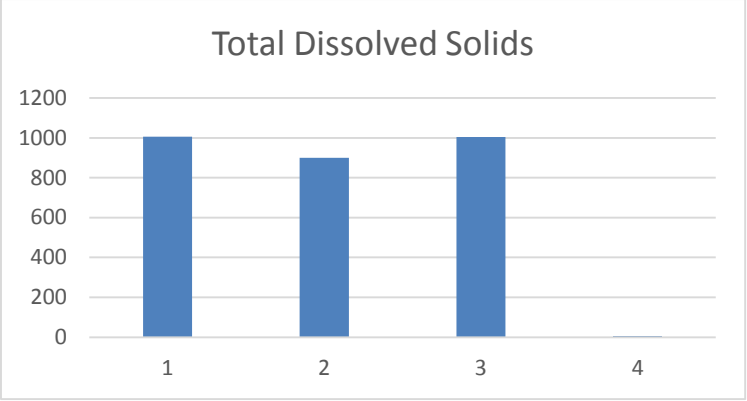

Fig. 9- Variation of the DO of water samples at different locations

Total Dissolved Solids: Total dissolved solids describes the amount of inorganic salts of calcium, magnesium, sodium etc. and small proportion of organic matter present in the water, where a high value of the same have been reported to be related to acute myocardial infarction as well as ischemic heart diseases in few studies . In this study, TDS values showed a considerable variability ranging from < 10 ppm - >1500 ppm.

- Location-1 = 1006 mg/l
- Location-2 = 900 mg/l
- Location-3 = 1004 mg/l
- Location-4 = 905 mg/l

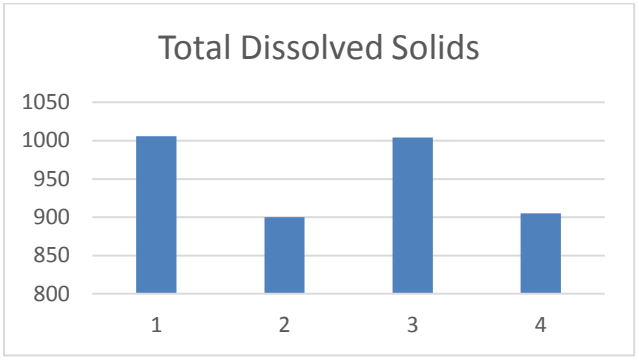

Fig. 10 - Variation of the total dissolved solids of water samples at different locations

Hardness: Hardness of water is an important consideration in determining the suitability of water for domestic and industrial uses. Hardness is caused by multivalent metalliccations and with certain anions present in the water to form scale. The principal hardness-causing cations are the divalent calcium, magnesium, strontium, ferrous iron and mangnous ions. Hardness was below the permissible limit in all samples and might have caused increased concentration of salts by excessive evaporation.

- Location-1 =220 mg/l
- Location-2 = 340 mg/l
- Location-3 = 160 mg/l
- Location-4 = 140mg/l
-

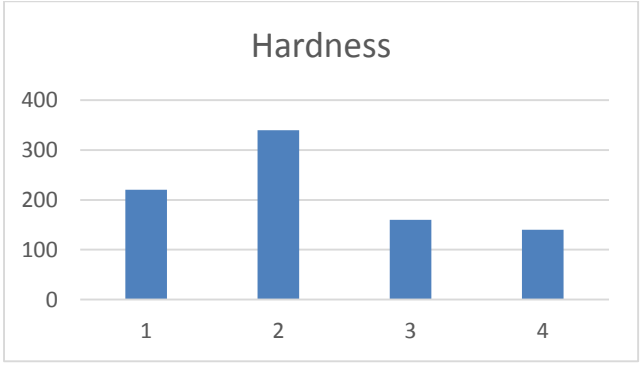

Fig. 11 - Variation of the Hardness of water samples at different locations

4.3 Adaptation to Climate Change :

Climate change poses significant challenges to water quality due to altered precipitation patterns, increased temperatures, and more frequent extreme weather events. Adaptive strategies, such as green infrastructure, drought preparedness plans, and restoring natural hydrological processes, are crucial for maintaining water quality resilience. The local authority as well as state authority had taken many initiative starting from school, college , village , panchayat level etc.

4.4 Pollution Prevention and Control:

To reduce air quality level index the state pollution board and districts pollution department had made mandatory for the mining authority to initiated mass plantation drive across the open casting mines and through the corporate social responsibility they trained the adopted village for environment sustainability.

4.5 Stormwater Management:

Managing Stormwater runoff is critical for reducing erosion, flooding, and pollution of surface water bodies. Techniques such as green infrastructure (e.g., rain gardens, permeable pavement), detention basins, and erosion control measures help capture and treat Stormwater before it enters waterways. The district authority had already taken the initiative with collaboration with many companies to established sewerage and drain water system to avoid erosion, floods and reduce the pollution level in various areas of Jharsuguda districts. Even in some cases they take help of industry expert and well funding for the storm water management.

4.6 Flood Management:

Controlling and mitigating floods is an important aspect of surface water management to protect lives, property, and infrastructure. This involves floodplain mapping, constructing levees and floodwalls, implementing flood warning systems, and adopting land use planning measures to minimize flood risk. As the district is situated near the upper basin of Mahanadi River every year during rainy season they have faced such situation. To avoid such circumstances the districts authorizes and state flood & disaster management department had taken many initiative such situation. Till date such situation was never happen before in the districts of Jharsuguda, if arise such situation will be easy avoids by the state authority.

4.7 Water Conservation:

Maintaining healthy aquatic ecosystems is essential for biodiversity conservation and ecosystem services such as water purification and flood control. Surface water management should consider the ecological needs of rivers, wetlands, and other water bodies, including habitat restoration and protection measures. It's the role and responsibility everyone who are reside in that district to preserve the ecosystem of river, wetland and water bodies etc. Odisha government and along with state forest and fishery department have already taken many initiative programs.

4.8 Ecosystem Protection:

Maintaining healthy aquatic ecosystems is essential for biodiversity conservation and ecosystem services such as water purification and flood control. Surface water management should consider the ecological needs of rivers, wetlands, and other water bodies, including habitat restoration and protection measures. It's the role and responsibility everyone who are reside in that district to preserve the ecosystem of river, wetland and water bodies etc. Odisha government and along with state forest and fishery department have already taken many initiative programs.

4.9 Integrated Water Resource Management (IWRM):

The district authority had already adopted an integrated approach to managing surface water resources involves considering the interconnectedness of water quantity, quality, and ecosystem health. IWRM frameworks aim to balance competing water uses, address water conflicts, and promote sustainable development while considering social, economic, and environmental factors.

4.10 Community Engagement and Stakeholder Collaboration:

Involving local communities, stakeholders, and indigenous groups in surface water management decision-making processes fosters ownership, promotes sustainable practices, and ensures that management strategies reflect local needs and priorities.

4.11 Policy and Regulatory Frameworks:

Establishing and enforcing policies, regulations, and standards for surface water management is essential for ensuring compliance, protecting water resources, and promoting sustainable development. This includes setting water quality standards, issuing permits for water-related activities, and enforcing

pollution control measures. The state pollution control board and OHPC (Odisha Hydro Power Corporation) & Mahanadi tribunal established many policy and regulatory frame work for the Jharsuguda Districts.

4.12 Adaptive Management and Resilience Building:

The local and the state authority given consent for the uncertainties associated with climate change and other stressors, adopting adaptive management approaches is crucial for building resilience in surface water management systems. This involves continuously monitoring and evaluating the effectiveness of management strategies and adjusting them in response to changing conditions and new information.

5. Result & Discussion:

Surface water management in mining operations is crucial for minimizing environmental impacts and ensuring operational efficiency. Mines often encounter challenges related to surface water, including runoff, erosion, and contamination. Monitoring and maintaining the quality of surface water bodies such as rivers, lakes, and reservoirs is crucial for supporting aquatic life, human consumption, and recreational activities. This involves regular sampling and analysis of water quality parameters such as pH, Dissolved Oxygen, Total Dissolved Solids and Hardness etc. As result of water quality the pH value ranged between 7.63 to 7.88, dissolved oxygen content range from 5.04 to 5.59 mg/l, total dissolved solid range from 950 to 1006 mg/l and in case of hardness range from 140-220 mg/l.as a result the water quality is quite satisfactory. Apart from this the resident, locals as well as district authority must focused on the following this such as hydrological assessment, Stormwater management, sediment control, water quality monitoring, best management practices (bmps), regulatory compliance, community engagement etc. Overall, effective surface water management in mining operations requires a proactive approach that integrates engineering controls, environmental monitoring, regulatory compliance, and stakeholder engagement to minimize environmental impacts and sustainably manage water resources.

6. Conclusion :

In conclusion, surface water management is a critical aspect of mining operations, with significant implications for both environmental sustainability and operational efficiency. Mines face numerous challenges related to surface water, including runoff, erosion, sedimentation, and contamination. However, by implementing comprehensive management strategies, mines can mitigate these challenges and minimize their environmental footprint. Key components of effective surface water management include hydrological assessments, Stormwater management systems, sediment control measures, water quality monitoring programs, implementation of best management practices, adherence to regulatory requirements, and community engagement efforts. By integrating these elements into their operations, mines can minimize the impact of their activities on surface water resources and ensure compliance with environmental regulations. Ultimately, successful surface water management in mining operations requires a proactive and multifaceted approach that prioritizes environmental protection, regulatory compliance, and stakeholder engagement. By striving for continuous improvement and innovation in surface water management practices, mines can achieve sustainable operations that safeguard water resources for future generations while meeting their production goals.

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The Impact of Artificial Intelligence on the Business Landscape

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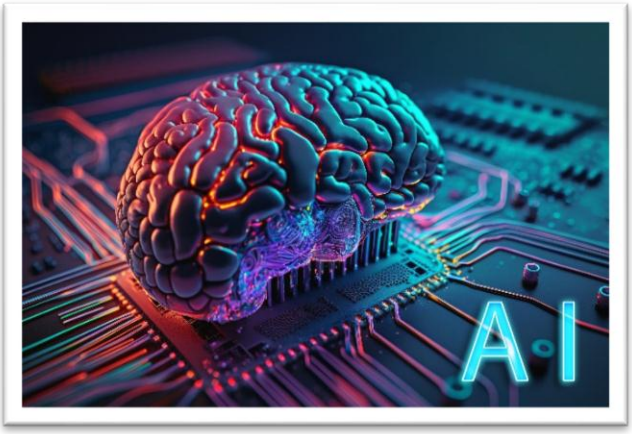
Abstract:

The report aims to discuss the impact of Artificial Intelligence (AI) on business industries, the workplace, and society at large. This report provides a comprehensive analysis of the integration of AI into different facets of life, such as biometrics, and presents an in-depth examination of the future of work on AI.

Discovering how AI is transforming various aspects of life, including biometric technology, and uncovering the future of work with AI through our insightful report. Our in-depth analysis provides a comprehensive overview of the current integration of AI and offers valuable insights into the potential impact of AI on the workforce. Gain a competitive edge and stay ahead with our expert analysis.The report brings to light the fact that Artificial Intelligence is changing industries and the workplace in both good and bad ways. It also emphasizes that the future of work with AI is going to be a complex mix of job automation, skill development, job creation, and societal considerations. The article also talks about how the potential transformative impact of AI on economic and social structures needs to be taken into account.

The findings of the report can be used to inform individuals, businesses, and policymakers about the proactive approach needed to navigate the changes effectively. It can also be used to examine the implications of AI applications on the future of work and to ensure occupational safety and health in the workplace.



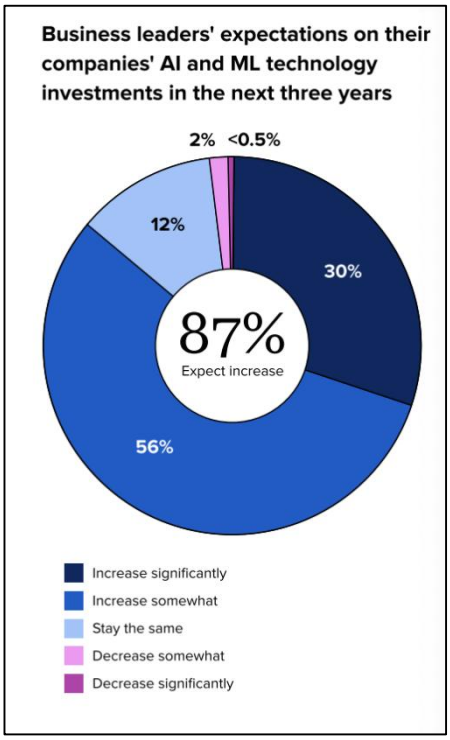
Artificial intelligence, commonly abbreviated as AI, refers to the ability of computer systems to emulate human intelligence processes. The development of AI necessitates the use of specialized hardware and software for writing and training machine learning algorithms. While no single programming language is synonymous with AI, numerous languages, including Python, R, Java, C++, and Julia, are widely used among AI developers.

The concept of AI has gained significant attention in recent years, with many businesses and academic institutions seeking to leverage its capabilities to enhance their operations. AI is capable of performing complex tasks that would otherwise require human intelligence, such as decision-making, pattern recognition, and natural language processing. As such, AI has the potential to revolutionize numerous industries and disciplines, including healthcare, finance, transportation, and education.

The AI market has grown to $136.55 billion in 2022 and is projected to reach $1,811.8 billion by 2030 with a CAGR of 37.3% from 2023 to 2030. AI is transforming various industries worldwide by automating tasks, analysing data, and delivering personalized customer experiences. Businesses invest heavily in AI technologies to remain competitive and gain a strategic edge in their industries. The rapid expansion of the AI market presents significant opportunities for businesses to drive innovation and gain a competitive advantage.

The burgeoning demand for AI-based tools and systems in India can be attributed to the rapid digitisation of key economic sectors such as banking and financial services, healthcare, automobile and telecommunications, among others. AI technology enables process automation, minimisation of errors and management of repetitive tasks. The Indian artificial intelligence market has already reached a size of $680 million in 2022 and is projected to expand to $3,935.5 million by 2028, with a compounded annual growth rate (CAGR) of 33.28% during the 2023-2028 period. In 2018, expenditure on AI in India rose sharply by 109.6% or $665 million and is expected to grow at a CAGR of 39% to reach an estimated $11,781 million by 2025.

Artificial intelligence (AI) systems employ labeled data sets to analyze the correlations and patterns that underlie them. These patterns are subsequently employed to generate predictions regarding future states. For example, a chatbot that is fed text-based inputs can be trained to simulate realistic human exchanges, while an image recognition tool can identify and describe objects within images by thoroughly scrutinizing millions of examples.



Artificial Intelligence (AI) has emerged as an indispensable constituent for several of today's largest and most successful corporations. Industry behemoths such as Alphabet, Apple, Microsoft, and Meta have come to rely on AI technologies to streamline their operations and gain competitive advantages over their peers. Notably, Google has made extensive use of AI in its search engine, Waymo's autonomous vehicles, and Google Brain, which has developed the transformer neural network architecture responsible for the recent breakthroughs in natural language processing.

1. **Current trends of use of AI in business:**

The growing trend of incorporating AI into business models can be attributed, in part, to the evolution of machine learning and natural language processing technologies. These advancements have enabled AI to offer practical assistance to businesses, with the potential to enhance staff productivity and customer satisfaction. Compared to conventional methods such as phone and email, AI can achieve business objectives more efficiently and cost-effectively.

During a recent address to employees of Reliance Industries, Mukesh Ambani emphasized the need for the company to expedite the adoption of artificial intelligence across all business units in 2024. This move will enable the conglomerate to maintain a competitive edge by deploying advanced technologies ahead of its rivals. By applying artificial intelligence to its operations, Reliance Industries can enhance its efficiency, productivity, and profitability, while keeping pace with the rapidly evolving technological landscape. Ambani's call to action underscores the importance of leveraging cutting-edge technologies to drive innovation and achieve long-term success in a highly competitive global business environment.

A recent survey has revealed that Indian businesses are preparing to implement significant changes in their hiring practices over the next year. The study points out that these businesses will concentrate on integrating artificial intelligence (AI) and addressing the expectations of GenZ employees. The survey also indicates that 42 percent of respondents believe it is essential for employers to adhere to ethical AI principles while adopting AI to ensure effective implementation.

The findings of this survey highlight the growing importance of AI in the Indian business landscape. As companies seek to streamline their hiring processes and attract top talent, adopting AI is becoming a critical strategy. However, it is equally vital that employers follow ethical AI principles to ensure that the integration of AI is done responsibly and effectively.

In conclusion, this survey emphasizes the need for Indian businesses to embrace AI and adapt to the changing needs of the workforce. By focusing on the ethical implementation of AI, businesses can ensure that they are not only attracting top talent but also contributing to the advancement of responsible AI practices.

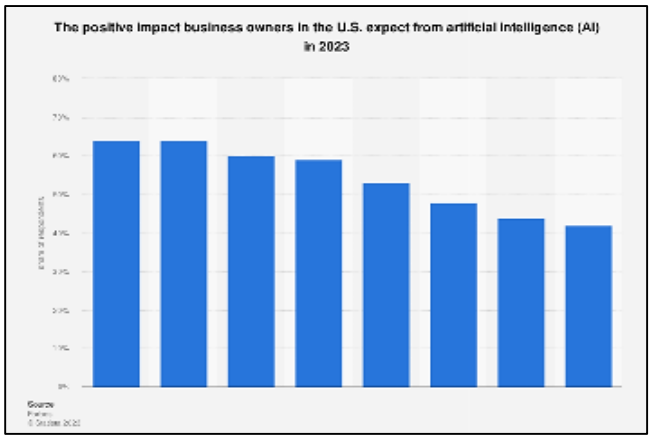
Staqu Technologies is a provider of security and enterprise big data analytics services that leverage artificial intelligence (AI). The company has set an ambitious target of increasing its revenue from □14 crore to □400-500 crore by 2028 as part of its expansion plans. The flagship product of the company, Jarvis, has been widely adopted in the audio-video analytics and management sector, with a customer base that includes prominent organizations such as Raymond, Cafe Coffee Day, Starbucks, Chaayos, GMR, Croma, IBM, Adani Power, Tata Communication Services, Telangana Police, Uttar Pradesh Police, and Bihar Police. Staqu has also collaborated with the Election Commission in various states during elections.

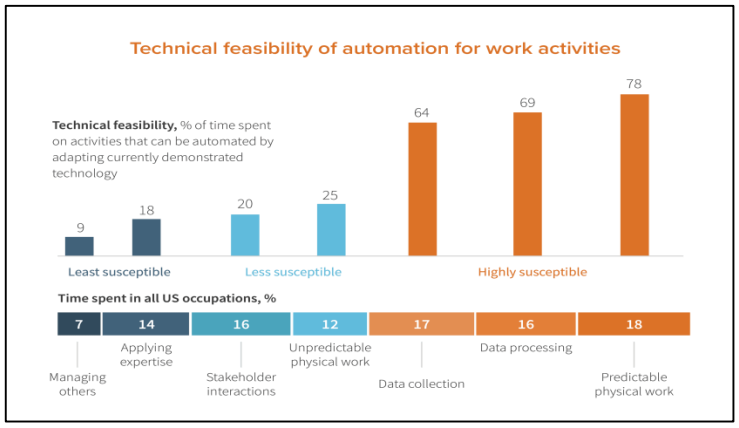
Jarvis, the innovative AI-powered product of Staqu Technologies, has been instrumental in revolutionizing the audio-video analytics and management sector. The product has garnered significant attention from major players in the industry, and has established itself as a leading solution in the market. The impressive list of customers that have adopted Jarvis is a testament to its effectiveness and reliability.

Staqu Technologies has consistently demonstrated its commitment to innovation and excellence in the field of security and enterprise big data analytics services. The company's collaboration with the

Election Commission during elections is a testament to its expertise and ability to deliver effective solutions. With its ambitious expansion plans and impressive track record, Staqu Technologies is well-positioned to continue its growth trajectory and achieve its revenue targets.

Staqu's growth strategy hinges on the continued adoption of its AI-powered technologies by a diverse range of industry verticals. With its proven track record of providing cutting-edge solutions that deliver actionable insights to its clients, Staqu is well-positioned to capitalize on the growing demand for advanced analytics services in today's data-driven business landscape. By remaining at the forefront of innovation in the field of AI-powered analytics, Staqu aims to solidify its position as a market leader and achieve long-term success.





2. **Positive impact:**

The extensive impact of artificial intelligence on the business environment is becoming increasingly evident as it transforms the operations of companies and uncovers innovative prospects for growth. Its ability to process vast amounts of data is a major driver of improved performance metrics, including revenue, productivity, business growth, digital transformation, and efficiency. As a result, artificial intelligence is playing an increasingly important role in advancing business practices and driving strategic decision-making. As a result, organizations are increasingly leveraging AI-powered tools and

solutions to optimize their resources and stay ahead of the competition. The role of AI in enhancing organizational performance and driving growth is thus a key area of focus for business leaders and researchers alike.

A recent study conducted by the Harvard Business Review reveals that businesses that integrate artificial intelligence (AI) into their sales and marketing strategies witness a substantial upsurge in lead generation by more than 50%. Additionally, they experience a significant reduction in call times of 60% to 70% and an overall cost reduction ranging between 40% to 60%. It is noteworthy that 54% of business leaders attribute these improvements to the integration of AI. The results of this study highlight the potential benefits of incorporating AI into sales and marketing strategies, and suggest that businesses that do so may gain a competitive advantage over those that do not.

By 2023, businesses that adopt AI are expected to witness a 25% increase in customer satisfaction. During Q2 2019, AI-powered startups received over $7.4 billion in funding, highlighting the growing demand for AI-powered solutions across various industries. For example, Netflix's AI-powered recommendation function alone is valued at an impressive $1 billion annually.

Integrating AI into sales and marketing strategies can lead to significant improvements in lead generation, cost reductions, and productivity, while also increasing customer satisfaction. The growing trend of investing in AI-powered startups highlights the potential of AI to revolutionize various industries.

3. **Challenges:**

AI adoption has many benefits, but also significant challenges. A recent survey highlighted a shortage of data science specialists and concerns about data bias and transparency issues. Executives also face impediments such as cost, lack of expertise, and managers' insufficient knowledge of cognitive technologies. Despite these challenges, AI is transforming the business landscape, offering improved efficiency, accuracy, and decision-making.

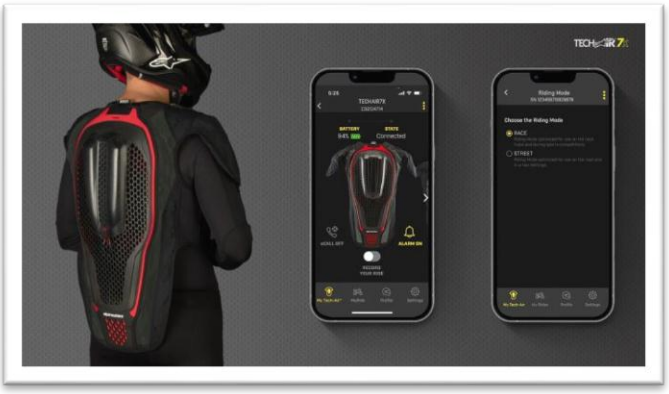
1. **Data Privacy and Security:** It is imperative to safeguard sensitive information present in AI systems by implementing robust security measures and ensuring compliance with privacy regulations. Recent trends have shown an increase in targeted attacks on fintechs and the supply chains of financial institutions, highlighting the criticality of secure data storage. Digital-native fintechs are rapidly introducing With our cutting-edge services, you can enjoy the convenience of real-time payments, quicker loan disbursals, expert investment advisory, and transparent insurance distribution. Plus, our peer-to-peer lending platform offers a straightforward and hassle-free way to secure the funds you need. Experience the future of finance today! As a result, it is crucial to prioritize the implementation of measures that protect the confidentiality of such information and ensure that regulatory compliance is met. (*Economic times.coi.com*)

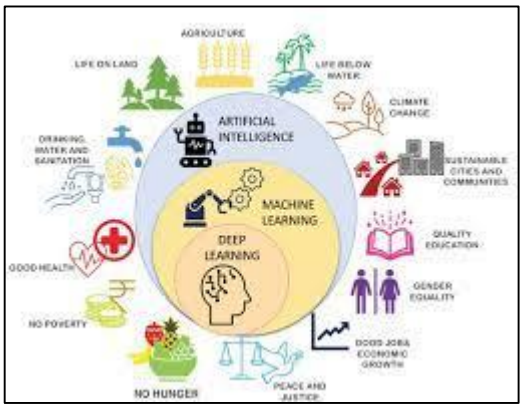
The ethical implications of artificial intelligence (AI) development and use cannot be overstated. The paramount concern is to ensure the absence of any form of biases in AI algorithms and maintain the highest level of fairness. Achieving these goals necessitates the development of ethical guidelines for AI development and use. In recognition of the potential of AI to foster inclusivity and reduce biases and discrimination, a respected member of the Arboretum, Sprout's community forum, has emphasized the significance of fair and unbiased decision-making processes in AI. Addressing algorithmic bias in AI development can play a pivotal role in shaping a future where AI is a force for positive transformation in society.

By prioritizing fairness in AI development, it is possible to enhance the performance of algorithms, reduce the potential for unintended consequences, and promote trust in AI systems. Ethical guidelines for AI development can help ensure that the benefits of AI are widely shared and that the risks of harm are minimized. We must continue to explore ways to improve the ethical and social dimensions of AI, so that we can harness the full potential of these powerful technologies for the betterment of society. (*Sproutsocial*)

2. **Lack of Skilled Workforce**: German robotics startup Neura Robotics recently raised €15 million in an investment round with American private equity firm InterAlpen Partners, following a €52 million funding round with leading European investors. Neura's robots, which can see, hear, and sense touch, are being developed to collaborate with humans in various industries and

environments. NEURA is also working on introducing the first multi-purpose humanoid robot to the market. *(EU Startups)*





3. **Integration with Existing Systems:** To ensure compatibility, understand workflows and approach integration thoughtfully. Our colleague, Troy, benefited from the technology when his Alpinestars airbag deployed during a collision. The new Tech-Air 7x, announced at CES, replaces the Tech-Air RACE and integrates with Alpinestars' existing systems. It's designed for racers. *(motorcycle.com)*

4. **Cost of Implementation:** Conduct a cost-benefit analysis to determine the potential ROI of AI implementation and absorb the associated costs of acquiring tools, training employees, and maintaining systems.

Attaining a sustainable business environment through AI:

An organization's sustainability strategy can incorporate artificial intelligence (AI) in a multitude of ways. Of particular note is AI's potential to reduce the carbon footprint of industries, including but not limited to manufacturing, mining, travel, and transportation. Although the initial implementation costs may be higher, the long-term advantages are substantial, including reduced costs, enhanced brand reputation, and increased customer loyalty.

By leveraging AI to optimize resource usage and reduce waste, businesses can achieve greater efficiency and cost savings. Furthermore, the reduction of carbon emissions can have a positive impact on the environment, improving the organization's sustainability and social responsibility. The use of AI can also foster innovation and promote a culture of continuous improvement.

Therefore, it is recommended that organizations explore the benefits of AI in the context of their sustainability strategy. By doing so, they can gain a competitive edge and contribute to a more sustainable future.

The following is one of the top companies that have successfully implemented Artificial Intelligence in their operations to achieve sustainability:

DeepMind, a subsidiary of Google, has developed AI systems that optimize energy use in data centers. The systems have been effective in reducing energy consumption. Consequently, notable reductions in carbon footprint have been observed.

Tesla, an electric vehicle manufacturer, utilizes AI to manage energy consumption in its vehicles. The technology maximizes the range and efficiency of the vehicles while minimizing reliance on fossil fuels.

Orsted, a renewable energy company, has integrated AI into its wind and solar farms. The AI technology optimizes energy production based on real-time weather forecasts and grid conditions, resulting in increased renewable energy output.

Xylem, a water management company, uses AI-powered sensors and analytics to detect leaks and optimize water distribution in cities. This process minimizes water waste and enhances sustainability.

Aclima employs AI in analysing satellite and sensor data to map air pollution levels in real-time. The technology supports targeted emission reduction efforts.

Unilever has implemented AI in its supply chain to optimize logistics, reduce transportation emissions, and improve resource efficiency. The technology has been effective in enhancing sustainability.

These companies have demonstrated that AI technology has significant potential in achieving sustainable business practices. The effective use of AI in various industries can be a crucial step towards achieving a sustainable future.

4. Conclusion:

The concept of Artificial Intelligence (AI) is no longer a far-fetched idea, as it is swiftly revolutionizing the business landscape. AI can analyse colossal data, automate tasks, and personalize experiences, thereby empowering organizations to achieve substantial growth, unlock efficiencies, and gain a

competitive advantage. The use of AI in lead generation, cost reduction, and increasing customer satisfaction has been witnessed by many.

The positive impact of AI on business operations is evident through increased productivity, revenue growth, and enhanced customer satisfaction. Integrating AI into sales and marketing strategies has proven to be an instrumental tool in lead generation and cost reduction. However, challenges such as the lack of data science specialists, data bias concerns, and the need for expertise are some obstacles that need to be addressed.

Looking ahead, the sustainable use of AI presents unique opportunities with the potential to reduce carbon footprints and foster innovation. Companies such as DeepMind, Tesla, Ørsted, Xylem, Aclima, and Unilever serve as inspiring examples of successful AI implementations for sustainability.

Navigating the AI landscape requires a dual focus on innovation and responsibility. Embracing AI technologies responsibly, addressing challenges proactively, and aligning with sustainability goals will drive success and contribute to a resilient and forward-looking business environment. Although the journey towards harmonious AI integration poses challenges, it promises unparalleled opportunities for growth, efficiency, and positive societal impact.

Managerial excellence and sustainable growth: It and operational issues

Case study FCI: Entrepreneurship, case studies and Best Practices.

Sushil Minz[1*]
Dy.General Manager, Food Corporation of India

1. Introduction

This study will provide a scholastic and holistic view into why Food Corporation of India (FCI) one of the largest Food Supply Chain in the world who has managed as on date to feed 18% of worlds 8 billion people; does not figure among the top Public Sector Undertakings (PSU) of India. The other agencies in this sector are Central Warehousing Corporation(CWC), State Warehousing Corporation(SWC), Central agencies such as the National Cooperative Consumer' Federation (NCCF) and National Agricultural Cooperative Marketing Federation of India (NAFED), hosts of state agencies, such as Haryana State Cooperative Supply, and Marketing Federation Limited (HAFED), West Bengal State Cooperative Marketing Federation limited (BENFED), Punjab State Civil Supplies Corporation (PUNSUP), Punjab Grains Procurement Corporations Limited (PUNGRAIN) etc.

1.1 What are its hurdles, the best way it can cope up with its weakness and threats and how to have the best edge in managerial excellence and sustainable growth: IT and Operational issues.

1.2 This will not only help FCI to take appropriate strategies and be a role model, but also help other entrepreneurs to adopt the best practices.

1.3 The research is based on the facts that after the Bengal Famine of 1942-43 a number of issues had cropped up related to the famine such as the damage of the rice crops, the panic purchase and hoarding by the rich, failure of Governance, the un-equitable distribution of the available foodgrain, disruption of communication and transport, due to the reigning WWII, etc. This resulted in starvation, deaths, poverty and inequality, exploitation, agricultural stagnation and other chain reactions. Consequently, it paved way for establishment of FCI a statutory body in the year 1965. This was on the recommendation Food Grain Prices Committee headed by L. K. Jha under the Food Corporations Act of 1964.

1.4 The main objectives of establishing FCI was to provide Minimum Support Price (MSP) to the farmers for maintaining a balanced price mechanisation, procurement, storage and distribution from the area of plenty to scarcity, Public Distribution System (PDS), maintaining a buffer stock as per National Food Security Act (NFSA 2013).

1.5 Initially, it had to grapple with the Public Law (PL) 480 the Indo-US Food Agreement and state trading in Foodgrains[1]. From a food grain importer, it has now become self-sustained.

1.6 There has been a massive change in its system of working. Old equipment's and infrastructures which were redundant and obsolete were replaced. State-of-the art gadgets have taken over the manual systems. Transparency has replaced opaqueness in working, and the most important with the help of Artificial Intelligence (AI) and Management Information System (MIS) and Information Technology (IT) and Internet Supported Instruments effort have been made to capture real-time data. These are the factors which have contributed in the turnabout of the Corporation.

2. Introduction:

Food Corporation of India (FCI) had a humble beginning from Thanjavur headquartered at Chennai, the first Chairman was Sh. T.A. Pai, and it had operated from just 4 Regional Offices in the 1960's. Now, FCI is headquartered at New Delhi, and has 5 Zonal Offices, 26 Regional Offices, I64 Divisional Offices, 1923 Food grain depots. From one of the key Institution to dealing with the Era of Food Deficit it has brought the country to the Modern Era of Food Surplus. There is no scarcity of food grains but, there is problem of plenty. Problems of procuring, storing, preservation, distribution and movement of foodgrains has cropped up in place of the earlier problem of food deficit. Now, in case of a Bumper Harvest the farmers instead of rejoicing may resort to "distress-sale" just to avoid "dumping of stock" a situation in the market when a very low price is given for the produce[6]. Storing the huge surplus stock becomes an issue, as storage facilities for Agri-produce is never commensurate with the production. The storage gap is filled with make shift arrangement such as Covered and Plinth (CAP) storage, hiring godown space or

new business venture such as warehouses and silos under Public-Private Partnership (PPP) scheme[2] which is time taking.

Movement of food grains is still an issue as Transit Losses runs in crores.

The question remains even though FCI is the giant in Foodgrain supply chain in the world with the Target to reach the poorest of the poor, the government have to constantly chide regarding it's working. There are endless scams, misappropriations and embezzlements covered by the media from time to time. (The Telegraph Online, Friday 29th December 2023 with the heading "CBI raids grain Godown in Punjab and Haryana. Surprise checks in this Premises. following a large number of Complaint of Irregularities in FCI Godowns" and "FCI Corruption: CBI conducts searches at 50 Locations across three states. The operation was christened as "Operation Kanak" to prevent corruption in FCI)[3] & 4

3. Findings:

The key problems in FCI as has been diagnosed are: -

- There is no scarcity of food grains but, there is "problem of plenty."
- Problems of procuring, storing, preservation, distribution and movement of foodgrains has cropped up in place of the earlier problem of food deficit.
- Gap in Storage Facilities as Agri-produce is never commensurate with the production. The problem gets aggravated when the situation adversely changes.
- There are endless scams, misappropriations and embezzlements covered by the media from time to time.
- Even though the onset of the digital revolution in the 1990s, all the major firms and institutions were gearing up to embrace the digital world such as railways, banks, LIC, Airways etc, FCI did not recognize the impact of the digital world nor it did develop strategies that would have helped it adapt itself to the changes and stay ahead of the competition. It continued its traditional methods sometimes in hybrid mode which significantly is the cause for its present state.
- Real online live status is difficult to achieve without complete digitalisation and integration of Management Information System.

4. Discussion with Recommendation:

4.1 From 1960's -2020's FCI's Growth Story in Operations the Bench Mark achieved and the best Practices[5].

4.1.1 The operations-Procurement and Storage: - From 13 LMT in 1965 to 826 LMT in 2023 Procurement operations of Wheat and paddy increased 64 times, which have set a new bench mark. This was the consequence of growth of Storage Facilities 115 times storage capacity increased from 6.18 lac MT at the time of inception in the year 1965 to *711.59 lac MT in the year 2023 as on 01.04.2023 to about 2000 different locations. Storage capacity with FCI is 337.43 LMT and with agencies 376.16 LMT (fci.gov.in to show the bifurcation in FCI owned capacity and capacity with agencies).*

PIE CHART 1 Showing the Storage Capacity FCI owned vis-à-vis Agencies.

Recommendation: Every effort to be made to keep the storage capacity in the control and custody of the Central Agency for better monitoring of the stocks and to have a direct control in its affairs and releasing of Government Subsidy. FCI has to buy millions of tonnes of foodgrains from the farmers, by paying them the Government Fixed Minimum Support Price (MSP) during the process of procurement. First it has to store this in their own FCI warehouses or hired one and thereafter after proper preservation and treatment moves them for redistribution to almost 800 million poor people free of cost under the National Food Security Act (NFSA 2013). The MSP is the base price to help the farmer avoid distress sale.

4.1.2 Most Important Component: - Weigh Bridge (WB) increased from 4 Mechanical Weigh Bridge at the time of Inception in the year 1965 to *681 fully electronic as on 30.9.2020. That is addition of 677 WB's.*

Recommendation: *WB helps in maintaining accuracy, transparency and proper record, at times it helps in solving disputes. Like ATM this should be linked with individuals mobile*

Number as well as Email account also so that the number of bags or Quantity of Stock is issued is instantly freezed and there is no scope of manipulation.

4.1.3 Construction of Storage Depots: -The number of Depots increased from 7 at the time of inception in the year 1965 to 107, that is addition of 100 depots. Low-cost open, Covered and Plinth (CAP) storage is being phased out. Modernization in Storage infrastructure is taking place through the Construction of Steel Silos in Hub and Spoke Models with 111.125 Lac MT.at 249 locations is in pipeline. 25 Lac MT with Hub location and 86 Lac MT for Spoke locations. Further it is also stated 15 Lac MT silos already in use. Private Entrepreneurship Guarantee (PEG) Scheme Warehouses 2008 and 2009 and again in 2018 were launched to boost the much-needed storage capacity and fill the storage gap of the nation[4].

Recommendation: In fact, vertical loose grain Storage as in Silo is recommended more than horizonal creation of Storage Capacity as in PEG Scheme Godown. On comparison of the requirement of Silo as well as PEG scheme godown as per the RFP and MTF available in fci.gov.in it is seen that in land measuring 4 acres (approx.) PEG warehouse can be made for only 10000 MT capacity whereas in that same area of land a silo can be constructed with a base capacity of 25000 MT. (2.5 times over).[4S] Silo is far better and more beneficial in the long run.

4.1.4 Movement and Transportation of food Grains: - Since inception in 1965 the total amount of food grain movement is almost 40 times the quantity of stocks of Food Grain, that is 15 lac MT it has moved in 1965 *to 600 Lac MT in 2023. On an average. around 32 lac bags are loaded and unloaded every day from around 60 rakes. The food grains can be said to move around 1200 Kms prior to final consumption.*

Recommendation: *To prevent pilferage, spillage or any kind of transit loss, Containers transportation may be explored and implemented if feasible in every mode of transportation whether by land, sea or air.*

4.1.5 The operations on the field (Food Grain Distribution): - It has increased from 18 Lac Mt in 1965 to *700 Lac MT in the year 2023 almost 39 times*.

4.1.6 Food Grain Testing laboratory: - To preserve the food grains along with maintaining its quality the grains have to be tested in the laboratory which from mere 32 in 1965 in

has increased to 1850 to 2023, a jump of almost 58 percent. Further, there are 5 state-of-the-Art testing laboratories which can if needed can check all the intrinsic qualities' minutely, and can also check the food value.

Recommendation: *This should be available in every District Office level also, as the main work starts from the depot and field level.*

4.1.7 **Working Capital and paid-up capital**: - FCI started its journey in 1965 with just Rs 4 crore paid up capital against working capital of Rs 100 Crore. *Presently as on 2023 the paid-up capital is Rs 9999.96 crore against Rs 10000 Crore working capital.*

Recommendation: *Special Transaction Audits to be done of each and every office so as to curb unnecessary and wrong expenditures.*

4.1.8 The trend of losses has also been controlled to a great extent. Effort is made to maintain the standards as per the Study of Indian Council of Agricultural Research-Central Institute of Post Harvest Engineering and Technology (ICAR-CIPHET)[5].

4.2 From 1960's -2020's FCI's Growth Story in Information Technology (IT)[5] the Bench Mark achieved and the best Practices[5].

4.2.1 In the span of six decades, it has made much progress from an importer of foodgrains to sustaining its own need and exporting to friendly countries undergoing through a distress. It has a number of new innovations adopted in its process, the bench mark and the best practices can be adopted and adapted all the related agencies. which can be used by other state and other agencies, related to Artificial Intelligence (AI) and Information Technology (IT), these are the steps which can bring complete control and transparency and avoid malpractices expunging the ill will of corruption stain brought not on FCI but any government Institution.

4.2.2 **AI enabled automatic Grain-Analyser**, ***Bench mark, Best practices and Recommendation***: *Since, FCI is the only agency which has a stronghold on the Government storage for maintaining the Buffer stock, it has started using the high-tech AI-based grain sorters to examine and test check the commodity it needs to procure from the farmers. It ensures that the poor quality or produce of the farmers are automatically vetted without any interference.*

4.2.3 Mixed Indicator methods instruments, *Bench mark, best practices and Recommendation*: *FCI has further started using chemical Testing to verify the age of rice so as to crack down on fraudulent practice of Recycling. Once procured, not to be reprocured again.*

4.2.4 GPS based Vehicle Location Tracking System (VLTS), *Bench mark, best practices and Recommendation*: *All transporters should use GPS-enabled truck tracking systems from procurement to depots. The Hindustan Times (HT) newspaper agency quoted, "Adopting new technology of GPS vehicle tracking system (VTS) has been implemented to ensure real-time tracking of trucks carrying the foodgrains of FCI for a real-time planning of intake in its godowns."*[6]

4.2.5 Warehousing Inventory Networking and Governing System (WINGS) linking all the rice millers with their respective depots for delivery of rice. ***Bench mark, best practices and Recommendation***: *The best development is that it includes the digital linking of Rice Mills with individual warehouses for delivery of rice and allocation of the space at individual warehouses for transparency in the procurement process, called as "mapping."*

4.2.6 IT has taken over in every field: for all administrative office file purpose E-office and Human Resource Management System (HRMS) is used. ***Bench mark, best practices and Recommendation***: *Food Corporation of India has also taken a very concrete step. It has digitised it's "total work flow of the corporation and implemented a seamless e-office. Every office is now connected through videoconferencing facility, which has not only improved the day-to-day operations, but also brought down administrative cost."*[6]

5. Special achievements:

5.1 A year after the Covid in the year 2022-23, FCI procured 76.56 million tonne of paddy rice and 26.2 million tonnes of wheat from 12.3 million farmers cultivators shelling out Rupees 2.19 lakh Crores in all, which is accounted as governments food subsidy bill.

5.2 Presently FCI is helping in implementing the dreams of the Hon'ble Prime Minister in bringing a smooth transition from a nation of Food Security to Nutritional Security. Fortified Rice which contains iron, zinc, vitamins B1 and b12, Folic Acid that tackles anaemia, Malnutrition, and stunting, is being distributed in all the Government Schemes.

6. Conclusion:

6.1 As on Jan 14, 2024 when FCI celebrated it's 60th anniversary there has been speculation whether FCI will exist, or amalgamate with other similar organisations. But it rose like a phoenix, with a robust plan.

6.2 Hindustan Times (HT) New Delhi Edition, dated Jan 14.2024 12.36 AM IST with the headlines, "FCI uses AI-based equipment to detect frauds, says official". By Zia Haq[6.] has reflected the present updated position in lucid manner summarising the important facets of FCI.

6.3 FCI has been given the responsibility to procure "fair and average quality (FAQ)" grains from the purchase centres or "mandi" as is demarcated in most of the north India States. The grains must pass the quality checks and specifications especially related to moisture content, as per the instructions issued by the Government from time to time.

6.4 AI equipment chips in, and does the job in a far efficient way, not compromising with the parameters, there by ensuring that the customers and the end consumers get standard food and farmers get Minimum Support Price (MSP) fulfilling the objectives of FCI.

6.5 FCI has further started using chemical Testing to crack down on fraudulent practice of Recycling, which has helped to detect 140,000 tonnes of recycled rice.

6.6 Last but not the least, it also mentioned that in the Corporation, "Every office is now connected through videoconferencing facility, which has not only improved the day-to-day operations, but also brought down administrative cost," it was further revealed that a call centre is being opened so as to take all calls for complaints, grievance redressals and suggesting of solutions, which are the initiatives taken to modernize the organisation.

6.7 Firms and institutions, could be facing such upheaval changes in their core business, they should be more proactive so as to develop strategies that can fit with the changes of time and can be easily adapted. Further they should also be free and not be a stumbling block from investing or taking the chance whenever any opportunity comes along the way so that such investments does not lose its value in the future. They should also be ready to mould themselves to that situation and embrace the changes in their market or industry and focus more on the changing needs. They should also take the risk as far as possible and develop innovative ideas keeping in view of all the stakeholders.

7. References:

7.1 PL 480 the Indo-US Food Agreement and state trading in Foodgrains by H Laxminarayan, The Economic weekly, September 24. 1960.

7.2 The Telegraph Online, Friday 29th December 2023 with the heading CBI raids grain Godown in Punjab and Haryana. Surprise checks in this Premises following a large number of Complaint of Irregularities in FCI Godowns.

7.3 The Telegraph Online, Friday 29th December 2023 with the heading FCI Corruption: CBI conducts searches at 50 Locations across three states. The operation was christened as "Operation Kanak" to prevent corruption in FCI.

7.4 Silos and PEG scheme, fci.gov.in

7.5 FCI HQ Magazine Anna Swaraj 2024 and Press release of FCI HQs on the occasion of 60th Anniversary celebrated on 14.01.2024

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