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Multidisciplinary Indian Cases for Integrated Learning

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About CSIBER Press

Publication represents our commitment to societal contribution, fostering research, and sharing knowledge for national development. CSIBER Press upholds its rights and responsibilities with diligence. Commencing in 2022 from the Central Library Building of Chhatrapati Shahu Institute of Business Education & Research (CSIBER), Kolhapur, we have embarked on publishing edited books adorned with ISBN. Our current focus lies in disseminating and promoting research articles across the domains of Commerce, Management, Computer Science, Environment, and Sociology, sourced from both established and burgeoning researchers.

Looking ahead, we aspire to publish books authored by individual experts spanning various disciplines, possibly extending into the realm of poetry, enriching life's narrative. Additionally, we aim to deliver high-quality books translated into local languages. The current publication signifies a stride toward our envisioned destination, recognizing that every significant journey begins with a single step.

Your feedback on our publication is crucial in achieving our objectives. Please feel free to contact us at csiberpress@siberindia.edu.in.

Dedication

To the Memory of Late Dr. A. D. Shinde,

As I pen down these words, I am filled with profound reverence and gratitude for the remarkable life and contributions of Late Dr. A. D. Shinde. A luminary in the realm of accountancy and academia, his legacy continues to inspire generations. As the esteemed Chartered Accountant, former Dean of the Commerce Faculty at Shivaji University, Kolhapur, and the visionary Founder Director of CSIBER, Kolhapur, his vision and dedication remain etched in the annals of time.

To Hon'ble Prof. Dr. R. A. Shinde,

Your unwavering commitment to the ideals and mission of CSIBER Trust, Kolhapur, resonates deeply within the hearts of all who have had the privilege to be touched by your leadership. Your guidance and steadfast support have been instrumental in shaping the institution's journey, propelling it towards excellence and innovation.

To Hon'ble CA H.R. Shinde,

As a trustee of CSIBER Trust, Kolhapur, your steadfast dedication to the institution's values and objectives serves as a beacon of inspiration. Your tireless efforts and unwavering commitment to nurturing talent and fostering academic excellence continue to enrich the lives of countless individuals within the community.

To Honorable Dr. S. P. Rath,

Your visionary leadership as the Director of CSIBER, Kolhapur, has been instrumental in steering the institution towards new horizons of success and distinction. Your profound insights and dedication to academic excellence have paved the way for countless achievements and milestones.

In honoring the legacies of these esteemed individuals, we pay homage to their invaluable contributions to the fields of academia, commerce, and beyond. Their enduring spirits continue to illuminate our path, guiding us towards the pursuit of knowledge, excellence, and service to society.

With deepest reverence and gratitude,

Editors:
Mrs. Sneh A. Nagaonkar
Ms. Urmila Chavan

Acknowledgement

We would like to express our sincere gratitude to all the authors of the CSIBER case study Series - 1, for their valuable contribution & efforts in writing the cases and their work and ideas in varied domains are worth mentioning and deserve appreciations

We would like to express our deep gratitude to the **Management of Chhatrapati Shahu Institute of Business Education and Research (CSIBER), University Road, Kolhapur.** For their continuous support and motivation during the writing of this book. This endeavor has been made possible in a significant way by their dedication to supporting academic excellence.

We would like to express our profound gratitude to **The Director Prof. (Dr.) S. P. Rath,** whose inspiring leadership and consistent drive motivated the case writers to pursue excellence in their work. The substance of this book has been greatly influenced by their mentorship and advice.

We would also like to express our appreciation to the **IIM Indore Faculties** for their kindness and knowledge shared during the "Annual 5-week Faculty Development Programme" (FDP) -2023. The program's insights have increased our understanding, and the case studies in this volume are of a better grade.

Additionally, we would like to sincerely thank CSIBER Press for publishing this book and Editors for their careful editing and precious assistance in enhancing the contents of this book. Their commitment to maintaining coherence and clarity has improved the case studies' readability and impact significantly.

Our sincere gratitude goes out to all of the contributors and participants, whose combined efforts have resulted in this compilation of case studies. The endeavor has been propelled by their devotion for exchanging information and dedication to excellence.

Editors:
Mrs. Sneh A. Nagaonkar
Ms. Urmila Chavan

Editorial Note

Dear Readers,

It is our immense pleasure to publish our endeavor, a compilation of diverse and insightful case studies in the form of series. This book brings together a wealth of knowledge and real-world experiences, offering a comprehensive exploration of various disciplines Management, Environment and Psychology.

In This case studies book, we delve into the dynamic landscape of Maharashtra, India, where localized solutions emerge as powerful responses to a diverse array of challenges. Through a curated selection of case studies, we illuminate the ingenuity and resilience of Maharashtra's communities, offering insights that resonate far beyond its borders.

The case studies presented within these pages offer a mosaic of Maharashtra's pragmatic mechanisms in action. For example, from "Unlocking the Future of Retail" with Lucky Bazar's transformation to "Optimizing Pricing Strategy for a Sugar-Free Ayurvedic Cough Syrup" by TOSEBB SF., each narrative reflects the innovative spirit and adaptability of Maharashtra's entrepreneurs and businesses.

We also explore critical issues such as "Coping with ADHD" and "Healing Scars- a post-traumatic stress disorder," shedding light on Maharashtra's holistic approach to mental health care. Through these stories, we witness the compassionate interventions and community support systems that underpin Maharashtra's healthcare landscape.

Through the lens of "Chocolate of Choice," we witness the resilience and innovation inherent in Maharashtra's confectionery industry. This narrative encapsulates Maharashtra's entrepreneurial spirit and its ability to thrive amidst competitive markets and changing consumer preferences.

Beyond documentation, our case studies book serves as a catalyst for action and collaboration. We offer consulting services tailored to the needs of practitioners, policymakers, and development professionals, facilitating the translation of insights gleaned from Maharashtra's experiences into tangible initiatives.

Furthermore, our exploration extends to the industrial realm with "From Waste to Value," a strategic approach to implementing lean manufacturing in a Maharashtra-based firm. This case study underscores Maharashtra's commitment to sustainable practices and resource optimization in the manufacturing sector.

In addressing environmental challenges, we examine various issues like the "Challenge of Managing Municipal Solid Waste" and the complexities of the "Indian Sugarcane Crop." These case studies offer valuable insights into Maharashtra's efforts to balance economic

growth with environmental stewardship, paving the way for sustainable development initiatives.

As we embark on this journey of discovery, we invite readers to immerse themselves in the narratives of Maharashtra's pragmatic mechanisms. Together, let us celebrate the triumphs, learn from the challenges. The diversity of perspectives represented within these pages reflects the dynamic nature of the specific discipline cases and underscores the importance of collaborative learning.

We extend our sincere gratitude to all the authors whose dedication and expertise have enriched this compilation. Their commitment to advancing knowledge is evident in the thought-provoking narratives shared within these pages.

As you embark on this intellectual journey, we hope you find inspiration, new perspectives, and practical takeaways that contribute to your understanding.

Thank you for being a part of this enriching exploration.

Warm regards,
Place: Kolhapur, India.

Editors:
Mrs. Sneh A. Nagaonkar
Ms. Urmila Chavan

Date: March, 2024

CONTENT

Optimizing Pricing Strategy for Sugar-Free Ayurvedic Cough Syrup: A Case Study of MN Pharmaceutical's TOSEBB SF - Kolhapur, India.

Mrs. Sneh A. Nagaonkar
CSIBER, Kolhapur, India.

MN Pharma, a leading Ayurveda company renowned for its commitment to holistic healthcare solutions, found itself at the crossroads of innovation and consumer wellness. With the rising concerns over sugar consumption and a growing demand for healthier alternatives, MN Pharma decided to introduce a revolutionary product - a sugar-free cough syrup infused with the goodness of Ayurvedic herbs.MN Pharma aimed not only to provide effective relief for cough and cold symptoms but also to address the increasing health-conscious consumer base. The challenge was to devise a pricing strategy that reflected the product's unique features, positioned it competitively in the market, and appealed to the target audience.

Background of the Company:
In 1910, the company was founded on the auspicious festival of Vijayadashami. MN Pharmaceuticals traces its origins back to the visionary Vaidya Dhondiba Rajaram (D.R) Nagaonkar. What began as a modest venture with herbal products laid the foundation for a legacy that transcended generations. Driven by a commitment to holistic well-being, Vaidya D.R. Nagaonkar's grandson, Dr. Chandrashekhar Vidhyadhar Nagaonkar, breathed new life into age-old formulations to cater to the evolving needs of the market.

In a momentous collaboration, distinguished agriculturist Mr. Achyut J Mujumdar, his son Mr. Shirsih Mujumdar, and Mr. Ashish Chandrashekhar Nagaonkar, the great-grandson of Vaidya D.R. Nagaonkar, proudly announced the inauguration of MN Pharmaceuticals. This heralds a fusion of historic formulations with contemporary touches and cutting-edge technology, enriched further through rigorous clinical trials to enhance the efficacy and safety of their medicines.

MN Pharmaceuticals, with its motto "A Contemporary Approach in the Lap of Traditional Medicine," upholds a commitment to follow centuries-old legacy formulations, strengthened by modern-day technology. The company operates under the esteemed leadership of A Mujumdar and A Nagaonkar, with its parent organization, MN Pharmaceuticals, housed at Madhu Mansion. The headquarters are situated in Nipani, with branches extending across various divisions, including Pharma and Consumer, in Kolhapur and Sangli Districts of Maharashtra State and Belagavi, Dharwad, Hubli, Davangere, and Bijapur Districts of Karnataka State. Under the dynamic leadership and re-establishment in 2019, MN Pharmaceuticals continues to bridge tradition and innovation, delivering effective healthcare solutions to mankind.

Products of Company:
M.N. Pharmaceuticals have enhanced traditional formulations by incorporating innovative methods and modern touches, as well as conducting rigorous clinical testing to make the goods more efficient and secure. They seek to utilize contemporary technology and practicality to produce the highest quality products possible using conventional formulation. **(**Exhibit 2) Products Owned By M N Pharmaceutical **AVIGO Pain Balm ,Dentoven Toothpaste, Tosebb Cough Syrup, Tosebb SF(Sugar Free), ZIPITRIT Cream, Sirena Shampoo and Sirena Hair Oil .** All these products are manufactured under GMP certified approved units.

MN Pharmaceuticals' TOSEBB COUGH SYRUP (Exhibit 3) is an Ayurvedic drug enriched with twelve herbs that are known to alleviate fever, accompanying chills, irritation of the throat, bronchial cough, & dry

and wet cough. Active ingredients of the syrup are **Raisins, PanchTulsi, Lavang, Kantkari, Kulinjan, Shunthi, Pippali, Olive leaf, Jeshtmadh, and Adulsa**. It's a clinically proven formula effective in treating various types of cough. This Product is available in the entire Kolhapur district of Maharashtra as well in various states under the Pharma & Consumer division. Most of the retail counters entail maximum sales of this product. The importance of this product has risen because of the ingredients & no side effects. The product is helpful in reducing cough and related symptoms in wet, dry, and bronchial cough.Now the MN Pharmaceuticals has come up with the variant of **TOSEEB COUGH SYRUP** which is **sugar free TOSEBB SF (Exhibit 4)**

TOSEBB SF- Sugar Free Cough Syrup:
This sugar-free syrup contains the following active ingredients:

Panch Tulsi: The combination of five types of holy basil in Panch Tulsi may contribute to its anti-allergic, anti-inflammatory, and antimicrobial properties. It can help in managing allergies, infections, and respiratory conditions such as coughs and colds.

Lavang (Clove): Lavang is known for its analgesic and antimicrobial properties. It can provide relief from coughs and soothe throat discomfort.

Kantkari: According to popular belief, Kantkari possesses bronchodilator qualities that assist in relieving coughs without making people sleepy. For respiratory disorders, it might offer symptomatic relief.

Kulinjan: Kulinjan acts as an expectorant and helps in the removal of phlegm from the respiratory passages. It can aid in the management of cough by facilitating the expulsion of mucus.

Shunthi (Dried Ginger): Shunthi possesses anti-inflammatory and analgesic properties. It can help relieve cough and soothe sore throat symptoms.

Pippali (Long Pepper): Pippali's expectorant and anti-allergic qualities have led to its traditional use in Ayurveda medicine. It might help in managing allergies and coughs.

Jeshtmadh (Licorice): Jeshtmadh is known for its soothing and anti-inflammatory properties. It can help alleviate inflammation and provide relief from sore throats.

Adulsa: Adulsa is commonly used in Ayurvedic formulations for treating various types of coughs. It is believed to have bronchodilator and expectorant properties.

These ingredients collectively contribute to the potential efficacy of the product in managing coughs, soothing sore throat, and relieving symptoms associated with respiratory conditions, this product consists of five Tulsi which is more effective than other products and completely Organic.

TOSEBB SF Features:
The syrup's natural and thoroughly tested formula includes a combination of 12 herbs, including the active components listed above, that have long been utilized in Ayurveda for their therapeutic benefits. This all-natural remedy offers relief from different types of coughs and their accompanying symptoms. Tosebb SF is sugar-free, it is appropriate for people with dietary restrictions, such as diabetics who must limit their sugar intake. Tosebb cough sugar free (SF) is effective in treating cough related symptoms such as wet and dry cough, sore throat.

Tosebb SF is developed to provide relief without causing undue tiredness or drowsiness, unlike certain cough syrups that may do so.The syrup adheres to the holistic medical philosophy of Ayurveda and seeks to address the root causes of cough and cold symptoms rather than merely masking them. The use of Tosebb SF as an Ayurvedic remedy for cough and associated disorders has a number of benefits, however individual outcomes may differ. Before beginning any new drug or treatment, it is always essential to speak with a healthcare provider or an Ayurvedic practitioner. The Taste holds Natural Flavor, its Base is Stevia & The Tosebb SF is suitable for the age groups above10 years , provided with appropriate dosages, suited for diabetic patients, one who is under dietary plans and it can also be used as a regular Toseeb Cough syrup

The Importance of Ayurveda & Medicines:
The best way to describe the age-old Ayurveda is as the "Science of Life and Longevity." This is due to the fact that Ayurveda heals all illnesses by providing the body with food, nutrition, and therapeutic techniques. Ayurveda's participative and educational methods aid in the patient's growth in self-awareness and accountability. You can live a better quality of life with the aid of Ayurveda. Many different types of medicinal plants, often known as herbs, may be found throughout the Indian subcontinent and are used in Ayurvedic medicine. For thousands of years, a basic element of Indian medicine has been the utilization of plants for therapeutic purposes. Medical professionals in India have traditionally treated a variety of ailments and disorders with plant-based remedies..

In light of the growing prevalence of lifestyle disorders, side effects from modern treatments, unfavorable drug reactions, and budgetary concerns, An alternate method for improving human welfare is Ayurveda.. M N Pharmaceuticals has applied tried-and-true expertise of these therapeutic herbs to improve quality of life. Traditional Indian medicine, or Ayurveda, is becoming more and more popular in Europe, America, and many other countries. It works wonders for many chronic ailments. Patients often develop a lifelong dependence on lifelong drugs used in traditional medical care. Numerous medications include unpleasant side effects and withdrawal symptoms that could cause problems if the prescription is subsequently removed.

In these situations, Ayurveda has a lot to offer. The majority of patients respond favorably to Ayurvedic medicine, enjoying a lessening and occasionally even a termination of their sickness and symptoms. By lowering the use of cortisone and analgesics, Ayurveda can help people feel better by improving their quality of life.

In recent years, Ayurvedic cough syrups have seen a major increase in market share. This increase can be linked to a number of factors, such as rising consumer awareness of and preference for natural and herbal therapies, growing worries about the negative effects of synthetic drugs, and the burgeoning market for Ayurvedic goods. As efficient alternatives for treating cough symptoms, can be an Ayurvedic cough syrup that has grown in popularity.

These syrups are strengthened with a combination of ancient herbs known for their therapeutic benefits. Increased acceptability of Ayurvedic treatments in the general market and a shift towards holistic healthcare practices are both reflected in the market share growth**. (Exhibit 5)**In 2022, In India, the Ayurvedic product market was valued at INR 626 billion. According to the report, the market is expected to develop at a compound annual growth rate (CAGR) of 19.51% from 2022 to 2028, reaching INR 1,824 billion.

Key Players in Market

Sl. no	Products	Company	Ingredients	Results	Age Group	Price
1	**KOFOL SF**	**CHARAK**	• Shunthi • Tulsi • Vasa • Haridra • Bibhitaki • Yastimadhu	• It effectively heals and soothes the throat • Provides relief from coughing-related pain, and is helpful for treating all types of cough.	ALL	156
2	**TISNOV**	**NOVOLILLY**	• Unav Gajban • Mulethi Saunf • Reshakhatmi • Banaksha Munaka • Kakarsinghi Ka Anjeer • Kantakari Ka	• A dry cough, sometimes referred to as a non-productive cough, is one that produces no phlegm or mucus.	ALL	87
3	**HONITUS**	**DABUR**	• Shudha Madhu (Honey) • Tulsi • Mulethi • Banaphsa • Kantkari • Talispatra • Sunthi • Pippali • Vasaka • Shati • Pudina Satva	• Effective Relief for throat discomfort and cough Non-drowsy medication Safe Formula Without Sugar	ALL	139
4	**KUKA**	**MULTANI**	• Tulsi • Pippali • Sat Pudina	• Safe formula	ALL	99
5	**TUSSICA**	**SOLACE HOLISTICS**	• Glycyrrhiza glabra (Mulethi) • Adhatoda vasica (Vasa) • Solanum xanthocarpum (Kantkari)(Tulsi) • Piper nigrum (Kali mirch)	• 100% Ayurvedic Cough Syrup • Natural Cough Relief • Alcohol Free • Safe for kids to their grandparents	ALL	139

6	**THOATEX**	**SHATAGUN**	• Sunthi • Pippali • Vasaka • Shati • Pudina Satva • Tulsi • Mulethi • Banaphsa • Kantkari • Talispatra • Shudha Madhu (Honey)	• SAFE	ALL	140

Ref - https://www.amazon.in/sugar-free-cough-syrup/s?k=sugar+free+cough+syrup

Path Ahead for Market Analysis:

The Founders of MN Pharmaceuticals want to fix the price of this new Cough syrup variant .They are working to determine the pricing strategy for the sugar-free cough syrup. The research team at Pharmaceuticals conducted a study on currently available products in the market. As per the IMARC group expert the Ayurveda products market size is approximately 626 Billion in 2022 it might reach 1,824 Billion around 2027-28 leading to 19.3% CAGR growth rate. People are moving towards Ayurvedic cough syrups to avoid certain side effects of western medicines .The popularity of these products is increasing due to safe and healthy ways to cure. Hence leading to rise in the market.

As per the experts of Mprex CRO company's Founder Dr Nagore highlighted Some of the major players in the Indian ayurvedic products market include Dabur India Ltd., Patanjali Ayurved Limited, The Himalaya Drug Company, Charak Pharma Pvt. Ltd., Hamdard Laboratories, Shree Baidyanath Ayurved Bhawan Pvt. Ltd., Kerala Ayurveda Ltd., Amrutanjan Healthcare Limited, etc.

According to the survey on Some of the sugar free cough Syrups available in market (Exhibit 7) such as Kofol SF by Charak,Tosnov SF- Novolilly,Honitus SF-Dabur,Kuka –Multani,Tussica SF-Solace Holistics, Thoatex – Shatagun ,it was studied that all these cough syrup are 100% natural and ayurvedic,safe for all age groups & few of them are clinically tested & non drowsy ,they provide relief from throat pain, smoothenes the throat, reduces mucus,discomfort caused in throat. The majority of them include Shudha Madhu (Honey), Tulsi, Mulethi, Banaphsa, Kantkari, Talispatra, Sunthi, Pippali, Vasaka, Shati, and Pudina Satva.Additionally, flavors like strawberry and honey are added to improve the taste of the products.

The prices (Exhibit 8) were analyzed of all these products and it was found that average value of these products is INR 126.66/- , most of the products price is INR 139/-the price difference between the highest and lowest rates is INR 69.00/-.there is a variability in prices in the price distribution, The MRP of the TOSEBB SF is also dependent on the production cost and other business aspects, considering the current marketing trend the pharmaceutical decide to go with the optimal price of the product which must be catering all the customers willingness to pay and meet their production cost along with the tax and must provide the minimal margin to their Distributors & Retailers.

The board decided to go with the cost which satisfies the current market trend and bear the fluctuations in market & cope up with the raw material costs variations emerging in the markets additionally production

costs can vary significantly depending on the manufacturing process, sourcing of ingredients, production volume, and other factors specific to the product and company.

Pricing Strategy:
The Pharmaceutical considered production cost which may be further depended upon the batches and units produced but remain stable with fixed price currently, desired profit margins, market competition & customer willingness to pay for 100 ml as it is sugar free some added value pricing is to be decided, MRP must cover all the costs & lead to profit. Respective taxes are also decided to be calculated such as GST .The Pharma decided to provide 10% margin to the distributor and 20% margin to retailers. They decided to adjust the margins depending upon the market conditions, demand ensuring profitability, some negotiations may be expected further.

Change desired Value of MRP, Tax and Margin to calculate PTS/PTR		
MRP	Tax (%)	MRP excluding TAX
137	12	122.32
MRP Excluding Tax	Retail Margin (%)	Price to Retailer
122.32	20	101.93
PTR	Stockiest Margin (%)	Price to Stockiest
101.93	10	92.67

The Pharmaceuticals decided to go with MRP of INR 137 Rs keeping the appropriate margins for distributors and retailers. The further market studies are under construction till the first batch of Tosebb SF reaches the retail counter. The price of product is yet to be finalized and may vary till it comes on to the retailer counter. The founders are still deciding the price and under analysis they are undergoing certain challenges.

Key Challenges:

- **Determining Optimal Pricing:** Choosing the best pricing for the sugar-free cough syrup is one of the main tasks. MN Pharmaceuticals must examine a number of aspects, including manufacturing costs, targeted profit margins, market competition, and customer willingness to pay. It might be difficult to balance these considerations in order to determine a price that covers costs, ensures profitability, and remains competitive.

- **Managing Margins for Distributors and Retailers:** MN Pharmaceuticals intends to provide distributors a 10% margin and retailers a 20% margin. However, managing these margins can be difficult, especially if market conditions change or if discussions with distributors and retailers are underway. Maintaining fair and sustainable margins while still allowing for profitability for all parties involved necessitates considerable study and management.

- **Taxes and government Regulations:** Pricing plans must account for taxes such as GST, regional, and municipal taxes. MN Pharmaceutical companies must navigate the tax landscape and make certain that the final pricing includes all necessary taxes. Furthermore, they must follow local pricing legislation and any pricing limits or restrictions imposed by regulatory agencies.

- **Market Acceptance and Demand:** Pricing methods for sugar-free cough syrup should consider market acceptance and demand. MN Pharmaceuticals must assess customer preferences, assess the competitive landscape, and determine the willingness of the target market to pay for a sugar-free alternative. Setting a price that meets market expectations and generates demand while being profitable can be difficult.

Way Forward:
MN Pharmaceuticals finds itself at the forefront of innovation with the introduction of TOSEBB SF, a sugar-free Ayurvedic cough syrup. The company, rooted in a legacy dating back to 1910, has evolved under the visionary leadership of Vaidya D.R. Nagaonkar continues to bridge conventional formulas with contemporary additions. The new variant is a testament to their commitment to holistic health and the integration of ancient Ayurvedic wisdom with contemporary technology.

The sugar-free cough syrup market is experiencing significant growth, fuelled by a shift towards natural and herbal remedies. MN Pharmaceuticals' TOSEBB SF is strategically positioned in this landscape, offering a unique blend of 12 herbs renowned for their therapeutic benefits. The product's effectiveness—which comes without artificial sweeteners—aligns with the expanding consumer wellness market's need for better substitutes. The pricing strategy for TOSEBB SF reflects careful consideration of various factors, including production costs, desired profit margins, market competition, and customer willingness to pay. By setting a competitive MRP of INR 137, MN Pharmaceuticals aims to balance profitability with market dynamics, offering fair margins to distributors and retailers.

In navigating the pricing strategy for TOSEBB SF, MN Pharmaceuticals is poised to encounter a set of challenges inherent in the dynamic pharmaceutical market. Firstly, determining the optimal price requires a delicate balance between covering production costs, ensuring profitability, and remaining competitive. Fluctuations in raw material costs, coupled with varying production volumes, can complicate the decision-making process. Managing fair margins for distributors and retailers while adjusting to shifting market circumstances further adds complexity. Additionally, tax regulations and compliance with local pricing legislations demand meticulous attention to ensure a transparent and legally sound pricing structure.

Furthermore, customer preferences, competitor product introductions, and changing health trends all affect the market acceptability and demand for sugar-free cough syrups. The success of TOSEBB SF will depend on MN Pharmaceuticals' ability to assess customer willingness to pay for a sugar-free alternative, considering the rising popularity of herbal remedies. Navigating these challenges requires continuous monitoring, adaptability to consumer feedback, and an agile response to emerging market dynamics. As MN Pharmaceuticals embarks on this pricing journey, staying attuned to the evolving landscape and swiftly addressing challenges will be crucial in ensuring the sustainable success of TOSEBB SF in the competitive pharmaceutical arena.

Case Questions:

1. What recommendations would you provide to MN Pharmaceuticals regarding their pricing strategy for Toseeb SF?
2. What were the primary factors considered by MN Pharmaceuticals in determining the optimal cost for TOSEBB SF?
3. How did MN Pharmaceuticals arrive at the decision to set the MRP of TOSEBB SF at INR 137? What factors influenced this pricing strategy?
4. Comment on whether the company should go with the decided price.

Exhibits

Exhibit1:www.mnpharmaceuticals.in

Exhibit 2: Products Menu page

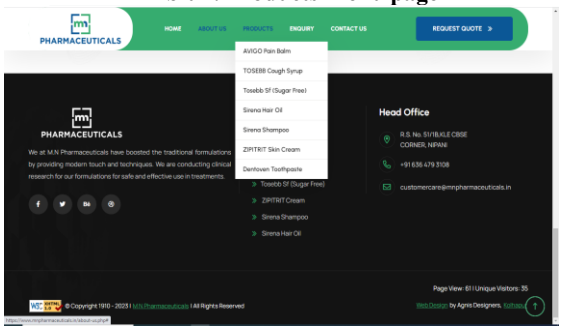


Exhibit 3: TOSEBB Cough Syrup

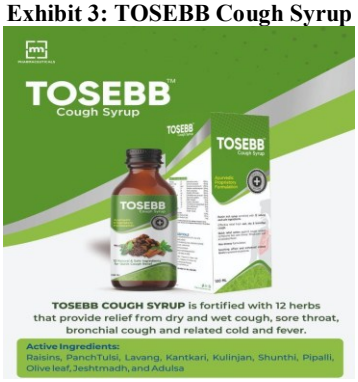
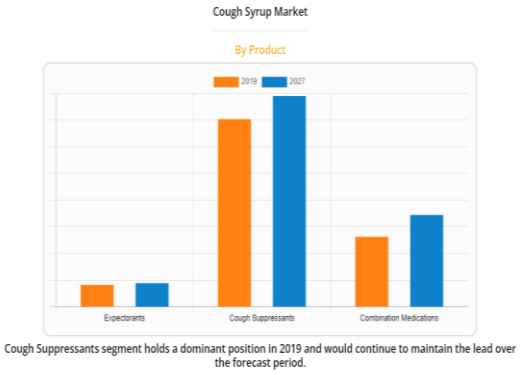


Exhibit 4 : TOSEEB SF (Sugar Free)

Exhibit 5 The market for Ayurveda products in India: trends, size, growth, opportunity, and forecast for 2023–2028

Exhibit 6 https://www.allidmarketresearch.com/cough-syrup-market-A10312

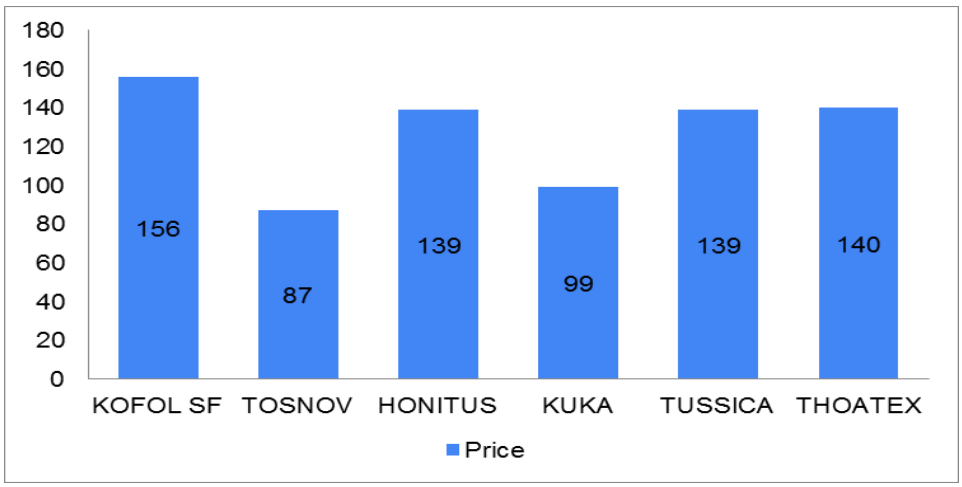


Cough Suppressants segment holds a dominant position in 2019 and would continue to maintain the lead over the forecast period.

Exhibit 7: **Top Ayurvedic Sugar free Cough Syrups in Market**

Ref: https://www.amazon.in/sugar-free-cough-syrup/s?k=sugar+free+cough+syrup

Exhibit 8: Price list of Ayurvedic Sugar free Syrup in Market



Teaching Note:

This case study centers on MN Pharmaceuticals' quest to devise an effective pricing strategy for Toseeb SF, a ground-breaking sugar-free Ayurvedic cough syrup. Faced with the challenge of balancing the product's unique attributes, market competitiveness, and consumer preferences, the company aimed to set an optimal price that ensures profitability while resonating with the target audience. The study unfolds against the backdrop of a growing demand for sugar-free alternatives and a surge in the Ayurvedic cough syrup market.

The primary problems encountered in this pricing endeavour include determining the optimal price, managing margins for distributors and retailers, navigating tax regulations, and gauging market acceptance and demand. Striking the right balance between covering production costs, setting competitive prices, and ensuring profitability poses a multifaceted challenge. Additionally, factors such as fluctuating raw material costs and changing market conditions contribute to the complexity of the decision-making process.

MN Pharmaceuticals' solution involves a meticulous approach, considering various factors like production costs, profit margins, market competition, and customer willingness to pay. The company opted for an MRP of INR 137, taking into account fair margins for distributors and retailers. However, the ongoing challenges emphasize the need for continuous monitoring, adaptability to market dynamics, and a responsive strategy to address emerging issues. The case study provides valuable insights into the dynamic nature of pricing strategy formulation for innovative healthcare products and underscores the importance of agility in adapting to evolving market landscapes.

1. Recommendations for MN Pharmaceuticals regarding their pricing strategy for TOSEBB SF:

- **Market Research and Competitive Analysis:** Conduct thorough market research to understand competitors' pricing strategies for similar sugar-free cough syrups. Analyze consumer preferences and willingness to pay in the target market.

- **Flexible Pricing Approach:** Adopt a flexible pricing approach that allows adjustments in response to changing market dynamics. Consider periodic evaluations to ensure competitiveness and adaptability to shifts in production costs.
- **Consumer Education and Value Proposition:** Emphasize the unique value proposition of TOSEBB SF as a sugar-free Ayurvedic cough syrup. Educate consumers about the benefits of the product and why it justifies a premium in comparison to conventional cough syrups.
- **Collaboration with Distributors and Retailers:** Collaborate closely with distributors and retailers to understand their perspectives on pricing. Ensure that the proposed margins for distributors and retailers are fair and in line with industry standards.
- **Transparent Pricing Structure:** Maintain transparency in the pricing structure, including all applicable taxes. Clearly communicate the reasons behind any price adjustments, such as changes in production costs or improvements in the product.
- **Monitoring Regulatory Compliance:** Stay informed about tax regulations and pricing legislation to ensure compliance. Regularly audit the pricing structure to confirm adherence to legal requirements and to avoid potential regulatory issues.
- **Adaptability to Consumer Feedback:** Encourage and actively seek consumer feedback on the pricing of TOSEBB SF. Use this feedback to make informed adjustments to the pricing strategy, ensuring that it aligns with consumer expectations and preferences.
- **Strategic Positioning:** Leverage the growing trend towards natural and herbal remedies. Strategically position TOSEBB SF as a premium, sugar-free Ayurvedic cough syrup, highlighting its efficacy and benefits over conventional alternatives.
- **Scenario Planning for Production Costs**: Conduct scenario planning for potential fluctuations in production costs. Have contingency plans in place to address unexpected changes, ensuring that the pricing strategy remains resilient.
- **Continuous Monitoring of Market Trends:** Implement a system for continuous monitoring of market trends, competitor actions, and consumer behaviours. This proactive approach enables MN Pharmaceuticals to make timely adjustments to the pricing strategy.
- **Promotional Pricing and Discounts:** Consider promotional pricing or discounts during product launches or specific marketing campaigns. This can help create initial market traction and attract price-sensitive consumers.
- **Long-Term Value Consideration:** Evaluate the long-term value of TOSEBB SF in the market. Consider building brand loyalty through consistent quality, customer satisfaction, and strategic pricing that reflects the product's value over time.

2. MN Pharmaceuticals considered several primary factors in determining the optimal price for TOSEBB SF:

- **Production Costs:**
  Consideration: MN Pharmaceuticals factored in the costs associated with manufacturing the sugar-free cough syrup, including raw materials, production processes, and quality control measures.

- **Profit Margins:**
  Consideration: The Company took into account the desired profit margins to ensure the sustainability and profitability of TOSEBB SF in the market.

- **Market Competition:**
  Consideration: MN Pharmaceuticals analysed the competitive landscape to position TOSEBB SF effectively. They likely considered the pricing strategies of existing sugar-free cough syrups and similar products in the market.

- **Customer Willingness to Pay:**
  Consideration: Understanding the target market's willingness to pay for a sugar-free alternative was crucial. MN Pharmaceuticals likely conducted market research to gauge consumer preferences and affordability.

- **Negotiations with Distributors and Retailers:**
  Consideration: MN Pharmaceuticals factored in the margins provided to distributors (10%) and retailers (20%). Negotiations and discussions with these key stakeholders were likely considered in determining the optimal price.

- **Taxes and Government Regulations:**
  Consideration: The Company navigated the tax landscape, accounting for GST and other applicable regional/municipal taxes. Compliance with local pricing legislations and regulatory restrictions was also a factor.
- **Fluctuations in Market Conditions:**
  Consideration: MN Pharmaceuticals anticipated and adjusted for fluctuations in market conditions, including changes in raw material costs, production volumes, and other dynamic factors that could impact pricing.

- **Adapting to Consumer Trends:**
  Consideration: The Company considered evolving consumer trends, especially the growing preference for herbal and natural remedies. TOSEBB SF's positioning as a sugar-free Ayurvedic cough syrup aligns with these trends.

- **Covering All Costs:**
  Consideration: MN Pharmaceuticals aimed to set a price that covered all costs, including production, distribution, and taxes, while providing room for profitability.

3. Factors Influencing the Price Decision:

- **Production Costs:** MN Pharmaceuticals likely considered the costs associated with manufacturing TOSEBB SF, including the procurement of Ayurvedic herbs, formulation, testing, and packaging. Setting the MRP at INR 137 may be an attempt to cover these production costs.

- **Profit Margins:** The decision might be influenced by the desired profit margins of MN Pharmaceuticals. A balance must be struck between profitability and market competitiveness. The specific percentage of profit margin chosen wasn't provided in the case study, making it challenging to assess whether it aligns with industry standards.

- **Competitive Pricing:** MN Pharmaceuticals likely conducted a competitive pricing analysis to position TOSEBB SF within the market. The choice of INR 137 may be a result of aligning with or differentiating from the pricing of similar sugar-free cough syrups in the market.

- **Customer Willingness to Pay:** Understanding the willingness of the target market to pay for a sugar-free alternative is crucial. INR 137 might be a price point deemed acceptable by the target demographic based on market research or consumer surveys.

- **Distributor and Retailer Margins:** The decision also considered providing 10% margin to distributors and 20% margin to retailers. These margins aim to incentivize distributors and retailers to promote and sell TOSEBB SF.

- **Tax Considerations:** The case mentions the inclusion of taxes like GST in the pricing strategy. The decision to set the MRP at INR 137 likely considered complying with tax regulations while ensuring the product remains affordable.

4. Factors Supporting the Proposed Price (INR 137):

Cost Considerations: The pricing decision takes into account production costs, desired profit margins, and market competition. If the proposed price covers these costs while allowing for profitability, it aligns with sound business principles.

Market Competitiveness: A price of INR 137 should be assessed in the context of competitors' pricing in the sugar-free cough syrup market. If it is competitive and positions Toseeb SF effectively, it strengthens the case for adopting this price.

Consumer Willingness to Pay: Understanding consumer behaviour and willingness to pay for a sugar-free Ayurvedic cough syrup is crucial. If market research indicates that consumers perceive value in Toseeb SF and are willing to pay INR 137 for its unique benefits, it supports the proposed price.

Distribution Margins: The decision to provide 10% margin to distributors and 20% margin to retailers contributes to a fair distribution structure. If these margins align with industry standards and maintain positive relationships with distributors and retailers, it supports the proposed price.

Challenges and Considerations:

Market Acceptance: The success of Toseeb SF hinges on market acceptance. If initial market responses or consumer feedback suggest resistance to the price, it may warrant a reassessment.

Dynamic Market Conditions: Given the dynamic nature of the pharmaceutical market, MN Pharmaceuticals should stay vigilant to any shifts in market conditions, including competitor actions, regulatory changes, or fluctuations in raw material costs.

Adaptability: The Company's ability to adapt the pricing strategy based on ongoing market analyses and consumer feedback is crucial. If there's evidence that adjustments are needed, the company should be open to revisiting the pricing strategy.

Recommendation: While the proposed price of INR 137 seems reasonable based on cost considerations and market factors, MN Pharmaceuticals should closely monitor the initial market response. If there are indications that consumers find the price too high or if competitors adjust their pricing significantly, the company may need to consider adaptability and potentially revise the pricing strategy in response to market

dynamics. Regular assessments and flexibility in the pricing approach will be key to ensuring the sustainable success of Toseeb SF in the competitive pharmaceutical market.

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Illness Anxiety Disorder: A Case Study of a Woman struggling with Health Anxiety, India.

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Basic Case History of Sharada:
37-year-old Sharada thought she first began to worry about her health at about age 10, when she was playing with some friends after school. During that moment, she suddenly felt like she realized her own mortality. She was playing kickball with her friends when this heavy feeling struck her, and it stayed with her throughout the entire game. While her friends were having a great time and fully engaged in the fun, Sharada couldn't shake off her uneasy feeling. Later, when she got home, she found her mother doing her usual chores, and slowly, the feeling started to fade away.

Since that moment of awakening, Sharada felt that her emotional life was never quite the same. Even though she was generally happy and well-adjusted, she became more sensitive to life's negative possibilities, unlike others. Sometimes, while at school or playing with friends, she'd suddenly worry about her family being in a car accident without her knowing. This worry would linger throughout the day until she could confirm everything was fine at home. Despite these unsettling moments, they didn't define Sharada's childhood. Overall, her childhood was positive, and her family was loving. Her father worked as a salesman, providing a comfortable life, while her mother was a full-time homemaker. Sharada did well in school, attended a prestigious college and law school, and eventually worked as a lawyer in a big city. At 30, she became house counsel in a brokerage firm

Sharada had dated various men during her twenties. However, at 32, she felt anxious about not finding a husband and rushed into marriage with a man she knew she should avoid. He identified as a musician and played with his rock band at underground clubs. Although his lifestyle seemed thrilling, a closer look would have revealed his immaturity, self-centeredness, and lack of stable income. Despite these red flags, Sharada overlooked them initially. After marrying against her family's advice, Sharada faced the harsh reality of their life together. She found herself supporting a self-centered partner who showed no signs of becoming an equal contributor. While she went to work, he stayed in bed, and the house was left messy with dirty dishes upon her return. As time passed, it became evident that he used a significant portion of her earnings to support his harmful habit. Despite being a successful lawyer, Sharada felt overwhelmed by her marital troubles, both personally and legally. Eventually, she humbly reached out to her family for help to break free from her situation. They quickly stepped in and supported her in getting a divorce and removing the man from her life.

After the divorce, Sharada experienced a period of despair and sought counseling for about a year. Through therapy, she realized that she tended to be drawn to men who were "interesting, offbeat, or unpredictable," even though these qualities didn't align with her long-term goals of having children, financial stability, and a stable home life. During counseling, she started considering men whom she would have previously dismissed as too dull, and she found that the boredom she experienced was often self-imposed. Eventually, at 33 years old, she met Swastik, a high school science teacher, and they got married six months later. Their son, Sagar, was born a year after their marriage.

For the first 34 years of Sharada's life, she didn't worry too much. Sometimes she'd get concerned about her family's safety or health, but it wasn't a big deal. It wasn't until she got pregnant that her worries started getting more serious. During her pregnancy, she visited the doctor regularly and read a lot of books about being pregnant. She also had all the usual tests like blood tests and sonograms. But as time went on, she

started to notice all the things that could go wrong with her health or the baby's. Every month, the tests and changes in her body made her more and more anxious, and only the doctor's reassurance or good test results could calm her down. When her son, Sagar, was born, Sharada felt peaceful for a while because he was healthy. But soon after, she started worrying about her own health again. Over the next 2½ years, her worries about her body got worse. Although they weren't always there, she had more and more times when she was sure she had a serious illness that could even be fatal.

Most of the time, Sharada felt okay. But when one of her health fears hit, she couldn't relax until she got reassurance from a doctor. Sometimes, just one visit to the doctor was enough to calm her down, but other times she had to see many different doctors. Because she kept calling them and going back for more visits, some doctors got annoyed with Sharada and didn't want to see her anymore. These visits to the doctor weren't fun for Sharada at all. Actually, they were some of the worst things she could imagine doing. She only went because she didn't know how else to deal with her terrible fears.

One day in November, Sharada woke up feeling a strange numbness in her right arm. Worried, she tried touching her skin in different places to see how much feeling she had lost. She could still feel something, but it didn't feel normal. Sharada thought about asking her husband, Swastik, for his opinion. But she hesitated because just the day before, she had asked him to feel a bump on the back of her skull to see if it had always been there. She even made him feel their son's skull to compare. And the day before that, she asked Swastik about a pimple on her neck. He said it seemed like a normal pimple and told her to wait a day before worrying. Thankfully, the pimple was almost gone the next day. But the numbness in her arm worried her a lot. She remembered reading an article in the newspaper a few weeks ago about multiple sclerosis, which usually affects people between 20 and 40 years old. Sharada was scared to realize she was in the most at-risk age group. When she read the article, she was relieved that she didn't have any of the symptoms listed, like weakness or vision problems. But now, she was feeling numb, and it scared her.

Sharada couldn't hold back her fear and woke up her husband, Swastik, to tell him about it. As she talked, she could see that Swastik didn't take her fear too seriously because she had been scared before over things that turned out to be nothing. He tried to make her see that she might not be seriously ill because she could still move her arm and feel things with it. Just like before, he suggested she wait a day before calling the doctor. Swastik’s opinion did not hold her for long, however. The article had explicitly stated, Sharada recalled, that the initial symptoms of multiple sclerosis could indeed be minor, but the illness to follow could be devastating. If the disease progressed rapidly, she could be reduced to a wheelchair within a few years.

Sharada decided to see her doctor that day. She raced to get herself and her son dressed and on their way. She began her day at the nursery school, chatting with the teachers and other parents as usual in the morning. However, while there, all she could think about was how lucky they were to be in good health, whereas she might now be gravely ill. Sharada then gave Sagar a kiss good-bye and raced to her office. Sharada called the doctor and was relieved to learn that she could get an appointment at 11:00 a.m. She left immediately, and when she arrived at the doctor’s office, she settled down in the waiting room, nervously flipping through a magazine. While she waited, anxiously anticipating the judgment on her symptoms, Sharada thought about her difficulty. She wondered why she was having these scary symptoms. She found it strange that she, who cared so much about health, would have these issues. She remembered a story about people who survived disasters like airplane hijackings. They said they used to care about things like jobs and money, but after surviving, they realized family and health were most important. She thought, "I already know this without going through a disaster. I've always cared about my family's health. So why am I dealing with this? Why can't it happen to someone who needs a wake-up call, like a smoker or someone too focused on their career?"

The doctor came into the waiting room and took Sharada into the office. Sharada explained about the numbness, and the physician performed a standard neurological exam. All findings were normal. When Sharada raised the question of multiple indurations, the doctor replied that it couldn't be discounted completely— a statement that visibly alarmed her. Seeing Sharada's distress, the physician hastened to remind her that the results of the neurological exam were normal; therefore, it was unlikely that her numbness was serious. The physician suggested that they wait a few days to see whether the numbness subsided before conducting any further investigations.Sharada left the office feeling not at all reassured. She wanted a definitive answer. Almost immediately, she made another appointment, this time with a neurologist, who might be better able to assess her condition. By the time she got to see the neurologist a week later, the numbness had disappeared. Still, she kept the appointment just to hear what the neurologist would say. After an exam and several tests, the specialist, too, concluded that the numbness was not a serious problem; perhaps a muscle ache had caused the feeling of numbness.

The numbness did not reappear, and about a week later, Sharada's concern with multiple sclerosis had more or less subsided. She got back into her regular routine of work and family and felt happy and content that she had no symptoms to worry her. Indeed, under these conditions, she was at complete peace with the world. The way she saw it, she had a wonderful husband and son, 2 loving parents, and a job that provided a reasonable living and a sense of doing something worthwhile. If only things could just stay this way, with no more symptoms or illnesses to worry about. Things did stay that way for about 2 weeks, during which time Sharada maintained her sunny outlook. Then one morning she awoke with blurry vision and became frantic that it might be another sign of multiple sclerosis. She asked her husband to take Sagar to school and then called in sick, determined to find an ophthalmologist who would see her that day.

She was finally able to obtain an appointment for that afternoon. Over the course of the morning, the blurriness disappeared. Still, she was deeply concerned because she had learned, during a morning of searching online, that the symptoms of multiple sclerosis can come and go. The eye doctor checked Sharada's eyes, especially the optic nerve because she had concerns about multiple issues. He told her everything looked normal and that the blurriness was probably just a temporary problem caused by eye irritation or a minor infection. He gave her eye drops for the infection. Sharada felt relieved and thanked him before leaving. When she got home, she thought about the last three years. She didn't like how she seemed helpless whenever she worried about her health, especially when she wanted to appear strong for her son. She also noticed that Swastik was becoming more frustrated with her. Recently, after a period of intense worry, he even suggested she seek professional help for her problem. That evening, Sharada told Swastik that she was indeed ready to seek therapy. With his encouragement, she soon made an appointment with a psychologist, Dr. Gouri, through the referral service of her managed care network.

A Spouse's View living with imagined Illness:

When Sharada informed Swastik that she was ready to seek therapy, he felt as if he were being given a "new life." He had just about given up hope of his wife ever improving—or of her taking the steps needed to improve. For the most part, he had kept his exasperation to himself. He loved Sharada and thought it would be cruel to belittle her or threaten her. Besides, when he did express upset or anger, things always seemed to get worse. She became more and surer that a serious sickness was taking over her body. It was usually best to calmly reassure her and gently suggest that she might be overreacting.

On the outside, Swastik tried to be calm and understanding. But on the inside he was boiling. He was able to hide his feelings—at least some of them—from Sharada, but he would periodically open up to a close friend or family member. Indeed, he felt he had to open up or else he would explode. Just a week ago, he had confided to his brother that he was, for the first time, considering seeking a separation. Her behaviour is truly unbearable. I mean, I'm not sure I can continue in the marriage. You know, she never gave any indication that she had problems this serious when we first met. We fell in love, and everything seemed

wonderful. I guess that's what comes from marrying someone you only known for 6 months. I knew we were rushing things, but was so sure. I never thought there could be any reason I wouldn't want to spend the rest of my life with her.

Everything was going well for about a year. Then she began talking about her silly "medical problems." It began with worries like, "The baby will be deformed... He'll be stillborn... He'll die within 6 months." At first I worried right along with her because she seemed so sure that something was going to be wrong. I thought it just might happen. But then the doctors told us everything was going to be fine, and her attitude was, "What if they're wrong? What if he dies?" Then I thought, well, she's just nervous about becoming a mother. But the sheer strength of her worries finally convinced me that her thinking was really disturbed. Then again, I told myself that the pregnancy must be wreaking havoc on her entire system and that she'd soon be back to normal. But after Sagar was born and he was fine, I realized that she wasn't going to get any better. It was cancer one week and tuberculosis the next. She might have a brain tumour during the day and a curvature of the spine by night-time. Do you know how hard it is to repeatedly explain that the world isn't going to collapse, to repeatedly remind your wife that she's not gravely ill? It's been like living with Chicken Little, constantly screaming that the sky is falling. When she panics, even though I realize that she's not right and that there's no real problem, I can't help but get caught up in her emotions at first. Sometimes she's even able to convince me that this time it's for real—it's a problem that will change everything. But then it soon becomes obvious that it's the same old story—another false alarm—and I'm back to my usual job of trying to convince her that everything's going to be fine.

I guess what upsets me the most is that the woman I married no longer seems to be an adult. Here we are trying to raise a child, and she is behaving like a child herself. It's both surreal and depressing when you have to hold your wife while she cries in your arms because she has a headache or a cold that won't go away. I also get nervous when I think about what this may do to Sagar if it continues. When she puts him to bed at night or leaves him at school, she sometimes gets teary-eyed and says things like, "Remember that Mommy loves you always, even if something happens to me!" I mean, for heaven's sake. When I think about what she's starting to put him through and how he may feel when he really starts to understand what she's saying—well, that frankly makes me mad. It's got to harm him, maybe seriously. How anxious, nervous, or all-around screwed up is he going to be?

After three years of this nonsense, I think I've had enough. I don't need this nightmare, and I certainly don't want my son exposed to it. But then again, I love her, and I don't want to hurt her. And really, I don't want to leave her. I just want her to change and for our lives to become normal. But then I come back to the fact that I'm running out of steam. I don't know how much longer I can be the patient, understanding husband, especially when I don't understand anything about this. Fortunately, Swastik didn't have to act on his thoughts of separation. It was as if he and Sharada had reached bottom at the same time. When she came to him, saying that she was ready for therapy, he knew that this was the right direction—not separation or arguments or accusations. Of course, even as Sharada made her appointment with the psychologist, Swastik realized that there were no guarantees that everything would turn out all right. But at least she—and he—now had a chance.

After hearing Sharada's story of worrying about illnesses and feeling anxious repeatedly. Dr. Gouri concluded that the young woman's condition met the DSM-5 criteria for a diagnosis of illness anxiety disorder

DSM-5-Tr- Diagnostic Criteria
Kindly go through DSM-5-Tr for the details.

Recommendations:

Sharda's Diagnosis-
For the past three years; her somatic symptoms were mild (e.g., transient numbness or blurry vision); she was having higher anxiety about her health; and this preoccupation had led her to engage in excessive health-related behaviours such as checking her body signs of illness and making frequent medical appointments.

Dr. Gouri became convinced of the similarities between this disorder and O.C.D. after studying clinical research. In this disorder, a patient's anxious and intrusive focus on bodily sensations and physical symptoms is often equivalent to the obsessions with germs or disaster displayed by patients with obsessive-compulsive disorder. Similarly, the efforts of such patients with I.A.D. to cope with fears of illness—repeatedly seeking reassurance, seeing doctors, reviewing medical texts, and monitoring their physical state—are reminiscent of compulsions.

Dr. Gouri decided to use the psychological approach first and to refer the client for drug therapy only if psychotherapy failed. Exposure in the treatment of this disorder involves bringing the person into contact with the stimuli—sensations, thoughts, or images—that provoke illness anxieties, with the goal of extinguishing those anxieties. In the response prevention component of treatment, clients with this disorder are prevented from performing the behaviours—for example, reading medical information online or seeking reassurances—that they usually turn to when they fear illness.

Session 1:
At the first session with Dr. Gouri, Sharada related her history. Not now in one of her "crises," she was in good humour as she discussed her difficulties. She told the psychologist that in between the crises she had no real complaints. She enjoyed her work, loved her family, and was generally an upbeat and enthusiastic person. Still, she always felt mildly apprehensive, as she knew the slightest thing could set her off and plunge her into an acute and terribly painful anxiety episode.

As the first step in the treatment, Dr. Gouri explained to Sharada **the theoretical treatment model.** To start, she cited the role of Sharada's self-scrutiny, reassurance seeking, reading of medical material in maintaining her problem. The psychologist clarified that Sharada's actions were a natural response to her fears, which is common for individuals with illness anxiety disorder. However, although these behaviours temporarily eased her anxiety, they ultimately reinforced her fears in the long term.

Thus, the prior step in the treatment, Dr. Gouri explained, was to begin limiting some of these "coping behaviours" (the prevention component of the treatment).

First, Dr. Gouri suggested that Sharada begin documenting her health worries by keeping a written record. This record would include details such as the symptom or sensation that triggered her concern, her initial reaction to it, how she tried to manage her anxiety, and the outcome of her attempts. Then, Dr. Gouri introduced the exposure aspect of the therapy.

She said that generally it would be a good idea for Sharada to limit her coping behaviours (for example, asking Swastik for constant reassurance) whenever she was amid a crisis; this resistance would help lessen her anxiety over time. In addition, rather than just wait around for crises to occur, therapy could speed along the process by causing conditions that produced illness anxiety and regularly exposing Sharada to such conditions. At the same time, the psychologist noted that causing such conditions presents logistical problems—one cannot readily.

I.A.D. can present a clinical picture very similar to that of S.S.D that is somatic symptom disorder, the somatic symptom and related disorder marked by one or more somatic symptoms which are impacted in daily life. Manufacture unexplained physical symptoms—so the 2 of them would have to develop some type of substitute, such as a visualization exercise, in which Sharada would imagine in detail having such symptoms.

Sharada said she could see the value in exposure exercises, even remarking, "I guess it's the same as what you do if you're afraid of snakes—have more and more contact with snakes until the fear diminishes." At the same time, she expressed doubt that just visualizing herself ill would have any emotional impact. She assumed that there would be no therapeutic benefit in an exposure exercise unless there was some real anxiety to extinguish. Dr. Gouri and Sharada agreed to give this question some thought for the coming week. In the meantime, Sharada would keep the log of her symptoms and responses to them.

Session 2:
Sharada returned with blank record forms, saying she simply had not been troubled by any symptoms during the week. She noted that this was not unusual for her. She could go for a couple of weeks without a crisis occurring. Dr. Gouri said she would like to devote the session to 2 main matters. First, she wanted to devise some specific guidelines for limiting Sharada's coping behaviours, should any be provoked in her real life. Second, she would like to work out an exposure procedure, especially since Sharada was not having any spontaneous fears
That might be used for therapeutic purposes. Regarding the guidelines for limiting coping behaviors, the psychologist suggested the following:

1. Stop doing online medical searches, whether provoked by symptoms or not.
2. Stop taking blood pressure at home.
3. Refrain from seeking reassurance from family or friends if a symptom arises.
4. Refrain from calling the doctor for at least 2 days when faced with symptoms that cause only minor discomfort.

Sharada agreed to try to observe these guidelines if any symptoms arose. Afterward, she and Dr. Gouri talked about an exposure technique. Despite her convictions, the client insisted that picturing herself with an illness wouldn't evoke enough anxiety. She explained that her fears didn't have a visual aspect, and even attempted to visualize herself unwell during the session with her eyes closed, but struggled to imagine it vividly. She described it as feeling forced and unnatural. Accordingly, to help develop an appropriate exposure procedure, Dr. Gouri asked Sharada to explain the exact sequence of events when a spontaneous fear of illness arose. Sharada replied that the process usually began with her noting a particular abnormality in her appearance or an abnormal sensation; next, she thought of a dreaded illness that might be implied by the abnormality; and then She frantically sought reassurance, usually first by approaching her husband, doing online searches, and then by calling or visiting the doctor.

Dr. Gouri devised an exposure procedure modelled on this natural sequence. She suggested a written exercise, as follows: Three times a day for the next week, Sharada was to take time out from her normal activities and briefly survey her body's appearance and sensations. Then, based on a particular attribute that she identified, she was to manufacture a particular illness fear (a different one each time) and write it down in a notebook. By doing this three times a day, she would produce 21 illness fears by the weekend. Should the fear be great enough to provoke a desire to engage in any coping behaviors, Sharada was to follow the guidelines described earlier in the session for limiting the behaviors? To test the exercise, Dr. Gouri asked Sharada to carry it out right then. Sharada paid attention to her body for a moment and noticed a slight tingling feeling in her right foot, probably because she had been sitting with her legs crossed for a while. Then, Dr. Gouri asked Sharada to think about a serious illness that could be causing the symptom. Sharada

was nervous about saying it out loud because it would make her very anxious. However, the psychologist encouraged her to continue. Eventually, in a quiet voice, Sharada suggested that the tingling might be a sign of multiple sclerosis.

Dr. Gouri praised Sharada for this effort and suggested that the client next carry out the exercise on paper, following the procedure outlined for the coming week's assignment. Accordingly, Sharada wrote down: "(a) my foot is tingling." Next, the client should have written: "(b) I have multiple sclerosis." But once again, Sharada hesitated. She said that she was seized with the fear that writing down the words might become a self-fulfilling prophecy. Dr. Gouri empathized with Sharada's concern but then led the client in a rational discussion of whether writing down an illness could actually have any role in producing it. Sharada replied that intellectually she knew it was nonsense, but somehow writing it down filled her with fright. Yet, at the same time, she felt intuitively that writing down the sentence—"I have multiple sclerosis"—would be therapeutic for her. All of a sudden, Sharada said that she wanted to go ahead and do the written exercise. She thought that if somehow she could accomplish it, she would feel like she was defying her fears. She took the pen in her hand and wrote the sentence down.Dr. Gouri and the client agreed that Sharada would continue to carry out the exercise three times a day in the coming week, each time trying to think of a new illness or at the very least not using the same illness more than once in a day.

Session 3:
Sharada said she did the activity every day. At first, it made her feel really stressed. Whenever she wrote about an illness, she felt like she was making it happen to herself. But as the week went on, she started feeling less scared. She even felt more confident about it. The more she wrote, the less scared she felt.

Dr. Gouri reviewed the entries that Sharada had made, one by one, and noted the increasing detail and daring as the week progressed. A typical entry for the first couple of days read: "(a) I had poor posture while sitting at a meeting at work," and "(b) I am getting osteoporosis." By the weekend she had written: "(a) I have a slight headache,'' and "(b) It is a brain tumor, which will invade my brain, rob me of my senses, and leave me a vegetable in a hospital bed.". Sharada said she was amazed at what she was eventually able to write. The illnesses were still unpleasant to write about, but the fear was drastically weakened.

As to the general effect of the exercise on her disorder, the client said this was difficult to assess. She had not been subject to any spontaneous illness fears this week, but this was not necessarily a sign of improvement because even in the past she could go for weeks without an incident. Still, this was her 3rd consecutive week without a problem, and it was getting close to the longest time in the past years that she had ever gone without a medical concern. She wondered if the deliberate focus on symptoms had replaced her usual fears. Dr. Gouri said she would also like to discuss the cognitive component of Sharada's fears. They both discussed it in detail regarding it.

Dr. Gouri then went on to explain the other aspect of thinking that produces anxiety, namely, overestimating the likelihood that a particular symptom signifies something serious. The psychologist went over some recent worries Sharada had about her health. None of them turned out to be serious: her arm ache wasn't multiple sclerosis, her eye issue was just a minor infection, and the bump on her head was normal. The psychologist suggested that Sharada should learn to recognize and correct these worries sooner. For the next week, the psychologist proposed a more involved exercise. Sharada would still monitor her body three times a day, noting any symptoms and imagining diseases. But now, she would also imagine the worst-case scenario of each disease to intensify the exercise. Additionally, Sharada would work on a cognitive aspect. After imagining the disease, she would come up with a more realistic explanation for her symptom, using what she learned from past experiences. Thus, for example, if she were to note numbness in a finger, in addition to forming the thought that it could represent multiple sclerosis,

she was to produce a more rational alternative, such as that it probably represented a mere muscle ache or some other less dire condition.

Session 4:
Sharada reported that she had carried out the exercise more or less as prescribed. She did find, however, that on some days she had difficulty coming up with three symptoms and three disease thoughts. She said she didn't know whether this was a sign of progress or just an indication that she was running out of ideas. She thought it could be a sign of progress, for she could never imagine herself at a loss for illness ideas in the past. She also noted that her attempts at decatastrophizing the aftermath felt very artificial at the start of the exercise but that toward the end of the week her renditions seemed more believable.

Sharada also reported that she had her first spontaneous disease fear since treatment began. One night, when entertaining guests, she noticed an abnormal swelling in her armpit. It was quite a noticeable lump, and the thought of a tumour arose. In a departure from her previous habits, she did not excuse herself to conduct a Google search, although she was tempted. Instead, she tried to apply her new cognitive skills by forming a more likely disease thought: "It's just a boil." This held her until the guests left, but then she felt compelled to ask her husband for his opinion. She didn't think that this represented a violation of the prohibition on requests for reassurance, as she didn't feel she was seeking reassurance, just "an unbiased opinion." Swastik, for his part, didn't know what to think.

The next day, Sharada was in a dilemma as to whether to call the doctor or not, in view of Dr. Gouri's guideline concerning waiting 2 days for symptoms that caused only minor discomfort. The symptom did seem quite unusual—even her husband eventually recommended calling the doctor—so Sharada decided to call, although without actively seeking an appointment (another departure from her usual habit).
She followed her usual routine that morning, taking Sagar to school and going directly to work. She then placed a call to the doctor without conveying any sense of urgency, just requesting that the doctor return her call when he was free. The doctor called back about an hour later, and Sharada described the swelling. After a few questions, the doctor concluded that the swelling was probably an infected hair follicle that would clear up in a few days. Sharada felt immediately reassured, which was a distinct departure from the past. Previously, she would have insisted on an appointment.

Sharada felt this experience represented a sign of improvement. Not only had she conducted herself differently, to honour the guidelines, but she also felt different in the process, as she did not experience the usual sense of fear or hysteria. She was pleased with her reaction .Dr. Gouri agreed that the client was showing signs of improvement. She advised her to continue her exercises and adherence to the coping rules for the coming week.

Session 5:
Sharada expressed that she felt she had reached the extent of her imagination because the scenarios in her writing exercises appeared to be becoming increasingly unrealistic. In the realm of natural disease fears during the week, Sharada revealed that she had had only some brief concern with a cough that she developed. Consistent with the guidelines, Sharada did not ask Swastik for reassurance, and she refrained from calling the doctor for 48 hours; her impulse to call was not strong in any event. When 48 hours got over, the cough had subsided somewhat and the impulse to call had gone. Sharada expressed delight, not only at her rather minimal fear, but also at being spared the burden of leaving work, arranging a doctor's visit, traveling to the doctor's office, and enduring the humiliation of the doctor's annoyance. Reviewing her experiences of the past several weeks, Sharada felt that there had indeed been some basic change in her feelings. She believed that if she just continued to observe the behavioural guidelines, she might eventually be able to return to her normal self of three years ago.

The plan for the next week was for Sharada to stop writing down her fears. If she felt worried about a disease without any particular reason, she was supposed to handle it using coping strategies and changing her thoughts about it. Dr. Gouri also mentioned that if the week went smoothly and Sharada could keep following the guidelines, they would plan sessions less frequently in the future.

Sessions 6 - 8:
Sharada came back for the sixth session and shared that her week had been calm with no major issues. She felt more confident that she might have overcome the problem. A review of the week's events indicated that the client had had some appropriate concern over a high fever that her son had developed, but otherwise she had been anxiety free and not preoccupied with her own health. At Session 7, held 2 weeks later, Sharada offered basically the same report, and at Session 8, held a month after that, she still had not had any new illness fears. She and Dr. Gouri agreed to stop therapy at that point, with the understanding that the client would call if any difficulties arose.

Dr. Gouri called Sharada 6 months after the last session, and the client reported she had maintained her progress. There were a couple of times when Sharada felt overly anxious, but she managed them well by using new ways of thinking and following the advice she learned. Overall, she still felt that life could bring unexpected challenges, but it didn't affect her daily life negatively. She also found herself appreciating the good things in life more than before. She felt like she had regained both physical and mental health through the treatment, considering it a great success.

Case Questions:

1. What typically happens before people become overly concerned about their health, leading to illness anxiety disorder?
2. What event precipitated Sharada's preoccupation with her health?
3. Why is illness anxiety disorder labelled as somatic symptom, related disorder as well?
4. What was the first serious disease that Sharada diagnosed for herself?
5. Why did Sharada decide to consult a psychologist?
6. Why did Swastik, Sharada's husband, become frustrated with Sharada to the point of thinking about a separation?
7. What other psychological disorder parallels illness anxiety disorder?
8. What therapy did Dr. Gouri decide to use with Sharada?
9. What were the four steps Dr. Gouri recommended for Sharada to start her written log as part of her treatment?
10. What were the 4 guidelines for limiting coping behaviors outlined by Dr. Gouri?
11. How did the exposure treatment eventually help Sharada?
12. Describe the concept of decatastrophizing as a treatment procedure.
13. How many sessions before Sharada was able to control her illness anxiety disorder?
14. Do individuals with I.A.D. often completely recover, as Sharada did?

Teaching Note & Procedure:

Sr. No	Content	Resource	Teacher's activity	Student's Activity	Mnts
1.	**Introduction**	-	1. To make students aware about psychological conditions	1. To listen	5
2	Presentation Of **Session Objectives**	-	1. To make students understand the objectives of the session	1. To listen	5
3	Phase 1- **Factual Part** Rucha's Case	Exact Half Part Of The Case In Printed Or Soft Copy Format	1. To form a group of students. 2. To ask the students to read the case individually	1. To read the given case. 2. To mark the vital points and make the notes of it.	30
4	Phase 2- **Root Cause** of Case Reflecting On Question Part-	Question Part Of The Case In Printed Or Soft Copy Format	1. To ask students to discuss the case study first. 2. To ask students to read the questions and reflect in the group	1. To discuss the case study in the group with the pointers made. 2. To read the questions and reflect on them by discussing them in the group.	40
5.	Phase 3- **Recommendations/ Treatment**	Recommendation Or Treatment Part Of The Case In Printed Or Soft Copy Format	1. To ask the students to discuss the recommendation treatment, therapy selection part	1. To discuss the recommendation treatment, therapy selection part	30
6.	Phase Iv- **Presentation**	-	1. To ask participants of each group to present the reflections in front of all students. 2. To ask other groups and participants to give inputs on presentation.	1. To select one presenter among the group. 2. To participate and reflect on the discussion.	40
7.	**Key Learning, Summary & Closing Statement**	-	1. To elaborate, summarize the case.	1. To note down the summary.	5

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Make or Buy? : A Strategic Dilemma for Cattle Feed Trading Company with reference to Shinde Traders, Miraj, India.

Mr. Viraj V. Jadhav
CSIBER, Kolhapur, India.

Background:
Mr. Mohan Shinde was born in 1977 to Chandrakant Shinde and Vaijayanti Shinde, a farming couple residing in Bhose, Sangli, and Maharashtra. Despite his humble beginnings, Mr. Mohan demonstrated an innate entrepreneurial spirit from a young age. After completing his B.Sc. in Chemistry from Miraj, he pursued a career in education, aiming to become a teacher by enrolling in a D. Ed program. However, he faced disappointment when he failed the program by a mere two marks.

Early Career Struggles:
Determined not to be discouraged by this setback, Mr. Mohan embarked on a journey of self-discovery. He initially found employment at a chemical manufacturing company, but soon realized that traditional employment did not align with his aspirations and values. Seeking a more fulfilling career path, he transitioned to the pharmaceutical industry and worked as a medical representative. However, the entrepreneurial bug continued to nag at him, and he yearned to build something of his own. He realized that he was not content with his job and decided to return to Bhose to explore opportunities in the family's ancestral agricultural land.

Family and Agricultural Ventures:
In 1999, Mr. Mohan married Asha, and together they have two children—an elder son currently pursuing an MBA and a younger daughter in 11th standard. Recognizing the potential of their ancestral agricultural land, Mr. Mohan decided to join forces with his father in farming. Armed with a vision, he leveraged his expertise and passion for agriculture to transform their modest farm into a thriving business. He gradually expanded the business, and within three years, the number of cattle increased from 6 to 25. This expansion significantly contributed to the growth and prosperity of the agribusiness.
Mr. Mohan's ability to identify opportunities played a crucial role in his success. Recognizing the potential of the agricultural sector, he capitalized on his ancestral land and expanded the farm's operations. Hid journey was not without challenges. From academic setbacks to career transitions, he exhibited resilience and adaptability, refusing to let obstacles deter him from achieving his goals. Mr. Mohan's dissatisfaction with traditional employment led him to embrace entrepreneurship. By harnessing his entrepreneurial spirit, he took charge of his own destiny and created a business that aligned with his passions and values. The support of Mr. Mohan's wife, Asha, and the involvement of their elder son in the family business were instrumental in driving the success of their agricultural venture. The Shinde family's collective efforts and shared vision contributed significantly to their achievements. His philosophy of enjoying life and not being overly consumed by work resonated strongly with his approach to business. He believed in delegating tasks and outsourcing when necessary to maintain a healthy work-life balance.

Start of Entrepreneurial Journey:
Mohan embarked on his entrepreneurial journey by starting a dairy business. He established two dairies, one located on agricultural land and another in a village. Initially, Mohan would purchase cattle feed from Sangli, requiring 50-60 bags for his operations.

Expansion into Cattle Feed Trading:
In 2001, Mohan identified an opportunity to leverage his existing dairy business and expand into the cattle feed trading sector. He decided to open a small grocery shop on his own land in the village and began

stocking 100-150 bags of cattle feed along with other grocery items. His primary target customers were local farmers.

Synergy with Dairy Business: Mohan's strategic move to stock cattle feed in his grocery shop proved highly advantageous. Farmers who supplied milk to his dairy also started purchasing cattle feed from his shop. This symbiotic relationship between the dairy and cattle feed businesses fueled the growth of his cattle feed trading enterprise.

Challenges in the Grocery Shop:
Although the cattle feed trading business experienced rapid growth, Mohan faced challenges in running the grocery shop. The local market already had established players, making it difficult for him to compete effectively. Recognizing these challenges, Mohan made a strategic decision in 2005 to discontinue the grocery shop and focus solely on the cattle feed business.

Unwavering Commitment and Success:
After Mohan's decision to concentrate on cattle feed trading, his business thrived. By capitalizing on his expertise in the dairy industry and leveraging relationships with farmers, Mohan created a niche market for himself. With relentless dedication and continuous improvement, he successfully positioned his cattle feed enterprise as a trusted and reliable source for farmers' needs.
Mohan's entrepreneurial journey from the dairy business to establishing a thriving cattle feed empire showcases the significance of identifying opportunities within existing ventures. Mohan's ability to recognize the potential of the cattle feed trading sector, adapt his business model, and focus on a specific market segment contributed to his success. This case study demonstrates the importance of strategic decision-making, persistence, and leveraging synergies in entrepreneurship management.

About Shinde Traders:
In 2005, Mr. Mohan Shinde established Shinde Traders as a cattle feed and agricultural commodities business. The company implemented a business model based on purchasing commodities at low prices and storing them to sell at higher prices during peak demand periods. This model allowed the firm to capitalize on market fluctuations and generate profit margins. However, the company encountered significant challenges related to the credit cycle and debt recovery when selling cattle feed to end-users, primarily farmers.
As farmers were the end-users of the cattle feed, they often purchased the product on credit due to their seasonal cash flow patterns. Unpredictable agricultural conditions, such as bad farming seasons, floods, droughts, reduced milk production, and fluctuations in milk prices, made it challenging for farmers to repay their debts on time. Consequently, Shinde Traders faced an increasing number of bad debts, affecting the company's financial stability and growth prospects.

Strategic Shift:
To address the credit and debt recovery challenges, Mr. Mohan Shinde recognized the need for a transformative approach. Instead of directly selling cattle feed to farmers, he decided to shift the focus to retailers and distributors. This strategic shift involved the following key aspects:

Building a Distribution Network: Shinde Traders began to build a robust network of retailers and distributors across the region. By doing so, the company created a buffer between itself and the end-users, the farmers. Retailers and distributors acted as intermediaries, purchasing cattle feed from Shinde Traders and selling it to farmers.

Reduced Credit Risk: With the new distribution model, Shinde Traders significantly reduced its exposure to credit risk. The company no longer extended credit directly to end-users. Instead, it worked with retailers

and distributors who had a better understanding of the local market and the financial capabilities of the farmers.

Diversification: Alongside cattle feed, Shinde Traders diversified its product offerings to include other agricultural commodities. This diversification further reduced the company's reliance on the cattle feed business alone and provided a buffer against potential fluctuations in demand.

Improved Cash Flow: The shift to the distribution model improved the company's cash flow situation. As retailers and distributors purchased the cattle feed upfront, Shinde Traders could better manage its working capital and invest in further growth opportunities.

Results and Impact:
The strategic shift proved to be a masterstroke and a life-changing decision for Mr. Mohan Shinde and Shinde Traders. The benefits of the new approach were evident in the following ways:

Reduced Bad Debts: By dealing with retailers and distributors instead of end-users directly, Shinde Traders significantly reduced the risk of bad debts and improved its overall financial health.

Increased Sales: The expanded distribution network resulted in increased sales as the company's products reached a larger customer base, including regions previously untapped.

Enhanced Market Understanding: Through engagement with retailers and distributors, Shinde Traders gained a deeper understanding of market dynamics, customer preferences, and emerging trends. This knowledge allowed the company to tailor its products and services more effectively.

Scalability and Growth: The successful implementation of the distribution model created a scalable business structure. Shinde Traders was able to expand its operations, reach new geographical areas, and establish a strong foothold in the market.

Mr. Mohan Shinde devised a strategy to build a network of distributors and retailers across Western Maharashtra and the Maharashtra-Karnataka border region. By offering commissions to dairies in different villages for referring farmers to his shop, Mr. Mohan successfully expanded the company's customer base and reduced the risk of bad debts. This strategic shift resulted in a significant improvement in the company's balance sheet. Shinde Traders experienced substantial growth, with the number of cattle feed bags sold per month increasing from 400-500 to 4000 bags. The expansion of the company's network of distributors and retailers played a crucial role in achieving this growth. As Shinde Traders continued to grow, Mr. Mohan identified an opportunity to capitalize on the market demand for cattle feed. In 2005, the company launched its own brand of cattle feed, named "Shree Cattle Feed." This move allowed Shinde Traders to establish its presence and build brand recognition in the market. The company focused on two variants of cattle feed: Cotton Seed Cake in 40kg and 50kg bags, and Maize Cake in 45 kg bags. To ensure quality and quantity consistency, Shinde Traders outsourced the manufacturing of cattle feed to local manufacturers. The company procured high-quality maize from the market and provided it to the manufacturers, who produced the cattle feed according to Shinde Traders' specifications. The final product was packaged under the firm's brand, "Shree Cattle Feed." This approach allowed Shinde Traders to maintain control over the quality of its products while leveraging the expertise of local manufacturers.

Partnership with Godrej Agrovet:
In 2010, Shinde Traders achieved a significant milestone by becoming an authorized distributor of Godrej Agrovet, one of the leading brands in the Indian cattle feed market. This partnership further strengthened Shinde Traders' market presence and credibility. By offering a renowned brand alongside its own "Shree

Cattle Feed," the company expanded its product portfolio and gained access to a wider customer base. This strategic collaboration also contributed to the company's financial growth and stability. With the reduction in bad debts and increased sales, Shinde Traders witnessed a significant improvement in its balance sheet. This improved financial condition positively impacted Mr. Mohan's family and the overall sustainability of the business.

Shinde Trader's cattle feed business had been steadily growing, with sales reaching 8,000 bags per month by 2016. However, due to space constraints and transportation issues at the existing location, he made the bold decision to purchase new land and relocate to a larger facility. Mr. Mohan's ability to capitalize on market fluctuations enabled Shinde Traders to earn handsome profits through intelligent buying and selling of commodities. This adaptability to market dynamics was a significant factor behind the company's sustained success. The company's profitability was primarily driven by the buying and selling of commodities, capitalizing on market fluctuations. Mr. Mohan had adopted a successful strategy of purchasing stock in January when raw material rates were low and selling it in August when prices were higher.

The Recession and Initial Setback:
In 2017, the cattle feed industry was hit by a sudden recession, causing prices to plummet. Despite being a calculated risk-taker, Mr. Mohan's decision to purchase additional stock during this period exposed the company to substantial losses amounting to approximately 25 lacs. This setback posed a significant challenge to the business's stability and required Mr. Mohan to reassess his strategy and approach.

Rebuilding the Empire:
Mr. Mohan's resilience and determination shone through as he refused to let the losses deter him. Instead, he focused on rebuilding his entrepreneurial empire. He continued to analyze the market dynamics and observed the ups and downs in commodity prices. Leveraging his experience and knowledge, Mr. Mohan repositioned the company to adapt to the changing market conditions.

Strategic Adaptation:
Mr. Mohan returned to his original strategy of capturing market fluctuations by buying stock in January and selling it in August. However, he made some crucial adjustments to mitigate future risks. He carefully evaluated the market trends, considering the impact of external factors on the cattle feed industry. By maintaining a vigilant eye on commodity prices, he ensured that the company made informed decisions about stock purchases.

Financial Strengthening:
Through his diligent efforts and strategic decision-making, Mr. Mohan managed to turn the tide in his favor. The company gradually regained profitability and financial stability. The increased sales volume, currently standing at over 15,000 bags per month, played a significant role in the company's resurgence. Moreover, Mr. Mohan's shrewd financial management enabled the business to purchase materials with full payment, leveraging cash discounts, while offering customers a credit cycle of 30-40 days.

Challenges in Credit Cycle:
Considering the nature of the business, catering to farmers, the credit cycle remains a challenge. Farmers face their own set of problems and challenges, making it difficult to reduce the credit cycle. However, Mr. Mohan understands the importance of maintaining a balance between providing supports to farmers and ensuring the company's financial stability.

Overview of Cattle Feed Market in India:
The cattle feed market in India has been experiencing robust growth over the past few years. According to market research, the market was valued at around INR 49,000 crores (approximately USD 6.5 billion) in 2020. The market size is projected to reach INR 77,000 crores (approximately USD 10.2 billion) by 2025, growing at a CAGR of approximately 9.5% during the forecast period.

Current Players in the Indian Cattle Feed Market:

Amul (Gujarat Cooperative Milk Marketing Federation Ltd): Amul, a renowned name in the Indian dairy industry, also has a significant presence in the cattle feed market. The company offers a range of cattle feed products that cater to the diverse nutritional requirements of cattle, including dairy cows and buffaloes.

Godrej Agrovet Limited: Godrej Agrovet is a leading player in the Indian cattle feed market. The company offers a wide array of cattle feed products under its brand name "Godrej Cattle Feed." Their products are formulated to provide balanced nutrition and enhance the overall health and productivity of cattle.

Anmol Feeds Pvt. Ltd: Anmol Feeds is a well-established name in the Indian animal feed industry. The company offers a comprehensive range of cattle feed products, including concentrates, supplements, and feed additives. They focus on providing high-quality feed solutions that meet the specific nutritional needs of different types of cattle.

Vimala Feeds: Vimala Feeds is another prominent player in the Indian cattle feed market. The company manufactures and markets a wide range of cattle feed products, including pellet feeds, mash feeds, and mineral mixes. Their products are formulated to ensure optimal growth, milk production, and overall health of cattle.

Cargill India Pvt. Ltd: Cargill is a global leader in the animal nutrition industry and has a strong presence in the Indian market. The company offers a diverse portfolio of cattle feed products that focus on providing balanced nutrition and promoting animal health and performance.

Nandan Animal Husbandry Pvt. Ltd.: Nandan Animal Husbandry is a well-known name in the Indian cattle feed market. The company manufactures and markets a wide range of feed products, including balanced cattle feed, calf starter feed, and feed supplements. They emphasize product quality and nutritional excellence to meet the specific requirements of cattle.

Suguna Foods Pvt. Ltd: Suguna Foods, primarily known for its poultry business, has also ventured into the cattle feed segment. The company offers a range of cattle feed products that cater to the nutritional needs of dairy cows and buffaloes, focusing on improving milk production and overall animal health.

Other Local and Regional Players: In addition to the major players mentioned above, there are numerous local and regional players in the Indian cattle feed market. These players cater to specific regions or niche markets, providing customized feed solutions for local farming practices and requirements.

The Indian cattle feed market is driven by various dynamics that shape competition and innovation within the industry:

Increasing Demand for Nutritious Feed: The rising population and changing consumer preferences have led to an increased demand for high-quality dairy and meat products. This, in turn, drives the need for nutritious and balanced cattle feed that can enhance animal health, productivity, and overall quality.

Technological Advancements and Research: Players in the cattle feed market are investing in research and development to develop innovative feed formulations and manufacturing techniques. These advancements focus on improving nutrient utilization, enhancing feed efficiency, and addressing specific nutritional requirements.

Government Initiatives and Support: The Indian government has implemented various schemes and policies to support the livestock industry, including subsidies on cattle feed and infrastructure development. These initiatives create a favorable environment for market growth and attract investments in the cattle feed sector.

Focus on Quality and Safety: With increasing consumer awareness and stringent regulations, cattle feed manufacturers are placing greater emphasis on quality control and safety measures. Adhering to quality standards ensures the delivery of safe and reliable feed products to farmers and enhances consumer confidence.

Changing Farming Practices and Animal Nutrition Awareness: Farmers are becoming more conscious of the importance of balanced nutrition in livestock farming. This growing awareness has led to a shift towards customized feed solutions that address specific nutritional deficiencies and support optimal animal health and performance.

The Indian cattle feed market is marked by the presence of established players and a competitive landscape. These companies, along with local and regional players, strive to meet the increasing demand for nutritious feed products. Technological advancements, government support, and evolving consumer preferences are driving competition and innovation in the market. With a focus on quality, safety, and tailored nutrition, the players in the Indian cattle feed market are contributing to the growth and development of the country's livestock industry.

Way Forward:
Shinde Traders sells over 15,000 cattle feed bags monthly, with Maize Cake contributing 13% of the total revenue. They currently purchase corn from farmers and outsource the Maize Cake cattle feed manufacturing to a local manufacturer at a cost of Rs. 3/- per kg. The current sales of Maize Cake have reached 2,000 bags per month, and the company anticipates it can increase to 2,100-2,200 bags per month. Shinde Traders has a strong distribution and retailer network established over the past 18 years, and transportation will be handled by their sister arm, Shinde Transports. Shinde Transport has 7 trucks out of which 6 has All India Permit and covers the routes Ahmedabad, Indore and Hyderabad. The cattle feed market in India is projected to grow at a Compound Annual Growth Rate (CAGR) of approximately 9.5% until 2025. This growth presents an opportunity for Shinde Traders to expand their market share in the cattle feed industry. Company expects that its sales will grow at 8% CAGR for next five years. If Shinde Traders decides to manufacture Maize Cake in-house, it will cost them Rs. 1.25/- per kg. They estimate that the current demand for Maize Cake can support a plant capacity of 25,000 bags. Setting up the manufacturing plant will require an investment of around 25 lacs (2.5 million INR). The land required for the plant is available on the Shinde family's property. Gajanan Shinde, the owner's younger brother and a Veterinary Doctor, will oversee the manufacturing plant as he has experience in managing the family's dairy business.

The decision to make in-house or buy Maize Cake cattle feed is a strategic dilemma for Shinde Traders. While buying provides flexibility and avoids upfront investment, in-house manufacturing offers cost savings and greater control. Shinde Traders should carefully evaluate their financial position, market projections, and long-term objectives to make an informed decision that aligns with their growth strategy in the cattle feed industry.

Case Questions:

1. Critically evaluate Mohan Shinde's qualities as a successful entrepreneur.
2. What are the key cost considerations for Shinde Traders when deciding to make in-house or buy strategy?
3. Suggest suitable strategy based on statistical data given in the case.
4. Discuss Challenges and Opportunities for Shinde traders if the company adopts In-house manufacturing of Maize Cake Cattle Feed.
5. Discuss Challenges and Opportunities for Shinde traders if the company continues with Outsourcing of Maize Cake Cattle Feed manufacturing.

Teaching Note:

This case study explores the entrepreneurial journey of Mr. Mohan Shinde, who founded "Shinde Traders" in 2005. Initially, the company dealt with cattle feed and various agricultural commodities, operating by buying agricultural products when prices were low and storing them for later sale when prices were high. However, the company faced a significant challenge in the form of credit cycles and debt recovery due to the sensitive nature of the agriculture business, with farmers as end-users buying cattle feed on credit. This led to a high rate of bad debts as unpredictable climatic conditions and market fluctuations affected farmers' ability to repay their debts. To overcome this obstacle, Mr. Mohan made a pivotal decision to shift the company's focus from end-users to retailers and distributors of cattle feed. This case study analyzes the strategic shift and its impact on the growth and success of Shinde Traders.

This case study explores the strategic decision faced by Mr. Mohan Shinde, the owner of a Shinde Traders; cattle feed trading company, regarding whether to produce cattle feed in-house or outsource it from external suppliers. The case delves into the various factors influencing this decision, including cost considerations, quality control, supply chain management, competitive advantage, and long-term sustainability. Through an analysis of industry dynamics and the company's unique position, students will gain insights into the make-or-buy decision-making process and develop their strategic thinking abilities.

Recommendation - 1

If Company opts for In-house manufacturing following are the opportunities-

Opportunities for Local and Regional Cattle Feed Manufacturers: Navigating the Path to Success Local and regional cattle feed manufacturers in India are poised for significant opportunities in the ever-growing livestock industry. With the nation's increasing focus on agriculture and the government's support for the rural economy, these manufacturers play a pivotal role in meeting the rising demand for high-quality and customized cattle feed solutions. This article explores the various opportunities that lie ahead for local and regional cattle feed manufacturers and how they can leverage them to thrive in this dynamic market.

Catering to Niche Markets:

One of the most significant opportunities for local and regional cattle feed manufacturers is catering to niche markets. Different regions may have specific livestock needs, and these manufacturers can tailor their feed formulations to meet those requirements. For instance, some regions may have a higher concentration of dairy farms, while others may focus on beef or buffalo farming. By developing specialized feed products

for these niche markets, manufacturers can create a loyal customer base and establish themselves as experts in the field.

Organic and Sustainable Feed Solutions:
In recent years, there has been a growing trend towards organic and sustainable agriculture practices. Consumers are increasingly concerned about the source of their food, including livestock products such as milk and meat. Local and regional cattle feed manufacturers can capitalize on this trend by developing organic and sustainable feed options. By sourcing locally grown, non-GMO, and pesticide-free ingredients, these manufacturers can offer environmentally friendly feed solutions that resonate with conscious consumers.

Collaboration with Farmers and Cooperatives:
Local and regional manufacturers have the advantage of being close to their customers – the farmers. By fostering strong collaborations with farmers and agricultural cooperatives, these manufacturers can gain valuable insights into the evolving needs of the livestock industry. This partnership can also help in conducting on-field trials and receiving direct feedback from end-users, enabling them to refine their feed products based on real-time data.

Digital Marketing and E-Commerce:
The digital revolution has transformed the way businesses operate and reach their customers. Local and regional cattle feed manufacturers can leverage digital marketing and e-commerce platforms to expand their reach beyond their immediate vicinity. Establishing an online presence allows them to showcase their products, highlight their unique selling propositions, and attract customers from different regions of the country.

Value-Added Services:
In addition to producing cattle feed, local and regional manufacturers can provide value-added services to their customers. These services may include nutritional consulting, on-farm training, and support for improving livestock management practices. By positioning themselves as partners in their customers' success, these manufacturers can build strong relationships and enhance customer loyalty.

Collaboration with Research Institutes:
Staying up-to-date with the latest advancements in animal nutrition and feed technology is crucial for any cattle feed manufacturer. Local and regional manufacturers can collaborate with research institutes, agricultural universities, and industry experts to access cutting-edge research and scientific knowledge. Such collaborations can help them innovate and develop feed formulations that are based on scientific evidence and best practices.

Government Initiatives and Subsidies:
The Indian government has been actively promoting agriculture and rural development through various initiatives and subsidies. Local and regional cattle feed manufacturers can take advantage of these government schemes to upgrade their facilities, improve manufacturing processes, and access financial assistance for research and development activities.

Export Opportunities:
With India's livestock industry gaining global recognition, there are opportunities for local and regional cattle feed manufacturers to explore export markets. Developing feed products that meet international quality standards and regulations can open doors to new markets and increase their revenue streams.

Recommendation - 2

If company continues to do what it doing i.e. outsourcing of Cattle Feed Manufacturing Business:

In the ever-evolving agricultural industry, cattle farming plays a crucial role in meeting the world's growing demand for animal-derived products. A key component in ensuring the health and productivity of livestock is providing them with high-quality cattle feed. As cattle feed remains an essential aspect of livestock management, manufacturers and livestock owners are continually seeking opportunities to optimize their production processes.

One of the significant trends gaining traction in the cattle feed industry is the outsourcing of manufacturing to local producers. This article explores the various opportunities that arise when cattle feed manufacturers opt to outsource their production to local partners, and how this practice can benefit both parties involved.

Access to Specialized Expertise:

Local manufacturers with a specialization in cattle feed production can offer valuable technical knowledge and expertise to cattle feed companies. This partnership allows access to specialized skills, which may not be readily available within the cattle feed manufacturer's workforce. By leveraging the local manufacturer's expertise, cattle feed companies can benefit from enhanced product quality, formulation, and packaging. This, in turn, can help them gain a competitive edge in the market and increase customer satisfaction.

Scalability and Flexibility:

Outsourcing cattle feed manufacturing provides a level of scalability that is often challenging to achieve with in-house production. Local manufacturers can adjust production volumes based on fluctuating demands, ensuring a seamless supply of cattle feed to meet market requirements. This flexibility allows cattle feed companies to adapt to changing market conditions, seasonal demands, and varying livestock requirements without facing the challenges associated with scaling up or down their own production capacity.

Focus on Core Competencies: Outsourcing cattle feed manufacturing allows companies to focus their resources and attention on core competencies. Instead of investing time, capital, and effort into establishing and managing a production facility, companies can redirect their energies towards activities that align with their strategic goals, such as product development, marketing, and customer relationship management. This strategic outsourcing enables businesses to leverage external manufacturing expertise while concentrating on enhancing their competitive advantage in other aspects of the value chain.

Reduced Operational Risks:

Establishing and managing a cattle feed manufacturing facility entails various operational risks, including market volatility, raw material price fluctuations, and regulatory compliance. By outsourcing to local manufacturers, companies can mitigate these risks as the manufacturers bear the responsibility of managing their operations. Additionally, local manufacturers often have established supplier networks, ensuring a consistent supply of quality raw materials and reducing the procurement risks associated with managing the supply chain.

Recommendation - 3

Current Situation:
Cattle Feed Bags Sold per Month: > 15,000
Share of Maize Cake in Revenue: 13%
Current Maize Cake Sales: ~2,000 bags/month
Outsourced Manufacturing Cost: Rs. 3/- per kg
In-House Manufacturing Cost: Rs. 1.25/- per kg
Investment Required for In-House Setup: Rs. 25, 00,000/-

Planned Capacity of In-House Plant: 25,000 bags
Expected Market Growth Rate (CAGR): ~8% for next 5 years
Calculations and Analysis:

Step 1: Calculate Current Monthly Costs of Buying from the Local Manufacturer
Current Monthly Sales Volume = 2,000 bags
Weight of each bag = 45 kg
Total Monthly Weight of Cattle Feed bought from the Local Manufacturer = 2,000 bags * 45 kg/bag = 90,000 kg
Cost of Buying from Local Manufacturer = Rs. 3/kg
Current Monthly Cost of Buying from Local Manufacturer = Rs. 3 * 90,000 kg = Rs. 2, 70,000/-

Step 2: Calculate Monthly Costs of In-House Manufacturing
Cost of In-House Manufacturing = Rs. 1.25/kg
Monthly Cost of In-House Manufacturing = Rs. 1.80 * 90,000 kg = Rs. 1, 12,500/-

Step 3: Calculate Monthly Savings if Manufacturing In-House:
Monthly Savings = Current Monthly Cost of Buying - Monthly Cost of In-House Manufacturing
Monthly Savings = Rs. 2, 70,000 - Rs. 1, 12,500 = Rs. 1, 57,500/-

Step 4: Calculate the Payback Period for the Investment in Setting Up the Plant:
Assuming all costs remains constant,
Payback Period = Investment / Monthly Savings
$\text{Payback Period} = \text{Rs. } 25,00,000 / \text{Rs. } 01,57,500 \approx 16 \text{ months approximately}$

Step 5: Calculate the Expected Sales Volume after Five Years:
Sales Growth Rate (CAGR) for the next five years = 8%
Expected Sales Volume after five years = Current Sales Volume * (1 + Growth Rate) ^5
$\text{Expected Sales Volume after five years} = 2{,}000 \text{ bags} * (1 + 0.08)^5 \approx 2938 \text{ bags}$

Step 6: Decision:
Considering the payback period of approximately 16 months, the investment in setting up the plant seems viable and financially beneficial for the company.
Considering the significant cost savings and the projected sales growth, it would be advisable for the company to set up its own manufacturing plant rather than continuing to buy from the local manufacturer. The initial investment of Rs. 2,500,000/- can be recovered within the 16 months, and the company can benefit from cost savings and greater control over the manufacturing process in the long run.

Challenges for Company if it starts in-house manufacturing of Maize Cattle Feed:
Local and regional cattle feed manufacturers in India play a vital role in meeting the diverse needs of farmers and livestock owners in different regions. While they enjoy proximity to their customer base and possess valuable local insights, they also face various challenges that can impact their growth and competitiveness in the market. This article delves into some of the key challenges confronting these manufacturers and explores potential strategies to overcome them.

1. Limited Economies of Scale:
One of the most significant challenges for local and regional cattle feed manufacturers is operating at a smaller scale compared to larger national and international feed companies. Limited economies of scale can result in higher production costs, affecting their pricing competitiveness. Scaling up operations may require substantial investments in infrastructure, technology, and marketing.

Strategy: Local and regional manufacturers can explore partnerships or collaborations with other manufacturers or farmer cooperatives to pool resources and achieve economies of scale collectively. Additionally, focusing on niche markets and offering specialized feed solutions can create a competitive advantage that larger manufacturers might not easily replicate.

2. Sourcing Quality Raw Materials:
Ensuring a consistent supply of high-quality raw materials is essential for producing nutritious and balanced cattle feed. Local manufacturers may face challenges in sourcing reliable suppliers for quality ingredients, especially during market fluctuations. Seasonal variations and unexpected price hikes can further impact the availability and cost of raw materials.
Strategy: Building strong relationships with local farmers, agricultural cooperatives, and suppliers can help in securing a stable supply of quality raw materials. Diversifying sourcing locations and exploring long-term contracts with suppliers can mitigate the risks associated with raw material availability.

3. Fluctuating Input Costs:
The volatility of input costs, such as grains, proteins, and vitamins, poses a constant challenge for cattle feed manufacturers. Fluctuations in prices can impact profit margins and the overall financial health of the business.
Strategy: Implementing effective cost management strategies and monitoring market trends can help manufacturers respond to price fluctuations promptly. Utilizing forward contracts and hedging mechanisms can also provide some protection against sudden price changes.

4. Competition from Established Brands:
Local and regional cattle feed manufacturers face stiff competition from well-established national and international feed companies that have strong brand recognition and extensive distribution networks. Competing with these brands for market share can be challenging.
Strategy: Differentiating their products through unique formulations, organic and sustainable options, and targeted marketing can help local manufacturers create a niche for themselves. Emphasizing their connection to the local community and offering personalized customer support can also build customer loyalty and trust.

5. Technological Upgradation:
Adopting modern technologies and equipment is crucial for maintaining product quality, production efficiency, and competitiveness. However, some local and regional manufacturers may face barriers in accessing the necessary funds for technological upgradation.
Strategy: Collaborating with research institutions and industry experts can help manufacturers stay updated with the latest advancements in feed technology without incurring exorbitant costs. Additionally, exploring government subsidies and support programs for technological upgradation can be beneficial.

6. Compliance with Quality Standards: Meeting stringent quality standards and regulatory requirements can be challenging, especially for smaller manufacturers with limited resources for testing and compliance.
Strategy: Investing in quality control and testing facilities can ensure that products meet the necessary quality and safety standards. Seeking certifications from relevant authorities can also enhance the credibility of the products and open up opportunities for export markets.

7. Supply Chain Disruptions:
Disruptions in the supply chain, such as transport issues or natural disasters, can impact the timely delivery of raw materials and finished products, affecting production schedules and customer satisfaction.

Strategy: Implementing robust supply chain management practices, including contingency plans and alternative sourcing options, can help minimize the impact of supply chain disruptions. Developing strong relationships with reliable logistics partners can also contribute to a more resilient supply chain.

Challenges for Company if Shinde Traders continue to Outsource Cattle Feed Manufacturing:
While outsourcing cattle feed manufacturing can offer several advantages, it also comes with its share of challenges. It's important for companies to be aware of these challenges and address them effectively to ensure a successful outsourcing arrangement. Here are some key challenges in outsourcing cattle feed manufacturing:

1. **Quality Control:** Maintaining consistent product quality can be a challenge when outsourcing manufacturing. Companies need to establish robust quality control mechanisms and conduct regular audits to ensure that the outsourced manufacturer meets their quality standards. Failure to maintain quality can lead to customer dissatisfaction, brand damage, and potential legal issues.

2. **Communication and Coordination:** Effective communication and coordination between the company and the outsourced manufacturer are essential for a smooth outsourcing process. Differences in time zones, language barriers, and cultural nuances can create communication challenges. Clear communication channels, regular meetings, and shared documentation can help overcome these challenges.

3. **Dependency on Third-Party:** Outsourcing manufacturing means relying on a third-party manufacturer for the production of cattle feed. This introduces a level of dependency on the outsourced manufacturer's capabilities, reliability, and capacity. Any disruptions or issues faced by the manufacturer can directly impact the company's supply chain and ability to meet customer demand.

4. **Supply Chain Complexity:** Outsourcing adds another layer to the supply chain, increasing its complexity. Companies need to carefully manage the logistics and transportation of raw materials to the outsourced manufacturer and coordinate the delivery of finished products. Any disruptions in the supply chain can lead to delays, increased costs, and potential customer dissatisfaction.

5. **Vendor Selection:** Choosing the right outsourced manufacturer is crucial for the success of the outsourcing arrangement. Evaluating potential vendors, conducting due diligence, and assessing their capabilities, track record, and reputation are essential steps in vendor selection. Making the wrong choice can result in quality issues, delivery delays, and negative impacts on the company's brand reputation.

6. **Cost Management:** While outsourcing can offer cost savings, effectively managing costs can be challenging. Companies need to carefully assess pricing structures, negotiate favorable contracts, and monitor cost components such as raw material prices, labor costs, and transportation expenses. Unexpected cost fluctuations or hidden charges can impact the overall cost-effectiveness of the outsourcing arrangement.

7. **Loss of Control:** Outsourcing manufacturing means relinquishing a certain level of control over the production process. Companies must establish clear expectations, performance metrics, and quality control mechanisms to maintain visibility and control over the manufacturing operations. Regular monitoring and communication are vital to ensure that the outsourced manufacturer aligns with the company's goals and quality standards.

By being proactive in addressing these challenges, maintaining strong communication, conducting thorough due diligence, and establishing robust quality control measures, companies can overcome the hurdles associated with outsourcing cattle feed manufacturing and reap the benefits of this strategic decision.

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Indian Sugarcane Crop: Performance and Challenges to the Environment - A Case Study on Kolhapur District, India.

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About Sugarcane Crop

The practice of developing natural resources for economic advantage and human sustenance is known as agriculture. It blends innovative production techniques and cutting-edge technologies with the creativity, inventiveness, and expertise required for raising animals and cultivating crops. Agriculture is the art and biology field of tilling land, producing agricultural products, and rearing animals. It involves concocting herb and animal items for human consumption and distributing them to marketplaces. Most of the food and textiles in the world are produced by agriculture. Agricultural items include wheat, sugar cane, fiber, leather, and wool, among others. Agriculture also produces paper and timber for construction. These goods, and the agricultural practices employed, may differ from region to region.

One among the biggest harvests in the entire globe is sugarcane. It is grown on over 26.9 million hectares (M. ha) all through 109 nations, having 1.91 billion tonnes (bt) harvested annually. One long-term moneymaker that belongs within the extensive crop category is sugarcane. More large-scale and micro-plant materials are necessary for it (Garside et al., 2000). Because there are insufficient fertilizers, the enormous consumption of soil nutrients restricts crop productivity. In a comparable way, the decrease of agricultural nutrients through the earth is brought on by spiraling rates combined with limited availability of fertilizer during peak time. So farmers prefer to add supplementary chemical fertilizers to increase yield of crops.

Brazil is one of the globe's largest suppliers of sugarcane. The remaining five biggest growers are Thailand, Mexico, China, India, and Pakistan. Around 65 percent of the regional community works in this agriculture-based profession. These sectors suffer to get energy due to their high manufacturing expenses. It requires less expensive source and by-product usage for revenue generation (Ghodake et al., 2020).

Behind the textile sector, sugar production is the nation's second biggest sector of agriculture. It's worth is boosted by its significance in everyday life. It is exceptionally significant to Indian agriculture in that manner. Among the greatest prominent and essential industries in the nation for sugarcane processing is the sugar industry. During the sixth and fourth century BC, the Persians and Greeks found the mythical "reeds which generate honey in absence of bees" in India. They turned up sugar and sugarcane farming, and they subsequently developed (Lakshmanan et al., 2005). The variety was produced prior to a variety of agricultural commercial crops throughout the 19th and 20th centuries, just like fiber and different crops that were raised on huge farms. The crucial force behind sugarcane cultivation is the worldwide need for sugar. Sugar beets comprise less than 20% of the sugar generated, with sugarcane accounting up the majority.

Sugarcane is the most crucial cash crop of Maharashtra. The state's regional demographic and educational progress are significantly influenced by the sugar business. Despite any barriers, the Maharashtra sugar sector has been steadily flourishing for the past 68 years. 6.20 lakh hectares were covered with sugarcane in 2016–17. Maharashtra generates 41.87 lakh tons of sweetness, with a median yield of 68.04 t/ha, average sugar extraction is 11.24%, and overall cane manufacturing of 372.45 lakh tons. The decline in area, production, recovery and productivity is because of severe drought situations during 2015-16 and 2016-17 in the state. The production of sugarcane has attained a stationary phase from the last 10-15 years (Suarez et al., 2023). Therefore, the further emphasis needs to be given on increasing the productivity while reducing the cost of production without increasing the area.

Despite having an optimal climate, Maharashtra's annual sugarcane yield has been hovering around 75 and 85 t/ha for the past 60 years. Maharashtra continues to lead the way in the recovery of sugarcane.

Approximately 88 cooperative and 62 independent sugar mills are producing ethanol, power, compost, and several kinds of distinct chemicals in Maharashtra. Thus, sugarcane and sugar manufacturers are the backbone for economic development in Maharashtra. A number of experiments on different aspects of sugarcane cultivation was carried out and the recommendations are made for sugarcane growers. Since sugarcane produces all year long, it is susceptible to variations in temperature, including severely high temperatures in the summer and extremely cold winter temperatures. These climate-related variables have an immense effect on the crop's final production. The global warming and climate variation may have influenced the planting time, crop productivity and sugar recovery percentage.

Pre-season sugarcane cultivation is advised from Oct. 15 to Nov. 30, taking consideration for the weather. One possibility for poor cane development and crop efficiency is that the crops or the substrate may be lacking in macro and micronutrients. Sugarcane production needs a variety of nutrients for proper expansion and growth. Though small quantities of micronutrients are needed, their unavailability may limit the crop growth due to monoculture or traditional farming methods.

The Kolhapur district is the southernmost district of Maharashtra state. The region occupies 7,685 km in total. It is located among latitudes 16° 0' 0"N and 17° 0' 0" North and 75° 0 '0" East and longitudes 74° 0' 0" and. The region is 160 km long from north to south and 60 km long from east to west. The stream Krishna, the Belgaum region to the southeast and east, the Sahyadri Mountains to the west, the Warna River to its north, forms the natural boundaries of the district. The region receives average rainfall 1900 mm. Sugarcane cultivation is popular in the Kolhapur district of Maharashtra state and the overall area beneath sugarcane cultivation is 0.149 Mha that produces 12.491 MT of sugarcane. The ordinary sugarcane efficiency yield in Kolhapur district is 83.68 tons/ha. Sugarcane is grown throughout the Kolhapur district. Together, the four talukas of Hatkanangale, Panhala, Radhanagari, and Karvir accounted for over 60% of the entire region cultivated with crops.

The local variety of sugarcane, namely, pundia, is grown only in a few places far away in the interior. Enhanced Co. 419 is the widely planted diversity in the region, encompassing the majority of the land planted to sugarcane. It is exceptionally productive and far more resilient to lack of rainfall than every other diversity; Co. 475, that initially arrived and performed superior to Co. 419 when it originally planted, was eventually eliminated because of its vulnerability to rust and smut illnesses. The current variety of cane is hard to crush and as such all over the district power crushers are used for the purpose. Two improved strains of sugarcane have been released namely, Co. 775 and Co. 678, which are under trial in the district. It’s probable that Co. 775 may substitute Co. 419 due to greater sugar percentage. Its habit of growth is erect. The sugarcane crop exhausts the soil almost completely and, therefore, fertility of the soil has to be maintained by heavy manuring or crop rotations.

As we all know that due to monoculture or single crop farming methods major issues are created in the agriculture sector. The fertility of soil is reduced, soil erosion is taking place, and Sugarcane Monoculture (SM) leads to soil hitches, such as soil degradation, acidification, and soil-borne diseases that ultimately have a negative impact on sustainability and crop productivity. So in this case summarized information is provided regarding the current scenario of Kolhapur sugarcane farming, its challenges and suggestive solutions to achieve the improved sugarcane farming.

Major Issues in Kolhapur Agriculture Sectors:

Monoculture Farming: Sugarcane cultivating farmers who stick to monoculture farming are facing more difficulties in terms of struggling with pest infestations on their field. Pests are prolific because farmlands are having a single sugarcane crop grown year after year. It makes sense, actually, as parasites multiply more successfully when they can maintain the food they prefer in one spot for extended periods of time. The monoculture sugarcane is disrupting the soil's fundamental equilibrium. The soil loses minerals when

there are too numerous of the identical kinds of crops in a single area, reducing the diversity of microbes and bacterial species required to keep the soil healthy and fertile. The foundation of the ground beneath is negatively impacted by the cultivation of an identical crop across an extensive region. Sugarcane monoculture has affected physico chemical soil properties and microbial communities, thereby reducing sugarcane production. It has also affected the structure of soil round the floras that can lead to destruction and loss of water.

The substantial subsoil layer that usually covers farmed land is absent, which leads to a disparity in the agricultural land' ability to retain water. Producers have been utilizing more of the precious resource to prevent the water loss. Producers had staked their entire potential yield from their allotted land areas when they have focused solely on planting monotonous crops, and the motive for this is actually obvious. If anything went wrong with agricultural growth (like a severe drought, persistent precipitation, a particular infestation of insects, etc.), is very little possibility that certain varieties will survive by exhibiting greater resilience compared to others because there won't be a variety of crops available. As a result, singularity farms run in danger of losing their entire crop and, consequently, their season earnings simultaneously. This poses an enormous risk to producers. After harvesting, the crop shall be transferred over many kilometers to multiple places. These locations are frequently abroad, which significantly raises the distance traveled.

This kind of shipping, which can be a motorized vehicle or a marine ship, mostly utilizes fossil fuels like petroleum and gas, which while burned, constitute a few of the worst causes of damage in our surroundings. Because of farming activities, the impact of greenhouse gasses in the environment that is being connected to global warming is also believed to be mainly triggered by the consumption of oil and gas.

Excessive Use of Chemical Fertilizers:
India uses fertilizer greater than all nations in the globe, second only to China, since it covers a big geographical area and has over 150 million producers working there. Fertilizer incentives were first implemented over 40 years early in order to reduce the cost of nutrients for producers and, eventually, guarantee national food security. Over time, the funding cost has increased significantly. It jumped from just $700 million in 1990–1991 to about $11 billion in 2017–18. Over the preceding ten years, India's annual usage of fertilizer was approximately 500 LMT.

According to information supplied to the Rajya Sabha by the government, urea is the widely used fertilizer, contributing to between 55 % and 60 % of the nation's inorganic fertilizer use having a yearly usage of about 300 LMT. The usage of DAP, NPKs, and ammonia has increased significantly during 2016–17 and 2019–20. The information for 2020–21 is tentative and will remain accessible through February 2021.

Data in below figure show that the average national usage of main chemical fertilizers decreased from 135.76 kg/ha in 2015–16 to 123.41 kg/ha in 2016–17. However, since then, consumption has progressively increased, reaching a national average of 133.44 kg/ha in 2019–20. 315269 M. Tonnes of chemical fertilizers were provided in the talukas of Karvir, Panhala, Hatkanangale, Shirol, Kagal, Gadhinglaj, Chandgad, Ajra, Bhudargad, Radhanagari, Gaganbawda, and Shahuwadi in the Kolhapur district in 2011–12. Due to the dominance of sugarcane in these regions, it is noted that Karvir, Shirol, and Kagal have high fertilizer consumption levels of urea and ammonium sulfate, whereas Gadhinglaj, Ajra, Bhudargad, Gaganbavada, and Shahuwadi have low fertilizer consumption levels.

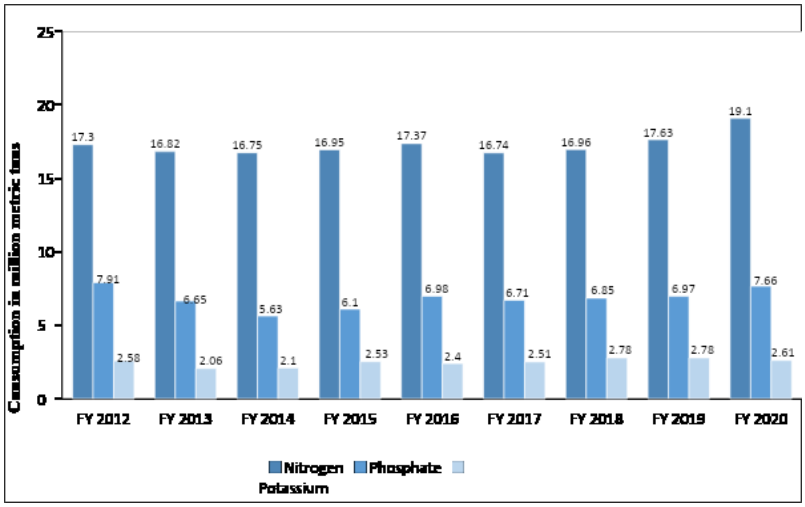

Fig 1: Represents concentration of NPK consumed transversely India between years 2012 to 2020. (Report on database and Research)

In Karvir, calcium ammonium nitrate is present in significant concentrations. Due to the cultivation of sugarcane in these areas, single super phosphate fertilizer use is high in Karvir, Shirol Hatkanangale, and Kagal, whereas it is low in Ajra, Bhudargad, Gaganbavada, and Shahuwadi. Ajra, Bhudargad, Gaganbavada Gadhinglaj, and Shahuwadi have low fertilizer consumption while Karvir, Shirol Hatkanangale, and Kagal have high concentrations of monoammonium phosphate and diammonium phosphate, respective.

Harmful Effects of Chemical Fertilizers (CF) to Environment:

- Improper use of CF can cause harm to the environment and human health by hardening the soil texture, reducing fertility, using more pesticides, contaminating the air and water, and emitting greenhouse gasses.
- Waterways are negatively impacted by chemical runoff from over fertilizer which are due to use of CF on crops.
- Excessive use of nitrogen in agricultural fertilizer increased the atmospheric emissions of greenhouse gasses like CO_2 and NOx, which decreased the quantity of oxygen in the water and caused fish to perish.
- Over use of CF increased soil acidity due to a loss in biological matter in the soil. The topsoil is harmed over time by heavy nitrogen spraying on farms, which reduces crop yields.
- The overuse of synthetic fertilizers has been detrimental to human health. High nitrate and nitrite content in chemical fertilizers has been associated with conditions like cancer, hemoglobin issues, Alzheimer's syndrome, and diabetes mellitus.

Cause for overdoing fertilizer in India:

- At this time, neither the quantity nor the eligibility of those who can purchase the subsidized fertilizer are limited. This has caused misuse of fertilizers in farming as well as urea being diverted to other industries (such as dairy, textile, paint, fishery, etc.).
- Biased: Most of the subsidy is provided in the practice of urea, which accounts for 70% of all fertilizer used in India. There is widespread urea abuse, an imbalance in fertilizer consumption has

worsened soil quality, which has led to decreased crop response to fertilizer, which has negatively impacted farm production and farmers' income.

- Lack of knowledge among farmers on the consequences of using chemical fertilizers excessively.

Excessive use of Pesticides:

Pest control agents are compounds known as pesticides. Insecticide, nematicide, molluscicide, piscicide, avicide, bactericide, rodenticide, microbicide, animalicide, and lampricide are samples of these. Herbicides are the most widely used of them, making up around 50% of all pesticides used globally.

Insecticides, fungicides and herbicides are used in India, with insecticides forming the highest share. Amongst the globe's biggest manufacturers of pesticides is India. A database Research and Markets (DBRM) data states that the Indian pesticides sector had a 2018 potential of Rs. 197 billion. By twenty-four, the sector is expected to have expanded to a revenue of Rs. 316 billion, with a yearly compound growth rate of 8.1% from 2019 to 2024. There were 292 pesticides recognized in the nation of India as of 2019. In India, the quantity of pesticides used either globally and per acre expanded significantly after 2009–2010.

The cost of manually controlling weeds is rising due to rising labor in agriculture, which is believed to be a contributor to the current spike in pesticide usage. Application of herbicides has gone up as well. Maharashtra is the region with the highest overall pesticide usage, next to UP, Haryana, and Punjab. Conversely, Punjab had the greatest per ha utilization of pesticides in 2016–17 (0.74 kg), next to Haryana (0.62 kg) and Maharashtra (0.57 kg). Pesticide use raises a number of environmental concerns.

State wise utilization of pesticides

States	Average pesticide consumption (tons)			Average Per ha (kg) pesticide utilization 2016-17*
	2003-04	2008-09	2015-16	
Andhra Pradesh	2035	1380	2710	0.23
Punjab	6800	5700	5750	0.75
Maharashtra	3390	2400	11670	0.58
West Bengal	3910	4150	3710	0.26
Kerala	325	275	1125	0.41
Chhattisgarh	335	275	1630	0.25
Odisha	679	1160	725	0.15
UP	6700	8970	10460	0.40

Haryana	4750	4290	NR	0.63
Tamil Nadu	1450	2320	2000	0.34
Karnataka	1695	1680	1435	0.11
Gujarat	4000	2650	1980	0.13
Bihar	858	920	835	0.12
Madhya Pradesh	65	665	740	0.04
Rajasthan	2300	3340	2480	0.06

(Report on database and Research)

Over 98% of splashed bug sprays and 95% of herbicides reach a goal other than their target species, counting non-target species, discuss, water and soil. Pesticide float occurs when pesticides suspended within the air as particles are carried by wind to other zones, possibly contaminating them. Pesticides are one of the causes of water pollution, and a few pesticides are determined organic poisons and contribute to soil and blossom (dust, nectar) defilement. Besides, pesticide utilization can antagonistically affect neighboring agrarian action, as bugs themselves float to and hurt adjacent crops that have no pesticide utilized on them.

The survey of pesticides consumption has done of Kolhapur district and it is found that the consumption of pesticides are higher in Panchganga river of the tehsils district of Tasgaon, Kagal, Hatkanagale, Panhala, Karveer, Bhudargad, Bawda, Shirol, Maharashtra. The region has been categorized by water source and due to dominance of sugarcane farming. Above 30gm/hectare of pesticides are consumed in Kolhapur district due to monoculture sugarcane farming. Sugarcane, top borer, Pyrilla, stemborer are commonly observed pests which harm standing sugarcane harvest, resulting in significant decrease in produce per unit area. Carboril, dimethoate, endosulfan are abundantly used pesticides by the agriculturalists to control the pest. Western Maharashtra's districts are Radhanagri, Daund, Jaoli, Solapur, Gadhiglaj, Indapur, Miraj, Ajara, Sangola, Pandharpur, Velhe, Baramati, Khandala, , Karmala, Kadegaon Shirala, Karad, Malshiras, and Shahawadi consumes moderate concentration of pesticides 15 to 30 gms/hectare. Havali,South Solapur, Akkalkot, Madha, Ambegaon, Satara, (tehsil), Mohol, Koregaon, Mangalwedha, Man, Khanapur, Mulshi, Maval, Khed, Shirur, Kavthemahankal, Chandgad, Bhor, Khatav, Junner, Barshi, Purandhar, Atpadi, Patan, Jat and Pune city tehsils of western Maharashtra consumes Low Consumption of pesticides below 15 gm/hectare.

In addition, the high consumption of pesticide in Kolhapur district due to monoculture sugarcane farming has reduced biodiversity, contributing to pollinator decline. Threatened plants and animals and damages ecosystems, particularly for birds. Because pests are currently resistant to the pesticide, an improved insecticide is needed. An enhanced amount of the pesticide is being employed as a substitute to combat tolerance; nevertheless, this will aggravate the issue of environmental pollution.

In order to reduce negative impacts, it is desirable that pesticides be degradable or at least quickly deactivated in the environment. The inherent chemical characteristics of the substances as well as external processes or circumstances are responsible for the reduction in pesticide cytotoxicity. For instance, in an

oxygen-rich atmosphere, the existence of halogens in the chemical makeup typically delays the decomposition. Soil adsorption can lessen the pesticide's accessibility to bacterial degraders while also delaying the pesticide's adaptability.

Agriculture as Water Polluter:
Productive utilization of accessible water assets is vital for a nation like, India, which offers 17% of the worldwide populace with as it were 2.4% of land and 4% of the water assets. Encouraged, per capita accessibility in terms of normal utilizable water assets, which was 5247 m3 in 1951 (by and by 1453 m3) is anticipated to wane down to 1170 m^3 by 2050. The Agrarian segment alone devours 80% of ground water. The declining slant of groundwater level in all parts of the nation moreover demonstrates that the guaranteed supply of great quality water will end up a concern for the country's improvement. The overall effectiveness of the flood irrigation scheme ranges from 26-40%. Poor management leads to wastage of about 70% of irrigation. Mohapatra said in a state like Haryana, the wastage of such a large quantity of water is a matter of concern. Due to overuse of the water the amount of water for agriculture has decreased. People may face acute shortage of clean water for drinking and there is a possibility of 30% reduction in agriculture.

Water Resources:
Regarding water supplies, the region of Kolhapur might be split into three belts, viz. the hilly and rugged country forming the Western Ghats towards west, the narrow broken-crested ridges stretching eastwards in the central portion, and the plains towards east. The region's greatest precipitation occurs in the mountainous west, where penetration wells and hill springs produce the bulk of the freshwater. In the Central portion the water supply is partly from springs and wells, the main source being the five perennial rivers (Water Supply and Sanitation Department, Government of Maharashtra, Groundwater and development Agency).

Kolhapur Region has 65 usual precipitation days with a typical rainfall of 1019.5 mm. Of these, 54 typical days of precipitation occur between the SW Monsoon (June to September), when the region normally gets 809 mm of precipitation. The SW monsoon normally has a period of onsets in 2nd week of June and normal cessation period of 2nd week of October. Kolhapur district receives rainfall 137.7 mm during NE Monsoon (October to December) in 8 normal rainy days. Additionally, the region of Kolhapur obtains 65.2 typical precipitation in 3 ordinary rainy days during the summer period (March to May). The soil varieties encountered in the Kolhapur region are deep laterite (172400 hector), shallow brownish (151500 hector), and moderately deep black (102900 hector). In the Kolhapur district there is 1 Municipal Corporation and 9 Municipal Councils. The total effluent (m^3 /d) and solid waste (MT/d) generated by Kolhapur Municipal Corporation was 85,000 and 150, Ichalkaranji 40,000 and 52, Kurundwad 750 and 2.8 respectively

Due to overuse and misuse of drinking water on 6th June 2019 Kolhapur The irrigation administration adopted the decision to prohibit water use from the Warna and Krishna rivers for commercial and farming purposes. In Sangli, water gathered from both of those rivers will solely be utilized for consumption. Similar initiatives have been initiated by those in charge in Kolhapur district, in which Panchganga River's water would be utilized for consumption. The worrying quantity of retention of water in the Koyna and Chandoli dams prompted an action to outlaw the utilization of river water for agriculture. Koyna Dam has about ten TMCC of water preservation, contrary to Chandoli Dam's four TMCC. Koyna Dam has a storing potential of about 105 tmc. The option to utilize river water entirely for consumption was made because of the monsoon's postponement, according to Hanmant Gunale, irrigation executive engineer in Sangli. He noted that the organization was implementing action to manage the water shortage, saying that "reservoirs will require some time to collect the water even when the annual monsoon occurs in the coming days."

The irrigation administration has chosen to carry out the change in two stages. Producers won't be able to draw freshwater out of the Krishna and Warna rivers till June 9 in the initial phase. Groundwater extraction

shall be prohibited in the following stage through June 16 to June 21, according to irrigation authority officials. Additionally, the department has created flying teams in order to carry out the decision's execution, corresponding to the authorities. Anyone realized to be breaking standards will face a penalty. The punishment involves a one-year ban on promoting water, a confiscation of pumping equipment, and an energy outage. In the beginning of April, authorities stated that the Koyna reservoir was capable of storing about 60 tmc of water; nevertheless, its water level decreased significantly due to high consumption for agriculture purposes.

Kolhapur region irrigation officials were considering taking comparable measures to conserve water. A scheme to restrict the consumption of Panchganga water supply for everything other than consumption is now being written, according to administrative engineer Rohit Bandiwadekar of Kolhapur, who spoke with Times of India. Additionally, Bahdiwadekar explained that until May 9, the stream water might be utilized for farming reasons; after that, they might decide if the water is best utilized for consumption.

Enhanced loss of soil nutrients, salinity, and levels of sediment in water, as well as the overabundance (or abuse) of farming inputs (such as fertilizers) to boost production, are often linked with intensifying agriculture. Agriculture-related contamination can affect farmland, nourishment, feed, the surroundings, and the environment as a whole. The two ground and surface waters can be affected by fertilizers, pesticides, silage WW, biological wastes, antibiotics, and manufacturing residues from cultivation operations. Massive agricultural activity, which includes growing livestock and fishing, is classified as a single reason for contamination; tiny-scale, family-sized agriculture is categorized as an indirect cause of contamination.

Case Questions:

1. Critique in brief about History of Sugarcane Crop with special reference to Kolhapur district
2. Elaborate in detail major issues of sugarcane crop in Kolhapur sector and its harmful effect on environment.
3. Critically explain best farming strategies which can be implemented to reduce negative impacts on the environment.

Teaching Note:

Undoubtedly, the largest means of revenue in India is farmland and its associated sectors, particularly in the nation's huge or predominantly rural regions. Depending on the land's status, the arrangement of the soil itself, and the water table's height, certain soils have poor drainage. Thus, the functions that chemicals play in supplying organic substances are essential. The development of soil biological material is aided by crop waste, varied shifts, and conservation tillage. Soils used for agriculture benefit from biological matter since it increases soil fertility, activity of microbes, penetration of water, and soil's water-holding capacity.

In addition, the high consumption of pesticide in Kolhapur district due to monoculture sugarcane farming has reduced biodiversity, and contributes to pollinator deterioration. Extinguishes ecosystems especially for birds, and has threatened endangered species. Pests has advance resistance to the pesticide (pesticide resistance), requiring the application of new pesticide. As a substitute, a greater amount of that pesticide is being applied to combat resistant species; nonetheless, this could exacerbate the issue of environmental contamination. So it is the urgent need of the hour to pay increased attention towards the development of agriculture and implement various managing strategies to decrease environmental pollution.

Solutions / Recommendations:
So, here are some of the best farming strategies that can be implemented in Kolhapur District which can reduce the negative impacts on the environment.

Crop Rotation
It is when cultivation of different kinds of plants is done according to the seasons. Thus, in order to enhance the crop, the pulse-cereal rotation techniques must be implanted. Crop rotation aims to sustain oil fertility while boosting yields of crops. Crucially, impulses might serve a substitute for increasing the variety or intensity of cereal repetitions. Pulses have the potential to increase the organic carbon content of soil and disperse nutrients across the soil profile. This method helps in preserving the soil and reducing pests which is deliberated as the major advantages. Rotating our crops helps us use less harmful pesticides that finish up in the water. Plant as much vegetation as you can in the same family.

Incorporate Intercropping
Here, more than two crops are grown concurrently. Resources are frequently not used effectively by only one crop. Thus, one of the best agricultural techniques for increasing productivity is this one. These crops are grown throughout the course of several growing seasons. By using this method, the soil is fumigated and biodiversity is enhanced. As a result, it aids in pest management and inhibits weed growth.

There are a few different ways of intercropping, such as:
- Mixed intercropping: In this technique, several crops are grown on the same piece of ground.
- Row cropping: As the name suggests, this method involves growing crops in rows.
- Temporal intercropping: This occurs when the pick that nurtures rapidly is harvested previously the one that produces deliberately reaches maturity.

Invest in Polyculture Farming
In the same plot, several plants of various species are grown using polyculture methods. Enhancing biodiversity benefits communities that can adapt to changing climates in particular. Polycultures come in a diversity of forms, including integrated aquaculture, permaculture, and cover crops.

Plant Cover Crops
Many farmers have crops planted all season long. However, this can impact the soil. Instead, using cover crops can protect the mulch during the off-season. They also prevent soil erosion, suppress weed growth and enhance the dirt's quality. Plus, this method reduces the need for fertilizers. This saves money and protects the environment. In addition, the coverage slows the spread of runoff water.
Here are a few different kinds of cover crops:
- Red clover
- Crimson clover
- Vetch

Look into Natural Pest Predators
It's essential to view the farm as a whole ecosystem. For example, many birds are natural predators of agricultural pests. So, you can raise these predators to help manage your bug problems. It's also a cost-effective solution that limits the usage of chemical pesticides. Do research to figure out the natural killers for your most grown plants.
Here are a few natural enemies of pests to add to your farm:
- Ants
- Beetles
- Spiders
- Mice
- Skunks

Use Biodynamic Farming
Biodynamic practices focus on composting, using manure from livestock and cover cropping. Crop rotation is also used to generate healthy soil for food production. These methods can also be practiced to home gardens or even vineyards. The benefits of biodynamic farming include reduced soil erosion and increased crop growth.

Use Natural Resources through Water Harvesting
Using this environmentally beneficial technique, rainfall is collected and stored for use in agriculture. The liquid can be collected from the roof's surface and stored in a well. Rain barrels are a simple way to collect the water. Some farmers gather water for streams during the monsoon season to utilize during dry spells. Reusing water reduces the possibility of water scarcity.
Water harvesting can be utilized to take care of cattle as well. Some homeowners do this to conserve well water or to water their plants. Even commercial buildings like schools and hospitals could use this strategy.

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Unlocking the Future of Retail: A Case study on Lucky Bazar's Transformation into a RFID based Smart Trolley Store - Kolhapur, India.

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In the swiftly advancing landscape of smart stores, Mr. Vyankatesh, the CEO of the esteemed Lucky Bazar in Kolhapur, has enlisted the expertise of IT consultant Miss Sneh to develop and execute a visionary smart store transformation plan. The objective is to harness state-of-the-art technologies, including smart trolleys and mobile apps, with the aim of elevating customer retention and positioning the store as a preeminent brand in the city. Concurrently, the CEO seeks to optimize operational costs to enhance overall efficiency.

By embracing smart store technologies, the store aims to increase customer retention by providing a personalized and technologically advanced shopping environment. Furthermore, the implementation of these innovations is expected to optimize operational costs through streamlined processes, automated checkout, and efficient inventory management. The ultimate objective is to establish the store as a leading brand in the city, recognized for its commitment to technological advancements, customer satisfaction, and operational excellence

Background of the Company:
Bade Sons Marketing Pvt. Ltd., Kolhapur (Lucky Bazar) E Ward, Lucky Tower, 8th Lane, Rajarampuri, Kolhapur Bade Sons Ltd. 's history dates back to 2002, when late Mr. Ramchandra Bade, the company's Chairman, founded the company, and their son now runs it with success in the market. The current Directors of the company are Mr. Sambhaji Ramchandra Bade, Mrs. Sheela Sambhaji Bade & Mr. Vyankatesh Sambhaji Bade is the current CEO of the company. The company operates one of the largest shopping centers in the city.Lucky Bazar is a supermarket, one of the renowned marketplace in Kolhapur with almost everything in one location. The target customers of this store are the residential market segment as most customers visit them to restock their household supplies. This store is popular because of the availability of all kinds of products of various brands under a single roof (Exhibit 1-6). They have enough clients and the store is running under profit. This store has benefited from nearby residential areas Lucky Bazar, which has an 18000 sq. size and 30 different departments. It also features two conference rooms for cultural occasions and meetings, Indraprastha Sanskrutik Bhavan and Surya Conference Hall, all of which are located at the above-mentioned address. Over the years, the company has evolved into one of the largest stores in Kolhapur, stocking all consumer durables, beverages, and goods that are quite valuable to customers.

Objectives of the company: Organization believes in customer satisfaction. Company has good value in the market.

1. Supplying a wide range of inexpensive consumer goods under one roof.
2. Serve better quality & variety other than malls in city areas.
3. To improve customer satisfaction by improving reliability of products.
4. To increase the average value of products by adding high values
5. To be the first smart Retail store in the city.

Products & Categories: They have a wide variety of departments in the retail store to meet the demands of our customers The store facilitates various sections like (Exhibit 1-6) Cosmetic, Bakery, Stationery Provisions, Grocery, Steel, Plastic, Household materials , Handloom, Hosiery, Toys and Gifts articles, Crockery, Furniture, Sanitor etc.

Mr. Vyankatesh introduces the store departments to his friend IT consultant Miss Sneh - Our Custom section offers customized products adapted to individual requirements for people looking for something unique and personalized. In the Cosmetics Section the store provides a comprehensive range of beauty and personal care goods in our Cosmetic area, from skincare to cosmetics, to suit different skin types and preferences. Bakery area is a bakery lover's paradise. It offers a large selection of cakes to satisfy any sweet tooth, along with fresh bread, pastries, chocolates, and biscuits to satisfy any craving.Our Stationery area stocks a wide variety of workplace and school supplies, including pens, notebooks, and other essentials. Our grocery and provisions sections provide a wide range of food, drinks, and daily essentials, making them a one-stop shop for all your household needs. Customers can find sturdy and functional things for their homes, such as cookware, storage solutions, and household accessories, in the Steel and Plastic Household categories. The Handloom Hosiery department offers a unique and ethically sourced selection of handwoven fabrics and clothing.

The Toys and Gifts section is a treasure trove for children and gift shoppers, with a large range of toys and novelty products ideal for all ages. The Crockery section features attractive and functional crockery and tableware that is ideal for enhancing your dining experience. Furniture lovers can peruse our Furniture section, which features a diverse range of attractive and comfy pieces to fit a variety of tastes and budgets. Finally, our Sanitor section provides cleaning and sanitation materials to ensure a sanitary and safe atmosphere for our consumers. Overall, by offering a varied selection of categories, our retail store seeks to deliver a holistic shopping experience, ensuring consumers can find all they need under one roof.

Our retail store's grocery section is a one-stop shop for all of your culinary needs. We take pleasure in offering our customers a wide selection of affordable, fresh, and high-quality products to suit their varied tastes and preferences. Everything you need to prepare delicious and wholesome meals is available here, including fresh produce and pantry staples like pasta, cereal, and spices. Apart from the essentials, we also have a selection of specialty and gourmet items such as artisanal cheeses, exotic chocolates, and unusual sauces and seasonings. Our skilled staff is always ready to assist you in locating specific ingredients or making recommendations for new and intriguing products to explore.

We endeavor to provide a pleasant and convenient shopping experience in our grocery section of our retail store. We provide broad aisles, clear product labeling, and speedy checkout stations to ensure a seamless and hassle-free shopping experience. We are dedicated to providing outstanding customer service and serving your shopping needs with the utmost care and attention. Whether you're planning a family meal, filling up on pantry staples or looking for specific ingredients for a recipe, our grocery area is the place to go. We invite you to browse our comprehensive product line and experience the thrill of shopping for your daily requirements in a welcoming and well-stocked environment.Miss Sneh just took a round at the store and she was really astonished to see all these sections managed under one roof but the store seemed a bit crowded and needed to be organized which could provide a spacious ambience in the store. She went to the

down segment of the store and found the clothing section which has a Men & Women Clothing section. Also, she was really keen to insist on the transformation & expansion of the store to Mr. Vyankatesh. The further study was carried out by Miss Sneh to understand the business insights, working of the store & learn the Retail management carried out in the store most importantly IT infrastructure & IT Management of the organization.

Business Insights:
The store manager helped Miss Sneh to understand the Retail store's Management process, Working, IT organization in the store, Employees structure & Employees selection Process in the store.

Employee Structure of the Bazar: When considering possible employees for the store, they carefully consider their experience and knowledge in order to establish the best department for them. When an employee is chosen, they are given the opportunity to perform a complete shift in that department to demonstrate their skills and competencies. They also have part-time roles available for anyone looking for flexible work.In circumstances where an employee lacks specific training, they have put in place a mechanism to allow them to learn from their senior colleagues. Less-experienced personnel receive direction and assistance from experienced team members through a mentorship programme, allowing them to gain the required skills and expertise to flourish in their profession.

The store manager said that he organizes personality development courses for our retail employees because they recognize the necessity of continual growth and development. The employees are provided with smart salaries, increments & incentives, they also offer on-roll salaries. Overall store is run smoothly with enough manpower, they run the store with 30+ employees working as salesmen and few of them work in the inventory & supply management & logistics sections, their work hours from morning 9.30 am to 9.30 pm, each of the salesperson is well trained to handle the customer. Thus employees work under various sections in the store, the store manager and account manager controls and coordinates the retail store management process. The store has the following structure of employees.

Employee Structure:

Sr. NO.	Description	No. of Employees
1	Employees to generate invoice at counter (3 counters)	3
2	Employees to handle inventory & purchases, sales, modules of bazar manually as well as lagging of all the items	3
3	Tally S/W & servers are managed by accountants & account manager	2 + 1 = 3
4	Remaining employees works as salesman under various sections of store	17

Sr. NO.	Description	No. of Employees
5	Bills checking and security at entry	2
6	Exit logistics	2

Ref: From the store: Lucky Bazar, Kolhapur.

Working of the Retail Store:

To meet the demands of its varied customer base, the store follows a procurement strategy of bulk purchasing from multiple wholesalers and distributors. These products are then sold individually to the public, with end-users acquiring items in small, needed quantities directly from the store.

Process: - To run a successful Retail Business.

The entrepreneur / CEO of Bazar sets objectives & plans every detailing like:

- **Staffing** – The store maintains the adequate qualified staff to enhance the customer experience and satisfaction. Proper planning will lead the business to decide the number of employees with respective qualifications.
- **Market Research** – It will help to understand customer preferences, demands of products and discover ways to advertise its products and services.
- **Proper logistics** – How the products will reach stores & customers, how they transport & store products.
- **Finances injection / revenues plans** – Retail stores establish their funding activities, setting revenue targets and developing strategies for attracting their company goal and incomes and investments.
- **Location** – The store contains two floors and is located at a central location. There is congestion for parking around the store.
    a. First floor – It is equipped with a grocery & cosmetic section. Second floor – It is equipped with clothing for the men & women section.
- **Inventory & Supply Chain Management**: There are fully dedicated employees in this section. All the products are tagged with the barcode & their entries are made into the "Retail ware S/W" maintained in the in-house server.
    a. **Purchase module:** the products already having barcodes are scanned directly through barcodes & entries are made into the "Retail ware S/W" and proper invoices are generated along with the GST. Same S/W is accessed at the billing counter to make the bills of each customer & after billing same is updated in the centralized S/W "Retail ware"
    b. **Sales Module:** Provides the sales detail product wise, category wise & provides customized details related to sales. The s/w also tracks the Reorder level, Sales & Purchase report in a customized pattern. Overall analysis is obtained by the store through this software. All these modules of software are run and restored under the server of "Lucky Bazar". The data is stored & backed up on the centralized in-house offline server.

- **Discount & Promotion** – The plans are carried out according to the products and bazaar also provides discounts and gifts during festivals & seasons. Today company provides all types of facilities to customers. They accept all types of Debit & Credit cards. They have facility of purchase against passes & "Accor Ticket"/ Company provides lucky gift coupons for purchase material with customer's choice to avoid similar quantity.
- They implement the Traditional Offline **Retail Business Model (Exhibit 10)**

They use a POS (Point of sale) system for running the Retailing business. From Inventory Management to Billing

POS: Point of sale or purchase is a point where you bring up the customers when the customers purchase the goods, pick up the items from shelves, and walk to the checkout counters they are said to be at the point of sale. The Point-of-sale-system is the combination of hardware and software which enables the business to record the sales and transactions.

POS systems accept the payments, keep track of sales and customers. It is basically referred for cash registration at a store. This is a point where customers pay money to retailers on the counter. All the transactions are recorded and invoice is produced in return, some retail shops rely on cashier machines to record money transactions such as goods sold and cash earned.In today's modern era retailers are implementing new technologies to run the business efficiently.

Working of Lucky Bazar Retail POS system (Exhibit 7):
POS system works in certain phases initially A customer decide to buy product and adds to the cart in the physical store which includes a bar code which is scanned during the billing at counter, later the POS systems calculates the price of the items purchased by the customer including the taxes and also updates the inventory module to show the item count sold. In order to complete the transaction the customer performs the payment through credit card or debit cards or through payment options like GPay and other or the customer can opt for cash transaction as well depending upon the type of payment modes the transactions have to be carried out with the authority of customer's Bank. Then transactions are finalized and printed invoice is generated and items are handed over to the customer.

POS systems Hardware and software (Exhibit 7)
Hardware:
- The Register /Connected device is a screen that helps to calculate and process customer transactions.
- Card Readers : It must be able to facilitate with all the devices such as swipe machines to allow all the payment modes such as credit & debit modes & mobile payments,
- Printers : for printing receipts
- cash drawers to store cash
- Barcode scanners to read the product details it acts as a quick way to check the prices ,the stock levels and other details
- POS system must be well equipped Internet & Lan connections

Software Features:
It acts a repository of all the data, it lists all the items and ring up sales. Modern POS solutions also include features such as Tools for Sales Reporting , Inventory Management, sales, purchase, promotions, discounts ,customer management ,Routing Funds .payment Processing where are some POS need to use other party software's to include all these features at one point such as ERP & CRM.

Modules: Sales, Purchase & Inventory Management:
It allows you to keep tabs on all the products. It helps to track the stock levels and Reorder levels when the stocks are running low, Allows the retailers to collect all the sales data for enhancing the business ,It helps in analyzing the business trends to understand the fast moving items as well the slow one.

Payment Processing & Invoice generation:
After every purchase the payment has to be processed in various modes such as Cash, Secure online Payments, Chip cards, Contactless payments etc. & managing the errors occurring during payments. Generating invoices for customer purchasing & Billing and updating the inventories.

Finance Management:
POS doesn't come up with this module; it is integrated with well-known accounting systems like Xero, Tally & Retail Insight.

Promotion and discounts:
Tracks the discounts and promotion on items.it helps to set the discount prices on items and the store manager manages all the updates. It helps to manage the promotion effectively
Store Management: Information access from retail shop and back end servers

Employee Management:
Proper tracking of employees, salaries, leaves, their targets, incentives etc., implement commission structure to reward the staff, track the staff performance.

CRM's:
It is a Customer relationship management tool which lets you understand the customer purchase trends and patterns, it will help to provide better customer services, communicate and enhance customer satisfaction and improve marketing strategies.

They have On-premises POS systems installed in local systems and local servers they can be accessed in local organizations to retain security and it also provides better integration with all the h/w devices in-house. They do not require internet connectivity; they rely on LAN & use Client-Server Architecture. On-premises

POS are purchased by the stores on License basis. They are preferred for more cash outlay and incur onetime cost investment for installation, training & they are user friendly.

IT Infrastructure of "Lucky Bazar" (Exhibit 11-14)

Sr. NO.	Category	Description	Total No
1	Desktop (the a/c clients)	Purchase module, Sales module & Billing, tally	3 3
2	Desktop Computers	Connected to centralized server	1
3	H/W	Printers	2
4	H/W	Barcode Reader	6
5	Server & Storage		1
6	S/W	Retail ware (POS)	Applications running on 6 Machines
7	S/W	Tally Tally Server	2 1
8	POS System (Billing Counter)	Desktop Card reader Barcode GPay Retail ware software	3

Retail ware Software version 3.02.1418

Lucky Bazar uses the licensed copy of Retail ware Software (Exhibit) of Retail ware SofTech Pvt. Ltd. They provide software solutions for micro, small and medium retailers. The store uses the licensed copy purchased in the year 2002 till date. This software is installed on four clients which are connected to the centralized server. The software can be accessed through various modules and logins, such as purchase module, sales module, customer, register, Tally integration, Analytical etc.

Purchase Module – All the items are scanned, tagged and entered into the software. The inventory & stock details are updated & maintained through this module, all the purchased items are tagged & purchase invoices are generated & account details are maintained in software. Server as well as in the Tally centralized server of the store.

Sales Module – It lists all the Sales reports of the store product wise, category wise, brand wise, sub category wise & provides the customized sales report of the store. Retail ware software provides user friendly IT solutions to retailers and help them to achieve their business goals.

Features of Retail ware

Customer loyalty card, Scheme Management, Sales Management, Barcode for right billing, logistics & warehouse management, Role based access and multi user login, Re-order level & Re-order stock Management. Summary reports for Analysis, Mobile App Facilities, Supply Chain Management, GST

Management, Billing & Inventory, Stock Management, Sales Return, WhatsApp Business Account Integration, Tally Integration (Export / Import Data), Analysis of Reporting.

Specifications-

Supported Platforms	-	Windows
Device	-	Desktop
Deployment	-	Perspectival
Suitable for	-	Retailer
Language	-	English
Ranked	-	*****

Overall, this software is a complete solution for the retail store which include category, sub category wise material dealings, in awarding of stock, purchase & sales report management, billing, UPI integration, CRM & provides proper analysis of business to the owner & manager. Overall, the store accesses accurate billing, it is not dependent on the internet. It works on a standalone machine and all the service and support are provided by the Retail ware team.

Data Management - Server & Storage (Exhibits 11 -13)

Contents	Components	Description
Server	Windows Server 2012	Standard
System	Processor RAM System type	Intel(R) Xenon(R) CPU E5-2609 1.70 GHz 32.3 GB 64 bit OS
Name domain & Workgroup	Compiler name Full Compiler name Workgroup	SERVERSPL SERVERSPL LUCKY
Storage	Volume; 930 GB/1 TB Disks – H C D	1 TB 300 MB 197 GB 293 GB

The store also relies on “Tally " software that was implemented in the store in 2017. It is handled by two accountants and one account manager who also takes care of the centralized server of tally as well as POS system in the store. There is a centralized server in the store placed in a separate room, which stores the data & updates the system continuously. The server is not connected to the cloud of Retail ware. It is an on premises data storage system. Overall, Lucky Bazar implements on-premises IAAS, from Retail ware. All the data since 2002 is stored in this server, no software issues noticed till date.

Overall Operational & Maintenance cost carried out to run the business. It is observed that all the clients are connected to the central server and all the inventory management & billing processes are carried out on the Purchase, sales & Billing Logins with the limited authorities & all the transactions are synchronized to the central storage and server.

"Miss Sneh Studies the working & all the aspects for store transformation & draws certain things to be considered"

Current Scenario of Store: Consideration to transform into Smart Store using Smart Trolleys

The store relies on the Use of Traditional Billing System in Store: They have implemented the current system using the **conventional barcode scanning technique**. Each product must be scanned using the barcode scanner, which makes the process incredibly slow. To scan barcodes, (Exhibit 7-15) a barcode reader is used; it is a component of electronic equipment.

There is no automated billing mechanism in place for this process, customers must wait in lengthy lines near the counters (Exhibit 5) to be billed. As a result, the barcode process billing approach is cumbersome. Long lines eventually emerge from this.

Data Management: Data must be managed properly All the clients data is stored in the centralized server (Exhibit 11), the server consists of the data from nearly 2002 it is controlled by the Admin of the store all the data is stored in-house through Retail ware Software ,all the sales and purchase data is updated in the same server. The billing is carried out through the POS system (Exhibit 5) All the tags are scanned and billing details are generated along with the GST and everything is updated back into the server .They completely rely on the in-house storage. **There is no other backup system in the store.**

Employee cost, retaining and replacement is challenging for the bazar, replacing employees' costs a lot of costs and time. Store provides smart salaries to the employees and incentives as well, good employees receive on-roll salaries but few employees lack the communication to attract the customer goodwill, the store manager is concerned about these salesman performance in terms of **customer satisfaction**

Customer expectations & Loyalty- The store has variety of customers from different parts of the city, maximum of them often come to same store to do the purchases, but as the owner feels that customer expectations will keep changing hence they have to adopt quickly with the customer demands, apart from seasons and trends factors alike economic viability, advertisements, offers and rising competence in retail store is impacting the customer demands. There is a need to maintain customer loyalty, store manager constantly plans for promotions, offers and discounts & seasonal attractions for the customers.

After analyzing all the scenarios, The IT consultant conveys to the CEO that the future of retail stores lies in the adoption of IoT-enabled Smart Stores.

Future of Retail stores:

In the coming years, the smart retail market is projected to reach $91.36 billion by 2030, with a notable Compound Annual Growth Rate (CAGR) of 22.4% from 2023 to 2030, as reported by Meticulous Research®. The surge in importance placed on enhancing customer experiences, optimizing retail

operations, and the proliferation of smart stores are key drivers propelling this industry forward. Furthermore, the market is expected to benefit from potential opportunities stemming from increased shoplifting incidents and the deployment of disruptive technologies for predicting future market trends. Despite these prospects, the slow adoption of technology in the unorganized retail sector could pose limitations to the market's full potential.

IoT Smart Stores:
The Internet of Things (IoT) is revolutionizing the retail industry in a number of ways, including enhancing the shopping experience and accelerating retail management through data collecting, online connectivity, and smart storefronts. Retailers are utilizing IoT's ability to traverse the shifting business landscape in a number of use cases, including seamless in-store navigation, smart shelves, product placement, buyer behavior tracking, checkout automation, on-site sensors, and cold-chain monitoring.

Due to the fierce competition in the retail sector, businesses must find innovative ways to automate operations and raise the standard of customer care. These issues can be resolved via smart stores. The idea of automating retail trading platforms with the help of Internet of Things (IoT) technology is known as a "smart store." RFID sensors, online POS terminals, smart shelves, smart trolleys, video cameras, Big Data technology, and many other tools can be utilized to automate these procedures. Retailers benefit greatly as a result from several options to streamline their operational procedures and raise the standard of customer service. For instance, you may control in real time the types of products that were removed off the shelf using RFID tags and specialized software, which ones were loaded into carts, which ones were paid at the checkout reducing the waiting times of customers and utilizing the space in the store & help analyze the customer satisfaction levels of expectations.

Way Forward for Transformation of Traditional store to Smart Trolley Store:
The store runs the traditional Retail Management process. All the items are tagged using traditional barcode tags, and they use POS systems for the Billing process. As the store relies on the Client server architecture and in-house centralized server, all the Inventory, Sales, Purchases, Supply chain system, tag entry are made in the system through the Retail ware Software, All this data is maintained & backup into the in-house offline server of the store, the owner is worried about the storage, data loss, backups and data management at the store and the server. Considering the current market situation the owner wants to stand enough competent amongst all the retail stores. The owner believes that all the store employees and managers are providing the best services to their customer, still he is worried about the rising needs of customers, customer satisfaction & expectations Hence to overcome these challenges in the Retail store the owner is planning for transformation of Bazar to Smart retail store to enhance the working of store to meet the competence level in the smart Retail stores, as he learned that Future retail success depends on intelligent retail solutions. This new technology is crucial for setting the path forward and enhancing both the customer and brand experiences in retail.

In order to overcome all these challenges the IT consultant enthusiastically advocates the incorporation of RFID-based smart trolleys into the retail store, presenting a pivotal shift towards an innovative shopping paradigm. These advanced trolleys, seamlessly integrated with IoT technology and RFID systems, promise to redefine the customer experience. RFID technology facilitates automatic item scanning and real-time

inventory tracking, ensuring accurate and efficient shopping. The synergy between these smart trolleys and a dedicated mobile app enhances customer engagement with features such as personalized promotions and recommendations. Embracing this technological evolution not only elevates customer satisfaction but also optimizes operational processes through precise inventory management. By adopting RFID-based smart trolleys, the store is poised to distinguish itself as a trailblazer in the competitive realm of contemporary retail, forging ahead with enhanced efficiency and a heightened shopping experience.

The proactive owner, driven by a commitment to maintain a top-tier position among stores in Kolhapur, is proactively seeking ways to stay ahead in the competitive landscape. Recognizing the evolving trend towards smart stores, the owner has set sights on transforming the traditional store into an RFID-based Smart Trolley Store. This forward-thinking approach aligns with the owner's vision for the retail store, reflecting a strategic move to integrate cutting-edge technology. With an unwavering commitment to excellence, the owner is determined to implement the most viable plan, ensuring that the store not only adapts to the changing retail landscape but also emerges as a leader in smart retail within the Kolhapur market.

Case Questions:

1. Explore different cloud computing service Models & Deployment models
2. How can Lucky Bazar effectively address and overcome the existing data management challenges in the store, particularly in terms of centralized server reliance, lack of backup systems.
3. Consider yourself as an IT consultant & propose RFID based smart trolley store Transformation plan & solutions
4. Considering you as an IT consultant propose a Design for RFID-Based Smart Trolley.
5. How can a comprehensive cost-benefit analysis be conducted for the proposed RFID-based smart trolley system, taking into account both initial implementation costs and potential long-term benefits?

Exhibits

Exhibit 1 : Lucky Bazar Lucky Bazaar [A retail mall] Plot No 164, Lucky Tower, Shahu Mill Road, 8th Lane, Rajarampuri, Kolhapur-416008

Exhibit 2 : Inside the bazar

Exhibit 3 : Inside the bazar

Exhibit 4 : Inside the bazar

Exhibit 5:POS Counters

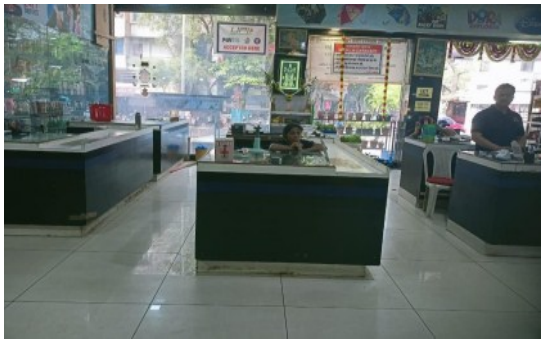


Exhibit 6 : Products & Categories

Exhibit 7: https://squareup.com/us/en/the-bottom-line/operating-your-business/what-pos-system

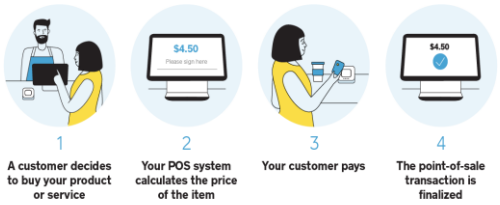


Exhibit 8 : Hardware and software in POS https://squareup.com/us/en/the-bottom-line/operating-your-business/what-pos-system

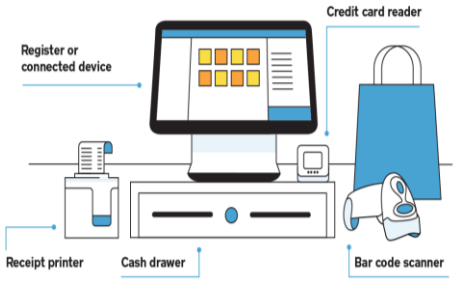


Exhibit 9 : POS examples - https://possales.com.au/blog/best-pos-systems-of-2023-for-small-businesses/

Exhibit : 10 https://www.retaildogma.com/what-is-retail/

Exhibit 11-Server in Lucky Bazar

Exhibit 12 -

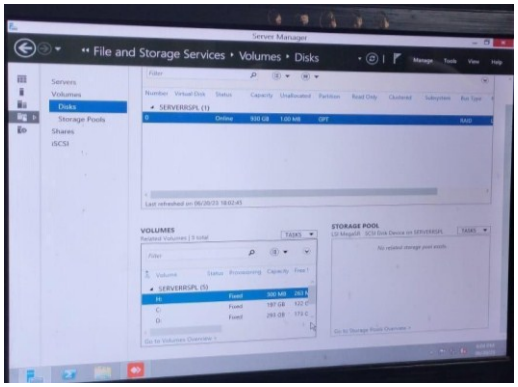


Exhibit 13-server configuration

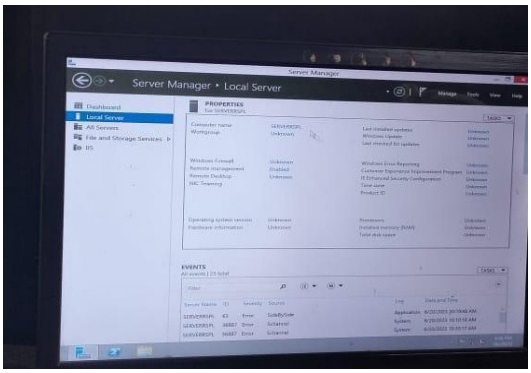


Exhibit 14- Barcode scanner

Exhibit 15 -Client server Architecture

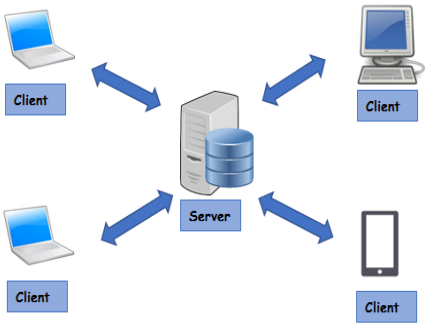


Exhibit: 16 Trolley at store

Exhibit 17 : Retailware software on Indiamart.com

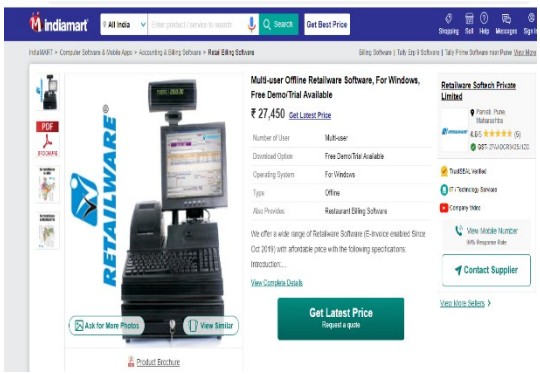
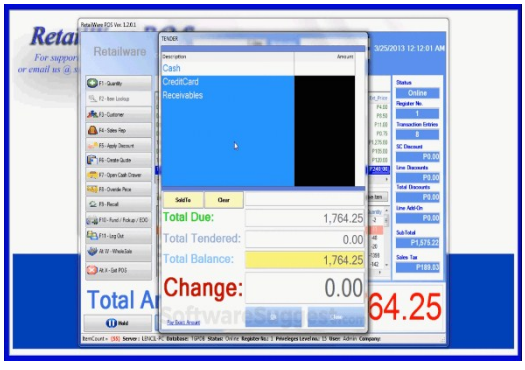


Exhibit 18 : Retailware Software



Teaching Note:
In a bold strategic move, Lucky Bazar is gearing up for a transformative journey to overcome its current challenges and emerge as a pioneering Smart Trolley Store. Faced with traditional billing systems and lengthy queues, the visionary CEO envisions a future where the shopping experience is redefined through RFID-based smart trolleys seamlessly integrated with cutting-edge IoT technology. These intelligent trolleys promise to revolutionize the customer journey, offering automatic item scanning, real-time inventory tracking, and personalized interactions via a dedicated mobile app. The decision reflects Lucky Bazar's commitment to innovation, operational efficiency, and a customer-centric approach, as it positions itself to lead the way in the dynamic landscape of smart retail in Kolhapur. This strategic evolution marks a pivotal step toward not only meeting the challenges at hand but also setting new standards for excellence in the competitive retail arena.

Objective:
This case study encourages students to critically analyze the interplay between cloud computing, IoT, RFID, and app development in the retail sector, fostering a holistic understanding of technology integration in real-world business scenarios.

Key Learning Objectives:

- Understand the importance of inventory management in the retail industry.
- Differentiate between traditional barcode systems and RFID technology.
- Learn the implementation of RFID based smart trolley technology in stores
- Learn the implementation of IoT, Arduino, and Sensors etc.

Introduction: Briefly introduce Lucky Bazar and its prominence in Kolhapur.

Current Inventory Management:
- Discuss the store's infrastructure, layout, and use of technology in the current barcode system.
- Emphasize the strengths and limitations of the existing system
- Discuss client server architecture
- Discuss cloud models & advantages of off-premises over on-premises storages

Provide the Introduction to RFID: Discuss how RFID technology works and its potential advantages over traditional barcodes.

IoT Implementation Steps:
- Dive into the detailed implementation plan of RFID based Smart trolley
- Discuss various sensors and microcontrollers

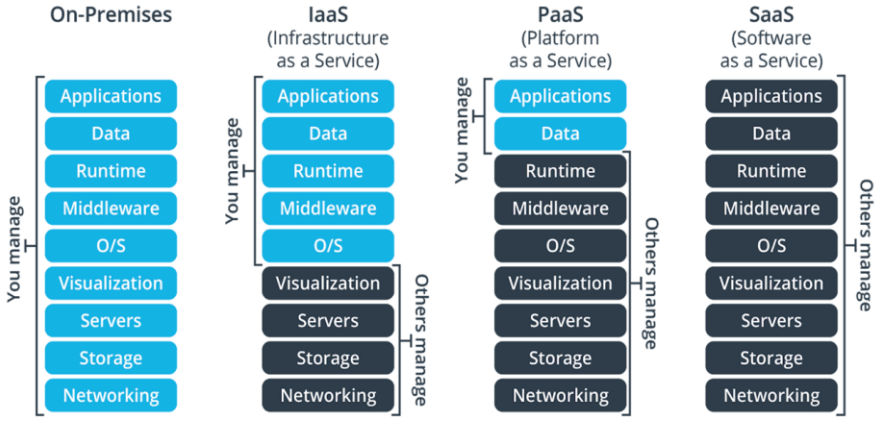
Class Discussion: Facilitate a class discussion on the feasibility, challenges, and benefits of smart trolley implementation for SPICE Store. Encourage students to analyze the case from different perspectives, considering the store's goals and potential impact on customer experience.

Conclusion and Future Outlook:
Summarize key takeaways from the case.

Refer all the Exhibits for solving the case

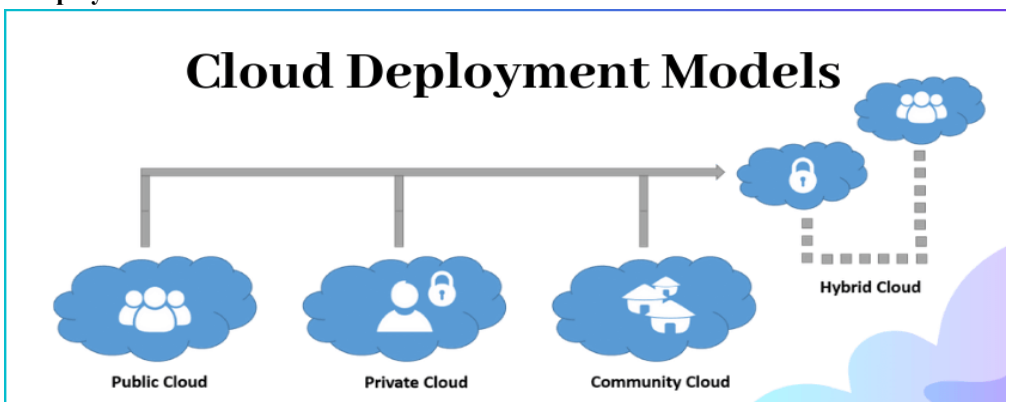
1. **Cloud Models**

Service Models:



Ref: https://images.app.goo.gl/82PoiRCamddMcgSs6

Deployment Models:



2. **In order to overcome the existing data management challenges in the store, particularly in terms of centralized server reliance, lack of backup systems.**

To effectively address and overcome Lucky Bazar's present data management difficulties, including dependency on a centralized server, lack of backup systems, and the need for efficient data administration, the shop can deploy a number of strategic solutions. First, Lucky Bazar should look into cloud-based storage options to improve data accessibility, security, and scalability. This change would reduce the risks associated with using a single centralized server, resulting in a more resilient and dynamic data infrastructure.

Furthermore, implementing regular and automated backup systems is critical for avoiding data loss. Lucky Bazar can invest in reliable backup solutions, such as off-site backups, to maintain the integrity and availability of critical sales and purchase data. This strategy would provide a safety net in the event of unexpected technical problems or data.

Recommended Cloud based solutions:
Choosing the cloud based solution will provide below advantages

- Data recovery and continuous backups
- Data safety & security
- Reduced Operational & Maintenance cost
- Reduced Employee Costs
- Huge Data storages
- Pay-as -you-go Solutions.
- Choose appropriate services like SAAS, IAAS & PAAS.
- Choose the relevant Deployment Model - Private, Public or Hybrid
- Choose the Cloud based POS.

Hybrid Cloud Deployment:
Using a hybrid cloud architecture will allow Lucky Bazar to maintain sensitive data, including transaction and customer information, on-premises while utilizing cloud services for the POS system. The POS programme itself can be run on the cloud, allowing for greater flexibility and scalable performance. It ensures that essential client data remains in a secure on-premises environment. Cloud services allow the POS system to be scalable and flexible.

Public Cloud Deployment: If they choose to use public cloud services, they must migrate all the data and apps to the infrastructure of a third-party cloud service provider. This may be appropriate for non-sensitive data and scalable applications that benefit from the cloud's elasticity.

Private Cloud: Setting up a private cloud for Lucky Bazar entails constructing a safe and unique internet environment solely for them. It's similar to having a personal, digital storage place that is extremely secure and customizable to their specifications. This helps to protect client information and ensures that Lucky Bazar follows all relevant rules. It also includes a robust backup system to protect against data loss. The private cloud also ensures that the store functions properly without any glitches. It's like having their own private and dependable digital universe to manage all of their data.

Cloud based POS:
Cloud-based Point of Sale (POS) systems for retail are novel solutions that use cloud computing technology to improve the efficiency and flexibility of retail operations. Unlike traditional POS systems, cloud-based POS runs on internet-connected servers, allowing businesses to view and manage sales data, inventory, and customer information from anywhere.

These systems provide real-time updates, easy connectivity with other corporate applications, and automated backups to reduce the risk of data loss. Furthermore, cloud-based POS systems are expandable,

making them ideal for enterprises of all sizes. They offer inventory management, sales statistics, and secure transactions, resulting in a more efficient and responsive retail experience. Square, Shopify, and Light speed are among popular cloud-based POS providers.

3. RFID Technology

Radio Frequency Identification is referred to as RFID. It is a system that wirelessly identifies and tracks items using radio waves. The tag is activated by the reader's radio signal, and it then answers with a special identification number. RFID tags can be affixed to a variety of things, such as goods, assets, and even live things, and they can be read without a direct line of sight from a distance. Inventory management, asset tracking, access control, and contactless payment methods are just a few of the uses for RFID technology.

Benefits in smart store management

- Enhanced inventory accuracy: Real-time inventory tracking made possible by RFID technology can assist merchants avoid overstocking and stock outs. Higher sales and improved stock management may follow from this
- Enhanced efficiency: Inventory counts and product searches are only two laborious activities that RFID systems can automate, saving time and money on labor
- Improved customer experience: RFID can help businesses serve customers more quickly and accurately, cutting down on wait times and raising satisfaction levels.
- Better visibility into the supply chain is made possible by RFID technology, which enables merchants to trace things from the producer to the store shelf. This improves supply chain management and lowers the possibility of lost or stolen goods.
- Reduced shrinkage: RFID can assist merchants in tracking the flow of items and identifying them, making it simpler to spot and stop theft or loss.

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Implementation of RFID in Smart Store:

All products must be RFID-tagged, RFID readers and antennas must be installed, and the system must be integrated with existing systems for the RFID implementation to be successful. Retailers who use their RFID technology can increase shop productivity, decrease out-of-stock situations, and improve inventory accuracy. Implementation and integration are quick and simple because they may be readily connected with already installed POS software and systems. To ensure that merchants are completely prepared to use their new RFID systems properly, they also offer training and assistance. RFID solutions can be successfully implemented by choosing the appropriate hardware, organizing the system layout, training people, integrating with current systems, and doing a pilot test. RFID implementation will help meet company objectives and streamline inventory management procedures.

IT consultant proposes Transformation plan & solutions

Implementation of RFID in the store & by merging numerous technologies, a smart trolley, sometimes referred to as a smart shopping trolley or intelligent shopping trolley, transforms the conventional shopping experience.

Smart Trolley APP development: it features the customer logins, displaying product details, maintaining customer details & the app can be integrated with the POS system of the store to centralize all the details of the items in the store. Customer's first register or log onto the smart tram system using a supplied device or

smartphone app. With the use of integrated navigation or touch-screen displays, the trolley helps customers find what they're looking for by displaying store maps, product categories and item placements.

Product details on the screen :
Customers can access specific product information, such as pricing, ingredients, customer reviews, and nutritional information, right on the trolley's display by using RFID .Furthermore, the smart trolley provides customers with related goods, exclusive deals, and tailored recommendations in real-time based on the items scanned. By highlighting the
items on their list and sending them messages when they are nearby, it helps customers navigate the store by allowing them to build a digital shopping list or sync a pre-made list from a mobile app.

Retain Customer Loyalty:
The shopping experience is improved by personalized discounts, offers, and loyalty programme integration since these features allow customers to earn and use reward points conveniently and are tailored to their unique needs.

Automated Check-outs:
The Radio frequency ID reader automatically detects the merchandise by scanning the tag while the consumer is still holding the product in the smart trolley. An automatically produced electronic product code number is assigned to it. Microcontroller memory is used with an LCD display to store information on item prices and total billing. The information about the goods, including its name and price, is provided by this electronic product code. It provides an RFID-based invoicing system, to prevent the procedure. The user has two payment options: cash or credit/debit cards. However, the process that takes the most time is for billing purposes. As a result, there is now a longer wait to pay the bill. The RFID-based smart tram system is suggested as a solution to the laborious process. The smart trolley offers support and assistance functions that let users ask store employees or customer service representatives for assistance, raise queries or get product recommendations as needed.

Proper Backups & Data Management:
there is a need of scaling up of the servers & Storages in-house or develop in-house data centers else they can prefer “private Cloud Solutions” if the data is stored using cloud solutions various analysis can be carried out to study the sales & Customer behavior & buying patterns which will enhance the customer behavior.

Implementation of this transformation cost is one time investment but it will also reduce the operational & Employee cost at the store .Overall the implementation of this smart trolley store - transformation of Lucky Bazar will help them to rank one of the first smart stores in the city.

4. Sample Design of Smart trolley.

These are few sample of smart trolleys already available in the market, The bazar can purchase the entire Trolley with the setup as well they can assemble the RFID based smart trolley for the store on the cost analysis ratio.

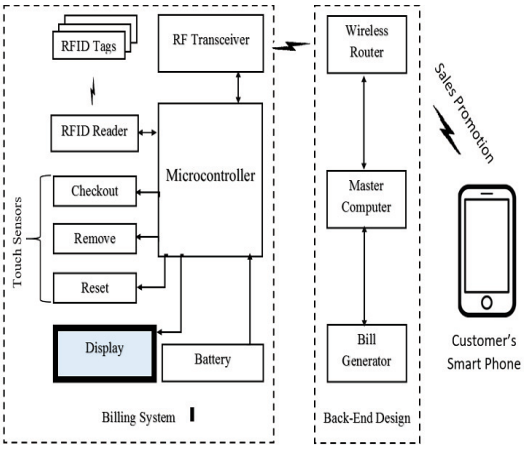
Samples of Smart Trolleys in Market

Smart trolley available in market
https://www.indiamart.com

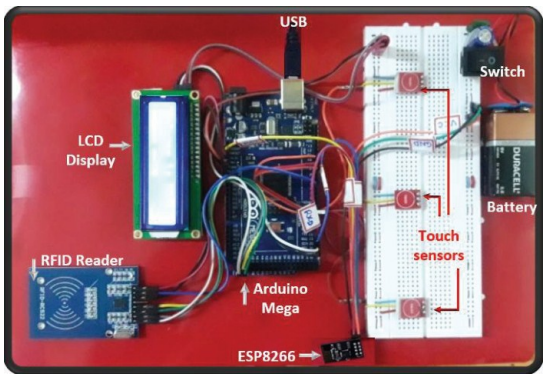
Smart trolley available in market
https://smartshoppingtrolley.medium.com/

Smart trolley Design using Arduino /Raspberry & App implementation with Cloud solutions.

Block diagram



Design (App integration as well design of smart trolley)



Hardware setup

Attribute	RFID	Barcode	QR Code
Accessibility Range	≤ few meters	≤ few inches	≤ few inches
Line of Sight	Not Required	Required	Required
Read/Write	Read and Write	Read Only	Read Only
Information Capacity	More than QR code and Barcode	Very Less	Less
Reliability	Damaged tags can work flawlessly	Damaged tags won't work	Up to 30% damaged tags can work
Cost (in bulk)	$0.01	$0.001	$0.001

RFID BASED

Ref: https://ijrcs.org/wp-content/uploads/201802064.pdf

5. Conducting a comprehensive cost-benefit analysis for the proposed RFID-based smart trolley system

Identify the initial implementation costs:

- Hardware Costs: Determine the costs connected with getting RFID technology, such as smart trolleys, RFID tags, and scanning equipment.
- Software Costs: Estimate the costs of developing or obtaining RFID software solutions, as well as mobile app development and integration with existing systems.
- Installation and Training: Consider the price of implementing the system in the store, training employees, and potential disruptions during the deployment process.
- Infrastructure Upgrades: If necessary, examine any changes or upgrades to current infrastructure, such as network improvements.

Estimate the ongoing operational costs:

- Maintenance: Determine the cost of routine maintenance of RFID hardware and software components, including updates and patches.
- Operational Support: Consider the expense of continuous support, such as customer service and technical assistance.
- Energy Consumption: Evaluate the impact on energy expenses of the new RFID system's continuous operation.

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Understanding a child with Oppositional Defiant Disorder: A Case Study, India.

Ms. Urmila Chavan
CSIBER, Kolhapur, India

Swanand's Case history:

As she stood outside her son's bedroom door holding the handle shut, trying to keep him inside for his punishment, Akshata fought back her tears. She felt like she failed, not knowing what to do. Her 4-year-old son's intense tantrums scared her a lot, and she felt both powerless and angry. Her mother-in-law would be home soon, and Akshata wanted her son, Swanand, to calm down before she arrived. He stopped screaming and banging on the door, making Akshata breathe a sigh of surprise and relief, hoping he would stop. Then she heard a loud crash, making her jump. She quickly opened the door, afraid for Swanand's safety. To her horror, she saw him on the bookshelf, tearing the curtains and knocking the bookshelf down. She yelled at him, spanked him, and then started crying. He ran into the living room and turned on the TV while she sat on the floor feeling hopeless.

Seeking Psychologist Help:s

At that point, Akshata decided she had to get help, or her son would surely end up like his father. The next morning, she called Swanand's pediatrician, and his nurse arranged an appointment with a child clinical psychologist, Dr. Vijaya.Two weeks later, Akshata and Mrs. Arun brought Swanand for his appointment. Dr. Vijayaa met them in the waiting room, calling Swanand's name. She then kneeled down to his height level, smiled at him, and said hello. She said hello to Akshata and Mrs. Helms and shook their hands. She took all three of them into her office and asked Swanand to play with the toys while she talked with his mom and grandma. She wanted to know about the problem, what symptoms they noticed, and about their family history.

Swanand's Behavior Symptoms:

When Swanand was younger, he acted like other kids his age. But in the last year or so, he started behaving differently. He became very rude and angry, saying mean things to his mom and grandparents. He'd call his mom names and tell his grandparents he didn't like them. His mom and grandparents felt like they had to be careful around him, hoping he wouldn't get upset, because when he was mad, nobody around him could be happy.

Swanand's behavior was hard to handle. Akshata, her husband's parents, nobody could control him. They tried praising him, talking to him, begging him, and taking away his toys. They even tried giving him candy or ice cream if he stopped misbehaving. But if he didn't get what he wanted, he'd throw a tantrum until he did. During tantrums, his mom and grandma felt like he was trying to control them, not just losing control. He'd cry, scream, fall down, kick, and hit things. He'd hit an adult if they tried to stop him. When Akshata tried to discipline him, he'd laugh and say it didn't hurt. She'd stop, feeling scared, and hug him, asking for forgiveness.

He wouldn't go to bed when asked and often fell asleep watching TV. He wouldn't clean his toys or brush his teeth. When his mom was on the phone, even if it was important, he'd annoy her by making loud noises. If he got what he wanted, he'd be happy and sweet, but that didn't happen much. Even at fun places, he'd argue about things like tokens or pizza. He argued harshly and bossily.

If Akshata tried to discipline him, he'd retaliate. Once during lunch, he wanted a cookie. She said he could have one after eating half his sandwich. He poured milk on his sandwich and table. When she locked him in his room, he'd make a mess until she let him out. She stopped taking him out because of his behavior. She worried about what would happen when he started school.

Social and Family History:
Swanand was the only child of Arun and Akshata. They were married the summer after they graduated from high school, and a year and a half later, Swanand was born. Swanand's mom had a normal, healthy pregnancy, and there were no issues when he was born. He reached all his early milestones like crawling, walking, and talking when he should, and he didn't have any health issues. As a little kid, he was loving, talkative, curious, and liked asking questions. He enjoyed being read to and could sit still for a long time listening to stories even when he was just 2 years old. Akshata and Swanand developed a close, warm relationship.

Akshata was a full-time homemaker, and Arun worked as a welder. They lived in their own apartment in the same part of town as Arun's parents. Akshata's parents were divorced and she was living with her mother. She saw him last when she was 8 years old. Akshata's mother did not have a very close relationship with Akshata, and they frequently argued over Akshata marrying Arun over how she was raising Swanand. Akshata had pretty much stopped spending time with her. Arun was very close with his parents, though, and they got along well with Akshata. Akshata spent a lot of time with his mother when Arun and his father were at work, and her mother in law would often babysit for Swanand.

Akshata and Arun usually had a loving and good relationship, but Arun sometimes had periods of feeling down, which might have been serious depression. This tendency to feel moody seemed to be common in Arun's family, affecting the men. Arun's father also had times of feeling depressed. Neither Arun nor his father got help for their depression. Arun's family members were concerned that all the boys in their family might have this problem. Swanand's grandma kept a close eye on him as a little kid, looking for any signs that he might also get this moody trait.

Arun started smoking when he was in middle school and kept at it through high school and sometimes even after he got married to Akshata. They drank alcohol occasionally, but Arun drank more than Akshata did. When Akshata got pregnant, she didn't want Arun to smoke at home, so she asked him not to bring cigarettes there, and he mostly listened. He still hung out with his friends and sometimes used drugs, but he didn't bring it home anymore. He was a good dad and loved spending time with Swanand, who was his pride and joy. They'd play together, and Swanand loved watching his dad play video games, pretending to play along.But when Swanand turned 3, Arun started feeling depressed again. He spent less time with his family and more time away with friends or by himself. He started smoking a lot again.

Akshata was worried but didn't know what to do besides asking him to quit smoking. After two months of this, one day he left. When Akshata and Swanand were out shopping, he packed his things and left in his truck without saying goodbye to anyone. Akshata hoped he'd come back at first, but when they ran out of money, they had to move in with Arun's parents. They hadn't heard from him since he left. Arun's parents were supportive of Akshata and Swanand and felt ashamed of their son for leaving them. They were determined to take care of them.

The DSM-5 criteria for ODD.

Kindly find Diagnostic Criteria as per DSMIV-V-Revised in 2022

According to the Diagnostic and Statistical Manual of Mental Disorders (DSMIV-V-Revised in 2022; pp. 522), Swanand met the criteria for oppositional defiant disorder (ODD), one of the disruptive behavior disorders.

Recommendations
Observation, Conceptualization and Treatment

Session I

While gathering this background information, Dr. Vijaya kept a close eye on Swanand's behavior. He played quietly with the toys and seemed a little shy at first. He was listening carefully to every word that was said but didn't participate in the conversation. He readily went to the waiting room with his grandmother when asked so that his mother could speak privately with Dr. Vijaya about sensitive information. As the session went on, however, he would occasionally leave the toys and stand by his mother while she talked, touching her hair and laughingly, almost embarrassedly, denying her claims. When his grandmother would chime in, agreeing with and supporting Akshata's reports, Swanand would go back to playing. If asked a direct question, such as what his favorite foods were, or what television shows he liked, he readily responded. His play was age appropriate, And there weren't any signs of having trouble paying attention.. In fact, Swanand seemed more mature than many 4-year-olds in his ability to follow the conversation. There was clearly warmth and affection between Swanand and his mother during their interactions in this first session. In addition, his Grandma appeared to be very supportive of Akshata. But the issues started to show when it was time to leave, and Swanand started acting up. He wanted to take a toy home. When his mom and grandma tried to tell him no, he got more stubborn until he angrily threw the toy down and walked off.

Dr. Vijaya recommended that Akshata and Swanand come alone to the next session so Akshata could learn the tools she would need to discipline Swanand successfully and to set appropriate and effective limits on his behavior. Swanand's oppositional defiant disorder was seen as emerging out of his difficult emotions stopping from the loss of his father. These emotions, combined with his mother's lack of self-confidence after her own loss of her husband (made particularly difficult for her in light of her own lost relationship with her father) undermined her consistency and sense of certainty in disciplining Swanand. It is also often harder for single parents to maintain discipline because they don't have their spouse's help. From a family systems perspective, Akshata was now almost in a child role in relation to her in laws, and although her mother in law did not actively undermine her, this child role further weakened her authority with Swanand. Finally, all three adults remaining in Swanand's life were afraid that if they disciplined him too severely, it would scar him for life by making him moody and depressed. The intervention, therefore, was to first *teaching Akshata how to manage Swanand's behavior, then elevating her status in the family system to being clearly an adult/authority figure, and next reassuring everyone that Swanand actually needed discipline as much as he needed love.* Finally, Swanand would be seen individually in play therapy to address his feelings of loss relating to his father's departure.

Session II

Time-Out Procedure: At this session, Akshata and Swanand were seen together. Again, Swanand was allowed to play in the room with toys while Dr. Vijaya talked with Akshata, his mother. Dr. Vijaya educated Akshata about the importance of clear, realistic expectations about children's behavior and consistent, predictable, and effective discipline. Again, Swanand listened carefully. After a short time, he interrupted the conversation. Akshata gently reminded him to wait until she finished what she was saying. Swanand started poking her and intentionally getting in the way of her line of vision with Dr. Vijaya. Akshata looked helplessly at Dr. Vijaya, who asked her if this behavior was acceptable to her. After Akshata said it was not, Dr. Vijaya encouraged her to communicate this message calmly, clearly, and directly to Swanand, along with a request of what she expected him to do. When she did so, he hit his mother in the arm. Again, Dr. Vijaya supported her in setting appropriate limits. With the psychologist's support, Akshata told Swanand to sit in a **"time-out" chair** until he was ready to behave. She gently guided him to a chair where he sat for a moment, before getting up and misbehaving again. Next, Dr. Vijaya helped Akshata explain that since he would not sit there himself, his mother would have to hold Swanand in the chair until he was ready to behave. When Akshata held him in her lap in the time-out chair, however, Swanand began kicking and hitting his mother angrily. Again, Dr. Vijaya supported Akshata's efforts to limit his behavior. Akshata explained to Swanand that due to the basic rules of their family that no one can

be hurt, she would hold him in such a way that he could not hurt her. Dr. Vijaya taught her a limit hold that would let her control his behavior in a nonviolent manner, while keeping Swanand safe and not letting him hurt her.

Swanand responded just as Dr. Vijaya thought he would, but his reaction really upset Akshata. At first, he laughed like he was challenging them, but then he got worried when his mother didn't give in. His physical challenges to the hold increased: He fought and twisted, trying to headbutt his mother, then to kick her. He started crying and sobbing, begging to be let go. Dr. Vijaya encouraged Akshata through each step of this ordeal. She was told to remind Swanand that when he was calm and quiet and ready to behave, he could get out, but that he was not allowed to hurt people. Swanand kept arguing and started screaming and crying, saying he needed to go to the bathroom and that he was thirsty. He even tried to spit at his mom. She stayed calm (even though she was crying too) and told him that he could go when he was calm and ready to behave. After about 50 minutes of arguing, Swanand finally calmed down and stopped. Before releasing him, Akshata checked again with him to get his agreement that he was ready to behave, and he nodded through his sniffles. When she let him go, he immediately curled up in her lap, quiet and exhausted but behaving appropriately.

At this point, Dr. Vijaya praised Swanand for his good behavior and effusively praised Akshata for her courage in facing the difficult episode and her determination to take good care of her son. She was encouraged to repeat the same procedure at home any time he was defiant, disobedient, or argumentative and to begin with the least-restrictive time-out (a time-out chair by himself) and to move up to physical restraint only if necessary. She was told not to skip using time-out but to use it again as soon as possible. They planned another session for a few days later.

Session III

During the next session, Akshata was joyful and eager, while Swanand seemed calm and quiet.After the last session, Swanand seemed exhausted and had not misbehaved again that evening. He had even gone to bed when she asked him to. But on the next day, she had to hold him in time-out again for about an hour before he surrendered. A second time, she had to hold him in time-out for 20 minutes. After that, when he misbehaved, he would sit in the chair by himself with her watching him.

Next few Sessions:

The next few sessions involved strengthening the time-out procedure and helping Akshata understand when and how to use it. Dr. Vijaya also taught Akshata to positively reinforce Swanand by praising him when he behaved appropriately or did what she asked.

Family Sessions:

Grandma joined Akshata and Swanand in the next few sessions. She was also invited, but he did not feel his work schedule allowed it. During these family sessions, a parental alliance was strengthened between Akshata and her Mother in law, and clear boundaries were drawn with Swanand to elevate Akshata clearly to a parental level with Grandma, while keeping Swanand clearly at the child level. During these sessions, Dr. Vijaya taught more parent management strategies to help Akshata and her mother in law have age-appropriate and reasonable expectations for Swanand’s behavior. During this time, Swanand’s behavior was “transformed.” Akshata and his grandma were both happy about Swanand’s gains and had been able to follow through very successfully with consistent use of time out. During these sessions, the issues of loss and missing Arun were discussed. After Arun’s Mother expressed her fears that her husband’s and Arun’s “moody genes' ' would be passed on, Dr. Vijaya reassured her.

Individual Play Therapy:
After the goals of parent management training had been met, Dr. Vijaya began to meet individually with Swanand in play therapy. Play therapy is used with preschool children because they often use symbolic play to manage their feelings and practice new skills. Children that age have difficulty verbalizing their feelings directly. Initially, Swanand was aloof and angry when he entered the playroom and resisted symbolic play. Dr. Vijaya said she understood how mad he must be at her for helping his mom change the rules of their family. During initial sessions, he used large colored blocks to make sidewalks for him and Dr. Vijaya to walk on. Dr. Vijaya remained accepting, following his every lead, and after a few sessions, he warmed up and began engaging more readily in symbolic play. Dr. Vijaya looked for ways to comment on the feelings the themes of his play reflected. For example, Swanand's play repeated over and over again the theme of a "Daddy" figurine getting on the toy plane and flying away from the "child" figurine. Dr. Vijaya empathized with how sad the child must be that his daddy is going away and how much he must miss him. She then added that the child must also feel angry at his father for leaving. Swanand nodded at these interpretations. Dr. Vijaya added that Swanand must miss his father, too. Swanand initially did not respond directly to such comments, but after several sessions, a new theme emerged in his play. He chose to play with a toy mailbox, scribbling on a piece of paper then putting it in the mailbox. He said he was sending a letter to his father. Dr. Vijaya again focused on the feelings behind these actions, saying to Swanand how much he wished he could write his father a letter and get one back, and how sad it was that this could not happen. After these themes began to recede from his play and his feelings seemed to have been fully processed, Dr. Vijaya and Akshata decided to end the therapy. By the last session, Akshata felt more confident about her capability to provide effective discipline. Her relationship with Swanand was more positive, and his behavior was much improved.

Treatment: The best-established type of treatment for ODD is **parent management training**. There is substantial evidence that this treatment is very effective for reducing children's disruptive behaviors and improving family functioning. This intervention has many different forms but always focuses on training parents to improve their interactions with their children and respond successfully to problem behaviors. Parents learn to positively reinforce desired behavior and stop reinforcing problem behaviors. They learn to set up systems of consequences for problem behaviors, such as loss of privileges or time-out, and increase the consistency of their parenting. The evidence shows that parent management training results in substantial improvements for children who show disruptive behavior. This treatment is especially effective with children who have ODD as well as another comorbid condition or who have more severe dysfunction as the result of their disorder.

Cognitive behavioral approaches are also effective in treating ODD. One such treatment is collaborative problem solving, which focuses on improving the joint problem solving of parents and children. This treatment showed similar effectiveness to parent management training and children's gains in symptom improvement continued after treatment so that by follow-up, it was significantly more effective.

Family therapy approaches have also been shown to be effective in treating ODD, and some of these were used with Swanand. Including his grandmother in the treatment, and specifically focusing on strengthening boundaries between subsystems (the parent subsystem of his grandmother along with his mother, separated from the child subsystem of Swanand) was an example of this family therapeutic approach. For adolescents, multisystemic therapy proved to be very effective, but research needs to establish its effectiveness for school-age children. Multisystemic therapy involves targeting the entire family system and how it interfaces with the community—integrating social work, community support, and school support—and has often been used with adolescents with severe conduct disorder.

Most children who are treated for ODD are school age or adolescents; Swanand was treated as a preschooler. Treating preschoolers may be a real advantage because their behavior is not as rooted by habit

and may be easier to change. Regardless of the type of therapy used, establishing a strong therapeutic alliance is essential. The alliance between the therapist and the parent is linked to how much the parent is able successfully to change their parenting behaviors, Dr. Vijaya focused on developing a supportive, accepting relationship with Akshata, empathizing with her struggles and encouraging her progress. This support helped Akshata through the difficult changes required for therapeutic success. After these changes were established, she was able to focus on helping Swanand with his feelings of sadness and anger at his father for leaving.

Medication is not typically used for ODD unless it is comorbid with ADHD, and then drugs for ADHD are often used. To control aggressive behaviour, clinicians sometimes use antidepressants or anticonvulsants that are typically used to treat bipolar disorder. More recently, antipsychotics have been used to target aggression, but these medications have a number of side effects that may outweigh their benefits. Non Pharmacological interventions should be used first to see if medication can be avoided.

Case Questions

1. What is O.D.D.? If you come across a child like Swanand, what will be your way to observe him?
2. How do the case history causes regarding O.C.D.?
3. Family therapy plays a vital role regarding O.D.D. - Elaborate this with Swanand's example.
4. Some television shows featuring people helping families cope with their disruptive children have become popular. Have you ever seen them? Is disruptive behaviour in children on the rise? If so, what factors do you think are responsible?
5. Researchers found that Slapping causes increases in children's aggression and oppositionality, at least in some families. How did the researchers establish that Slapping caused the aggression, and not that aggressive children caused their parents to slap them more?
6. How do positive and negative reinforcement work in a forced cycle? Have you witnessed a parent and child having such an interaction before? If yes, can you point out what behaviours were encouraged and discouraged, and how Teaching Note & Procedure:

Teaching Note & Procedure:

Sr. No	Content	Resource	Teacher's Activity	Student's Activity	Mnts
1.	**Introduction**	-	1. To make students aware about psychological conditions	1. To listen	5
2	Presentation Of **Session Objectives**	-	1. To make students understand the objectives of the session	1. To listen	5
3	Phase I **Factual Part** Rucha's Case	Exact Half Part Of The Case In Printed Or Soft Copy Format	1. To form a group of students. 2. To ask the students to read the case individually	1. To read the given case. ii. Mark the vital points and to make the notes of it.	30
4	Phase II **Root Cause of Case** Reflecting On Question Part-	Question Part Of The Case In Printed Or Soft Copy Format	1. To ask students to discuss the case study first. 2. To ask students to read the questions and reflect in the group	1. To discuss the case study in the group with the pointers made. 2. To read the questions and reflect on it by discussing in the group.	40
5.	Phase III **Recommendations/ Treatment**	Recommendation Or Treatment Part Of The Case In Printed Or Soft Copy Format	1. To ask the students to discuss the recommendation treatment, therapy selection part	1. To discuss the recommendation treatment, therapy selection part	30
6.	Phase IV **Presentation**	-	1. To ask participants of each group to present the reflections in front of all students. 2. To other groups and participants to give inputs on presentation.	1. To select one presenter among the group. 2. To participate and reflect on the discussion.	40
7.	**Key Learning, Summary & Closing Statement**	-	1. To elaborate, summarize the case.	1. To note down the summary.	5

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From Waste to Value: A Strategic Approach to Implement Lean Manufacturing in a Manufacturing Firm with reference to Wilo Mather & Platt Pumps Pvt. Ltd., Kolhapur, India.

Mr. Viraj V. Jadhav
CSIBER, Kolhapur, Maharashtra State, India

On one of the hot days of May, Mr. Siddharth, Head of Department for Production Planning, Control and Process Engineering at Wilo Mather & Platt Pumps Pvt. Ltd ,Kolhapur was sitting in his office going through the new client orders received from the sales department. He was preparing a schedule for machining these new orders. To get more clarity about the existing schedule, he called the floor supervisor to his cabin. Floor supervisor came with the existing schedule of the shop floor. Siddharth was in complete shock when he went through the schedule. As per the schedule, there was not a single empty slot available to accommodate new products for machining despite all the machines not working at full capacity.

He rechecked the schedule, went through all the existing orders details but it was of no use. He was not able to find the empty slot for new products. Already the firm was facing cost pressure because of the global recession and in the middle of such a situation this was a serious problem. Firm cannot afford to lose the business. Siddharth was lost in thoughts when his phone rang. Amit, one of his close friends, was on call. Amit used to work for a Japanese manufacturing organization. While talking on call, listening to the tone of Siddharth; Amit realized that something was wrong. Amit asked him to discuss the issue. First Siddharth explained about his company Wilo Mather & Platt Pumps Pvt. Ltd.

Background of Wilo Mather & Platt Pumps Pvt. Ltd.:
Wilo SE is a European manufacturer of pump and pump systems for building technology, water and industrial sectors with headquarters in Dortmund, Germany. Founded in 1872 as a copper and brass factory by Louis Oplander, the company has over 60 subsidiaries in more than 50 countries and employs about 8200 worldwide. Wilo has evolved from being a local specialist to a global player. As the majority shareholders with a stake of approximately 90 percent, the Casper Ludwig Oplander founded ensures the company‘s continuity and independence.

Wilo is a premium supplier in the field of building services, water management and industry. This leading position drives us to maintain our superiority. For customers they make complex technologies user friendly, simple to operate energy, efficient and powerful. Mather and Platt started its operations in India in 1913, beginning in Kolkata. For over 100 years, it has been supplying water for various purposes in India, such as building services, water management, and industries. In 1959, the company expanded its manufacturing to Chinchwad, Pune, and Maharashtra. At its Chinchwad plant, the company produces a range of large centrifugal pumps and pumping systems. In 2005, Mather and Platt Pumps Ltd. became a part of Wilo. In 2009, a new modern manufacturing facility was established in Kolhapur, around 260 km from Pune. Covering approximately 6000 square meters, this facility manufactures the latest high-efficiency pumps and pumping systems in India.

The Pune and Kolhapur plants have acquired ISO9001, ISO14001 and ISO45001 and the products are CE certified. In the recent past they were the pioneers in manufacturing one of India's largest metallic vertical turbine pumps supplied with more than 4MW motors. In the year 2014 the status of the company changed from public limited to private limited and the name of the company was changed to Wilo Mather and Platt Pumps Pvt. Ltd

Table No. 1 Wilo Milestones

Year	Milestones
1995	Kolhapur activity started with a foundry.
2005	Wilo takes over Mather Platt.
2007	MVI/MHI Mfg. started.
2008	NL Mfg. started.
2009	MISI-PISO shifted from Pune.
2011	New building inaugurated.
2014-2015	1st WPS and IMS assessment successfully conducted.
2019-2020	PB and Atmos Giga-N, Monoblock Mfg. started.
2021	1st Global Award for the plant- WILO Innovation award. CMM installation.

Vision: We run world-class factories with smart people and smart processes resulting in ultimate customer satisfaction.

Mission: We identify Industry 4.0 potential for our plants and partners. Our engaged people use smart solutions and drive efficiency increase by harmonized, connected and flexible production systems.

Goals: We are ambitious. We set goals for ourselves with regard to sustainability, innovation and growth. We seek to set the global standard in these areas with our company.

Culture:
Wilo facilitates a free working style that empowers every single employee to make their own decisions.

Strategy:
Derived from our Wilo Ambition, each production site has its focus on individual plant strategy with a 3–5-year horizon. This strategy breaks down to short-term targets for the next 12 months, which are reflected in the value stream future state and well communicated within the organization.

System:
By targeting waste-free values stream, we generate production systems that meet our customers' requirements. All production and support processes are designed and harmonized to fulfill the value stream.

Process:
We continuously improve processes by combining the elements of our foundation to a holistic approach. This is the basis of creating a production system that meets the requirements of the future state value stream.

Foundation:
With the tools of our WPS Foundation, we enable transparent, waste-free and stable processes. This is the basis of all further improvements and should be applied comprehensively in every global Wilo site.

Customer:
Our daily activities are determined by fulfilling customer requirements in terms of quality, cost and delivery times. In WPS all steps necessary to meet customer requirements are defined as added value and everything else as waste.

People:
Peoples are our most valuable resources. Within a safe environment, we train, connect and empower people for continuous improvement and goal achievement.

Competition: Being one of the oldest firms, Wilo is having stiff competition from world class players like Goulds Pumps, Weir, Grundfos Xylem, Kirloskar Brothers Limited (Kbl), Suzler across the world.

After listening to Siddharth, Amit appreciated the efforts of his friend at Wilo. Then he asked Siddharth, "Have you checked "**MUDA**" in the system. Siddharth was not in a mood to crack jokes so he asked him to be serious. Amit told him that he is seriously and seriously asking about the "**MUDA**" which is a Japanese word for "**WASTE**". Then Amit explained the concept of Lean Management to Siddharth.

Lean Management:
"Lean manufacturing is the systematic elimination of waste. As the name implies, lean is focused at cutting fat from production activities. It is a production method aimed primarily at reducing times within the production system. Lean Manufacturing is defined as a set of management practices to improve efficiency and effectiveness by eliminating waste. The core principle of lean is to reduce and eliminate non-value adding activities and waste.

MUDA (Waste):
What is Muda?
Muda is anything in the manufacturing process that does not add value from the customer's perspective. MUDA is a core concept of waste in the Toyota Production System (TPS), the building block of Lean management. As part of the 3M concept—alongside MURA and MURI—MUDA helps find activities in a process that don't add any value. The Japanese word 'MUDA' means uselessness or futility. In Lean management, MUDA refers to changes or actions that don't make the product better in a way customers would want to pay for.

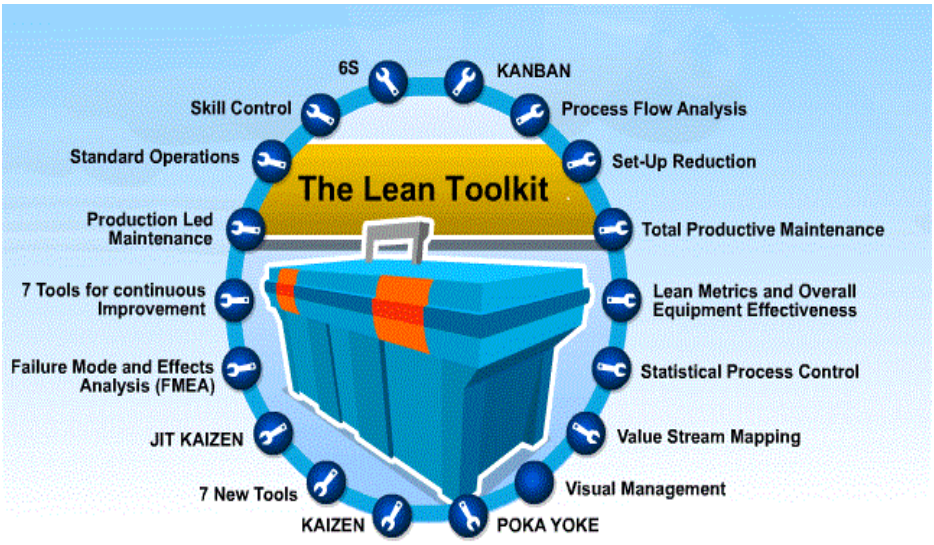
Source: https://goleansixsigma.com/8-wastes/

How does Muda help?
Muda doesn‘t help. Muda means “waste”. The elimination of Muda (waste) is the primary focus of lean manufacturing.

Why does understanding waste in a business process matter?
When aiming to make your processes more efficient and save money, you might wonder: what can we trim down or change? To figure this out, you need to distinguish between what's essential in the process and what isn't. You also need to identify which actions add value to the product for customers and which don't, even if they're still necessary.

How to identify process waste that needs removing?
Take a close look at your current processes and find out where there's unnecessary waste. You can check how much materials and components you're buying compared to what you're actually producing, review waste disposal records, have conversations with managers or workers involved, or even just walk around your workplace. If needed, you can also gather more details from your customers or suppliers

Lean Manufacturing Techniques:
Many of the concepts in Lean Manufacturing originate from the Toyota Production System (TPS) and have been implemented gradually throughout Toyota‘s operations beginning in the 1950's. Lean has a very extensive collection of tools and concepts.



Source: Odeyinka O. et.al. (May, 2018)

After getting good insights about lean management from Amit, Siddharth observed all the processes of various products (**Exhibit No. 1**) again with a different approach; that of identifying wastes. He noted down a few observations and recorded process time with the help of Stopwatch. He prepared a sheet to collect observed data (**Exhibit No. 2**). Amit shared one format with Siddharth to record Wastes present in the system (**Exhibit No. 3**)

These observations are as follows:

Table Description:

i. Activity: The table's activities like "Rough cut" and "Finish cut" refer to the steps that a machining component goes through.
ii. No. of Cuts: The quantity of cuts refers to the number of cuts necessary to eliminate extra material from the machining component.
iii. Total Time of the Activity: Total Time of the activity is the observed time that was timed using a stopwatch to acquire information for the component's machining.
iv. Time per Activity: The formula below is used to calculate the amount of time spent on each activity.

$$\text{Time per Activity} = \frac{\text{Total time of Activity (Minutes)} + (\text{Total time of Activity(Sec)}/60}{\text{No. of Cuts}}$$

Job Type	2871 ET Bearing Housing
Size	Medium
Date	02-12-2022

Table No. 2 Machining Time for 2871 ET Bearing Housing

First Side of the Machining				
Activity	No. of Cuts.	Time Per activity	otal Time of Activity	
Rough Cut		Min	Min	Sec
Flange Facing and Turning (Material removal 1.5mm Per cut)	5	3.1	15	20
ID(Inner Diameter) Flange boring(Material removal 1.5 mm Per cut)	4	1.7	6	41
Step Bore boring (Material removal 1.5 mm Per cut)	20	0.2	3	0
Finish Cut				
Facing and Turning of flange (Material Removal 1 mm per cut)	2	1.0	2	0
ID(Inner Diameter) Flange boring(Material removal 1 mm Per cut)	2	1.1	2	10
Step Bore boring (Material removal 1 mm Per cut)	2	0.5	1	0
		Total Time	**30.18 Min**	

Table No. 3 Job loading and Unloading Time

Job Loading	Min	Sec
Lift the Job and keep on fixture with crane		40
Job Setting(matching 3 holes of casing with dowel pin)		
Tightening jig nuts with spanner	1	22
Total Time	**2.02 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture	1	28
Lift the job and keep on pallet using crane		50
Total Time	**2.3 Min**	

Table No. 4 Machining Time for 2871 ET Bearing Housing

Second Side of the Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		Min	Min	Sec
Base facing(Material Removal 1.5 mm per cut)	6	2.1	12	28
Rough bore boring(Material Removal 1.5 mm per cut)	4	2.8	11	12
Finish Cut				
Base facing(Material Removal 0.5 mm per cut)	1	2.2	2	11
Boring (Material Removal 1 mm Per cut)	2	1.9	3	44
		Total Time	**29.58 Min**	

Table No. 5 Job loading and Unloading Time

Job Loading	Min	Sec
Lift the Job and keep on fixture with crane	1	3
Job Setting(matching 3 holes of casing with dowel pin)		
Tightening jig nuts with spanner	1	21
Cleaning the Fixture with air blower		30
Total Time	**2.54 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture	1	46
Lift the job and keep on pallet using crane	1	0
Total Time	**2.46 Min**	

Table No. 6 Total Throughput Time

Total Time for the First Side of the Machining	34.50 Min
Total Time for the Second Side of the Machining	34.58 Min
Total time for Machining + Job loading/unloading in Min for PTA-80(Min)	**69.08 Min**

Job Type	**2873 ET Bearing Housing**
Size	**Large**
Date	**04-12-2022**

Table No. 7 Machining Time for 2873 ET Bearing Housing

First Side of the Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		Min	Min	Sec
Flange Facing and Turning (Material removal 1.5mm Per cut)	5	4.2	21	0
ID(Inner Diameter) Flange boring(Material removal 1.5 mm Per cut)	4	2.0	8	0
Step Bore boring (Material removal 1.5 mm Per cut)	20	0.2	4	20
Finish Cut				
Facing and Turning of flange (Material Removal 1 mm per cut)	2	1.2	2	22
ID(Inner Diameter) Flange boring(Material removal 1 mm Per cut)	2	1.3	2	40
Step Bore boring (Material removal 1 mm Per cut)	2	0.7	1	24
		Total Time	39.76 Min	

Table No. 8 Job loading and Unloading Time

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane		54
Job Setting(matching 3 holes of casing with dowel pin)		
Tightening jig nuts with spanner	2	35
Cleaning the Fixture with air blower		35
Total Time	**4.06 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture	2	15
Lift the job and keep on pallet using crane	1	0
Total Time	**3.15 Min**	

Table No. 9 Machining Time for 2873 ET Bearing Housing

Second Side of the Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough		Min	Min	Sec
Base facing(Material Removal 1.5 mm per cut)	6	2.6	15	21
Rough bore boring(Material Removal 1.5 mm per cut)	4	3.4	13	35
Finish Cut				
Base facing(Material Removal 0.5 mm per cut)	1	2.9	2	52
Boring (Material Removal 1 mm Per cut)	2	2.3	4	37
		Total Time	**36.41 Min**	

Table No. 10 Job loading and Unloading Time

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane	1	25
Job Setting(matching 3 holes of casing with dowel pin)		
Tightening jig nuts with spanner	1	8
Cleaning the Fixture with air blower		44
Total Time	**2.28 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture	2	0
Lift the job and keep on pallet using crane	1	22
Total Time	**3.22 Min**	

Table No. 11 Total Time for Machining

Total Time for the First Side of the Machining	46.97 Min
Total Time for the Second Side of the Machining	41.91 Min
Total time for Machining + Job loading/unloading in Min for PTA-80(Min)	**88.88 Min**

Job Type	**1584 HSC Impeller**
Size	**Medium**
Date	**29-11-2022**

Table 12 Machining Time for 1584 HSC Impeller

First Side machining				
Activity	**No. of Cuts**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		**Min**	**Min**	**Sec**
OD Turning (Material Removal 1.5 mm Per cut)	4	3.2	12	50
Neck Facing and OD Turning (Material Removal 1.5 mm Per cut)	2	5.0	10	0
Shroud machining (Facing Material Removal 1.5 mm per cut)	2	4.0	8	0
Inner diameter Boring with chamfer (Material removal 1.5 mm per cut1)			5	50
Finish Cut				
Neck Facing and OD Turning(Material Removal 0.7 mm Per cut)	1	4.0	4	0
Taper turning(Material removal 0.7 mm per cut)	1	4.3	4	20
		Total Time	**45 Min**	

Table 13 Job loading and Unloading Time

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane		40
Job Setting(matching 3 holes of casing with dowel pin)		28
Tightening jig nuts with spanner		0
Total Time	**1.08 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture		
Lift the job and keep on pallet using crane		35
Total Time	**35 Sec**	

Table 14 Machining Time for 1584 HSC Impeller

Second Side Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		**Min**	**Min**	**Sec**
Neck Facing and OD Turning(Material removal 1.5mm per cut)	2	5.0	9	56
Shroud machining(Material removal 1.5 mm per cut)	3	2.6	7	40
Boring with radius bore and chamfer(Material removal 1.5 mm per cut)			16	0
Finish Cut				

Neck Facing and OD Turning(Material removal 0.5mm per cut)	1	3.8	3	50
Checking by micrometer				30
		Total Time	**37.9 Min**	

Table 15 Job loading and Unloading Time

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane		48
Job Setting(matching 3 holes of casing with dowel pin)		25
Tightening jig nuts with spanner		0
Total Time	**1.21 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture		
Lift the job and keep on pallet using crane		40
Total Time	**40 Sec**	

Table 16 Total Time for Machining

Total Time for the First Side of the Machining	**46.43 Min**
Total Time for the Second Side of the Machining	**39.51 Min**
Total time for Machining + Job loading/unloading in Min for PTA-80(Min)	**85.94 Min**

Job Type	**1530 Split case Impeller**
Size	**Large**
Date	**17-12-2022**

Table No. 17 Machining Time for 1530 Split Case Impeller

First Side of the Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		**Min**	**Min**	**Sec**
Rough OD Turning(Material Removal 1.5 mm per cut)	5	2.0	10	0
Neck Facing(Material removal 1.5 mm per cut)	3	2.0	6	0
Neck OD turning(Material removal 1.5 mm Per cut)	2	2.5	5	0
Shroud turning (Material removal 1.5 mm Per Cut)	3	4.0	12	0
Neck bore ID Chamfer(Material removal 1.5 mm per cut)	2	1.5	3	0
Bore Boss turning(Material removal 1.5 mm per cut)	10	0.8	8	0
Rough bore turning(Material removal 1.5 mm per cut)	1	5.0	5	0

Finish Cut				
Neck OD turning(Material removal 1 mm Per cut)	1	3.0	3	0
			Total Time	**52 Min**

Total Time for the First Side of the Machining	54.26 Min
Total Time for the Second Side of the Machining	63.01 Min
Total time for Machining + Job loading/unloading in Min for PTA-80(Min)	**117.52 Min**

Table No. 18 Job loading and Unloading Time

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane		38
Job Setting(matching 3 holes of casing with dowel pin)		35
Tightening jig nuts with spanner		
Total Time	**1.21 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture		
Lift the job and keep on pallet using crane		50
Cleaning of Fixture with air blower		15
Total Time	**1.05 Min**	

Table No. 19 Machining Time for 1530 Split Case Impeller

Second Side of the Machining				
Activity	**No. of Cuts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		**Min**	**Min**	**Sec**
Neck Facing (Material Removal 1.5 mm Per cut)	3	0.7	2	10
Neck OD Turning(Material Removal 1.5 mm Per cut)	3	1.0	2	57
Shroud machining(Facing)(Material Removal 1.5 mm per cut)	3	4.7	14	10
Bore facing with chamfer and radius(Material removal 1.5mm per cut)	16	0.4	6	0
Bore finish (Material removal 1.5 mm per cut)	3	10.9	32	36
Checking by plug gauge				30
Finish Cut				
Neck OD Finish	1	2.3	2	20
		Total Time	**60.21 Min**	

Table No. 20 Job loading and Unloading Time

Job Loading	Min	Sec
Lift the Job and keep on fixture with crane	**1**	**10**
Job Setting(matching 3 holes of casing with dowel pin)		**48**
Tightening jig nuts with spanner		
Total Time	**1.58 Min**	
Job Unloading Time	**Min**	**Sec**
Untighten the nut of the fixture		
Lift the job and keep on pallet using crane	**1**	**0**
Cleaning of Fixture with air blower		**22**
Total Time	**1.22 Min**	

Table No. 21 Total Time for Machining

Total Time for the First Side of the Machining	54.26 Min
Total Time for the Second Side of the Machining	63.01 Min
Total time for Machining + Job loading/unloading in Min for PTA-80(Min)	**117.52 Min**

Way Forward:

Sr. No.	Part Name and No.	Size	Observed Time	Production Capacity/Shift
1	2871 ET Bearing Housing	Medium	69.08 Min	8
2	2873 ET Bearing Housing	Large	88.88 Min	5
3	1584 HSC Impeller	Medium	85.94 Min	6
4	1530 Split Case Impeller	Large	117.52 Min	5

After collecting all this data and recording all the observations, Siddharth summarized observations as per above. He needs to develop a plan to reduce the wastes and improve the Production capacity per shift.

Case Questions:

1. Identify the wastes present in the system.
2. Suggest the suitable Lean Management Techniques to reduce or eliminate the waste.
3. Develop a lean implementation plan for the firm.

Exhibits

Exhibit 1: Product List

No.	Product Name
1	Close Coupled Horizontal Pump
2	Close Coupled Vertical Pump
3	Vertical Sump Pump
4	Dry pit Non Clog Sewage/Waste water pump
5	Submersible Sewage Pump
6	Submersible Dewatering pump

8	End Suction Pump
9	Horizontal Monoblock Pump
10	Vertical Inline Pump
11	Single Pump Booster
12	Multi Pump Booster
13	Multistage Ring Section Pump
14	End Suction Pump as per ISO 2858
15	Norm Pump as per EN733
16	Standard Horizontal Split Case Pump
17	Engineered Horizontal Split Case Pump
18	Vertical Combine Pump

Exhibit 2: Observation Recording Sheet

Job Type	
Size	
Date	

First Side of the Machining				
Activity	**No. of uts.**	**Time Per activity**	**Total Time of Activity**	
Rough Cut		**Min**	**Min**	**Sec**
Finish Cut				
		Total Time		

Job Loading	**Min**	**Sec**
Lift the Job and keep on fixture with crane		
Job Setting(matching 3 holes of casing with dowel pin)		
Tightening jig nuts with spanner		
Total Time		
Job Unloading	**Min**	**Sec**
Untighten the nut of the fixture		
Lift the job and keep on pallet using crane		
Total Time		

Total Time for the First Side of the Machining	
Total Time for the Second Side of the Machining	
Total time for Machining + Job loading/unloading in Min	

Exhibit 3: DOWNTIME (Types Waste) Recording Sheet

Sr. No.	Waste	Present(Yes/No)	Description
1	Defects		
2	Overproduction		
3	Waiting		
4	Non-Utilized Manpower		

5	Transportation		
6	Inventory		
7	Motion		
8	Extra-processing		

Exhibit 4: Improvement Suggestion Sheet

Observed Time				Proposed Time	
Sr. No.	**Min**	**Sec**	**Remarks**	**Min**	**Sec**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
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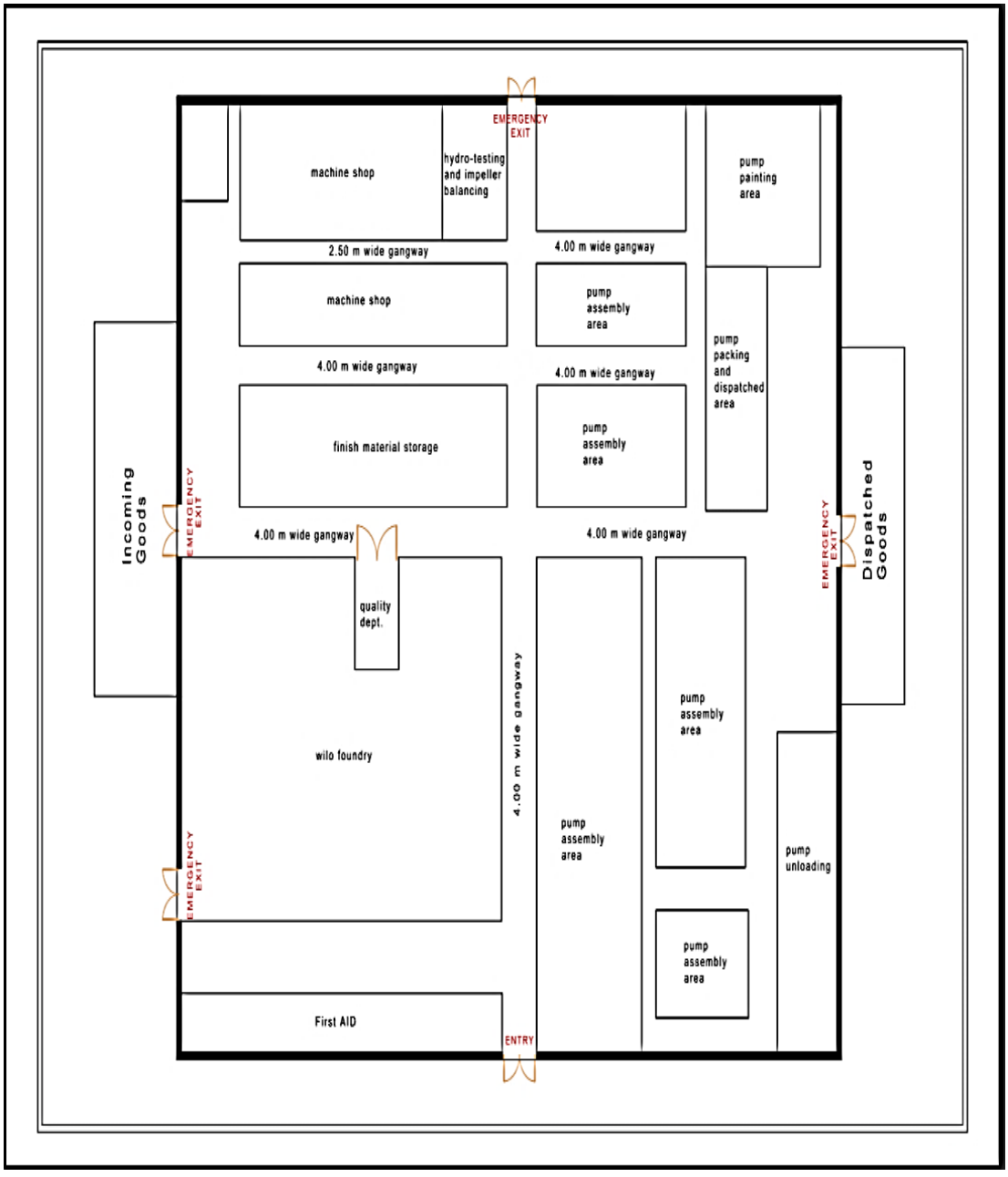
26					
27					
28					
29					
30					
31					
32					
33					
	Total Time			**Total Time**	

Exhibit 5: Facility Layout



Teaching Note

Problem/ Issue	Improvements
Pallet height and Placement.	• The operator faces the problem of pallets placed near the machine. The pallet height is less as compared to the base platform of the machine. It consumes more time by the operator to pick up the job by crane. The pallet height should be increased at a certain height so that it can save • Time by the operator for lifting the job.
Problem of the fixture and its availability at the workstation or machine.	• The operator finds it difficult to locate the fixture at the production/ machine job, as the same fixture. So there is a lack of availability of the fixture at the workstation. So proper measures should be taken and the fixtures should be available at one common place for the operator to avoid production halt or disturbances at the machine.
Availability of the measuring tools/Equipment	• The major problem identified at the machine/production shop is lack of availability and misplaced tools from the workstation. So the measuring tools i.e. bore dial gauge, Vernier caliper etc. should be available at the workstation where and when necessary.
Hydraulic fixture clamping or hydraulic power chuck for the proper fitment of the job on the Machine.	• The problem identified at the PTA-80 Machine is Clamping of the job. A hydraulic chuck provides excellent clamping characteristics combined with precise concentricity. • Furthermore, they enable a simple and fast tool change, with the assistance of a special extraction key. The hydraulic clamping will save the time for the machining as well as reduce the fatigue caused to the operator. So, the hydraulic chuck arrangement should be provided to maintain accuracy for the machining of the job.
Material handling equipment‘s movement.	• The material handling equipment like pallet trucks should be available at all the workstations so that operator or the handler can quickly move the machined jobs/components from the workstation to provide smooth and efficient flow to the man and materials around the machines.
Machining Tool Location on the workstation.	• Machine tool location should be at the common place of the machine shop. The arrangement should be made such that the operator need not spare his time to find the tool at the other machines. This with in turn save time for tool changing and machining too.

Problem/Issue	Improvement	Techniques
• The crane installed for the PTA-80 machine work station is placed in such a way that it creates movement of jobs parallel to the machine. • Time Consumed by the operator to load and unload the job on the machine	• The crane movement should be designed in such a way that the Job/Component movement should be perpendicular to the machine	• MUDA's • Kaizen
• Pallet height and Placement.	• Pallets Replaced with Heavy duty Plastic Pallets with 1200*1200*150mm.	• 5S • MUDA's • Root cause analysis
• Fixture availability and operation	• Manual clamping should be replaced by Automatic Hydraulic clamping fixture • The fixture required for different machines should be available at particular workstation	• Poka-Yoke
• Availability of measuring tools and equipment	• The measuring tools i.e. bore dial gauge, Vernier caliper etc. should be available at the common place at the workstation	• 5S • MUDA's • Kaizen
• Material handling equipment's movement.	• The material handling equipment like pallet trucks should be available at all the workstations so that operator or the handler can quickly move the machined jobs/components from the workstation.	• 5S • MUDA's

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Effluent of Dairy Producers Association (D.V.S), Dudh Utpadak Sangh Kolhapur, India: Performance and Challenges to the Environment

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In the natural ecosystem, nature prevents pollution by recycling materials at approximately the same rate at which they are produced as the human population increases by leaps and bounds causing an acceleration of production of materials in all spheres resulting in their atmosphere, water and soils of the earth. Water is one of the most important commodities which man has exploited more than any other resource for sustenance of his life. Approximately 97% of total water exists in gigantic oceans and the remaining 3% of water is distributed in the form of ice sheet, underground, lakes, river and biological water contained in living organisms. Freshwater like lakes and rivers and biological water are contained in living organisms. Freshwater like lakes and rivers is hardly 0.01% of total water (APHA 2005).

Water is a prerequisite for the existence of life. We can go without food for even 30 days or more, but we cannot go without water even for a few days. We need water for personal use. Agriculture and industry. Water can be regarded as polluted when it's get changed in its quality or composition either naturally or as a result of human activities so as to become less suitable for drinking, domestic, agriculture, industrial, wildlife, other uses or when pollutants are directly or indirectly discharged into aquatic bodies without eliminating pathogenic elements. Water pollutants are physical, chemical, or biological factors causing or detrimental effects on aquatic life and those who consume water (Jaiprakash K et al., 2011).

India being a developing country and agricultural based country and its economy depends upon rural development and also got under the effect of rapid industrialization at the cost of environmental degradation. Indiscriminate dumping of untreated waste into our ecosystem has vanished the self-purification capacity of our earth and has started polluting it. The major amount of wastewater is generated due to dairy industries from rinsing, washing, detergent, sanitizers, boiler, and sterilization of empty cans from almost all units (Kolhe et al., 2009).

Dairy farming a branch of agriculture involves the sustainable production of milk for eventual processing and sale as dairy products the practice of dairy farming dates back to the early Neolithic period around the seventh millennium BC and has been prevalent in numerous regions of Europe and Africa initially milking was a manual task carried out on small farms however with the advent of the 20th century large-scale dairy farms emerged adopting innovative technologies such as rotational parlours milking pipelines and automatic milking systems these advancements were introduced to the market in the early 1990s

The preservation of milk has seen remarkable advancements since the late 19th century when refrigeration technology emerged. Innovative techniques such as direct expansion refrigeration and the plate heat exchanger revolutionized the dairy industry by effectively reducing spoilage caused by bacterial growth and humidity. Today, milk preservation has become a global phenomenon, with prominent dairy industries in countries like India, the United States, China, and New Zealand playing crucial roles as major producers, exporters, and importers of milk. Notably, the 20th century witnessed a significant surge in global milk production, as indicated by the FAO's report of approximately 827,884,000 tonnes of milk produced in 2017.

Milk holds a distinctive position in India, transcending its identity as a mere food item. It brings insightful cultural, historical, and economic significance in the lives of Indians lives. The amusing needlepoint of Indian tradition, encompassing revered texts such as the Bhagavata and Mahabharata, prominently features milk and dairying. These scriptures touch upon various facets, including the occupation of dairying, communal involvement, trade practices, the value of cattle as a source of wealth, their role in agriculture,

and the versatile uses of milk, as well as its processing into diverse products (Ferguson AH., 1976). Remarkably, these aspects continue to hold relevance in contemporary times. One can envision an ancient era, where a lean value chain was in operation. Each day, animals were milked, and the milk was used for personal consumption. It was then transformed into less perishable forms like curd, butter, and ghee, facilitating trade. Even the low-value forms, such as buttermilk, were not wasted but instead donated. With the advancement of technology and increased efficiency within the sector, the modern dairy industry's core bears striking resemblances to its ancient counterpart.

The growth and impact of dairy cooperatives in India, along with the execution of Operation Flood, have been pivotal in shaping the nation's remarkable post-Independence development. India's dairy sector has undergone a significant transformation, propelling it to become the leading global milk producer, accounting for a remarkable 23% of the world's total milk production. This achievement stands as a testament to India's remarkable journey of growth and success.

During the 1950s and 1960s, India faced a significant challenge in its milk production. The country relied heavily on imports as it had a deficit in milk supply. For several years, the annual production growth remained negative, indicating a worsening situation. In the first decade after independence, the annual compound growth rate in milk production was 1.64%, which declined further to 1.15% during the 1960s. This slow growth reflected the struggles of India's dairy industry.

In terms of milk consumption, the situation was equally concerning. In 1950-51, the per capita milk consumption in India was a mere 124 grams per day. Despite having the world's largest cattle population, India's dairy industry was unable to meet the growing demand for milk. The annual milk production remained less than 21 million tonnes, reflecting the industry's struggle to survive in those times.

Dr. Verghese Kurien, acclaimed as the visionary behind India's transformative "White Revolution," held the esteemed position of the inaugural chairman of NDDB. Leading a dedicated team, Dr. Kurien embarked on a ground-breaking initiative, aiming to establish Anand-pattern cooperatives in various milk-producing regions nationwide. These cooperatives would effectively collect and distribute liquid milk to urban centers, revolutionizing the country's dairy industry.

1. In Phase I (1970–1980), Through the World Food Programme, the European Union (formerly referred as the European Economic Community) kindly offered assistance. The EU provided oil made from butter and powder from skimmed milk sales to fund the study. The initial stage created a foundation for subsequent development.

2. Phase II (1981–1985) marked a significant expansion of the program. The quantity of milk sheds skyrocketed from 18 to an impressive 136, while the urban markets flourished, providing an extensive network of 290 milk outlets. By the culmination of Phase II in 1985, the initiative had fostered a self-sustaining system. A remarkable 43,000 village cooperatives had been established, empowering a staggering 4,250,000 milk producers.

3. Phase III (1985–1996) focused on fortifying the infrastructure necessary to accommodate the ever-increasing volumes of milk. This critical phase facilitated the expansion and strengthening of dairy cooperatives, enabling them to effectively procure and market larger quantities of milk. The infrastructure enhancements in this phase were pivotal in ensuring the continued success of Operation Flood.

India's dairy industry has charted its own course, diverging from Western trends to tackle its unique challenges head-on. From animal genetics and husbandry practices to fodder and feed, processing, and distribution, every aspect of Indian Dairying boasts distinctive characteristics. Despite the relatively low milk yields among local milch animals, India has emerged as the world's largest milk producer, accounting for approximately 19% of global production with a staggering 210 million metric tons in 2021. This

impressive feat has been sustained for the past 23 years, even though the majority of milk producers in the country own just 2-5 animals on average, a sharp contrast to the usual crowd size of 180 animals in the US. Over the last 15 years, India's milk production has been growing at a robust rate of 4.5% compared to the United States' 2%.

Table 1: Tahsil wise milk production in Kolhapur district (2015)

Sr. No.	Taluka	Production (000 liters)	%	Milk collection (000 liters)	%
1.	Shahuwadi	18124	4.54	20511	6.55
2.	Panhala	27720	6.94	37770	12.06
3.	Hatkanangle	64455	16.15	32537	10.39
4.	Shirol	29492	7.38	28066	8.96
5.	Karveer	74128	18.57	50494	16.13
6.	Gaganbawda	21249	5.32	3333	1.06
7.	Radhanagari	35418	8.87	26052	8.32
8.	Kagal	29452	7.37	35444	11.32
9.	Bhudargad	19455	4.87	15358	4.90
10.	Ajara	14588	3.65	11152	3.56
11.	Ghadhinglaj	39452	9.88	30408	9.71
12.	Chandgad	24538	6.14	21803	6.96
	Total	399101		312927	

Source: Socio-economic Abstract, Kolhapur District, 2015.

Table 2: Tahsil wise co-op societies and member of societies in Kolhapur District (2014)

Sr. No	**Tahsil**	**Co-op Societies**	**%**	**Member of Societies**	**%**
1.	Shahuwadi	306	6.88	26010	6.88
2.	Panhala	469	10.54	39865	10.54
3.	Hatkanangle	275	6.18	23375	6.18
4.	Shirol	261	5.87	22185	5.87
5.	Karveer	683	15.36	58055	15.36
6.	Gaganbawda	98	2.20	8330	2.20
7.	Radhanagari	516	11.60	43860	11.60
8.	Kagal	445	10.00	37825	10.00
9.	Bhudargad	444	9.98	37740	9.98
10.	Ajara	253	5.69	21505	5.69
11.	Ghadhinglaj	309	6.95	26265	6.95
12.	Chandgad	387	8.70	32895	8.70
	Total	4446		377910	

Source: Socio-economic Abstract Kolhapur District, 2015

Within India, Kolhapur district stands out as a leading milk producer not only in Maharashtra but also in the entire country. Dairy plays a crucial role in the region's economy, with a robust cooperative structure and well-established infrastructure comprising over 4,446 cooperative dairy societies, 377,000 society members, and four Dudh Sangh organizations spread across the district. The dairy industry ranks as the second-largest sector after the sugar industry and provides substantial employment opportunities. Milk collection in the district reaches impressive figures, with 399,101 and 312,927 thousand liters collected respectively. The central and eastern parts of the district, including Radhanagari, Karveer, Panhala, Kagal tahsils, etc. witness the highest milk production due to favorable climatic conditions and advanced agricultural development. Notably, Karveer (18.57%), Hatkanangle (16.15%), and Ghadhinglaj (9.88%) make the most significant contributions, while Ajara (3.65%), Shahuwadi (4.54%), and Bhudargad (4.54%) contribute relatively less.

Despite the significant growth and production in the Dudh Utpadak Sangh, concerns have arisen regarding the substantial amount of wastewater and air pollution associated with this sector. Methane gas emissions from dairy operations contribute to air pollution, while the role of factories in agrarian toxic gas discharges has raised concerns about its environmental impact. Efforts have been made to address the phosphorus excretion from dairy livestock, as it contributes to water pollution. The dairy industry is widely recognized as the most polluting sector within the food industry, mainly due to the large volumes of water used in production of milk. The wastewater generated by dairy operations contains organic compounds such as sugars, proteins, and fats, making it highly biodegradable and resulting in a high Biological Oxygen Demand (BOD). Approximately two to three liters of wastewater are produced for every litre of processed milk. Given these circumstances, the purpose of this study is to assess the status of wastewater generated by the dairy industry, examine the associated issues, and propose alternative solutions to mitigate the environmental impacts.

Company Profile:

Address: MIDC Gokul Shirgaon.

Type of Industry: Food Industry

Establishment of the Society: 1963

Historical Background:
Dudh Utpadak Sangh, operating as Operation Flood, is a highly esteemed cooperative dairy project. Since its establishment in 1963, the organization has excelled in milk processing and the production of various dairy substances like Ghee, Butter, Shrikhand, Table butter, and milk powder. Their accomplishments span across milk procurement, extension services, animal health, breeding, milk processing, product marketing, and branding. Presently, the organization runs a state-of-the-art dairy plant with a capacity of 1.2 million liters per day, accompanied by four owned and one hired chilling centers capable of handling 550,000 liters per day. To boost milk production, they have implemented 41 mobile veterinary routes and 430 clusters within the milk shed.

The premises are equipped with essential safety measures, including an old cattle feed plant with a softener provision. Regular cleaning procedures, referred to as cleaning inside Procedure Section (CIP), are diligently performed to ensure a hygienic and wholesome environment. Dudh Utpadak Sangh is a renowned brand in Maharashtra, celebrated for its superior-quality milk and milk products.

Objectives of Organization:

- Fulfil the growing needs of milk and milk products of the consumer of milk and milk products in Maharashtra and other territories.

- Organize the Co-Operative structure of milk producers at village level.
- Development of infrastructure for the procurement of milking in rural areas to ensure an assured market for milk producers throughout the year, and offer them the best remunerative price.
- The import training for developing human resources at the rural level for effective leadership, management skill, and improvement of service to rural milk producers.
- Supplement the program extension and inputs, with particular to feel and fodder production and implement an intensive breeding program for milch animals to increase milk production.

Process of Effluent Treatment Plant:
On the basis of the characteristics of effluent, location of the milk Processing plant, climatic factors for treatment and performance of similar treatment system, adoption in dairy industry the following treatment scheme based upon Combination of anaerobic followed by aerobic treatment system is described.

- Effluent treatment plant system was designed to handle and treat wastewater having high organic content and suspended solids.
- Physico chemical and neutralizing treatments as well as equalization are steps in the manner of reducing dairy industry discharge
- Pollutants in wastewater (WW) releases from dairy sectors are organic matter, suspended solids, and fats.
- This Plant is designed to reduce COD, BOD, TDS, TSS, Organic Matter, and Fat content in effluent. After treatment of WW the treated water is recycled for agricultural purposes.

Primary treatment:
The row effluent generated at the dairy plant shall be led from the last manhole to the inlet of the Effluent treatment plant. The effluent shall be led to an existing effluent collection Sump. From this unit effluent will be pumped to the fat removal unit for removal of free-floating oil fat and grease material from the fat removal tank. The effluent would be laid to the existing equalization tank. The tanks are provided for dosing the alkali or acid solutions as per requirement for pH correction. From equalization tank effluent flows to existing feed tanks. From the feed tank effluent is pumped to Anaerobic Sludge Blanket (UASB) digester. (Old and new digester, old one is 600 m^3 and new one is 900 m^3).

Bar Screen Chamber:
Bar screen is used to remove the floating material from the effluent. The existing manhole will receive the raw effluent from the dairy plant. From here the effluent will flow to the bar screen chamber. The effluent from the manhole is passed through the bar screen chamber to remove the floating solids. The bar screen is installed in this chamber for removal of solids. From the bar screen effluent will flow into the sump.

Collection sump:
The sump tank is provided to receive the effluent from the bar screen chamber. The effluent from the bar screen chamber is collected in this tank. The tank is provided with a raw effluent transfer pump to pump the effluent from tank to fat removal unit.

Fat Removal:
In fat removal floating fats from raw effluent is removed. The unit is constructed in Reinforced Cement Concrete (RCC). It is provided with baffle walls, fat collection launder, drain connection and all-around walkway platform. The air is purged in the unit by providing separate blowers. A travelling bridge oil skimmer is provided on the unit for removing the fat collected on the top of effluent surface.

Equalization Tank:
In equalization the tank receives the effluent from the fat removal tank and in this tank effluent is mixed homogeneously. Here chemicals are added to maintain pH from the chemical dosing system. The tank is provided with raw effluent transfer from tank to flash mixer. And again it overflows through the tank along with chemicals dosed for pH correction.

Biological treatment:
The effluent from the equalization tank is pumped into the UASB digester, where it is mixed with sludge. Through the process of anaerobic digestion, the values of Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) are reduced. The gas produced during this process is collected in a gas holder. The feed tank effluent is pumped into the inlet of the UASB digester, where methanogenesis occurs. In this stage, strict and anaerobic methanogenic bacteria convert acetate, formate, and other acids, as well as hydrogen, into methane and carbon dioxide. The effluent is evenly distributed at the bottom of the digester. The gas generated from the digester is directed to a flare stack through an existing gas holder, with a provision for tapping for further usage.

After partial stabilization of organic matter through microbial action in the anaerobic system, the effluent flows into the aeration tank. Here, it undergoes extended aerobic biological treatment, resulting in the stabilization of soluble organic matter (OM) in the existence of oxygen. Oxygen is supplied through air blowers and fine bubble diffusers, enabling aerobic biological treatment and further stabilization of residual organics.The diversified liquor from the aeration chamber is directed to the centrally driven secondary clarifier, where sludge solids settle. These solids are then recirculated back to the inlet of the aeration tank to continue the desired Mixed Liquor Suspended Solids (MLSS) level. The clear supernatant, or treated effluent, from the clarifier flows into a V-notch chamber, and from there, it is collected in a treated water collection sump. The final treated effluent meets the specified characteristics outlined in the treatment requirements set by the state pollution control board. Leftover sludge from the UASB digester is periodically withdrawn through sludge valves and transported under hydrostatic pressure to the sludge drying bed.

Digester:
In the up-flow anaerobic sludge-blanket (UASB) process, a unique method is employed to treat wastewater. Instead of relying on oxygen, the treatment occurs in an anaerobic environment, where a sludge blanket consisting of naturally formed granules or particles is utilized. As the wastewater moves upwards, it interacts with this sludge blanket. Within this anaerobic setting, certain gases, such as methane and carbon dioxide, are generated as by-products. These gases facilitate an internal circulation process, crucial for the formation and maintenance of the biological granules. Additionally, some of the gas produced within the sludge blanket becomes attached to the biological granules. Ultimately, the combined effect of the attached gas and the freely produced gas causes them to rise to the top of the reactor.

Flocculator Tank:
In a flocculator tank, the aim is to encourage the aggregation of fine particles within a solution, resulting in the formation of flocs that either rise to the surface or settle at the bottom. This process occurs in a basin furnished with a mixer that facilitates agitation. The agitation should strike a balance between promoting contact between particles to facilitate growth and avoiding the break-up of existing flocs. Particles grow by colliding and adhering to one another, and sufficient detention time is required for flock formation. Longer detention times lead to larger flocs. Additionally, factors such as temperature and pH have an impact on the flocculation process.

Disc Thickener:
The purpose of a disc thickener is to increase the concentration of solids while reducing the amount of free water present. This step helps minimize the burden on subsequent processes like sludge dewatering and

digestion. Various methods are employed for sludge thickening. Thickening tanks incorporate slowly moving vertical paddles. Sludge enters the thickening tank and eventually has excess water removed, resulting in the accumulation of solids at the tank's bottom.

Aeration Tank:
The purpose of the aeration tank is to effectively eliminate the majority of biodegradable organic matter remaining after anaerobic treatment, specifically soluble BOD and COD. This tank employs an extended aeration system and utilizes a fine bubble aeration system. Constructed with reinforced concrete (RCC), the tank includes RCC inlet and outlet launders for smooth operation.

Clarifier Tank:
The secondary clarifier chamber is premeditated to discrete solid bio sludge from the effluent. Excess sludge is directed to the sludge sump, while the clarified effluent is discharged into the collection sump via a V-notch structure. The effluent enters the tank from the top through a feed well and then gradually flows from the center to the circumference in a radial manner. Clear effluent is released through the peripheral RCC outlet launder. The tank features a 1:12 bottom slope, allowing efficient removal and scraping of sludge. A central sludge collection channel enables the scraper arm to rotate and scrape the sludge towards the center. This process is facilitated by a central driven mechanism.

Filters:
The treatment process also includes two types of filters: the Pressure Sand Filter (PSF) and the Activated Carbon Filter (ACF).

Pressure Sand Filter (PSF): The PSF serves to eliminate excess suspended solids from the treated discharge. It consists of inlet, outlet, backwash, and air vent connections. The top of the PSF is equipped with a manhole, which contains a graded filter media comprising sand, gravel, and grit. For operational purposes, butterfly valves are installed.

Activated Carbon Filter (ACF):
The ACF's primary function is to remove odour from the treated emission. Effluent enters the ACF tank from the top and passes through activated carbon with a 900 iodine valve. This effectively eliminates any odorous elements present in the effluent. Following the ACF, the treated effluent is collected as the final treated water.

Table 3: Average Readings of Dairy Water

Sr. No.	Parameters	Before Treatment	After Treatment	MPCB Limit
1	pH	12.2	9.8	7
2	Total Suspended Solids (TSS) (mg/l)	450	160	50
3	Total Dissolved Solids (mg/l)	1660	780	500
4	Oil and Grease (mg/l)	980	430	10
5	BOD (mg/l)	490	230	50
6	COD (mg/l)	1787	690	250

Table 3 represents average reading of treated and untreated water of the dairy sector and from above results it has been concluded that all the parameters of wastewater are above the permissible limit.

The dairy sector is known for generating large amounts of industrial wastewater that contains a high organic load, which is difficult to eliminate. This wastewater is typically white or yellow and contains a

significant amount of organic content, including carbohydrates and proteins, surpassing those found in effluents from other food industries. The presence of organic compounds such as lactose, whey proteins, nutrients, and fats leads to foul odours and causes distress during the degradation stage.

The effluents released by the dairy industry exhibit high levels of (COD), (BOD), and (TSS). The characteristics of these effluents depend on various factors such as the scale of industrial operations, processing methods, process parameters, type of operation, and the type of water being discharged. Unfortunately, dairy effluents remain a significant contributor to water pollution due to their substantial organic load, which serves as a rich source of nutrients for bacteria, algae, and fungi.

Overall, the performance of the ETP has been unsatisfactory. The individual units within the plant are also underperforming, as their removal efficiencies fall short of the required standards. The treated effluent fails to meet the standards set by the Maharashtra Pollution Control Board (MPCB), indicating the inefficiency of the treatment plant. Furthermore, the plant lacks the potential to adequately reduce parameters such as pH, temperature, Total Dissolved Solids (TDS), COD, and BOD. Consequently, the discharged treated water, which does not meet the MPCB limits, negatively impacts water bodies and the environment when used for agricultural purposes.

Impacts of Dairy Industry:

The dairy industry, characterized by large-scale operations housing numerous cattle, has significant environmental implications. It is a major contributor to environmental pollution, particularly through the emission of greenhouse gases that accelerate climate change. Moreover, the industry inflicts substantial animal suffering. The consolidation of power among a few dominant corporations has also resulted in the displacement of smaller, family-owned farms. These smaller operations struggle to compete with the low milk prices dictated by larger farms, which often receive subsidies and other financial incentives.

What are the Environmental Impacts of the Dairy Sector?

The dairy industry's influence on the surroundings is substantial. Among all food sectors, livestock farming is the largest emitter of greenhouse gases. According to the Food and Agriculture Organization of the United Nations, global milk production increased by 30 percent between 2005 and 2015, accompanied by an 11 percent rise in the global dairy cow population. Dairy production is responsible for 2.9 percent of total human-induced greenhouse gas emissions. Additionally, intensive dairy farming systems contribute to air and water pollution, soil degradation, and deforestation. Out of the 195 countries committed to achieving the goals of the Paris Climate Agreement, 92 have recognized their own livestock industries as an area requiring climate action to meet national emissions reduction targets.

Effects on Water

The wastewater generated from dairy treating procedures consists of organic components, namely fat, proteins, and lactose. The environmental impact of these components varies based on their bio decomposition and solubility.

River Oxygen Levels and BOD

Rivers that are fully aerated and have temperatures ranging from 15-25 °C maintain a minimum oxygen concentration of 8 g/m3. Therefore, it is crucial to ensure that wastewater discharges into rivers do not reduce the oxygen concentration below 6 g/m3 or increase the river's biological oxygen demand (BOD) by more than approximately 3 g/m3, taking into account the river's reaeration characteristics. The organic components present in dairy treating WW are extremely biodegradable, and bacteria in waterways consume them through biodegradation, consuming oxygen in the process (as described in Eq. 1).

Organic Material + O_2 → CO_2 + H_2O + Bacteria

Sewage Fungus certain low molecular weight organic compounds in wastewater promote the growth of filamentous slimes in waterways, collectively known as sewage fungus. One common species of bacteria in

this category is Sphaerotilus natans. Lactose, a low molecular weight sugar found in dairy factory wastewater, is a significant component that enhances the growth of sewage fungus.

Colour and Turbidity
Highly coloured wastewater can impact the colour of the water. Although dairy factory wastes typically contain limited soluble colour, treatments applied to the wastewater may result in true colour. Colloidal and particulate components in the waste reflect light, giving rise to apparent colour. Turbidity, a closely related concept, is influenced by this phenomenon. Milk wastes contain substantial amounts of materials that contribute to the turbidity of wastewater discharges.

The Inorganic Constituents (Nitrogen and Phosphorus)
Capturing the material's protein, or organic nitrogen (OC) element, and transforming it into marketable goods is among business's foremost objectives. As a consequence, nitrogen serves a crucial role in the WW from dairy businesses. The flow of waste will lose a certain quantity of protein. Protein nitrogen is transformed by microorganisms into substances that are inorganic such as ammonium, nitrite, and nitrate ions. The consequences of these innumerable inorganic kinds of nitrogen on the surroundings vary. Significant amounts of nitrates are detrimental to individuals and creatures. In premature babies, nitrates can transform into nitrite that then enters into the circulatory system and transforms haemoglobin into met haemoglobin. Oxygen can't be transmitted by haemoglobin. Babies younger than six months old are vulnerable to methemoglobinemia because they don't have the enzyme that is necessary to change met haemoglobin into normal haemoglobin. The standard limit on nitrogen nitrate in water for consumption is 10 g m−3 in order to safeguard the well-being of people. Another disorder that might impact livestock is hemoglobinemia. Methemoglobinemia can be fatal in grazing animals due to their neutrality gastrointestinal pH and intestinal bacteria, which transform nitrates to nitrite. This usually arises by eating nitrate-rich feed, while it is currently recommended that stock ingesting water have a limitation of 30 g m−3 nitrate-nitrogen. In streams, phosphates and nitrogen that are inorganic such as nitrate, nitrite, and ammonium ions, serve as plant nutrition. It was recently proposed that TOC concentrations in the recipient water be restricted to no more than around 30–100 in order to prevent unexpected growths.

Impacts on Land WW:
Application to soils is a collective technique of WWT in the dairy sector.

Nutrients (Nitrogen and Phosphorus (N & P) :

- Soil-based treatment systems employ various process for nutrient elimination, including:
- Plant uptake and incorporation in animal products
- Adsorption and immobilization in the soil
- Environment losses
- Losses to groundwater through leaching

Plant uptake can result in the absorption of up to 500 kg/ha/year of nitrogen and approximately 30 kg of P. If animals graze on the pasture, up to 90% of the N & P can be recycled back into the soil. Losses of N to the atmosphere transpire through ammonia volatilization from urine and manure, as well as through denitrification, a process where microorganisms convert nitrate to dinitrogen gas under anoxic conditions and with an available organic carbon source. Denitrification rates can be significant in wastewater irrigation sites. N losses, in the form of nitrate, to groundwater can occur at certain irrigation sites, especially if other nitrogen removal methods are insufficient. Groundwater contamination by nitrate is a concern when the water is later used for human or livestock consumption, prompting adherence to normal potable water procedures. Phosphorus, on the other side, does not usually leach into groundwater due to its high retention and immobilization in soils.

Sodium (S) and Other Minerals:
Soils have the ability to immobilize S, P, C, and which inhabit cation exchange (CX) sites on clays and soil colloids.

- Impacts on the Environment
- Gaseous Emissions

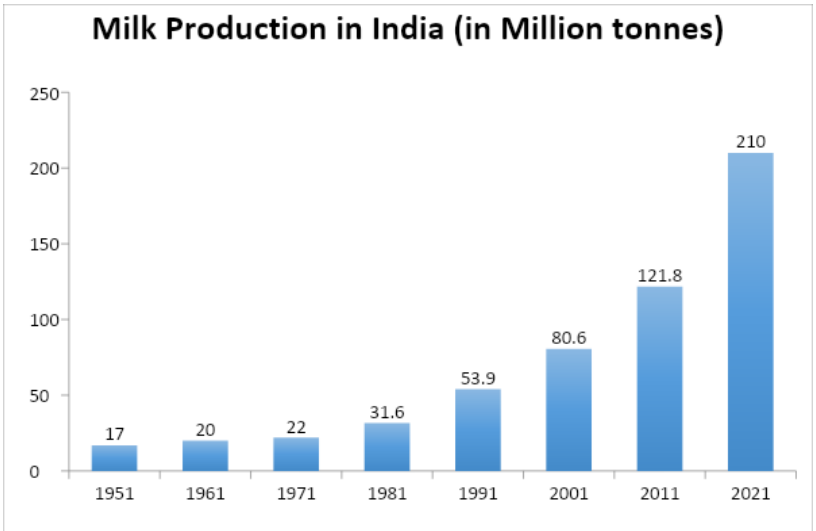
A variety of emissions may be released into the environment during the production process. Anaerobic WWT systems have the potential to produce methane, while WW irrigation areas may emit nitrous oxide (N2O) through the earth's surface. Methane, N2O, and CO_2 are significant greenhouse gases, and their environmental consequences are likely to require careful consideration in the future.

Dust/Odours:
During manufacturing processes, particulate matter can be discharged from sources such as boiler stacks and powder driers. Additional particulate losses may occur from various factory operations. High levels of particulate emissions can lead to the deposition of dust and powder on surrounding buildings, which is both undesirable and potentially corrosive. Smoke and steam plumes generated by factories can also be considered a form of toxic waste. It is important to address the discharge of unpleasant odors at industrial processing sites.

Case Questions:

1. Critique in brief Indian History of Dairy Industry
2. Elaborate in detail dairy production with exceptional reference to Kolhapur district
3. Evaluate the ETP of Dudh Utpadak Sangh, Kolhapur
4. Critically evaluate environmental impacts of the dairy sector and suggest a suitable strategy to reduce environmental impacts.

Exhibit



Teaching Note:

In the past, dairy effluent was not given much value. With an estimated 2.5 to 3 liters of wastewater produced for each liter of treated milk, the dairy sector is the biggest water polluter. In milk processing facilities, water is a vital resource that is utilized for a range of activities including heating, cooling, cleaning, and disinfecting. However, ongoing research and a better understanding of effluent management have led to a shift in the industry's focus from a waste mentality to a resource utilization approach. Today, there is a greater mindfulness of the significance of effluent management from both an environmental protection standpoint and the industry's marketability. The dairy industry must strive to maintain a 'clean and green' image by adopting current best management practices and adapting to changes in the field. Effluent systems consist of various integrated components or stages designed to oversee the flow of WW from manufacturing to distribution and regeneration. The general oversight and continuous upkeep of a WW system are often overlooked aspects that need attention.

Recommendations

1. Effluent minimization: Minimizing the amount of WW created at the dairy or feed pad reduces the need for storage and submission to grasslands.
2. Solid separation and fibre removal: Removing coarse materials the possibility of issues in subsequent phases of the WW system, such as pumping, preservation, transportation, and implementation, is decreased by removing materials from the fluid stream, like dung, trash, gravel, sand, and stones.
3. Conveyance: Determining how effluent will be transported from the point source, the destination, and whether gravity can be utilized helps determine the greatest suitable transference method.
4. Storage or containment: Identifying the applied and operative treatment to comprise WW within the possessions boundaries during the wetter months of the year is essential.
5. Application: Influential the location for effluent application is a crucial starting point in scheming an effluent system. Effluent application must be effectively associated to farm soil fertility objectives and fertilizer applications, ensuring it can be spread over a noteworthy proportion of the farm enclosures.
6. Management: The management and continuing conservation of a WW system are often overlooked aspects that need attention.

By addressing these components and considering the holistic management of the WW system, the dairy industry can effectively utilize its resources while maintaining environmental sustainability.

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The Fabric Tapestry of Ichalkaranji: Unveiling the Power loom Legacy, History, Opportunities, and Challenges - A Case Study of Southern Maharashtra, India.

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Origin of Textile Industry:
Ichalkaranji, a small village, was expanded into a city. It is located along the late 19th-century Kolhapur to Miraj railway route. It is located in the Sangli District.Karnataka's Belagavi district lies to the south and east, while Sindhudurg district lies to the west. The Joshi-Ghorpade family owned this location in the 18th century. His father Mahadjipant abandoned him while he was a little child, and the late Naropantji founded the Ichalkaranji state.Together with his mother Gangabai, he made Kapshi his home. The person in command of Kapshi was Maloji Ghorpade, who was ranked close to second following the famous Shivaji Maharaj Ji.

Textile Industry in Ichalkaranji in 19th century:
In Maharashtra, some communities were widely recognized for their weaving crafts. One of them, identified as the Manchester of South Maharashtra, is Ichalkaranji. There were 636 handlooms in Hatkanangle taluka of Kolhapur state in 1845 AD, of which 236 belonged to Ichalkaranji alone, according to records. A handful of the 2,102 weaving looms in Kolhapur State's 2,102 locations in 1882 included 654 in Ghadhinglaj, 350 in Ichalkaranji, 226 in Panhala, 179 in Kagal, and others. In the Kolhapur jail factory, 17 looms were in use for weaving various fabrics, including handkerchiefs, tablecloths, and towels. Nearly 114 handlooms emerged in Ichalkaranji during the course of 37 years. The primary source of looms was the cultivation of Kumtha cotton in the neighbouring villages.

Ichalkaranji rose to prominence as a weaving center in the Bombay province in 1892, during the reign of The Narayan Babasaheb. Ichalkaranji falls under a dry climate with a sufficient population and a large trade at bazaar day that was run properly, which built the pillars of the future plan in making this location as important for trading. According to the Kolhapur state industrial survey, which was released in late 1895, there were 447 functioning looms producing cotton garments by that time. Babasaheb promoted the development of industry in the Ichalkaranji. The establishment of the Municipal Council in 1873 was intended to supervise municipal endeavours, which accelerated the growth of industry.

Babasaheb invented weavers belonging to Koshti families, he moved people to Ichalkaranji, authorized lands for their homes as well as for factories, and provided financial assistance to produce cloth. Eventually, this plan led to great achievement, and Ichalkaranji was known for its cloth production, particularly for "Patagi" & "Kunabau sutade" & Wollen Carpets (The Galichas).Apart from providing tax incentives and funds from the state treasury, Babasaheb also crafted laws and created an environment that was conducive to the weaving industry. Additionally, he gave plenty of space for work and grounds for industrial growth.

There was just handloom business in Ichalkaranji till 1892, when under his direction the power loom industry began, producing grey fabric. The first power loom firm was named "Vyankatesh Rangtantu Mills, founded by Vitthal Rao Datar. To finance the manufacturers, the first bank, "The Ichalkaranji Central Cooperative Bank," was established in 1929, and thereafter, Ichalkaranji gained notoriety as South Maharashtra's Manchester. In addition to promoting women's education and empowerment, Srimant Babasaheb was a trailblazer in the development of credit cooperative societies.

After Independence some of the old power looms were discarded by the Mills and laid the foundation towards booming industries .The sugar cooperatives co-operators were inspired to start spinning mills and

"The Deccan Cooperative Spinning Mill" was established in 1962 ,Marwari merchants also built market for Dhotis & Saris ,this also created skilled weavers, sellers and increased the employment in Ichalkaranji.

Ichalkaranji produces 20 lakh meters of cloth per day & the yarn consumption was 1, 40,000 kg per day. Almost 60,000 workers worked in approximately 40,000 looms, almost one third of the town is involved in looms work. There are spinning mills, machine processing houses & sizing units. Overall 750 traders were involved in yarn sales-purchases. Ichalkaranji manufactures different varieties of clothes on power looms like Saree, Khadi, Dhoti, Poplins, Camric mulls etc. It also started printing in various colours. It also makes yarn to all types of processing of the produced cloth.

There were certain problems before the industry such as underutilization of capacity due to inadequate supply of yarn at reasonable prices ,non –availability of working capital, ripping effect due to the master weaver system ,sub standards looms discarded by Mills etc. unachieved targets, The department of Textiles : Ashok Mehta Committee on 1964 & the sub-working Group by the Ministry of Commerce prepared draft to the fifth plan reported the necessity of establishing co-operative spinning mills of power loom weavers Schemes for looms must be made.

About Handlooms:
India's textile history has been significantly influenced by handlooms. employing millions of artisans and preserving traditional weaving techniques (source: Ministry of Textiles, Government of India).The handloom sector in India contributes significantly to the country's socio-economic development, especially in rural areas, providing livelihoods to weavers and promoting inclusive growth Power looms have revolutionized the textile industry by enabling mass production, cost-effectiveness, and meeting the demands of a rapidly rising market .Power looms play an important part in increasing India's textile exports, helping the country maintain its status as one of the leading exporters of clothing and textiles worldwide. The power loom business in India supports the livelihoods of millions of people, particularly in clusters such as Ichalkaranji, Surat, and Erode The handloom and power loom sectors together contribute significantly to India's textile industry, which is a key source of employment, exports, and economic growth in the country (source: Government of India's Ministry of Textiles).

Handlooms are manual weaving equipment that have been used for generations to create beautiful and one-of-a-kind fabrics. The expert interlacing of threads in handloom weaving produces fabrics that are frequently identified by their unique designs, textures, and patterns. Handloom fabrics are prized for their artistry, intricate details, and cultural significance. They play a significant role in the history and identities of many nations. In the textile business, handlooms are crucial, especially in rural areas where they give weavers and other craftspeople a significant source of work and revenue. The handloom industry supports local communities and offers opportunities for long-term employment, especially for women who often make up the bulk of handloom laborers. Handloom fabrics contribute to the preservation of indigenous knowledge and traditional weaving techniques.

Handloom products are praised for their environmental friendliness and long-term viability. They are often made of typical fibers like cotton, silk, or wool and are woven using ancient techniques that do not rely on electricity or mechanized equipment. Handlooms are a popular option for anyone looking for ethical and sustainable fashion solutions because of their ecologically conscious approach.

However, the handloom sector faces issues such as **mechanized production rivalry, a shortage of capital and market access, and the need for skill development and modernization.** To ensure the continued growth and sustainability of this valuable skill, governments and organizations are actively trying to support and promote the handloom sector through a variety of initiatives such as training programmes, financial aid, design interventions, and market linkages.

Most of the textile industries are Power Looms; they are mechanized weaving machines that have transformed the textile industry by enabling large-scale fabric production. Unlike handlooms, power looms are mechanized and run on electricity or other energy sources. They use a system of mechanical parts and contemporary technologies to weave fabrics more quickly and precisely.

Power looms have considerably boosted textile manufacturing efficiency and productivity. Power looms have been the dominant means of fabric production in many regions of the world due to their capacity to weave fabrics in vast quantities while maintaining uniform quality. They have also helped to lower the cost and availability of textiles, allowing for the mass manufacture of clothes, household textiles, and industrial materials.The introduction of power looms has had an impact on the textile business, both positively and negatively. On the plus side, power looms have offered job opportunities, particularly in areas with a large concentration of power loom clusters. They have also facilitated the manufacture of fabrics with a variety of patterns, designs, and colours to meet the market's changing expectations.

Power looms have brought challenges to the handloom business since they can manufacture fabrics at a much faster rate and at a cheaper cost. This has resulted in increased competition and market pressures, which have a detrimental influence on the lives of handloom weavers who may struggle to compete on price and quantity. Furthermore, the quick expansion of power loom clusters has occasionally resulted in environmental concerns, such as trash management and energy usage.

The following are various types of power looms used in the textile business. Some examples of frequent types are:

Shuttle Looms: Shuttle looms were the first form of power loom. During weaving, they utilise a shuttle, which is a boat-shaped device that transports the weft yarn back and forth across the warp strands. Shuttle looms are well-known for their adaptability and ability to work with an extensive variety of textiles.

Rapier Looms: To introduce the weft thread into the shed of a rapier loom, flexible rapier tapes or rods are directed across the loom. The fast weaving pace of rapier looms makes them ideal for weaving a variety of textiles, including delicate and robust ones.

Compressed air is used to propel the weft yarn over the warp strands in air-jet looms. They generate a forceful air jet, which transports the weft thread through the shed. Air-jet looms are popular for making lightweight and medium-weight fabrics due to their rapid production speed.

Water-Jet Looms: Water-jet looms employ water as a carrier and inserter of the weft yarn. The weft thread is propelled through the shed by a high-pressure water jet. Because they give great yarn management and produce high-quality fabrics, water-jet looms are extensively employed for weaving synthetic and hybrid fabrics.

Projectile looms use a projectile, usually a small metal object, to carry the weft yarn across the warp threads. The loom's machinery propels the projectile across the loom, inserting the weft thread. Projectile looms are well-known for their adaptability and ability to work with a wide variety of yarns and materials.

Spinning mills in Ichalkaranji play an important part in the textile industry by creating yarn, which is the foundation of fabric manufacturing. These mills contribute to the textile value chain by transforming raw fibers like cotton into high-quality yarns for weaving or knitting.

Spinning mills at Ichalkaranji are outfitted with cutting-edge machinery and technology to ensure efficient and consistent yarn output. They hire professional specialists to supervise the spinning process, which

includes cleaning, carding, drawing, and spinning fibers into yarn. Cotton yarn is commonly spun in Ichalkaranji spinning mills since cotton is abundantly farmed in Maharashtra and neighbouring states.

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Modern equipment and technology are installed in Ichalkaranji spinning mills to guarantee a reliable and efficient yarn output. To oversee the spinning procedure, which entails cleaning, carding, drawing, and spinning fibers into yarn, they employ skilled experts and workers. Since cotton is abundantly cultivated in Maharashtra and other nearby states, cotton yarn is frequently spun in Ichalkaranji spinning mills. The spinning mills in Ichalkaranji support the regional textile industry. The power looms, handlooms, and weavers in the area rely on these mills as a reliable and steady source of yarn. The availability of yarn made locally reduces dependency on imports and contributes to cost savings in the textile production process.

Additionally, Ichalkaranji's spinning mills give the local labor force jobs. Expert professionals and laborers are involved in numerous divisions inside the mills employ skilled specialists and workers, providing a steady income for numerous individuals and bolstering the local economy. The spinning mills in Ichalkaranji are vital to not just the regional textile industry but also the entire textile manufacturing sector in Maharashtra, India. They uphold a consistent flow of superior yarn, foster economic expansion, and reinforce the area's standing as one of the world's leading textile hubs.

YARN:

Yarn is a continuous string of fibers that is the fundamental component of textile manufacturing. To make a cohesive and robust thread, fibers are twisted or spun together. Many materials can be used to make yarn, including synthetic fibers like polyester, nylon, and acrylic and organic materials like cotton, silk, wool, and linen. The final attributes of the fabric are largely determined by the quality and features of the yarn. The strength, texture, and look of the fabric are influenced by variables such the type of fiber, twist level, yarn structure, and yarn thickness (sometimes referred to as yarn count).

Sizing is a procedure that is usually carried out before knitting or weaving but after yarn has been spun. Applying a size agent or solution to the yarn enhances its handling qualities during weaving, a process known as sizing. The purpose of sizing is to give the yarn more lubrication, strength, and stiffness so that it may be woven smoothly and effectively without breaking or sustaining damage too much. Natural or artificial materials such as starch, modified starch, polyvinyl alcohol (PVA), or synthetic size agents may be present in the sizing solution used in the procedure. During the weaving process, these materials create a film or coating that protects and lowers friction around the yarn threads.

In order to guarantee the effectiveness and quality of weaving processes, sizing is crucial. It helps to control the tension and handling of yarn, avoid yarn breakage, lessen friction between the strands and the weaving apparatus, and enhance the process of weaving as a whole. The material that resembles thread and is made of twisted fibers that is used to produce textiles is called yarn, and the process of sizing gives the yarn strength and lubrication to improve its handling characteristics during weaving. In order to produce high-quality textiles, yarn and size are both crucial steps in the textile manufacturing process.

In textile manufacture, several varieties of yarn are utilized, each having its own distinct features and applications. Natural fibers such as cotton, silk, wool, and linen are widely spun into yarn and have features such as breathability, comfort, and moisture wicking. Synthetic fibers such as polyester, nylon, and acrylic are also commonly utilized and give durability, strength, and wrinkle and shrink resistance. Blended yarns are made by combining several types of fibers to create a yarn with a mix of qualities that offers a balance

of natural and synthetic fibers. Chenille, boucle, and slub yarns are noted for their different textures and looks, which provide visual appeal and complexity to fabrics. There are also fancy yarns that use unusual materials or processes, such as metallic threads or twisted ribbons.

Key Challenges:
Many people who previously used plain looms or power looms have switched to automatic shuttle less looms. The first generation (1980-2000) was dominated by automated looms and modern technologies, and the majority of the industry worked in a decentralized manner. According to the Macro, Small, and Medium Enterprises Act of 2006, organizations are classified as micro (25 lakhs), small (25 lakhs - 5 crores), and medium (5 crores - 10 crores) based on their investment in plant and machinery. Textile operations increased by 80% between 1950 and 1961, and there are now approximately one lakh power looms in the city, employing nearly 1.2 lakh direct workers and another lakh in ancillary businesses.

The power loom business aided the growth of adjacent industries such as spinning mills, yarn manufacture, sizing, processing, and so on. With a daily turnover above US $170 million, Ichalkaranji, located in Kolhapur district, Maharashtra, is the largest cotton fabric manufacturing center in India. Over the last ten or so years, the city has experienced significant growth, and during the coming years, this trend is anticipated to continue. Businesses are investing in new machinery and marketing campaigns as the industry shifts towards processed fabrics and exports rise. High-powered tariffs are another worry, and they are compelled to move their base to the nearby state of Karnataka in quest of superior amenities. Currently, automation is the main goal. As of 2013, there were 6000 shuttle-less looms.
The number climbed by 10,000 in 2015. Small business owners and the majority of young people operate these businesses, and the government even encourages exports from these enterprises. In domestic business, problems like credit risk and market volatility still exist. Certain companies rely on local dealers to get yarn, while others maintain healthy cash flows by sourcing directly from mills and avoiding local agents/traders. Still others are directly connected to spinners to ensure quality and quantity control. .
The proprietor of Sarathi Fabrication Industries, "Mr. Sachin Challake," states, "We oversee the procurement of yarn. “The city has a large number of suppliers while providing fabric to the domestic market, which is this hub's primary consumer base. Manufacturers often contact consumers through agents, while some do so directly.

Regarding the infrastructure of the city, opinions within the industry are divided. Some businesses, especially those concerned about the roads and cleanliness, are dubious while others think it's OK. The largest obstacle to the growth of this industry is that, despite Kolhapur's airstrip being 33 km away, there is no fly service to Kolhapur. Manufacturers want the government to give priority to the highway and city's connectivity. The people are quite concerned because, even though there is a sufficient supply of electricity, the government subsidies given to the weaving industry could end at any time. Due to the large number of migrant workers, the hub is starting to face a labor shortage.

The border with Karnataka is about 40 kilometres away. Situated approximately 100 kilometres away from Ichalkaranji, the state provides an excellent site for the placement of factories. Additionally, the government of Karnataka offers greater facilities than those of Maharashtra, luring companies situated in Ichalkaranji to relocate there.

Some industries are having good business and **injecting regular capital** but still they are facing internal crisis. Most of the problems are due to **Fluctuations in pricing of yarn, sizing problems, Quality of raw material, skilled employees and employee retention, electricity bills, transportation & sanitation.**

Power loom's owner says that they are facing problems of yarn rate fluctuation on a daily basis due to the raw materials. It impacts the sales and purchases, the employee wages working on hour basis and paid according to the manufacturing of cloth per meter.

The owner discusses that during July 7, 2017, more than 100 textile merchants in Maharashtra's Ichalkaranji have been protesting over the recently implemented pan-India Goods and Services **Tax (GST).** Textile mills in the area are expected to temporarily halt production for a period of time because their cloth would not be procured by the striking traders, causing prices to decrease.

The Ichalkaranji Power loom and Merchants Association is seeking that they be permitted to file **tax returns only once every three months, rather than three times per month**. They also want assurances that they would not be persecuted by tax authorities.

The textile industry has come to a halt in several parts of the country, with traders and mill owners striking in places like Surat, Bhiwandi, Ahmedabad, Malegaon, Karur, Erode, and others. Since the implementation of the GST, more than 40% of loom owners in Ichalkaranji have ceased purchasing yarn. According to loom and mill owners, GST is imposed on every stage of textile manufacturing, including spinning, sizing, weaving, and processing, and producers will receive returns in the form of input tax credit. Previously, tax was only to be paid at the beginning of the yarn purchase process, and all later steps were tax-free. The merchants are seeking that the GST be removed from unit-based operations.

Sizing of Yarn: The yarn has to be processed properly before weaving else it affects the weaving process most of the small –mid scale industries suffer the issues related to sizing.

Electricity bills are very high to incur as the owner says the government is not providing any subsidies, this will impact all the rates and business & which leads to unstable production cost and builds a huge monetary loss gap to the owners.

Employee retention is another challenge as few of the trained employees may quit the job or join another company and the new employees are not skilled enough and may affect the production rate. Most of the company wages are dependent upon the cloth production made by the individual employees and they are paid accordingly to that. Sometimes it's a mundane job for employees too working continuously for producing the cloth but they need to work in two different shifts. The owner stated that they have different set of employees working on two shifts

Lack of Skilled Professionals: Maintaining skilled employees at our location is very difficult, says the owner, so we need to train our family members for serving the purposes. They say that we could hardly retain the professional production managers.

The owner said the most difficult task is the capital injections & sometimes scarcity of capital Production cost varies depending on other factors, investment costs hardly are re-paid back as they remain invested in plant & Machineries & getting the regular Buyers is also a challenging task. Most of the sales are carried out on credit basis and need to wait a long time for returns. So they prefer the same parties during sales.

The owner also says that earlier the looms had less competition but nowadays the looms are increasing and the technologies used by industries are **latest and automated** with less human efforts, so it is quite difficult in the market to survive unless we adopt the latest technologies.

The waste management: Since most textile firms have their own effluent treatment plants and discharge their effluent into open gutters, waste management is another problem. Treatments are too expensive for most people. Through open gutters, the city's industrial and domestic wastewater is directed to Kala Nalla, the Nalla behind Niramay Hospital, the industrial estate Nalla, and Chandur Nalla. The Panchganga River

eventually meets this Nalla. Both the river's pollution and the level of bacterial contamination have increased. The Krishna River provides water to Ichalkaranji, and water-borne illnesses are a problem for both Ichalkaranji and its surrounding communities.

Ichalkaranji C.E.T.P. Project

The city is chosen for funding under the integrated upgradation project supported by the GoI & GoM and has four cooperative textile industry estates that supply land, water, connectivity, and transportation. To build a competitive cluster of textile industries is the project's mission statement. This will be advantageous for ITDC (Ichalkaranji Textile development cluster Ltd), which consists of 122 sizing units and 62 procedures for bleaching, dying, and printing textiles.

At Ichalkaranji, ITDC has installed 12 MLD CETPs, or Minimum Liquid Discharge, Common Effluent Treatment Plants Ltd. The project is situated at R. Sales No. 610 A, Ichalkaranji, Tal: Hatkanangle, Dist.: Kolhapur, Maharashtra, and the factory has been in operation since 2011. An 18-meter side ring road on the west side leads to the Project. This 12 MLD CETP is treating textile effluent that was previously dumped of quickly, with or without treatment, in the Nalla and gutter.

It is technically and financially feasible for people to have their own Effluent Treatment Plants in order to comply with CPCB disposal guidelines. They made the decision to create the CETP organization through the IDTC, which was created under the Companies Act of 1956, in order to carry out infrastructure development projects under the IIUS. The Ichalkaranji Municipal Council, in collaboration with the Ichalkaranji Co-operative Industrial Estate, Laxmi Co-operative Industrial Estate, Parvati Industries Estate, and DKTE's Textile and Engineering Institute, is pushing this special purpose vehicle. The Indian Ministry of Commerce and Industry approved the building of a 12 MLD CETP at S. No. 610 on April 8, 2005. The letter in Ichalkaranji. ITDC started working on the project on June 15, 2006. Since June 2011, the factory has been in operation. Since June 2011, the factory has been in operation. In Kala Nalla, the purified water is disposed of. To carry out infrastructure development projects under the IIUS, the Ichalkaranji Municipal Council, Ichalkaranji Co-operative Industrial Estate, Laxmi Co-operative Industrial Estate, Parvati Industrial Estate, and DKTE's Textile and Engineering Institute established the Ichalkaranji Textile Development Cluster (ITDC), a Special Purpose Vehicle.

The top priorities of SPV firms are:

- To supply an adequate quantity of water, a system for draining roads, electricity, and common infrastructure.
- To construct markets, a bank of raw materials, an industrial training facility, a communication center, a common facility, and so forth.
- To offer facilities for research and development, standard testing, and quality improvement.
- To create and promote significant infrastructure facilities for the textile industry, as well as to supply firefighting equipment and a shared effluent treatment facility.

Way Forward:
Maharashtra's textile sector plays a significant role in the state's employment and economic growth. One of the top states in India for textile production, Maharashtra produces a broad variety of textile goods throughout its numerous clusters. The industry includes spinning, weaving, and knitting, processing, and clothing manufacturing. Maharashtra’s Ichalkaranji, located in the Kolhapur district, is one of the state's most important textile centers. Known as the "Manchester of Maharashtra," Ichalkaranji plays a significant role in the textile value chain and a rich history in the textile industry. The city is home to a large number of

handloom units, power looms, and textile manufacturers. In addition to sarees, dress supplies, and home textiles, its areas of expertise are cotton and synthetic fabrics.

Recent data emphasize the importance of the textile sector in Maharashtra, particularly in Ichalkaranji. According to available data, Maharashtra produces a sizable portion of India's textile and apparel. According to current figures, the textile industry in the state employs over 6 million people and contributes significantly to its Gross State Domestic Product (GSDP). Ichalkaranji, with its concentration of textile mills and weaving facilities, is a significant contributor to these figures, creating jobs and fostering economic growth in the region. The business has also seen an increase in exports. Maharashtra's textile exports have been gradually expanding, demonstrating the state's global competitiveness. The availability of skilled labour, a favorable business environment, and a strategic location have elevated Maharashtra and Ichalkaranji to the forefront of the industry.

Power looms have a big impact on how the textile business looks, and it's a vibrant, ever-changing field. But the business faces a wide range of difficulties, from protests against GST and fluctuating yarn pricing to technical advancements and infrastructure issues. It becomes clear that embracing technology, diversification, and sustainable practices is essential for continued expansion. Environmental responsibility is demonstrated by projects such as the Common Effluent Treatment Plant (CETP) project.

In order to effectively address these obstacles, the industry should prioritize workforce development, market expansion, and cooperation with governmental and community organizations. Sustained success will need careful attention to shifting market dynamics, risk management, and financial planning. Ichalkaranji’s textile sector is at a turning point, with room for expansion and innovation. Through tackling the recognized obstacles, using contemporary technology, and promoting cooperation, the sector may construct a robust future that enhances not only financial gain but also the welfare of the nearby community and the environment.

Case Questions:

1. Identify and assess contemporary challenges faced by the textile industry in Ichalkaranji, including technological disruptions, infrastructure concerns, and protests against taxation policies.
2. How can Ichalkaranji's textile industry strategically overcome its challenges?
3. What role does the Common Effluent Treatment Plant (CETP) play in addressing environmental concerns and promoting sustainable practices within the textile industry in Ichalkaranji, Maharashtra, as discussed in the case?
4. Discuss the Export and Market opportunities for the Ichalkaranji Cluster highlighted during the conference for industry development on 27 Oct, 2021.

Exhibits

Exhibit 1: Handloom vs Power looms

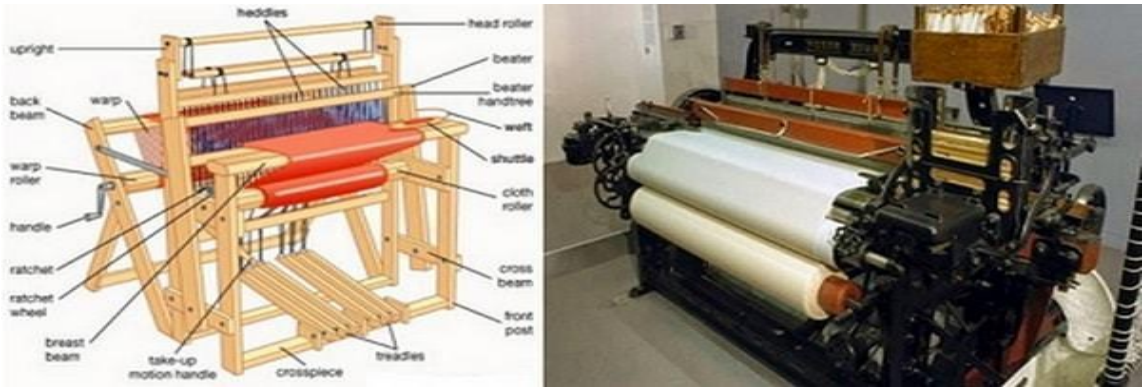


Exhibit 2: Power looms

Exhibit 3: Detailed Process chart of the CETP units. Exhibit 4: CETP unit.

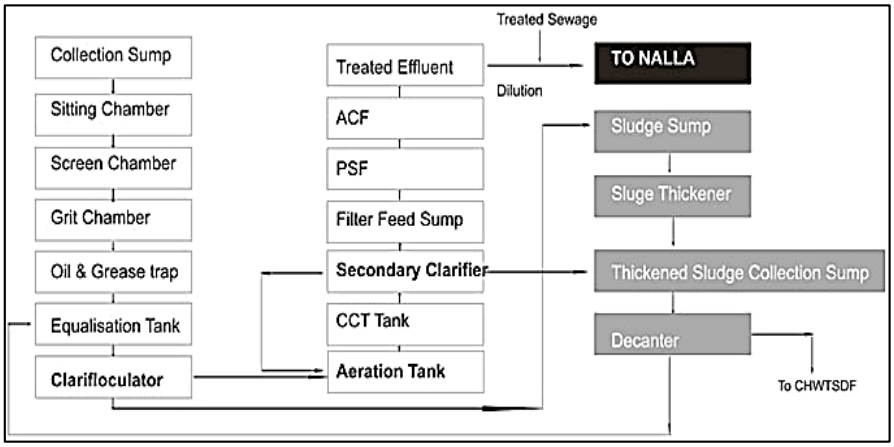
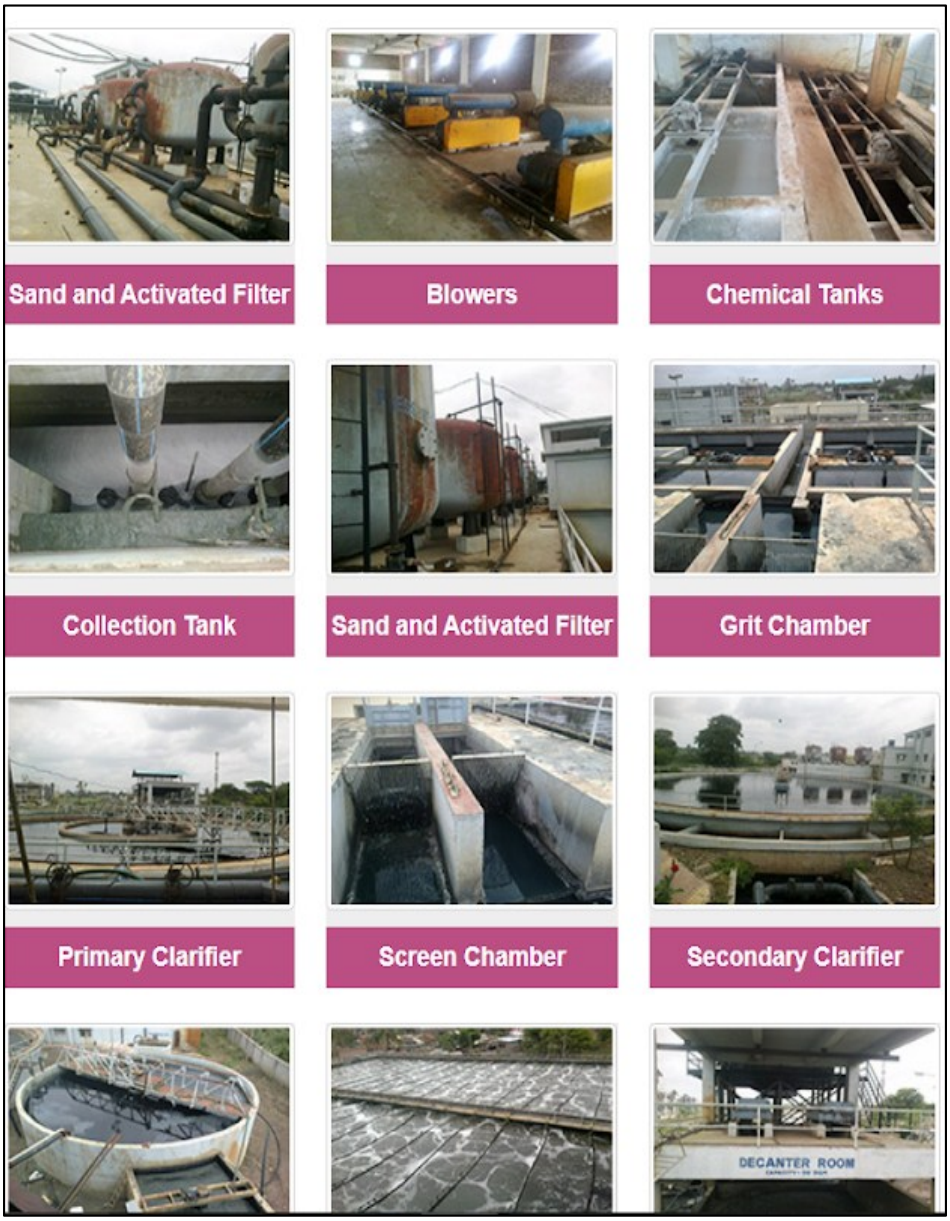


Exhibit 4: CETP unit.



Ref 1: https://images.app.goo.gl/vwQGFnMuqNZb7SRG8
Ref 2: http://www.ichalkaranjitextilecetp.com/gallery.aspx

Teaching Note:
The case studies Ichalkaranji, Maharashtra's textile industry's historical growth and current situation.. It emphasizes the transition from handloom to power loom, the contributions of significant leaders such as Narayan Babasaheb, and the industry's continuing expansion post-Independence. The industry faces challenges such as technology developments, infrastructure concerns, GST protests, fluctuating yarn pricing, high electricity expenditures, employee retention issues, and greater competition.

The narrative also discusses projects like the Common Effluent Treatment Plant (CETP) project, government assistance, and the importance of skill development. It highlights how important diversity, technological adaptability, and eco-friendly practices are to the industry's future. Studying the challenges and opportunities within Ichalkaranji's textile industry reveals a dynamic landscape shaped by historical legacies and contemporary market forces. Challenges such as technological disruptions, protests against taxation policies, and fluctuations in yarn prices underscore the need for the industry to remain agile and adaptive. But these difficulties also offer chances for creativity, productivity increases, and diversification. Overall, the case explores the prospects and difficulties facing the textile sector.

Contemporary Challenges Faced by the Textile Industry in Ichalkaranji:

Technological Disruptions:
Identification: The case discusses issues that have arisen as a result of technological disruptions in Ichalkaranji's textile sector.
Assessment: The sector must constantly adapt to emerging technologies. The transition from handloom to power loom was a fundamental technological change that signalled a continual trend of technological adaptation. However, the story implies that the rapid advancement of technology may present obstacles in terms of staying current and competitive.

Infrastructure Issues:
Identification: Infrastructure constraints are identified as a challenge for the textile industry in Ichalkaranji.

Assessment: The scenario shows that, while some firms believe the city's infrastructure is acceptable, others are sceptical, notably about roads and sanitation. This suggests the need for more infrastructure development and upgrade to meet the textile industry's expanding demands.

Protests against tax policies (GST):
Identification: The judgment specifically addresses protests against the Goods and Services Tax (GST) as a challenge for the textile sector in Ichalkaranji.

Assessment: Textile traders in Ichalkaranji have protested the GST rollout, highlighting a substantial difficulty. The sector is concerned about GST's influence on various phases of textile manufacturing, including spinning, sizing, weaving, and processing. The protests and calls for lower tax frequency demonstrate the industry's dissatisfaction with taxing rules and the necessity for legislative changes to keep operations running.

Fluctuating Yarn Prices:
Identifying and addressing fluctuating yarn prices. Fluctuating yarn prices are cited as a challenge for the textile business in Ichalkaranji.

Assessment: The owner of a power loom expressed concerns about the daily changes in yarn rates. This causes difficulty in sales and purchases, affecting the hourly earnings of employees. The continual

fluctuations in yarn pricing add to the unpredictability of production costs, hurting the overall financial health of textile companies.

High electricity expenses: Identification: The case highlights high electricity prices as an economic concern for the textile industry in Ichalkaranji.
Assessment: According to the narrative, electricity expenses are a huge financial strain for the region's textile companies. The lack of government subsidies exacerbates the problem, creating questions about the consistency of manufacturing costs and the overall financial viability of the enterprises.

Employee Retention Issues:
Identification: The case highlights the issues of employee retention in Ichalkaranji's textile sector.

Assessment: Retaining skilled professionals is highlighted as a major concern. According to the story, the industry struggles to retain a trained worker, necessitating the training of family members to cover the skill gap. Employee retention is critical for maintaining constant productivity and operational effectiveness.

Greater Competition:
Identification: The narrative argues that rising competitiveness is a difficulty for the textile sector in Ichalkaranji.

Assessment: The owner recognises the increased competitiveness and use of cutting-edge technologies by other businesses. The competitive landscape presents a challenge to traditional enterprises, emphasizing the importance of continual innovation and technology advancement in order to survive and grow in the market.

Ichalkaranji's textile industry has a number of obstacles, including technological disruptions, infrastructure concerns, protests against taxation laws, fluctuating yarn pricing, high electricity costs, employee retention issues, and increased competition. Each of these difficulties necessitates strategic planning and aggressive efforts to ensure the industry's long-term prosperity.

2. **Overcoming the Challenges**

A proper, regulated mechanism must be there to estimate yarn costs. The government should establish a system that tracks the yarn. The government can establish a system for determining yarn prices in Ichalkaranji textile industry through market analysis, a specific price index, stakeholder engagement, regulatory framework, price control mechanisms, transparency, and periodic reviews. This comprehensive approach ensures fair and stable yarn prices, considering factors such as demand, supply, production costs, industry perspectives, compliance, market stability, information sharing, and adaptation to changing conditions.

Yarn sizing is an important phase in the weaving process, and many small to medium-sized businesses experience difficulties in this area. To overcome sizing difficulties, a thorough solution must be implemented. This can include giving textile workers technical assistance and training on proper sizing techniques, encouraging the use of advanced sizing machinery and equipment, conducting R and D to optimize sizing formulations for different types of yarn, and establishing quality control measures to ensure consistent and reliable sizing results. Collaboration among industry stakeholders, government agencies, and research institutes can aid in the development of standardized sizing practices and the dissemination of best practices across the sector. By tackling sizing issues, the textile sector may improve weaving efficiency and quality, thereby aiding small businesses.

High electricity bills can have an impact on production costs and result in financial losses for owners. To solve this issue, the government may adopt a variety of solutions. To begin, they might examine and evaluate the current electricity pricing structure to ensure that it is equitable and indicative of actual costs. Second, the government can look at offering subsidies or financial aid to businesses, particularly small and medium-sized industries, to help offset high electricity costs. This can be accomplished through targeted subsidy programmes or financial incentives for the adoption of energy-efficient technologies and practices.

Furthermore, encouraging the use of renewable energy sources such as solar power can assist minimize dependency on traditional power systems and lower total energy prices. Finally, raising awareness and making energy-saving methods and technology more accessible can enable businesses to optimize their energy usage and lower their electricity bills. By addressing the issue of excessive electricity prices, the government may help to stabilize production costs and assist the financial sustainability of Ichalkaranji companies.

Employee Retention and a shortage of competent specialists are frequent issues for many businesses, including those in the textile industry. A multifaceted approach can be used to address these difficulties. To begin, giving competitive wages and benefits can aid in attracting and retaining qualified staff. This involves offering performance-based incentives connected to fabric output in order to instil a sense of ownership and motivation among employees. Second, investing in employee training and development programs can help existing employees improve their abilities and prepare them for higher-level responsibilities, minimizing the need to constantly hire new staff. In this context, collaboration with local educational institutions or vocational training centers can be advantageous. Furthermore, creating a great work environment that encourages employee satisfaction and engagement can boost retention rates.

This can include implementing employee recognition programs, providing opportunities for career growth, and fostering a healthy work-life balance. In cases where it is difficult to find skilled professionals locally, exploring partnerships with external agencies or organizations that specialize in workforce development or professional placements can be considered. By implementing these measures, businesses can improve employee retention, develop a skilled workforce, and efficiency in the textile industry.

To address loom and mill owners concerns about GST in the textile industry, the government should consider implementing the following recommendations: conduct a comprehensive review of the GST structure, with a focus on lowering or simplifying taxes at various stages of textile manufacturing; streamline the process of claiming input tax credit to facilitate timely refunds for businesses; and engage in stakeholder consultations to gather feedback and insights from stakeholders.

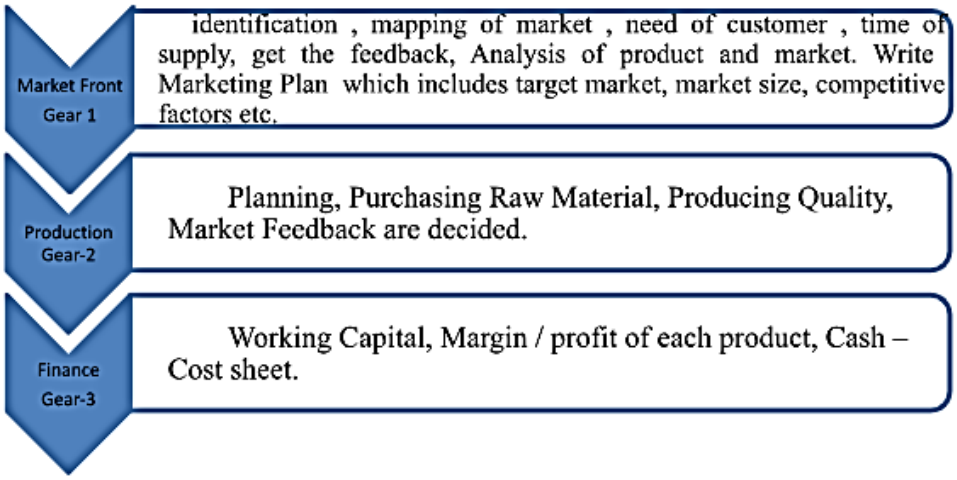
Several ideas might be explored to alleviate the issues faced by textile industry owners in terms of capital injections, manufacturing costs, and attracting regular buyers. To begin, the government can facilitate access to finance by simplifying lending procedures, promoting financial programs or subsidies geared exclusively to the textile industry, and fostering partnership with financial institutions. Second, applying cost-cutting initiatives such as adopting efficient manufacturing practices, utilizing sophisticated technology, and pursuing partnerships or joint ventures can assist in mitigating high investment costs. Furthermore, the government may help with market expansion and buyer diversification by organizing trade shows, sponsoring marketing campaigns, and developing foreign company relationships. Finally, encouraging digital platforms and implementing clear and efficient payment mechanisms might assist reduce wait times for returns and refunds.

4. Opportunities for Ichalkaranji Textile Industries discussed during conference 27 Oct, 2021 Regarding the Export and Market opportunities

During the "Export and Market Opportunities for the Ichalkaranji cluster" conference for industry growth on October 27, 2021, a wealth of ideas and information were shared with the whole textile sector. Ichalkaranji has 1, 15,000 looms, and of which 35,000 are shuttle less/air jet looms. Lacs of meters are produced every day, according to Shri Vishwanath Agarwal, Vice Chairman of PDEXCIL. The quality of production and processing is likewise good, and he claims that export push programs are necessary because the city is well-established under Mr. Wade's direction. They also emphasized how important internet marketing is to the growth of businesses.

During the conference, Mr. Rahul Mehta, the chief mentor of CMAI (the garment manufacture association of India), offered various recommendations for enhancing the company. One of these was to develop the Ichalkaranji brand, which now accounts for half of sales and raises the product's worth. He suggests building a website tailored to the Ichalkaranji Market. The market needs to be consistently communicated with in order to reach the clients. Furthermore, he suggests concentrating on the target market because 60% of Indian youth are under 35 and favour cotton; therefore, cotton must be supplied to customers in the necessary quantity and quality, and exports must receive more attention.

Speaking to the audience as well was Mr. S. P. VERMA, Joint Textile Commissioner, who stated that the sector needs to prioritize three areas: First, the market; second, production last and third: finance

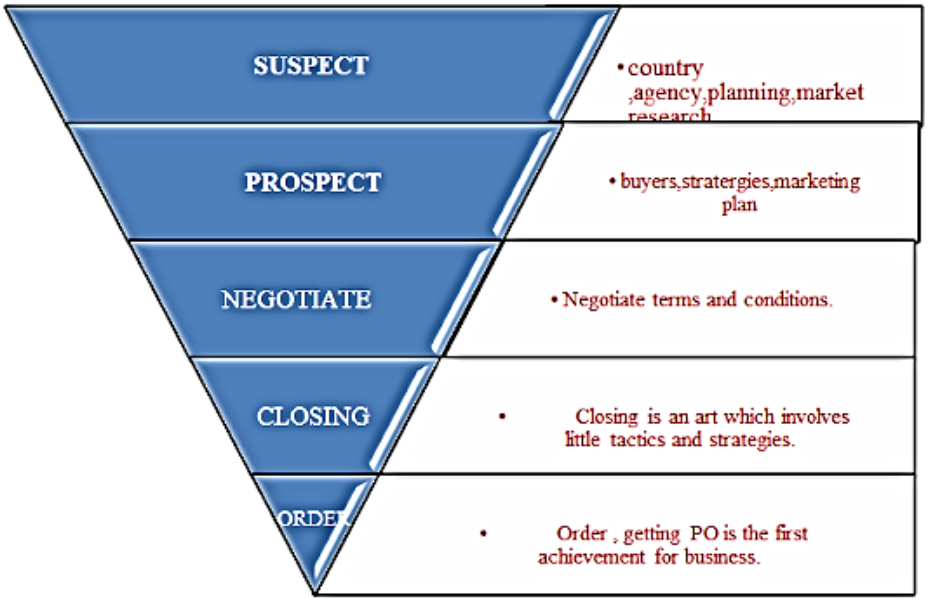


Ref: https://textilevaluechain.in/news-insights/conference-on-export-and-market-opportunities-for-ichalkaranji-cluster/

He also discussed SPANCO CYCLE facts. The six stages of a typical sales cycle, which take place throughout every sales process, are referred to as SPANCO. SPANCO cycle's basic marketing tool recommendation:

Governments and industry participants are always trying to find solutions for the problems the power loom business faces. In addition to encouraging sustainable practices in power loom clusters, efforts include giving power loom weavers access to market connections, financial support, and technical training.

Maintaining a diverse and sustainable textile business requires balancing the growth and development of both power looms and handlooms.



SPANCO CYCLE

5. The role of the Common Effluent Treatment Plant (CETP) play in addressing environmental concerns and promoting sustainable practices within the textile industry in Ichalkaranji, Maharashtra, as discussed in the case.

The Common Effluent Treatment Plant (CETP) in Ichalkaranji is critical to addressing environmental concerns in the textile sector. It functions as a centralized facility for treating textile effluents, ensuring that released water meets environmental criteria. The CETP project, initiated by the Ichalkaranji Textile Development Cluster (ITDC), offers a long-term solution for handling effluent from several textile facilities.

The key aims of the CETP are:

Environmental Compliance: By processing textile effluents before disposal, the CETP helps to maintain water quality, avoid contamination, and reduce the environmental effect of textile manufacturing.

Infrastructure Development: The initiative helps to improve Ichalkaranji's overall infrastructure, resulting in a cleaner and more sustainable industrial environment.

Resource Conservation: CETP promotes responsible use and conservation of water resources by treating and reusing water, hence reducing the environmental impact of textile operations.

Cluster Approach: The ITDC's collaboration with several textile units ensures a collective and efficient approach to environmental management, sharing the benefits of a centralized treatment facility.

Essentially, the CETP in Ichalkaranji is a proactive move towards developing ecologically friendly practices within the textile industry, aligning with global efforts to balance industrial growth with ecological responsibility.

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Healing Scars: A Case Study on Post-Traumatic Stress Disorder in Elderly Women, India.

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At age 65, Sumati, a retired professor of social work, was living a full and active life. Although retired, she had never been one to sit back and let life pass her by. She had always been an energetic and outgoing woman, something of a social butterfly who enjoyed good friends and good food. She liked to go to many places in the city. She visited her favorite shops, museums, and lectures. She also saw her many friends from the university.

Sumati - A Woman with Energy and Optimism:

In fact, Sumati's energetic and optimistic life in retirement was consistent with the robust and challenging state of mind with which she had always approached life. Actually, she never really had any big problems with her feelings or her mind, and she wasn't seriously sick physically either. But she definitely went through some tough times and difficult experiences. In stress disorders intensified during the COVID period rigorously. She spent her childhood living in Mumbai during the Sanyukt Maharashtra movement. Her father became an outspoken local leader for this movement. Throughout her early childhood into her teenage years, Sumati witnessed marches and nonviolent protests that were often met with threats and violence. In school, her higher class classmates ignored her; at worst, they mocked and bullied her. Sumati became accustomed to eating her lunch in solitude, her expression unchanged as those students teased and ridiculed her. Even within her own community, some people harboured strong animosity towards her and her family. Every night as she and her parents watched the nightly news, she saw the stories of the many people who had been hurt or killed during the movement. She coped up perfectly with the pride, and being mentally strong. Following high school, Sumati went to the university to study for a bachelor's degree in social work. She eventually earned a doctorate and obtained a faculty appointment at a major university in the West Maharashtra, where she remained for 30 years.

At the university, she put all her energy into her work, spending her time teaching, doing research, and writing. Her intense involvement in her work was legendary, and stories circulated in her department of how she had occasionally been found asleep at her desk when colleagues arrived in the morning; apparently, she had become so absorbed in her work that she had ended up staying the night.

With her devotion to her career, there was no doubt in Sumati's mind that her personal life had suffered. As she remained unmarried, her colleagues and students became her family. (Both of her parents had since passed away, and her siblings remained in the other state) Sensing her devotion, students gathered to receive the benefits of her wisdom and experience, which she generously gave. She, in turn, took great personal interest in her students' progress, maintaining contact with them and following their careers, sometimes for decades, after they had graduated. And so it was, both prior to and during retirement. Sumati was a picture of emotional and physical strength—a woman of incredible poise, self-confidence, and direction. Then, in just one quick moment, everything felt different. A disaster hit her, sending her life and thoughts in a completely unexpected and unimaginable direction.

Sumati disaster Attacks- The series of Actual Incidences:

Sumati was taking the subway home from a shopping trip when it hit a stationary train on the track ahead. Although her train was not traveling at high speed— perhaps 20 miles an hour at most—the impact was forceful enough to throw the passengers from their seats and partially crush the metal cars. Sumati herself had been standing at the moment of impact. As she was thrown ahead, her left leg hit a seat hard, hurting her knee, and her head banged against a metal pole, making her lose consciousness. When Sumati regained

consciousness, she was lying in a pile of other passengers who had been thrown together in the same corner of the car. As far as she could make out in the dim light, most were unconscious and started bleeding. Sumati put her hand to her own forehead and it came back wet with blood. She was horrified. What if she was bleeding to death and no one could reach her to stop the flow? She tried to get up but could not overcome the weight of the other passengers. She spent the next half hour lying there, paralyzed with fear, wondering if she would be able to survive until help arrived.

When the rescue squad finally did arrive on the scene, the injured passengers were taken out of the train on stretchers. Only 4 were judged to require hospitalization—Sumati among them—and they were taken to separate emergency rooms in the vicinity of the train crash. The initial examination it was clear that Sumati did not have a critical loss of blood. Now, as she lay on a gurney awaiting further tests, the terrified woman stared wide-eyed at the gruesome scenes walked before her: people being brought in as a result of stabbings, shootings, drug overdoses, and the like. A man who looked like he had been stabbed, but only had minor cuts, sat next to Sumati and winked at her, which scared her. She turned her head away, hoping he wouldn't bother her anymore, but she felt like he might attack her at any time.

Sumati spent 3 hours in this highly anxious state, controlled by the bands, until she was finally taken to the radiology department for tests. At first she was relieved to be removed, but then, as she was wheeled down a dark corridor, she began to wonder if her relief was premature. Overcome by her fears, she even wondered whether she was being taken away to be raped or killed by the hospital orderly, of all people. Once her X rays and a computed tomography (CT) scan were done, Sumati was returned to the waiting area, where her fears further intensified. Now she began to focus on the risk of infection. Numerous patients were coughing persistently, and Sumati became afraid that she was being exposed to tuberculosis, which had been making a well-publicized comeback in city hospitals. She glanced at the disreputable - looking man hacking away next to her. He seemed extremely tired and sickly, practically spitting on the floor, and she became convinced she was about to contract a drug-resistant strain of tuberculosis. After another 2 hours, the doctor finally arrived and informed Sumati that the X rays and CT scan had revealed no fracture or brain haemorrhage. Everything seemed normal. The doctor told Sumati she was free to go home as soon as the nurse dressed her head wound. To play things safe, however, he also advised Sumati to see a doctor for follow-up.

Sumati was relieved to be released finally. However, she glanced at the clock and saw that it was now 1:00 a.m., 6 hours from when she had originally been brought to the hospital. The thought of going outside at night, especially feeling like this and in this area, was just as scary as everything else. So she preferred to wait in the hospital. Early in the morning she hobbled out to a taxi. The taxi took her through the city as it started to wake up. The ride felt oddly calm and dreamlike, finishing the journey Sumati had started 12 hours earlier on the subway. She arrived at her apartment house in 20 minutes and dragged herself out of the cab and into her building, where she took the elevator up to her floor. Once inside her apartment, she collapsed on her bed, happy to be home at long last. What had begun as a simple trip home from a downtown shopping trip had turned into a nightmare. Sumati slept for almost a full 24 hours.

Repercussion of the Trauma:

The next day, Sumati called some close friends to tell them what had happened. In the light of day, she now realized that one of the most disturbing elements of the whole experience had been coming face-to-face with the prospect of physical disability. As someone who lived alone and had no close living relatives, she realized that even a temporary inability to care for herself could be disastrous. Fortunately, she had a close network of friends and colleagues from the university where she had taught until a few years ago. With her calls thisMorning, she hoped to reassure herself that her friends would indeed step in if the need arose. Her friends were sympathetic and asked her if she needed anything. But oddly, Sumati felt disoriented and

found it difficult to answer their questions she found it hard to make sense of what had happened the day before, and it took a lot of energy just to try to explain it. Even talking for a few minutes felt exhausting. By the time she had made the third call, her voice was so weak that her friend felt great concern and suggested she see a doctor sooner rather than later.

Sumati set up an appointment with a neurologist for 3 days later. In leaving her apartment—for the first time since the accident—she was alarmed at how noisy and confusing it was just to be outside. The city traffic was very much loud, and Sumati wondered if she would even be able to cross the street. Her body still ached from the accident, but more important, she became concerned that history might repeat itself. She had never been in an accident before and had never been concerned while cross the road.

Eventually, Sumati arrived at the doctor's office tired and out of breath. She was breathing heavily, partly from running and partly from worrying about the traffic. When she got there, she didn't even talk to the receptionist at first. Instead, she collapsed on the nearest seat, closed her eyes and gulped for air, as though having just escaped some grate danger. After a few minutes, the receptionist noticed her sitting there and walked up to greet her. At the sound of the receptionist's voice, Sumati practically jumped out of her seat, she was so frightened to find someone suddenly upon her. The neurologist gave her a thorough examination and reviewed the x rays and CT scan taken in the hospital emergency room. He mentioned that all the results appeared fine, but considering the cuts and bruises on her head and her feelings of tiredness, sensitivity to noise, and confusion, she might have gotten a concussion. He told her it was mild, but the symptoms could take several days or even weeks to go away. In the meantime, she should take it easy and get all the rest she needed.

The neurologist also noticed that Sumati's knee looked really swollen, so they suggested her to see an orthopaedist. Two days later, the latter physician determined that she would treat the knee with an anti-inflammatory drug; but if the inflammation did not improve or if it worsened, arthroscopic surgery to remove the inflamed tissue would be necessary. After seeing the orthopaedist, Sumati came back home feeling a bit uneasy, which slowly turned into a feeling like something bad was going to happen. She had not expected to hear surgery mentioned, and the idea was unusually threatening to her. She shuddered at the thought of going back to a hospital. She recalled her emergency room experience and practically shook with fear as she considered the terrifying scene. As time passed. Physically, Sumati started to feel more her old self, but she couldn't seem to shake her fearfulness. Each trip outdoors was extraordinarily stressful. Crossing the street was consistently anxiety provoking, as she couldn't get over her preoccupation with being in another accident, this time as a pedestrian. Taking the bus or subway was simply out of the question. So, she only went on short trips around her neighbourhood, mainly for essential tasks like buying food and going to the doctor.

Sumati's accident and the time she spent in the emergency room seemed to change the way she looked at life. After spending hours feeling extremely anxious and thinking a lot about the possibility of dying, being raped, or attacked, she started seeing everything in her life through this perspective. And there was no escaping the memories. When home, in what she considered a safe environment, her memories of the subway car or the emergency room would constantly intrude. As she watched television, her eyes would glaze over as some particularly disturbing element of her experience forced itself into her consciousness.
Before, she used to sleep soundly, but now she found herself waking up often from dreams about her time in the subway or the emergency room. They were not exactly nightmares; rather, they were mostly accurate interpretations of her all-too-real experience. She couldn't escape the images, even in sleep.

Sumati Drifts Away a Friend's Perspective:
In the week's right after the accident, Sumati talked on the phone with her friends a lot, telling them all about what happened. At first, her friends listened carefully and supported her. They felt sad to think about

what Sumati, who was like a wise grandmother, had been through. But as time passed, Sumati kept bringing up her "terrible experience" in every conversation, and her friends started to get tired of it. Even Swati, who was probably Sumati's closest friend, started to feel stressed by her daily phone calls. Later, when Swati talked to her sister about it, she tried to explain why she was feeling this way and how her relationship with Sumati had changed since the accident. But even people as strong-willed and tough as Sumati can develop stress disorders.

Accommodation:
Sumati in Treatment the Journey Back to Normality:

Background to see Psychological Help:
Over the next few months, Sumati's life became more isolated. Sumati's fear didn't get better, and she only did outdoor activities she thought were safe, even though nothing felt totally safe to her. Plus, her injured knee hurt more and more. When the orthopaedist, during a subsequent visit, talked more certainly about the need for surgery, she burst into tears and cried out, "I cannot face going back into that horrible place. My life has already been ruined by this accident. If I go back into the hospital once more, I know I will never survive." Soon realizing that his patient was in need of more than physical help, the physician suggested that Sumati make an appointment with Dr. Agasti, a psychologist, just to discuss her situation and see if the psychologist had any helpful suggestions about her lingering fears and upsets.

Beginning of Therapeutic procedure:
The next morning, after yet another fitful night's sleep, she decided to call Dr. Agasti. At the psychologist's office, Sumati recounted her "nightmare'' and how her life had worn overnight. As a former professor of social work, she was rather sophisticated about psychological matters and had spent some time pondering her dilemma. She told Dr. Agasti that on the one hand, she felt that her current state was an understandable result for anyone undergoing such a horrifying experience. But on the other hand, given her previous level of functioning, she would not have expected to be so completely undone by what she knew objectively to be just an accident. Her whole identity had been consumed by this accident and its aftermath. She felt like a different person. After listening to Sumati's story, Dr. Agasti concluded that her condition met the DSM-5 criteria for posttraumatic stress disorder.

The DSM-5 criteria for posttraumatic stress disorder.
For -Diagnostic Criteria, dissociative symptoms, Kindly go through the part of PTSD in DSM 5

Recommendations:
Development of posttraumatic stress disorder in Sumati's case:

- **First,** Sumati went through something really scary that could have seriously hurt her or even killed her. And she felt really, really scared because of it.
- **Second**, the traumatic event was followed by months of intrusive symptoms—in Sumati's case, in the form of intrusive recollections and intense psychological distress in response to cues that resembled the original trauma (subways, buses, traffic, and strangers on the street).
- **Third**, Sumati kept away from things that reminded her of the scary event, and she felt less interested in doing things or thinking about the future.
- **Fourth**, she exhibited persistent negative emotions and a significant change in her own thoughts about herself and the dangers of the world.

Finally, Sumati also exhibited increased arousal, including sleep difficulties, hypervigilance, and exaggerated startle response. This had been going on for 5 months now, and her functioning had been

greatly impaired as a result. Dr. Agasti believed that Sumati had developed an acute stress disorder in the immediate aftermath of the train crash but that as her early symptoms continued and even intensified after the first month, she now had posttraumatic stress disorder.

A specialist in stress disorders, Dr. Agasti knew that both ***behavioural and cognitive approaches*** have often proved helpful in cases of posttraumatic stress disorder.

The behavioural approach involves exposing the person—with either in vivo or imaginal exposure—to anxiety-provoking stimuli. **The cognitive approach**, called cognitive restructuring, guides the individual to think in another perspective about the trauma itself and about possible current dangers. Dr. Agasti typically used a combination of the approaches when treating clients.

In vivo exposure it's used to help people become less afraid of Stimuli that happen or that they see around them. The in vivo exposure procedure for the posttraumatic stress disorder client is similar to that used with other anxiety disorders, such as phobias. A hierarchy of anxiety-provoking situations, ranging from the least to most threatening, is constructed by the client and therapist. The individual is then given assignments to enter these situations and to remain there for a time, usually until he or she has a significant drop in anxiety.

The therapist generally has the individual repeat the exposures on several occasions until only minimal anxiety manifests during the exposure. Such exposure assignments proceed up the hierarchy until the most threatening item is mastered.

Imaginal exposure is used to help clients in posttraumatic stress disorder react less fearfully when recalling the original trauma. The individual repeatedly visualizes the entire sequence of events involved in the trauma for a long period, on a repeated basis. *In visualization exercises*, the client usually listens to a lengthy recorded description that he or she has provided. The purpose of the exposure is to desensitize the client to the memory of the trauma in the same manner that someone would be desensitized to any phobic object through repeated exposure. In essence, the meaning of the traumatic memory as a danger signal is changed by the exposure, and it eventually stops producing a sense of threat. Ultimately, the traumatic memory can be readily put aside like any other long-term memory.

Cognitive therapy, which more directly challenges the accuracy of the individual's negative cognitions, can further bring about changes in the fearful reactions of persons with posttraumatic stress disorder. In one cognitive strategy, a client might be guided to write down or practice less catastrophic, less self-damaging interpretations of the trauma, often in connection with exposure exercises. **Thus, Dr. Agasti, like a number of professionals, included this approach in his treatment program.** Under his care, Sumati embarked on a treatment program that extended over **19 sessions**.

Session 1:
In the first session, Sumati described the anxiety she had been feeling for the past 5 months. She also described the accident and its aftermath in the therapy room. She explained that the feelings resulting from that experience—mainly the fear of injury or attack—seemed to have coloured her entire approach to life. "I just can't seem to get past this horrible experience. This is not me. It's like I've become somebody else. I've got to get my old self back."

Dr. Agasti said he was optimistic that Sumati would be able to get back to her former self. He explained that she had posttraumatic stress disorder, the anxiety syndrome that arises following an intensely frightening experience. He also explained that after such an event most people go through a stressful period in which they feel especially vulnerable. The psychologist then outlined the basic treatment strategy. He

said one component of the treatment would be to survey all of the different ways in which Sumati's life had been changed by her current fears and anxieties, paying particular attention to curtailed activities. Then the two of them would arrange the activities along a scale ranging from the least to the most threatening. They would make up weekly activities where Sumati would face the situations she was avoiding, following specific steps. Dr. Agasti explained that Sumati's anxiety should ultimately improve after she repeatedly entered situations for specified durations and frequencies each week.

The second component of treatment, the psychologist explained, also involved exposure, for the coming week, he asked Sumati to start monitoring her feelings and behaviour. She was to note particularly any instances of fear and anxiety, including the circumstances that provoked the anxious reaction and any associated thoughts. In addition, the psychologist asked Sumati to start taking note of the various activities she was avoiding, so that he and she could begin constructing a series of in vivo behavioural exposure exercises.

Session 2:
Sumati began the next session by reporting that she couldn't keep any of the requested records. After discussing with Dr., She said she now felt prepared to throw herself wholeheartedly into the treatment. At the same time, Sumati expressed concern that her physical limitations might prevent her from proceeding at a reasonable pace with in vivo exercises (that is, doing things she had been avoiding). It was decided, therefore, that for the time being, greater emphasis should be given to the imaginal exposure and that the next session would be devoted to discussing the subway and emergency room experiences in more detail. Still, Sumati would try a couple of brief shopping trips in the coming week if she felt physically capable.

Session 3:
Dr. Agasti asked Sumati to tell him everything about the scary event she went through, like the accident and what happened in the emergency room. Dr. Agasti wrote down what Sumati said as she calmly started talking about it. Then, she closed her eyes like she was in a trance, focusing really hard on remembering. She talked for about 45 minutes, describing everything in detail, like the people in the dark subway, the blood on her head, how she felt scared on the stretcher, and more. After she finished, Sumati looked really tired. Dr. Agasti praised her for doing such a good job explaining everything. He then asked her **to estimate her level of anxiety** at its peak during the monologue and at the end of it, using a 0-to-10 scale. Sumati assigned ratings of 8 and 5, respectively, indicating that some reduction of anxiety had occurred by the end of the monologue.

Session 4:
Sumati and the psychologist listened to the recording together. While listening, Sumati closed her eyes and, as instructed, tried to imagine the events in one form of **exposure therapy, eye movement desensitization and reprocessing**, clients move their eyes in a saccadic or rhythmic manner from side to side while recalling or imaging traumatic and phobic objects and situations. As vividly as possible. This time, she said she seemed to have had some new insights. First she said she now realized that highest troubling concern of happened experience was the sense of loss of control. She drew a direct connection to her childhood experience during the movement, when physical and mental quickness were her most prized possessions, which she equated with life itself. Now she understood that her accident and the time she spent in the emergency room really hurt her self-esteem, which is how she sees herself.

Dr. Agasti tried to offer Sumati a means of viewing the experience in a less negative fashion, suggesting that occasional episodes of loss of control are a normal part of life and that people are not necessarily diminished or demeaned by their occurrence. On hearing this, Sumati seemed tentatively prepared to accept the idea. She herself noted that yes, even during her adolescence, when she felt so independent and vital,

nevertheless, she had later been able to view that episode as a transient interlude in an otherwise independent existence. When freed, she had felt prepared to pursue her independence even more vigorously than before. She said she could now see how it might be possible to view the recent accident in a similar light.

Sessions 5-8:
During the next 4 weeks, Sumati was instructed to listen to the recording almost every day. She recorded her peak anxiety level for about half of these imaginal exposures. Sumati's anxiety level declined progressively, and by the end of the fourth week, her anxiety reaction to the recording was virtually extinguished. Decided shifts in Sumati's thinking accompanied these reductions in anxiety. After about 2 weeks, when her peak anxiety had lessened considerably, Sumati told Dr. Agasti that listening to the recording was making her feel that many of her fears had been overblown. By the third week, when Sumati's anxiety had decreased still further, she said that the reduction in anxiety seemed to be carrying over to other parts of her life. She had resumed taking short bus and subway trips, at first with friends and then alone; moreover, she said she felt much closer with her friends, who had remarked on and rejoiced over the improvement in her spirits. Sumati also observed that repeated listening to the recording had made her feel that the episode was "now part of my experience." The memory was no longer constantly "in the back of my mind"; nor did she feel compelled any longer to shut it out when she did think of it. In other words, its intrusive properties had been eliminated. By the eighth therapy session, Sumati said that she had fallen asleep while listening to the recording a couple of times because it was so relaxing.

During these same 4 weeks, Sumati also spontaneously began to take trips downtown, both by subway and bus, to places that she hadn't visited since the accident (again, first with friends and later on her own). At about the same time, her fear of youths on the street also declined. The psychologist felt Sumati no longer needed to listen to the recording at this point, suggesting that the most benefit would come from Sumati's increasing the range of her behavioural activities through in vivo exposure. The therapist and client designed a plan for Sumati to take at least one local shopping or subway trip per day, plus a couple of downtown shopping trips per week.

Sessions 9–13:
During these sessions, held over a 4-week period, the emphasis remained on the in vivo behavioural exercises. Sumati continued to become more comfortable using public transportation and now did so without hesitation. At the same time, however, her physical condition was starting to deteriorate. Her knee had grown so tender that she was feeling very difficult to walk at all. The orthopaedist was again pushing for surgery. Intellectually, Sumati felt that the surgery was the rational solution to her problem, but she didn't know whether emotionally she could face going into a hospital. Thus, Dr. Agasti suggested that perhaps this anxiety could be reduced through some exposure to preliminary aspects of the medical process. He suggested that Sumati begin taking some of the steps that would be involved if the surgery took place, as a type of hypothetical exercise. The first step would be to make an appointment with the orthopaedic surgeon to inquire about the surgical procedure, including such matters as the preoperative testing, the duration of the surgery, the length of the hospital stay, and the recovery.

Sessions 14-15:
Sumati carried out the assignment and reported on the information she received from the orthopaedic surgeon. It ended up that surgery would be arthroscopic, a couple of small incisions, through which the inflamed and torn cartilage would be removed. There would be a recovery period of several weeks, but after the first week she shouldn't be any more debilitated than she was now, and she should steadily improve after that point. Acquiring this information seemed to allow Sumati to consider the idea with some objectivity for the first time. To further promote Sumati's psychological preparedness, Dr. Agasti suggested that she now look into the arrangements that would have to be made for a home recovery—again,

hypothetically. At Session 15, Sumati reported that the home recovery arrangements could apparently be made without much difficulty. The psychologist then asked her to call the orthopaedist's office manager and ask how one would go about actually scheduling the surgery, should she decide to do so.

Sessions 16-19:
Returning for Session 16, Sumati discussed her phone call to the orthopaedic surgeon's office. In fact, she had gone ahead and scheduled the surgery, reminding herself that she could always cancel or reschedule it. By Session 19, the surgery date was only a week away, and she felt only limited hesitation about proceeding.

Conclusion:
Sumati had the surgery and reported to Dr. Agasti that it had gone "marvellously." From beginning to end, she was impressed with the professionalism and caring of the medical staff. Her only remaining task was to recover physically, which she expected would take several weeks. From a psychological standpoint, she felt she had now come full circle. It had been just about a year since her accident, and here she was, once again emerging from a hospital, but this time in good spirits and filled with optimism, this time embracing her friends and their offers of help rather than pushing them away. Agasti contacted Sumati by phone 3 months later and learned she had made a full recovery from the surgery. She said she now felt fully restored, both physically and mentally. Her traumatic accident had finally come to an end.

Case Questions:

1. What event precipitated Sumati's posttraumatic stress disorder?
2. Why do friends and family members gradually become more distant from someone who has experienced a Traumatic event?
3. Why did Sumati finally choose to seek treatment?
4. Why did the doctor diagnose Sumati with PTSD rather than acute stress disorder?
5. What types of therapy did Dr. Agasti use to help Sumati with her problem? Can you give an example of each type of therapy?
6. In the first session, Dr. Agasti gave Sumati three parts of her therapy. Can you explain what those three parts were?
7. Why did Dr. Agasti record the scary event? What was the reason behind it?
8. Why didn't Sumati write down the activities she was scared of, as part of her treatment plan? How did Dr. Agasti handle this issue during his session with Sumati?
9. What other bad experience from Sumati's early life might have added to her posttraumatic stress disorder?
10. Based on the text, how long does it usually take for people to get better from posttraumatic stress disorder? What percentage of people still have symptoms even after getting treatment for many years?

Teaching Note & Procedure

Sr. No	Content	Resource	Teacher's activity	Student's Activity	Mnts
1.	**Introduction**	-	1. To make students aware about psychological conditions	1. To listen	5
2	**Presentation of session objectives**	-	1. To make students understand the objectives of the session	1. To listen	5
3	Phase I- **Factual part** Rucha's case	Exact half part of the case in Printed or soft copy format	1. To form the group of students. 2. To ask the students to read the case individually	1.To read the given case. ii. Mark the vital points and to make the notes of it.	30
4	Phase II- **Root cause of case** Reflecting on Question part-	Question part of the case in Printed or soft copy format	1. To ask students to discuss the case study first. 2. To ask students to read the questions and reflect in the group	1.To discuss the case study in the group with the pointers made. 2.To read the questions and reflect on it by discussing in the group.	40
5.	Phase III- **Recommendations or Treatment**	Recommendation or treatment part of the case in Printed or soft copy format	1. To ask the students to discuss the recommendation treatment, therapy selection part	1.To discuss the recommendation treatment, therapy selection part	30
6.	Phase IV- **Presentation**	-	1. To ask 1participant of each group to present the reflections in front of all students. 2. To ask other groups and participants to give inputs on presentation.	1.To select one presenter among the group. 2.To participate and reflect on the discussion.	40
7.	**Key learning, Summary & closing statement**	-	1. To elaborate, summarize the case.	1.To note down the summary.	5

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Evolution of Electric Vehicle (EV) Market Headwinds to Traditional Foundry Industry: A Case Study on Kolhapur Foundry Cluster, India.

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About Kolhapur:
Kolhapur is situated at the central point of South Maharashtra, North Karnataka, Konkan and Goa. Kolhapur is connected with Mumbai, Panjim, Bengaluru, Pune, Belgaum and other major cities with express highway, railways and airlines. Atmospheric condition of Kolhapur is healthy and not extreme. There are number of dams constructed on various rivers on the west side of Kolhapur District. Due to such excellent atmospheric and geographical conditions, agro based Industry, textiles Industry, mechanical industry, etc. has developed in Kolhapur and adjacent industrial areas managed by Shiroli Maharashtra Industrial Development Corporation, Gokul Shirgaon Maharashtra Industrial Development Corporation, and Kagal Hatkanangle five-star Maharashtra Industrial Development Corporation etc.

Background of Kolhapur Foundry Industry:
Kolhapur Foundry Industry: Kolhapur has emerged as a prominent hub for the foundry industry, particularly known for producing automobile castings. The region boasts around 450 foundry units situated in Kolhapur and Sangli districts. In Sangli, most units are found in the industrial areas of Miraj and Palus, which are close to Kolhapur district. In Kolhapur district itself, foundries are spread across four major industrial estates, as described below

Kolhapur City Shivaji Udyam Nagar:
Kolhapur district is blessed with fertile soil. It is watered by 14 rivers and is traditionally an agro based economy. In the second and third decade of the 20th century Kolhapur came to the forefront in the field of sugarcane cultivation and later into downstream jaggery manufacturing. At that time cane crushers were made by steel and were imported from England. Over time, routine wear and tear created a demand for replacement parts and farmers went to Kolhapur city, where skilled craftsmen, normally employees of machinery traders reconditioned them. Outbreak of Second World War in 1939 disturbed the routine supply of the steel crusher and hence skilled persons began to make spare parts for imported machinery. As the production of sugar cane increased the demand for oil engines came to light. With this industrial activity Shivaji Udyamnagar was established in the year 1947. The fourth and fifth decades of the 20th century saw several progressive entrepreneurs including S. Yashwant, Y. P. Powar, Mirasaheb Hudli, Gadre, Samani and C. Menon emerge and ensure rapid growth of the Kolhapur engineering and foundry industry. As the foundry business grew, need occurred for machine and fabrication industries. Gradually the machine and fabrication industries also developed during the last three decade of the last century. Over time as the city expanded, Shivaji Udyamnagar gradually came within the centre of the city and the surrounding area got blocked by residential apartments with no scope of expansion for the cluster.

Shiroli Maharashtra Industrial Development Corporation:
With natural growth restriction of Shivaji Udyamnagar, progressive entrepreneurs like Shriram Foundry, Sound Casting, Manugraph, Menon Piston etc. shifted to the Shiroli Maharashtra Industrial Development Corporation area since 1976. But the growth of the Kolhapur industrial sector was rapid and problem of availability of land surfaced again as the Shiroli Maharashtra Industrial Development Corporation area was surrounded by many small villages and two rivers Panchganga and Warana passed in between them. The people at those villages were not willing to spare more land for industrial purpose as there was availability of adequate water and the land was good for growing sugar cane. Simultaneously the farmers cultivate vegetables because the rapid growth of Kolhapur city led to heavy demand for vegetables. Hence there was

need for another place for the expansion of the Kolhapur industries and thus the Gokul Shirgaon Maharashtra Industrial Development Corporation (GOSHIMA) came into existence.

Gokul Shirgaon Maharashtra Industrial Development Corporation:
It started in the year 1989 for satisfying the need of land of the Kolhapur industrial sector. Gokul Shirgaon is situated on the north side of the Kolhapur city and 35 kms from Karnataka state border. Here there is scarcity of water and as a result there is no chance for agricultural development in this area. As a result land was easily available for the industrial purpose. In the border area of Karnataka state there is heavy demand for the industrial products hence this area has grown faster. Big industrial organization like Gokul Milk, Indo count etc. were established here. Rapid development of the industrial sector of the Kolhapur put pressure on the government and as a result the government setup yet another industrial estate for heavy and large industries ahead of Gokul Shirgaon Maharashtra Industrial Development Corporation in the form of Kagal Five Star Maharashtra Industrial Development Corporation.

Kagal Five Star Maharashtra Industrial Development Corporation:
It was set up in the year 2007. It is situated 20 km before the southern boundary of the Karnataka state. The basic purpose of the establishment of this industrial estate was to bring large and heavy industrial organizations in the Kolhapur region. Some multinational corporation like Kirloskar Oil Engine, Raymond, Vardhaman Textiles and Oswal Group successfully started their production in this industrial estate. It is situated in two talukas one is Kagal and other is Hatkanangle and it is also touches the boundaries of the Gokul Shirgaon Maharashtra Industrial Development Corporation. In this industrial estate the manufacturing of spare for the automobile sector and oil engine is major product. Along with this fabrication industries, machine industries, textile industries and food processing industries are also present.

Kolhapur Foundry Cluster Profile:
The foundry industry is dispersed across various geographical clusters, of which the Kolhapur cluster is one of the major ones. It accounts for approximately 10 per cent of total casting production by India. The cluster is spread over an area of around 19 square kilometers. There are around 2,000 manufacturing micro, small and medium enterprises units in the Kolhapur Area, of which around 450 are foundry units. Foundry units in the Kolhapur cluster manufactures various kinds of product categories such as automobiles, railways, pumps, compressors and valves, diesel engines, cement industry, electrical industry, textile machinery, sanitary pipes and fittings, power generation, construction and many other specialized applications.

	Micro	**Small**	**Medium**	**Total**
Cluster Turnover (INR Cr.)	1000	1400	2500	**4900**
No. of Units	250	130	70	**450**
Employment (In Lakhs)	0.2	0.4	0.6	**1.2**
Total Exports (INR Cr.)	1000			

Source: DIC Report – 2021

All these led to the rise of the 450 foundries present in Kolhapur and Sangli district, about 350-375units are present in the Kolhapur district and 90–100 units in the Sangli district. While units in Sangli district are located mainly in the adjacent industrial areas of Kolhapur districts like Miraj and Palus industrial areas, foundries in the Kolhapur district are mostly spread across the above four major industrial estates. Products manufactured the foundry industry primarily manufactures ferrous (iron) castings covering both Spheroidal Graphite (SG) iron and grey- iron castings. The foundry industry in Kolhapur, though traditionally catered to oil engine, agriculture and automobile is now starting to diversify its supply base to a variety of

consumer. However, still a majority of the foundry units in the cluster cater to the automotive sector. Increased global demand for castings over time has brought about a concurrent increase in demand for quality products at competitive cost. This has impacted the turnover, exports, and employment numbers in the industry.

The industry provides direct employment to nearly 60,000 and indirect employment 90,000 persons. Technological Up- gradation Industry estimates show that around 70 per cent of the foundries are now using induction furnace based melting process and 30 per cent are using cupola melting. Induction furnaces are a better option for producing SG iron castings and since many industries are now shifting towards this form of production, a simultaneous shift towards induction furnaces has also been observed. Some units are doing both forms. In addition to furnaces, technological up gradation has also taken place in moulding section with a few foundries also going for high pressure moulding lines.

Products Kolhapur Foundry Cluster Offers:
90 per cent of all the industrial goods and machinery have casting applications. Virtually any metal that can be melted is cast. The size can be from a few grams (for example a watch case) to several tons (marine diesel engine) and the shape from simple (manhole cover) to complex (6-cylinder engine block).Order can from one-off buyer, e.g. paper mill crusher to massive volume production, e.g. automobile pistons. Castings are used virtually everywhere. A sector wise casting consumption is given below which highlights the importance of casting in any industrial set up.

- Transport: Automobile, Aerospace, Railways Shipping
- Heavy Equipment: Construction, Farming and Mining
- Machine Tools: Machining, Casting, Plastics Moulding, Forging, Extrusion and Forming
- Plant Machinery: Chemical, Petroleum, Paper, Sugar, Textile, Steel and Thermal Plants
- Defence : Vehicles, Artillery, Munitions, Storage and Supporting Equipment
- Electrical Equipment Machines : Motors, Generators, Pumps and Compressors
- Hardware : Plumbing Industry Pipes, Joints, Valves and Fittings
- Household : Appliances, Kitchen And Gardening Equipment, Furniture and Fittings
- Art Objects : Sculptures, Idols, Furniture, Lamp Stands and Decorative Items

Raw Materials Procured By Kolhapur Foundry Cluster:

The main raw materials and inputs used for the manufacturing of castings in the cluster are pig iron, scrap, sand, bentonite, coke, aluminium, alloys, etc. Raw material cost varies over quality and quantity of material procured. The main sources of raw material and their tentative cost are as below:

- **Pig Iron**: is the main raw material for foundry. There are number of private sources who sell pig iron. Most of these come from adjacent sates of Karnataka and Goa. Average rate is Rupees 30,000 to Rupees 33,000 per metric ton or an average of Rs 31,500 per ton.

- **Coke:** Over 30 per cent of foundries use cupola for melting and coke is used for combustion. Most of the Coke is procured from local suppliers at the average rate of Rupees 5,000 to Rupees 6,000 per metric ton.

- **Scrap:** Iron scrap and steel scrap is next major raw material after pig iron. Around industrial estates small dealers are present and there are also major suppliers from nearby districts. Average rate of scrap varies around Rupees 24,000 to Rupees 26,000 per ton or an average of Rupees 25,000 per metric ton.

- **Alloys:** To attain required chemistry of casting number of costly alloying elements such as copper (Rupees 5,00,000 to 5,50,000 per metric ton), Aluminum (Rupees 1,45,000 to 1,50,000 per metric ton), Lead (Rupees 1,60,000 to 1,80,000 per metric ton), Nickel (Rupees11,45,000 to 11,60,000 per metric ton), Zinc (Rupees 1,80,000 to 1,90,000 per metric ton). There are dealers and direct suppliers of the material.

- **Sand:** Foundries use a large amount of sand in their operations, especially in the green sand moulding process for casting. Industrial Foundry Sand mainly consists of clean, evenly sized silica sand or lake sand, which is bonded together to make molds for casting both ferrous (iron and steel) and non-ferrous (copper, aluminum, brass) metal items. The average cost of this raw material ranges from Rs. 3,000 to Rs. 5,000 per metric ton. Most of the sand is sourced from nearby districts either directly or through agents.

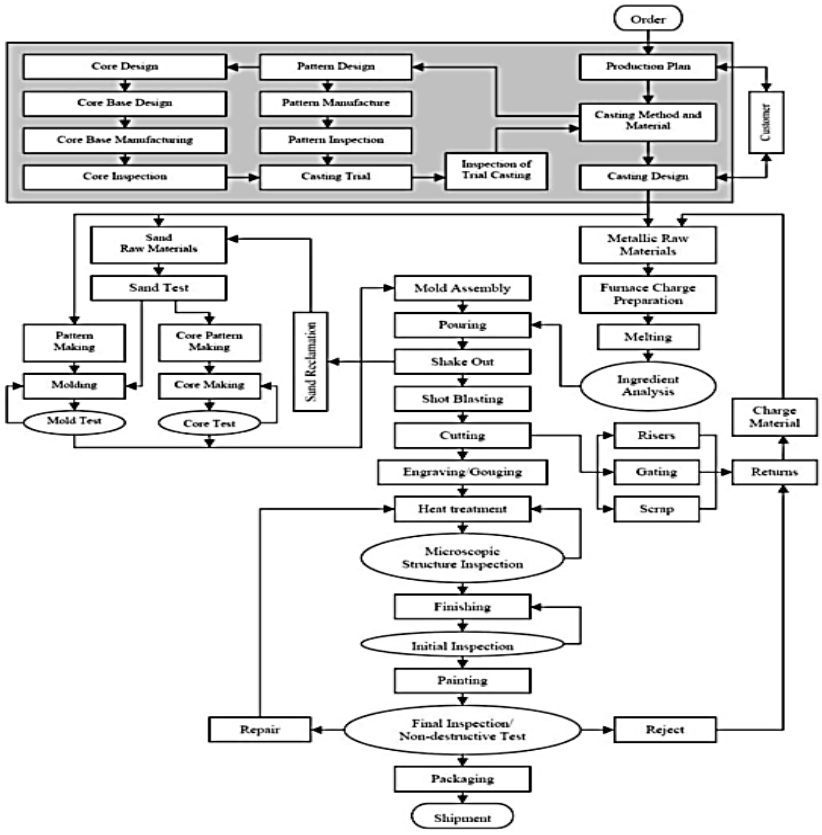
Manufacturing Process:

Different stages in manufacturing of a casting include the following

- Casting is a method where molten metal or its alloy is poured into a mould and left to cool and solidify. The final object takes the shape of the mould. Castings are made directly from liquid metal without needing extra steps like rolling or forging. They are crucial in the engineering industry and have been used for over 6000 years. Casting is a mass production technique used to create complex shapes that are difficult to achieve otherwise. It's also faster and more cost-effective than other shaping methods. Many metal items we use daily, like utensils and automobiles, are made using casting.

- Mixing of raw material is often done based on experience and not scientifically. This leads to excess/improper usage of precious raw materials, especially copper, aluminum, lead, nickel, zinc. The labourers are not sensitive to these issues as they are paid on productivity linked wages. Also iron and scrap are strewn all over the place which is a health hazard too. There is need for training on the same, such that how productivity can be enhanced as well as appropriate amount raw material are used. Here lean manufacturing techniques like 5S, Kaizen, etc. can prove very useful. Government of India has scheme to support such interventions.

- The Casting Process - The casting process starts by creating a mould in the shape of the desired part. There are two types of moulds used in metal casting: expendable moulds and permanent moulds. In expendable mould processes, a new mould is needed for each casting, which can limit production rates as the time to make the mould becomes a factor.



Source: Primary Observation by Case Writer

Customers of Kolhapur Foundry Cluster:
The foundry industry is directly impacted by cyclical market trends occurring in various engineering sectors Automobile giants such as TATA, M&M, Force Motors, Ashok Leyland, Eicher, Maruti, Hyundai, Automotive Axle Ltd., Walchandnagar Industries Ltd. Pune, Krupp Industries Ltd., Kulkarni Power Tool (KPT) Ltd., Menon Alkop Pvt. Ltd. , Bosch, Kirloskar, Piaggio Vehicle Pvt. Ltd., Siemens, Ashok Leyland, Equatorial International Ltd., Lombardini, Lister Petters US, Demag Cranes and Components, Germany, Fair Field Manufacturing Company, U.S.A., AGI International INC, U.S.A., Automotive Axle Ltd. Mysore, Tractor Engineers Ltd., Addison & Company, Chennai, Arrow Engine Company, Dallas, USA, Cummins India Ltd., Escorts Ltd., VST Tillers Tractors Ltd., Kirloskar Oil Engines,Tractor & Farm Equipment Ltd., ANZ International, JOHN DEERE Equipment Pvt., Brevini Fluid Power, Italy, Carraro Drivetech Spa, Italy, Kukje Machinery Co. Ltd. Korea, Swaraj Engines Ltd., Lister Petter Ltd. U.K., and Sugar Mills from all over India source critical castings for their industries from the Kolhapur foundry industry.

Key Issues Observed:
However, since the automotive sector is currently facing slow down, the Kolhapur foundries are also feeling an impact. The overall price of inputs has been on the rise resulting in rising prices of castings.

Volatility in Raw Material Prices: Raw material prices have increased by 10 to 15 per cent due to COVID relate supply problem. Further, iron ore scrap which is a major raw material comes is transported

from Goa in solid form resulting in increase in logistics cost, which can be decreased if the scarp is transported in powdered form. The quality of fresh iron ore is not up to the mark as it comes with a lot of sand. Some of the high cost raw materials include copper, aluminum, lead, nickel, zinc, magnesium and binders like bentonite, etc. However, this may be a temporary phenomenon, but history shows that whenever prices go up, they hardly come down.

Issues in Production Process: "One of the main challenges for units is the improper mixing of raw materials, which isn't done using scientific methods. Additionally, for coke-based foundries, it's crucial to stabilize the ash content of the coke, as it directly affects cupola firing time and metal requirements. It's also important to store coke in covered conditions, especially during the rainy season, to prevent high moisture content, which can lead to unnecessary higher usage of coke and increased costs. Raw material wastage occurs due to inefficient operations.

Another issue is the problem of proper maintenance of cupola.
Access to Markets: Foundries that serve the tractor and auto industry are facing the most challenges currently. However, those catering to the export market and non-auto customers, particularly hydraulic casting manufacturers, are doing relatively well. There's a lack of information about new markets and export potential, as well as an absence of marketing strategies in many units.

Skill Development: There is a shortage of manpower in process/skillsets: The current skill includes traditional foundry skills of melting and lathe machining. Most of the work is done based on experience, especially in the micro foundries. Various types of skills are required for current and future foundry operations. These include among others appropriate mould making under current and future practices like die casting, special moulding techniques, melting operation, casting simulation, auto-CAD designs, basic engineering design, advanced, etc. Also, for forward integration there is need for training in CNC and VMC machine, welding, etc. Such skills are rarely found in the cluster and are in short supply. Shortage of manpower in the cluster. No organized system in place to train candidates on foundry process and operation. No mapping of skill-sets required in different sub-sectors/trades. No interaction between SMEs and academic institutes providing technical training.

Air pollution is a major cause of concern in the cluster. To understand the degree of air pollution and control it special machinery is required. Business Development Service Providers (Now onwards termed as BDSPs) willing to give services for air pollution measure, cupola maintenance and mobile testing services as these are capital intensive services. Sustainable Development: The slag is widely disposed in land filling. However, it can be used to make paver blocks.

Lack of Proper Infrastructure: Getting raw material and sand requires movement of high tonnage trucks. In the event of lack of proper parking place, they are parked haphazardly and it takes almost a day to load and unload and clear the consignment. Also, the trucks coming with sand and iron and scrap need proper cleaning and the water that comes out of it needs treatment before getting discharged. At present such cleaning operations happen at the unit level. Also, the units do not have weighing mechanisms. A proposed solution is a Common Facility Centre (CFC) having parking, water treatment and weighing facilities.

Absence of Competent Technology: Mixing of raw material is often done based on experience and not scientifically. This leads to excess/improper usage of precious raw materials, especially copper, aluminum, lead, nickel, zinc. The labourers are not sensitive to these issues as they are paid on productivity linked wages. No Capability to produce volumes competitively. Low degree of mechanization especially for ferrous foundries. No R&D on product development and product quality improvement Limited technology service providers Poor resource efficiency / higher energy consumption.

Emerging Market of EV: As EVs don't need transmission system; foundries which are catering to tractor and auto Industry are the worst hit. They are forced to adopt 4 days working and at the month end, usually there is full week off. As against this the foundries which are catering to export market and non-auto customers, are doing fairly well especially the hydraulic casting manufacturers they are even today flooded with hundreds of new product developments. The successful foundries are having their client mix well spread. There is also lack of information about new markets and lack of knowledge on export potentials. Also there is participation absence of marketing strategy and infrastructure in most units. Scope for participation in trade fare and exhibitions are also limited.

Procurement Issues:

Scrap: Scrap comes from Goa mostly and they come in various shapes and have various types of impurities and unwanted material (other than iron) in it. Thus there is lot of space loss in transport. It is suggested that a scrap powdering unit be created at Goa and powdered scrap be transported which will reduce cost of transportation. This will reduce the wastage of time and the burden of disposing off impurities as well as reduce space requirement for storing the same.

Iron: Fresh iron also comes with lot of sand and this affects the quality of end product. There is need to discuss this issue with the Goa based supplier. However if it does not wok one needs to talk directly with the iron bar makers and buy purer materials at factory gate price.

Sand: Quality of sand is also an issue. Poor quality sand often leads to cracking of moulds and leads to loss. The normal rate of rejection due to mould breaking is around eight to twelve per cent.
Some of the high cost raw materials include copper, aluminum, lead, nickel, zinc, magnesium and binders like bentonite, etc. Associations or SPVs can be created to bulk purchase of these raw materials in bulk through a raw material bank

Case Questions:

1. Critically evaluate Kolhapur Foundry Cluster.
2. Conduct the SWOT Analysis of Kolhapur Foundry Cluster.
3. Identify key challenges being faced by Kolhapur Foundry Cluster.
4. Suggest suitable recommendations for survival of Foundry Industries.

Teaching Note:

Since the automotive sector is currently facing slow down, the Kolhapur foundries are also feeling an impact. The overall price of inputs has been on the rise resulting in rising prices of castings. Cluster has to work on areas like Provide training and create locally stationed and affordable BDSPs. Establish CFCs to move to high tech foundry products. Create linkage with buyers from newer product segments to overcome the challenges of emerging EV Market.

Recommendations Long Run (4 to 5 years):

- Institutionalize all skill upgradation programmes
- Create all Common Facility Centres (CFC)
- Create a strong industry association
- Make usage of all Government schemes
- Diversify products to high value customer by creating local capacity in mould designing and light weight casting
- Create all desired BDS providers

Recommendations for Short Run (2 to 3 years):

- Create a total of 50 to 75 Business Development Service Providers (BDSPs) in the areas of sand moulding, precision moulding, welding technique, inventory management (lean)
- Create training programmes and train 2 participants from each of the clusters in the areas of sand moulding, CNC/VMC, welding techniques, casting defect
- Create a CFC providing facilities of washing, weighing and parking for trucks coming and going with materials
- Create a CFC with facilities for casting simulation software, testing facility cum training centre, heat treatment facility, product Development facility / studio and general and specific machine shops like Vertical Machining Centre (VMC) and Computer Numerical Controlled (CNC) machines and special purpose fabrication / forging and welding facility Rs.40 lakhs
- Restart the sand reclamation facility
- Establish 10 new buyers in the cluster.

Recommended facilities at CFC:

A proposed solution is a CFC having parking, water treatment and weighing facilities. The exact costing of the same may be ascertained through a Detailed Project Report.

The other common facilities required and their equipment costs are estimated as follows:

- Testing facility cum training centre value estimated at rupees 50 lakhs
- Portable testing facilities for ascertaining material composition of the cast
- Product Development facility / studio (Facility where software simulation of product and estimated prototyping material requirements and costs can be measure. The facility would cost around Rs. 50 lakhs
- General and Specific machine shops like Vertical Machining Centre and Computer Numerical Control. These machines will cost around Rs.100 lakhs and can be set up at CFC or at private foundry units which can run the production and also facilitate the use of these machines to other stakeholders on piece wage basis.
- Special purpose fabrication / forging and welding facility Rs.40 lakhs
- Technical Information Centre cum testing facility: A facility with IT support where virtual classes related to product development, production process, manufacturing of product. This will cost around Rs 50 lakhs Also, in order to get continuous supply of energy, several suggestions came with respect to the following for which detailed project report needs to be prepared
- Common Captive Power Generating Units along with Transmission and Distribution infrastructure: This facility is required as foundry units require huge amount of uninterrupted power for manufacturing process.
- Alternate fuel – Gas

ENVIRONMENT SUSTAINABILITY RECOMMENDATIONS:

- **Slag:** The slag is widely disposed in land filling. However it can be used to make paver blocks. This technology exists with the Foundation for MSME Clusters and Development Alternatives. Either local paver block manufacturers or even a foundry unit can start this project.
- **Air Pollution:** To understand the degree of air pollution and control it special machinery is required. Instead of putting it in every unit BDSPs can be invited to put up such machinery in the four industrial estates. This can help in reducing air pollution and create better working atmosphere.

STRENGTHS OF CLUSTER:

- A benchmark cluster
- Have lots of medium firms
- Have lots of good technical institutions interested in foundry industry

- Organized in industrial areas
- The cluster is renowned for producing high quality castings
- Good availability of alloys
- Strong industrial base
- Proximity to Mumbai and Pune

WEAKNESSES OF CLUSTER:

- Lot of space is loss during scrap transport and its cleaning and waste disposal leading to high cost.
- Fresh iron also comes with lot of sand and this affects the quality of end product.
- Poor quality sand often leads to cracking of moulds and leads to loss.
- Small purchase volume of high cost raw material is also costly.
- Excess/improper usage of precious raw material is both a cost and quality burden.
- Labourers are not sensitive to these issues as they are paid on productivity linked wages.
- Need for preservation of coke in covered conditions.
- Usage of energy in induction furnace varies a lot and there is energy wastage.
- Inefficient motors and blowers leads to higher usage of electricity and higher usage of coke.
- Rejection rate high at times due to inefficient mould preparation.
- Lack of proper maintenance of cupola due to lack of infrastructure – fork lifters
- Lack of basic knowledge among labourers on industry best practices
- Lack of skill in the following areas:
  ▪ Sand moulding ▪ Precision moulding ▪ Basic engineering drawing for fabricators/supervisors ▪ CNC/VMC ▪ CAD/CAM ▪ Welding techniques ▪ Costing and inventory management ▪ Safety awareness ▪ Casting defect

OPPORTUNITIES FOR CLUSTER:

- In view of increasing export possibilities, availability of appropriate infrastructure in the form of appropriate infrastructure will be useful
- Appropriate infrastructure will help them to go for light weight casting

THREATS FOR CLUSTER:

- No proper disposal of slag
- No proper disposal of water
- No proper system for checking air quality
- A closed sand reclamation plant
- Road congestion restricts quick loading and unloading

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A Case Study on the Challenges of Managing Municipal Solid Waste of Kolhapur, India: Day To Day Issues

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Solid Waste:

Today solid waste management is a burning issue all over the world. Urbanization is occurring rapidly and living standards are improving .The primary sources of wastes are classified as municipal solid waste, residential wastes, institutional waste and commercial waste. The composition of urban solid waste depends upon industrialization, culture of waste management and local conditions. Environmental impact due to gaseous and liquid discharges has received greater attention than that by solid waste. The land pollution received limited public attention though it is significant. Generation of contaminated leachate remains as an inevitable consequence of practice of waste disposal in landfills. The migration of leachate away from landfill boundaries and the release to adjacent environments is a serious environmental pollution. Groundwater pollution is by far the most significant concern arising from leachate migration. Leachate may contain different organic and inorganic chemicals. As a result of the irregular and sporadic moisture penetration caused by leachate expansion, these water-soluble elements are extracted from the waste and mix and remain in the leachate. Over time, urban solid waste is not only increasing but the composition is also changing. The organic wastes are decreasing and the paper and plastics are increasing in the waste stream, indicating the changed pattern of metropolis solid waste. Solid waste management has not been concerned for most countries with the increased drift of people towards the city's massive accumulation of solid waste and its management has become an enormous problem for most countries. Appropriate public awareness, especially for homemakers, is needed on the variations between recyclable and inanimate garbage and how to separate it into different cans. The primary impediments to managing solid waste in cities include a lack of funding, amenities, sufficient planning and knowledge, and administration.

Non-governmental organizations can play a pivotal role in effectively projecting the community's problems and highlighting its basic requirements for urban services. They could help in organizing the rag pickers into waste management associations/groups under the supervision of the urban local body and the relevant residents' associations or market associations. Nowadays Urbanization has become an internationally recognized process. Factors such as patterns of migration, categorization of habitations, and natural population growth all have an impact on India's population living in cities. Due to rapid urbanization and uncontrolled growth rate of population, solid waste management has become acute in India. Solid waste management is a part of public health and sanitation and is entrusted to the municipal government for execution. Presently, the systems are assuming larger importance due to population explosion in municipal areas, legal intervention, and emergence of newer technologies and rising public awareness towards cleanliness.

Solid waste management covers the full cycle from collection of waste from households and commercial establishments through to acceptable final disposal. Throughout the process, recycling, materials recovery, processing treatment, and other methods are used to try and lower the end result proportions. An analysis along these lines should be carried out for any municipality, as a first step to understanding and dealing with the necessary upgrading of the system. There are many challenges in MSW management: analysis of quality and quantity of wastes, and appropriate institutional mechanisms for collection, transportation, processing, treatment and disposal.

The population of humans has grown as a result of fast development and activities are leading to the production of a very large amount of solid waste. The magnitude of waste produced in city limits and its disposal has become such major issues that processing of waste is forgotten. Generally the greater the population the higher the rate of waste is generated. Ineffective solid waste management can lead to a number of detrimental environmental effects, including the spread of infectious diseases, contamination of the soil and water, clogging of drains, and a decline in biological diversity. Waste management is a problem in urban and rural areas. Many areas, particularly in developing countries, still have inadequate waste management; poorly controlled open dumps and illegal roadside dumping remain a problem. Such dumping degrades natural resources, contaminates soil and water supplies, and poses a risk to the health of individuals, creatures, and plants.

The undesirable or worthless substance produced by human activity in households, businesses, or industrial settings are mentioned as solid garbage. The quality of solid waste is increasing rapidly due to increase in human population and increase in the standard of living. Solid waste can create significant health problems and a very unpleasant living environment if not disposed appropriately. Waste can serve as breeding grounds for pests, snakes, vermin, and insect vectors if it is not disposed of properly, which increases the risk for illness spreading. It might potentially contaminate the surroundings and drinking water supplies.

Appropriate solid waste management is the best strategy to avoid the harmful effects of solid waste. Solid waste management usually refers to the source segregation, collection, transfer, recycling, resource recovery (biogas, composting, waste to energy, etc.) and disposal of solid waste. It is nearly the most essential service for maintaining the quality of life in the urban areas and for ensuring better standards of health and sanitation. One way of reducing pollution and waste is to improve the efficiencies in operations and sustainable use of resources. One of the methods of management of waste is to generate biogas from solid waste. Using urban solid waste to produce biogas is not only meeting the remarkable portion of energy demand but also helping to maintain a clean environment by reducing the pressure on landfills.

In natural ecosystems, the concept of waste does not exist as everything operates in a continuous cycle of utilization and reuse. Organisms consume materials and later release them back into the environment in altered forms for further use. However, the notion of solid waste, referring to discarded materials considered useless or worthless, is a human construct. Organic substances are frequently altered by humans to increase their resistance to decomposition or storing them under conditions that impede degradation. Yet, what may be considered worthless to one person can be valuable to another, highlighting the capacities of urban solid waste as misplaced resources. Therefore, it is crucial for humans to learn effective strategies to minimize waste generation and efficiently retrieve the important materials it contains, ultimately striving for a sustainable and habitable environment.

The challenge of directing solid waste became an on-going issue since the establishment of large, permanent human settlements. As populations migrated to urban areas, the concentration of solid waste significantly increased. Ancient societies employed various methods to address waste disposal, including dumping it beyond their communist, incorporating some waste into construction materials, and recycling to a certain extent (World Energy Council Report, 2013). Throughout history, dumping and burning solid waste have been common practices. Before the Solid Waste Disposal Act, 1965 (a component of the Clean Air Act) was passed in the 1960s, the majority of American municipalities relied on burning or dumping their waste. Average daily special waste generation worldwide is expressed in kilograms (kg) per person for a specified set of trash categories. 2.2 pounds is equal to 1 kilograms. Industrial garbage (12.73 kg/capita/day), crop residue (3.35), building and demolition debris (1.68), toxic materials (0.32), health care waste (0.25), and digital debris (0.02) are the waste categories that generate the most and the

least, respectively. 2.21 billion tons of residential solid garbage are produced worldwide each year (Indo-UK Seminar Report, 2015). 292.4 million tons of municipal solid garbage (4.9 pounds per person per day) were produced in the United States in 2018, accounting for 3-9% of total rubbish produced in the country. This is in contrast to the higher median values found in South Asia (1.15 lbs. per capita daily), Eastern Asia and the Pacific region (1.23 lbs. per capita daily), and the other parts of Africa (1.01 lbs. per capita daily). In nations with high incomes, the amount of garbage generated per person on a daily basis is projected to take a 19% hike by 2050, while in countries with low to middle incomes, the rise is expected to be at least 40%. UNEP (2005) Food scraps and plastics are among the things found in municipal solid garbage. Paper makes around 23% of all waste products, making it the most frequent. Other common materials include yard garbage (sometimes called vibrant waste), materials such as metals, plastic, wood, glass, and food scraps. There can be seasonal and regional variations in the breakdown of garbage from cities.

Generation of Solid waste in India:

In the face of India's burgeoning population and rapid urbanization, waste management has emerged as a formidable challenge, particularly within urban areas. The quantity of waste generated has witnessed a dramatic surge over the years, with expectations of even greater escalation in the future. This increase in the generation of garbage has been further compounded by the changing nature of disposed materials, driven by the widespread adoption of electronic devices and equipment. Current government estimates indicate an annual generation of approximately 65 million tons of trash with a substantial portion—over 62 million tons—accounted for by Urban Solid Waste, encompassing organic waste and recyclables such as paper, plastic, wood, and glass. Regrettably, only a fraction, roughly 22-28%, of the collected MSW undergoes proper processing and treatment, while the remainder is deposited in dump yards. Projections suggest that by 2031, the generation of MSW will reach a staggering 165 million tons, skyrocketing further to an alarming 436 million tons till 2025. Despite the mounting volume of waste, the efficiency of waste collection in India still has room for improvement, with major metro cities achieving collection rates ranging between 70 to 90%, while numerous smaller cities lag behind with rates below 50%.

Household waste generation and composition:

In spite of advancements in the domains of aspects of society, economy, and environment, SWM mechanisms in India have largely stayed the same. In order to generate value from garbage, the unorganized sector is quite important. At present, 90% of the remaining trash is dumped rather than safely landfilled. The transition to more ecological SWM is urgently needed, necessitating the construction of waste management infrastructure and new management methods. The waste produced by the inefficient current wastewater management (SWM) systems harms the environment, the economy, and public health. The Waste Management and Handling Rules were introduced in India by the Ministry of Environment and Forests (MoEF), although compliance is only inconsistent and intermittent. In recent years, plastics and electrical garbage have made up a sizable portion of the entire waste stream. The new coronavirus illness (COVID-19) pandemic last year led to a significant rise in the utilization of biomedical waste and home hazardous waste. The surroundings and human life may be in danger if these materials are disposed of improperly and without scientific methodology.

The average daily garbage produced by an individual in the country's metro cities is 0.8 kg/person. In 2008, it was calculated that the total amount of urban solid waste produced in metropolitan India was 68.8 million cubic meters per year (TPY), or every day, 0.573 million metric tons (MMT/d). MSW collection Efficiency ranges on average between 22% & 60%. 51% of MSW is usually biological trash, then 11% hazardous garbage, 21% inert garbage, and 17% scraps. Regretfully, more than 40% of MSW is never collected, leaving it lying around the town or city and finding its way into surrounding drains and bodies of water, where it clogs pipes and pollutes surface water. Leaching and gaseous emissions are produced when trash is

collected and transported without separation, resulting in open disposal. Both ground and surface water in that region are contaminated by leachate, and emissions of gasses fuel global warming. A significant amount of unprocessed waste is haphazardly disposed of on the edges of towns and cities, polluting the air and water. As a result, to enhance the operating efficiency, there is an increasing requirement to identify blind spots in gathering and transferring of garbage. The garbage propagation is closely correlated with population growth; as humanity grows, so does the rate of garbage proliferation per person.

As per a poll published on Wednesday, only thirty percent of the 3.4 million tons (MT) of plastic rubbish generated in India is processed. According to a report published in the capital of the nation by the Marico Innovative Organization, the nation's usage of plastic increased at 9.7% yearly rate of expansion over a period of five years, ranging from 14 million tons in the 2016–17 fiscal year to 20 million metric tons in the 2019–20 fiscal year. (CPCB, 2015)

Generation of Solid waste in Maharashtra According to data supplied to the Union Environment Ministry according to the Ministry of Housing and Urban Affairs (MoHUA), Maharashtra topped the national list of states that generate urban solid garbage in 2018. Due to a recent examination by the Central Pollution Control Board (CPCB) report, Maharashtra produces more solid garbage per day than any other state in the nation, with over 26,820 tons produced daily. The National Green Tribunal (NGT) ordered the board to provide an unbiased assessment about the production of a national policy regarding gathering and disposing of solid waste from the municipalities and this is how the report was put together. The survey estimates that more than 500 tons of waste are produced daily in places like Pune, Mumbai, Ahmedabad, Agra, Bangalore, Bhopal, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kolkata, Lucknow, Nagpur, and Surat. Approximately 1.43 lakh tons of solid trash are produced daily in the nation.

According to data from the pollution control board for Maharashtra (MPCB), barely 1% of all the electronic trash produced in the state is recycled in Maharashtra. The state generates 10 lakh tons of electronic trash annually, out of which only 975.25 tons get reused in the official recycling system and 11,015.49 tons are disassembled but not necessarily recovered. According to MPCB representatives, they are improving the recycling of e-waste.

The Central Pollution Control Board (CPCB) was also given access to data on the production of electronic waste for the 2019–20 fiscal year. TV appliances, PCs, phones, laptops, and other electronic garbage are all considered forms of e-waste. Even though Maharashtra is the country's top source of electronic garbage, professionals have expressed worry over the state of e-waste recycling. Officials claim that if e-waste is improperly handled or recycled and then thrown in dumps or other disposal sites, major environmental problems will result. Mumbai was able to close one landfill and cut garbage production from 9,500 MT to 7,500 MT in just two years. But trash treatment at the source needs to be advanced to the level of cities like Nashik and Pune," Sontakke stated.

According to the Maharashtra Pollution Control Board (MPCB), they compiled and forwarded the most recent data to the Centre. YB Sontakke, joint director of MPCB, stated, "The data indicates an improvement in waste treatment in Maharashtra to 44% in 2018 from 27% in 2013." There's been steady progress. To lessen the load on landfills, major municipal corporations like all metro cities, and others have successfully introduced waste treatment methods including the reprocessing of biological waste by digestion systems, bio methane, and other methods.

Table 1: State wise generation of Solid Waste

State	Total No. of Wards	No. of wards with 100% door to door collection	Total waste generation (metric tons per day)	Total waste processing (%)
Maharashtra	7054	508	26820	10
Uttar Pradesh	11290	491	19180	13
Tamil Nadu	12802	9182	15272	16
Gujarat	1730	1658	9277	28
Karnataka	5252	3962	8784	34
West Bengal	2875	1130	8675	06
Delhi	272	232	8400	52
Telangana	1967	1625	6628	49
Andhra Pradesh	3389	3072	6440	08
Rajasthan	5247	1300	5247	16

Source: Ministry of statistics and Programme Implementation

Basically fourteen out of the twenty-seven municipal corporations including Marathwada and western Maharashtra Region treat their trash; the other seventeen are basically garbage dumps. Sontakke claimed that the lack of funds—which is frequently given as the explanation—is not the real reason why waste treatment is not occurring. The real cause, however, is the absence of political determination to set aside money for trash management. (MPCB Report 2020)

Experts have noted that the 2016 solid waste management rules' guidelines are not being sufficiently communicated to companies, local governing bodies, and municipal governments. This lack of awareness is concerning, especially considering that generation of waste is estimated to take a hike in the coming years. Avick Sil, the regional director of the Environmental Policy Research Institute (EPRI), expressed that although collection of data in Maharashtra is relatively better than in other states, there is a growing challenge in persuading people to treat waste at its source. There seems to be a prevailing assumption that the responsibility for waste management lies solely with the state. People must understand that even in the event that 10% of the state's daily garbage can be turned into compost—2,257 MT of valuable green waste—it may still be included into a financial system that benefits various societal groups.

The Centre for Science and Environment in Delhi's Swati Singh Sambyal, programme coordinator for sustainability governance (municipal solid waste), states that "there is an increase of 5% in the production of waste and a 3.5 percent rise in the overall population of people in India." Environmentalist Gopal Krishna of Toxics Watch Alliance remarked, "A 2012–13 analysis by the MPCB revealed that the volume of urban garbage collected in Maharashtra that year was almost 18,900 tons daily. The central pollution control board's latest estimate, which calls for 26,820 tons of solid trash to be generated daily, represents a significant rise in garbage creation in the state. It also suggests that rubbish may now be collected more effectively. Quick population expansion and urbanization are also responsible for the rise in garbage produced here, the speaker noted.

According to the CPCB report, every state should create a strategy for action to address trash, which might involve advising local organizations and deciding how to set up standalone or integrated facilities for handling and disposing of garbage using a regional or cluster-based strategy. It was recommended that each municipal authority create an action plan following an evaluation of the amount and type of garbage that is produced. The report suggested among other matters, that municipalities producing more than 500 metric

tons of solid trash daily create a plan of action that could include, between additional things, modernizing waste storage and delivery facilities; entering into agreements with "operators" for collecting and arranging for transportation of waste from various sources; and encouraging private initiative in the establishment of waste treatment facilities and disposal facility.

Solid Waste Sources and Their Types:
Solid waste comes from two main sources: urban and non-municipal. The leftover substance that remains from mining, extraction of oil and gas, the agricultural sector, and other commercial actions are referred to as non-municipal solid waste. It accounts for over 99 percent of all waste produced in the US. Building materials (such as roofing shingles, electrical components and bricks); garbage-water sludge; furnace leftovers; ash; filter sludge; petroleum, natural gas, and mining trash; barrels for pesticides and rail ties are a few typical items that are categorized as non-municipal garbage.

Waste material from homes, companies, and civic buildings is referred to as trash from the community. Merely slightly more than one percent of trash produced in the US is composed of this material. Food scraps and plastics are among the things found in municipal solid garbage. Paper makes up almost 40% of all waste products, making it the most frequent. Additional usual elements include food scraps, yard trash (green garbage), recyclables, metals, hardwood and ceramic. There might be seasonal and regional variations in the makeup of waste in cities. Garbage is a phrase that refers to food scraps, which includes veggie and animal remains from food preparation and consumption**.**

Table 1: Sources of Solid Waste

Origin of Waste	Common Drivers of Waste	Kind of Solid Trash
Household	Single family and multifamily dwellings	Paper products, cardboard as a base materials for plastics, fabrics, leather, yard contaminants, wood, glass, metallic substances, ashes, and special waste (such as heavy objects, electronic devices for consumers, power sources, and domestic toxic trash) are some examples of waste materials.
Industrial	Building sites, manufacturing facilities, medium and major producing goods, power stations, and chemical factories.	wastes from cleanliness, wrapping, food, toxic waste, building and destruction substances, ashes, etc.
Commercial	retail establishments, motels, eateries, marketplaces, office buildings, etc.	Paper products, glass, timber, polymers, metals food scraps, toxic trash, etc.
Institutional	Schools, hospitals, govt. center	Same as commercials.
Municipal services	Water and wastewater treatment plants, green spaces, sanitation, gardening, and other leisure spaces.	Slurry; common garbage from roads and other amusement places; tree and garden clippings; sidewalk sweepings.

Types of Waste:
The term "waste" has multiple divisions. Microbes have the ability to decompose renewable trash, but non-biodegradable garbage is more difficult to break down. Trash that poses a health danger is classified as hazardous waste. Dangerous wastes are particularly characterized as substances that are highly volatile, corrosive, explosive, mutagenic, cancerous (cause cancer), or teratogenic (cause birth deformities). Battery packs, fluorescent lights, different cleaning products, and e-waste—which is produced by abandoned electronics—are a few examples. Risky materials can contain precious metals that can be recovered and recycled, but doing so properly is necessary. (PPCB, 2010)

The majority of garbage produced worldwide is produced by industry and agriculture, then by mining. When combined, these produce solid trash that is not municipal. Building supplies (such as roofing shingles, electrical components and bricks); rubbish-water sludge; incinerator leftovers; ash; scrubbing waste; oil, gas and mining trash; railway ties; and chemical bottles are a few typical items that are categorized as non-municipal garbage. Urban solid waste, which makes up the leftover waste, is composed of substances that have been abandoned from homes, companies, and civic structures. Worldwide, the amount of garbage produced by industry was almost eighteen times greater than that of MSW, while the quantity of waste produced by agriculture exceeded 4.5 times the amount of MSW.

Generation of Solid Waste in Kolhapur city:

Kolhapur city is growing very fast with its population as well as industries. This increase is leading to production of large quantities of waste and that has to be managed properly. In the city 8 major sources generate solid waste. The waste produced is in the form of domestic waste, road sweeping, commercial waste, industrial waste, biomedical waste, slaughterhouse waste, gardens and park waste and other waste. Kolhapur City currently generates 150–160 MT of solid garbage every day, whereas the amount produced per person is 355–370 gram. Ghanta Gadi collects urban solid waste from door to door and delivers it to a communal storage and recycling facility. The contract of collection of solid waste is given to a private agency, RAMKEY Group Pvt. Ltd. The waste collection is carried out by the company from 6 am to 2 pm. Two separate bins are provided by the company for biodegradable and non-biodegradable waste. There are 66.82 km2 of covered land in all. Kolhapur city is separated into eleven sanitary wards, and each one handles its own collection. The current analysis notes that Kolhapur city uses a variety of kinds of automobiles for the gathering of solid trash.

In Kolhapur city, there are 165 metric tons of solid trash produced every day. The segregated both moist dry and moist waste is collected from individual houses and public bins and transported to the Kolhapur dumping site situated at Kasaba Bawada. Kolhapur Municipal Corporation (KMC). The dumped waste is processed to convert it into compost and biogas generated from that solid waste. The recyclable material such as plastic and scrap materials are segregated from dumped waste and sent to recycling and reusing units. The collection of waste and transportation is done as per scheduled timetable and route fixed by KMC, done every day from 6 AM to 2 PM.

Vehicles used for transportation include damper, tempo, RC trucks etc. which are 22 in number. These vehicles are closed type. Transport system collects solid waste daily from all the parts of the city. Suitable arrangement fabricated in the vehicles to shut out the falling of waste. The solid waste treatment plant treats 165 metric tons of urban waste per day in Kolhapur. The dumpsite is established in an area of 38,800 m^2 on a 30-year lease contract (Url-3, 2020). The biodegradable waste is converted to compost and sold in the market. In Kolhapur, a tremendous amount of waste is generated and dumped into the dumpsites. By taking account of future waste generation, these two treatment plants are not sufficient. There was a necessity to forecast the population and production of waste per capita per year. Generation of a renewable energy source in the form of biogas and carefully disposing the waste by integrating energy recovery components to make itself sustainable.

Case Questions:

1. Critique in detail about generation and challenges related to solid waste in India.
2. Elaborate in brief types of solid waste and sources of solid waste.
3. Evaluate in detail composition of Municipal Solid Waste (MSW).
4. Critically evaluate environmental impacts of Municipal Solid Waste (MSW).
5. Suggest current treatment to Kolhapur Municipal Solid Waste (MSW) and suitable strategy to reduce environmental impacts.

Exhibits:

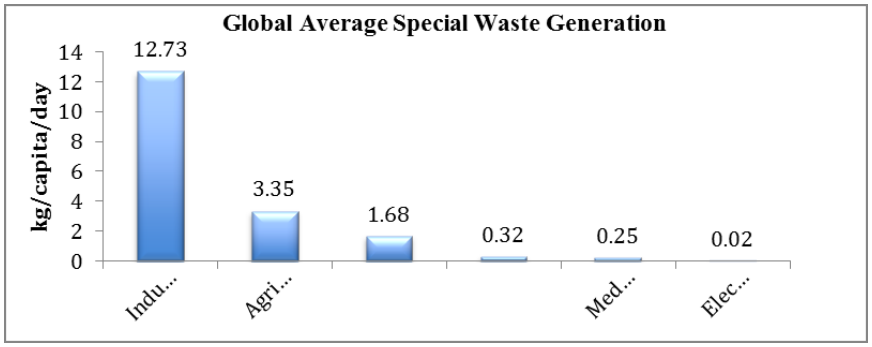
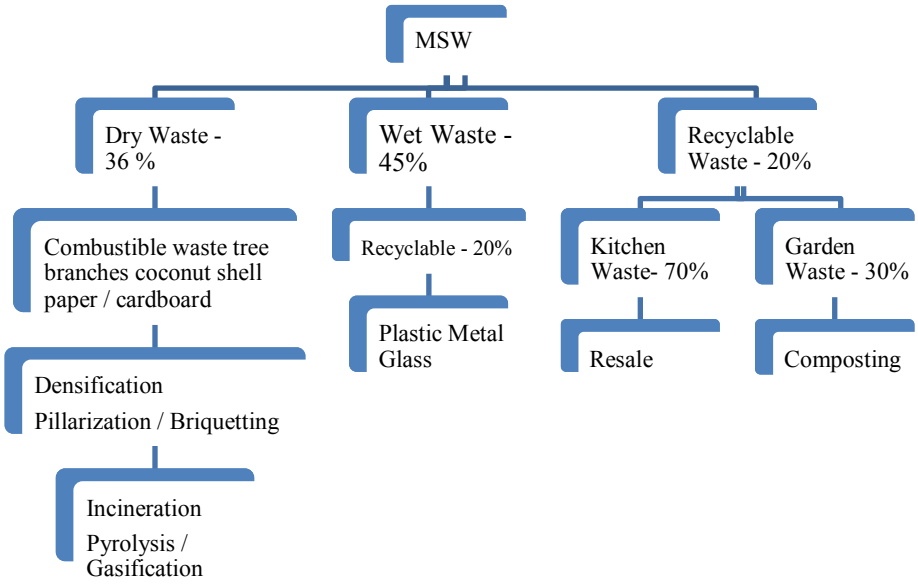


Fig 1: Global Average Special Waste Generation

Fig 2: Composition of MSW



Teaching Note:

In India, where urbanization, manufacturing, and economic progress have led to a rise in the production of solid waste from municipalities (MSW) per person, managing this waste is a significant issue for a large number of urban local bodies (ULBs). In densely populated cities, efficient SWM is a significant difficulty. India is a varied nation with many distinct communities of faith, cultures, and customs, making it more challenging to achieve long-term prosperity within a nation seeing fast population increase and advancements in living conditions. To treat, the rules recommend adoption of a suitable technology or a combination thereof with the objectives of making use of wastes and to minimize burden on the landfill. This is desirable from the point of view of the '3R' Concept (Reduce, Reuse and Recycle) and has resulted in widespread use of composting or bio-methanation. The biodegradable fraction of municipal waste, the rules propose treatment of biogas production / anaerobic digestion, vermin- composting, or any other suitable biological treatment process in order to stabilize the municipal waste. Incineration with or without energy recovery should be the last option. Refuse Derived Fuel (RDF) should be the best option for use of waste for generating power / energy.

RECOMMENDATIONS:

Current Treatment to Kolhapur Municipal Solid Waste:
There are many challenges in MSW management: analysis of quality and quantity of wastes, and appropriate institutional mechanisms for generation, storage, collection, transportation, processing/ treatment and disposal.

1. Generation and Storage
2. Collection
3. Transportation
4. Process or treatment

1. **Generation and storage**

Generation is the stage at which materials become valueless to the owner an since they have no use for them and require them no longer; they wish to get rid of them. This is how the waste is generated at the domestic level. Then the generated waste is stored in separate bins or containers for dry and moist waste as follows:

i. Small containers: Household containers, plastic bins, etc.
ii. Large containers: Communal bins, oil drums, etc.
iii. Shallow pits.
iv. Communal depots: Walled or fenced - in areas.

2. Collection:
House to house waste is collected for transportation to the final disposal site or the treatment site. Collection process is carried out on regular pre- informed timings and scheduled by using the musical bell of the vehicle.

3. Transportation
Solid garbage is moved to the site of its final disposal at this point. Depending on the amount of garbage that must be transported, several transportation methods have been used. E.g. Tipper trucks are mostly use

4. Process or treatment

Municipalities must implement the necessary technology, or an assortment of methods, to lower the amount of garbage that ends up in landfills. The major requirement of the rules is that biodegradable and recycled waste should not be deposited at the landfills. This will not just preserve resources but will reduce the burden on landfills. Any suitable biological method, such as anaerobic breakdown, decomposition, or worm composting, should be used to process the separated biodegradable garbage streams. The rules allow incineration of waste and provide standards for controlling air emissions. Recyclable wastes need to be diverted to a recycling unit or reprocessing plants. This kind of waste that cannot be disposed of are limited to inert waste, waste that cannot be recycled or processed biologically waste processing facility wastes, and pre-processing rejections.

Issues with Solid Waste Management:

Inadequate infrastructure and resources: Even yet, Kolhapur has adequate facilities for collection. Kolhapur's citizens are forced to dispose of their rubbish in open fields or on the streets because of the absence of some waste management facilities and their frequent inadequacy. Important resources like organic material are also lost when landfills are inaccessible.

Lack of awareness: Many Kolhapur residents lack the knowledge necessary to manage their waste, which results in piles of trash that eventually contaminate the surrounding area. Through advertising campaigns and educational initiatives, efforts have been taken to increase public knowledge of the advantages of trash management.

Divergent cultural practices: Policy makers and systematic waste management implementers need to consider the diverse range of traditional waste disposal strategies practiced by Kolhapur peoples. For instance, a lot of people in rural regions continue to bury their rubbish rather than dispose of it in dumps, and some Hindus believe that burning waste is more auspicious than dumping it.

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A Case Study on SPICE Clothing Store's RFID Integration: Streamlining Inventory Control and Elevating Customer Experience - Kolhapur, India.

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SPICE is the modern clothing retail store in Kolhapur is known for its well-established presence and popularity. With five branches strategically located across various locations in Kolhapur, run by Jevrani family from 2002. The store has effectively catered to the fashion needs of the local community. Its wide range of clothing options makes it a sought-after destination for men, women, kids, and youth alike.

The store is renowned for its modern wear, which includes stylish and trendy clothing items that reflect the latest fashion trends. From casual wear to formal attire, the store offers a diverse collection to suit various occasions and personal styles. Customers can find an extensive selection of clothing options, including tops, dresses, shirts, trousers, skirts, jeans, jackets, and more. For men, the store features a wide range of fashionable apparel, including shirts, t-shirts, trousers, jeans, suits, blazers, and accessories such as ties, belts, and shoes. Women can explore a vast array of options, including dresses, tops, blouses, skirts, pants, jeans, jumpsuits, suits, and a variety of accessories like handbags, jewellery, and footwear.

The store also caters to the fashion needs of kids and youth, offering a dedicated section that showcases clothing specifically designed for them. From adorable outfits for infants and toddlers to stylish clothing for older children and teenagers, the store ensures a comprehensive range of choices to meet every age group's preferences. The popularity of the store is related to its commitment to providing high-quality clothing, on-trend styles, and a pleasant shopping experience. The store's focus on customer satisfaction, coupled with its reputation for offering fashionable and reliable clothing options, has developed a devoted following of customers throughout time. Whether someone is looking for everyday casual wear, formal attire, or special occasion outfits, this modern clothing retail store is known to deliver a satisfying shopping experience with its popular clothing range.

Store Infrastructure:
Location: The store would be strategically located in a prime area of the city, ensuring easy accessibility for customers. It may be situated in a popular shopping district or a prominent mall, maximizing footfall and visibility.

Store Layout: The store would feature a spacious and well-organized layout, allowing customers to navigate through the various clothing sections effortlessly. The layout would incorporate ample aisle space, fitting rooms, checkout counters, and displays to showcase the clothing collections effectively.

Interior Design: The store's interior design would reflect a modern and inviting ambiance. It would likely incorporate contemporary décor, attractive lighting, and comfortable seating areas for customers. The use of aesthetic elements such as mirrors, artwork, and digital displays may enhance the overall shopping experience.

Clothing Sections: The store would have separate sections or departments dedicated to different customer segments, including men, women, kids, and youth. Each section would be carefully curated and designed to showcase the specific clothing range, making it convenient for customers to find what they are looking for.

Fitting Rooms: The store would have well-equipped fitting rooms where customers can dress up and test on the clothing items before making a purchase. The fitting rooms would provide privacy and comfort, with mirrors and proper lighting to assist customers in assessing their choices.

Technology Integration: A modern clothing retail store in a metropolitan area would likely embrace technology to enhance the shopping experience. This could include digital signage displaying promotions and offers, interactive displays providing product information, and mobile payment options for seamless transactions.

Inventory Management: The store would employ an efficient inventory management system to ensure a well-stocked and a wide variety of outfit choices. This would involve real-time tracking of stock, regular replenishment, and accurate labelling to assist customers in locating desired items.

Customer Service: Well-trained and knowledgeable staff would be available throughout the store to assist customers, provide fashion advice, and handle any queries or concerns. The emphasis would be on delivering excellent customer service to enhance satisfaction and build customer loyalty.

Overall, the store infrastructure in a metropolitan setting would prioritize convenience, aesthetics, and customer satisfaction. The goal would be to create an enjoyable and seamless shopping experience while offering a wide range of modern clothing options to cater to the diverse fashion preferences of the urban population.

The Owner of the store has a broad vision towards customer he says -
Our contemporary clothes retail store, which has five branches spread across several cities and is based in Kolhapur, is dedicated to fostering strong client loyalty. By assuring a pleasurable shopping experience and providing a large selection of dependable and high-quality apparel selections, we put the needs of our customers first.

At our shop, we recognize the value of individualized service. In order to help customers, offer fashion advice, and create a unique shopping experience, our skilled and welcoming staff goes above and beyond. Every customer is special in our eyes, and we make an effort to meet their specific requirements.

We have put in place a comprehensive rewards and loyalty programme to thank our devoted consumers. Customers can take advantage of exclusive promotions, early access to specials, and exclusive savings. In addition, we provide a reward system that allows clients to earn points with every purchase and exchange them for future discounts or freebies.

We are proud of the excellent customer service we provide. Our committed crew is always accessible to immediately address any worries or questions. We appreciate client input and actively seek it out to enhance our products and services. We always work to improve our clients' purchasing experiences by paying attention to their feedback and taking their suggestions into consideration.

Their store aims to foster a sense of neighbourhood, going beyond simple retail. They organize events, work with neighbourhood influencers and groups, and actively promote philanthropic causes. These programmes give our consumers a sense of belonging and a chance to meet others who share their views.

Their brand identity is built on consistency. They make sure that customers can quickly recognize and relate to their brand thanks to factors like our recognizable emblem and consistent message. Their loyalty and trust in store are strengthened as an output of our constancy. In the end, they want to establish an emotional bond with our clients. They establish a connection with them that transcends business dealings

by offering extraordinary experiences, sharing important tales, and aligning with their beliefs and objectives.

The owner focuses on all the major aspects and says -We want our consumers to feel a feeling of community and make us their first choice for fashionable attire. Our contemporary clothes retail store in Kolhapur generates great client loyalty with these features and programmes. For our devoted customers, we are dedicated to making constant improvements and offering an amazing purchasing experience.

Working of the Store:
Based on the information provided, the Retail ware POS system plays a vital role in managing the clothing store's inventory and sales processes. The store's work structure is as discussed

Barcode Scanning: The POS system uses barcode scanning technology to identify and track clothing items. This simplifies the checkout process, reduces manual errors, and improves efficiency.

Inventory Management: The Retail ware POS system maintains the inventory database, which includes information about the available stock, product details, pricing, and other relevant data. This allows the store to track stock levels, manage reordering, and monitor sales trends.

Sales Management & Billing: The POS system handles sales transactions, including generating invoices or receipts, calculating totals, applying discounts or promotions, and processing various payment methods (cash, credit cards, etc.). It records sales data, providing insights into revenue, popular items, and customer preferences.

Centralized Server: The Retail ware POS system utilizes a centralized server to store and manage data. This ensures that all connected clients, such as the cash registers or terminals, can access and update real-time information from a single source.

Data Backup and Cloud Storage: To minimize the risk of data loss, the Retail ware POS system maintains backups on a private cloud. This ensures that if any issues occur with the local server, data can be recovered from the cloud backup, preserving the integrity of the system.

IT Support and Maintenance: Retail ware provides IT support and maintenance services, ensuring the smooth operation of the POS system. This includes troubleshooting technical issues, software updates, and general system maintenance.

Employee Structure: The store has approximately 25 employees, with 12 salespeople focused on customer interactions and the remaining employees involved in inventory management and related tasks.

Barcodes implementation in a clothing store: currently the store manages the sales & purchases in the store using Barcode scanning

Every clothing item is given a distinct barcode throughout the barcode generation process. Information about the goods, including its price, size, color, and SKU (stock-keeping unit), is encoded into this barcode. Specialized software or barcode generators can be used to create the barcode. After the barcodes are created, they are printed and affixed to the apparel. Barcodes can be printed on hang tags for garment labels directly, via thermal printers, or on barcode labels. A barcode scanner or a portable mobile device with an integrated scanner is used to scan the barcode. The POS system processes the data that the scanner decodes from the barcode.

During a sale, the Retail ware POS system updates the inventory database in real-time. This allows the store to track the stock levels of each clothing item and receive alerts when items need to be restocked. Barcodes also contain pricing information, which is retrieved from the Retail ware POS system when scanned. This ensures accurate pricing and reduces the need for manual price tagging. Barcodes simplify the process of returns and exchanges. The POS system can quickly recognize the item and its details by scanning the barcode, which facilitates the processing of the return or exchange transactions. It is possible to analyze barcode data to learn more about popular products, sales trends, and inventory turnover. Store owners can use this information to make well-informed judgements about marketing tactics and inventory control.

The Retail ware POS System's Purchase & Sales module provides all the most recent data. For each client, a unique login is given. All things considered, barcodes offer a quick and easy approach to track apparel, control inventory, and speed up sales transactions in a clothes store. They contribute to increased efficiency overall, error reduction, and operational streamlining.

The store is planning for the Implementation of RFID in SPICE over the Barcode System:
Barcodes use visual patterns of bars and spaces that can be scanned by barcode readers, while RFID (Radio Frequency Identification) tags use radio waves to communicate with RFID readers.

Barcode tags typically involve printing and attaching unique barcode labels to individual items or packaging. This process requires a barcode printer, labels, and adhesive. On the other hand, RFID tags consist of small electronic chips and antennas embedded or attached to the items during manufacturing or post-production. This process may require specialized equipment or RFID tagging services.

Barcode scanning is a line-of-sight process. Barcodes must be within the barcode reader's field of view in order to be scanned linearly. The scanning speed is generally fast, but each barcode must be individually scanned. RFID tags, on the other hand, can be read without line-of-sight and at a greater distance, allowing multiple tags to be read simultaneously. This makes RFID scanning faster and more efficient for inventory management.

Barcode tags store limited information, usually a product identifier that needs to be cross-referenced with a database for more details. RFID tags have more data storage capacity, including unique item identifiers, product details, batch numbers, expiration dates, and more. This additional data can be accessed directly from the tag itself, enabling more comprehensive inventory management and tracking.

Barcode tags need to be manually scanned for each item, which can be laborious and error-prone. RFID tags allow for several tags to be scanned at once, making automated, real-time inventory tracking possible. This increases visibility into stock levels, decreases human error, and enhances accuracy.

Barcode tags are generally more cost-effective compared to RFID tags. Barcode printers and labels are widely available and relatively inexpensive. RFID tags, while offering more advanced functionalities, involve higher upfront costs due to the need for RFID readers, antennas, and specialized tags.

The choice between barcode and RFID tagging depends on factors such as the size of the store, the complexity of inventory management needs, cost considerations, and the desired level of automation and accuracy. Barcode tags are suitable for smaller operations with simple inventory tracking requirements, while RFID tags are more suitable for larger stores or those requiring real-time and automated inventory management.

RFID:
RFID, or radio frequency identification, is a technology that tracks and wirelessly identifies objects using radio waves. An RFID tag, an RFID reader, and a backend system are its three primary parts.RFID tags come in a variety of forms. Passive tags run on the energy from the RFID reader, whereas active tags contain an internal power source—typically a battery—that allows them to function independently. Semi-passive tags are equipped with a battery to do specific tasks, such as improving the response signal. RFID tags can be integrated into or affixed to objects or items to facilitate tracking and identification.

RFID tags have become widely used in various industries, including manufacturing, supply chain, and inventory management, due to their efficiency and advantages over traditional barcode systems.

RFID tags have the important benefit of being able to be read at a distance without needing to be scanned in line of sight. Even though the tags are not immediately visible, RFID allows the data or EPC (Electronic Product Code) serial number encoded in the tag that can be detected from a short distance away. Because the RFID reader can wirelessly and automatically capture the information, there is no longer a requirement for human scanning. Barcode systems, on the other hand, demand that the barcode be directly scanned by a scanner, which can be laborious and error-prone if the barcode is blurry or damaged.

Additionally, RFID systems have the capacity to quickly count and sort several tags at once. When a reader is within the range of multiple RFID tags, it can read and process the information from all the tags at once, providing fast and efficient inventory management. This feature is particularly valuable in scenarios where a large number of items need to be tracked or counted quickly, such as in a warehouse or retail environment.

Businesses can boost supply chain visibility, decrease manual errors, expedite and accurately manage inventory, and raise overall operational efficiency by taking use of RFID technology's benefits. Many businesses looking to optimize their supply chain and inventory operations choose RFID over standard barcode systems because of its unique ability to read tags from a distance and gather data simultaneously.

Every single item (tee shirt, shirt, pants, sportswear, bags, etc.) at a clothes store or apparel shop has a distinct RFID tag, which indicates that each item has its own serial number, or EPC. The computer software can now manage the inventory by determining the number of pieces available for each model, the number that were sold, and even the number that remain in various stores throughout the globe.

Working of RFID:
When an item with an RFID tag enters the range of an RFID reader, the reader emits radio waves that power the RFID tag. The powered tag then sends back a unique identification code or data to the reader. This communication happens wirelessly and can occur even if the RFID tag is not in the direct line of sight of the reader.

The data from the tag is read by the RFID reader, which then transmits the data to the POS system.. The POS system processes the received data, identifies the specific item based on the tag's unique identifier, and retrieves the corresponding details from its database. This can include product information, pricing, inventory status, or any other relevant data. The POS system then updates its records accordingly, reflecting the current status of the item in the inventory. This real-time and automated scanning process allows for efficient inventory management, accurate stock tracking, and seamless integration with the POS system.

RFID technology presents several benefits, including accelerated scanning speeds, the capacity to read multiple tags simultaneously, and enhanced accuracy in contrast to conventional barcode scanning

methods. It optimizes inventory management in retail stores by offering real-time data updates and boosting the overall efficiency of point-of-sale (POS) systems. In terms of communication frequencies, RFID tags can be classified into categories based on low, high and ultra-frequencies.

The process of Implementing RFID for inventory management involves several key steps:

Tagging Items: RFID tags must be attached to every item in the inventory. RFID tags can be applied to already-existing objects to do this. RFID scanners are able to read the unique identification included in the RFID tag.

RFID Readers and Antennas: RFID readers are placed strategically throughout the store or warehouse to capture signals from RFID tags. The readers can be fixed at specific locations, such as entry/exit points, or integrated into mobile handheld devices. Antennas are utilized to increase the readers' coverage and range.

Database Integration: The information is transmitted to a centralized database or inventory management system by the RFID reader, which reads the unique identifiers from the tags. This system gets pertinent data, updates the inventory records, and compares the RFID tag data with the related item in the database.

Software and Integration: RFID data must be able to be processed by the inventory management software and integrated into the current system. This could entail using software solutions tailored to RFID technology or bespoke development.

System Calibration and Testing: The RFID system needs to be calibrated after installation in order to maximize read range and accuracy. Testing is conducted to ensure proper functionality and data integrity. Any adjustments or fine-tuning may be required to achieve optimal performance.

Staff Training: Employees involved in inventory management need to be trained on how to work with the RFID system. This includes understanding the process of tagging items, using RFID readers, and interpreting the data provided by the system. Training ensures that the system is used effectively and maximizes its benefits.

Process Integration: Processes used in inventory management today, like receiving goods, restocking, and stocktaking, can be connected with RFID technology. The new RFID-based system requires modifications to workflows in order to ensure a smooth transition and effective functioning.

Ongoing Maintenance and Optimization: To ensure constant performance, RFID infrastructure, including readers, antennas, and applications, must be maintained on a regular basis. Continuous optimization may be required to address any operational challenges and enhance the system's capabilities.

Implementing RFID for inventory management provides real-time visibility, accurate tracking, and improved efficiency compared to traditional inventory methods. It enables businesses to automate inventory processes, reduce errors, minimize stock outs, streamline replenishment, and get useful information on their inventory operations.

RFID Implementation Ahead?

This includes the use of passive RFID tags built expressly for clothing goods, as well as the integration of RFID printers and a dedicated RFID Point of Sale (POS) system. Using passive RFID tagging, each clothing item can be easily identified and monitored throughout the supply chain, increasing efficiency and accuracy. The RFID printers allow the company to encode and print RFID tags in-house, which eliminates

the requirement for outsourcing or manual tagging. Integrating the RFID POS system with the current infrastructure enables seamless inventory management and sales transactions, as RFID tags are automatically read and updated in real time at the point of sale. This end-to-end RFID technology could help the company achieve optimized inventory control, faster operations, and increased customer inventory control, enhanced customer service and standardized operations, which eventually increased their total business performance.

The proprietor of the business chooses to speak with an IT consultant about the possibility of integrating RFID technology into their business processes. The IT consultant may offer insightful advice on whether implementing RFID is appropriate for the organization, given their proficiency with technological solutions.. Several factors may influence the owner's decision to proceed with RFID implementation. These elements include the quantity and variety of clothing products kept in stock, the intricate processes involved in supply chain management and inventory management, as well as the need for accurate tracking and monitoring in real time. The potential for cost savings and efficiency gains, the integration capabilities with existing systems like the POS, and the long-term scalability and adaptability of the RFID solution. The IT consultant will assess these factors, understand the specific requirements and goals of the company, and provide a comprehensive analysis and recommendation on whether RFID implementation aligns with the company's needs and objectives.

Case Questions:

1. Considering the extensive selection of clothes at SPICE Store, how does RFID technology address challenges associated with handling large inventories compared to barcodes?
2. How well does the RFID implementation plan address the integration of RFID technology with SPICE Store's existing systems, especially the Retail ware POS system?
3. How might the transition from barcodes to RFID impact the customer experience at SPICE Store during the purchase process?
4. Considering yourself as an IT consultant Propose an RFID implementation plan for the store

Exhibits (Refer to solve the Case questions)

Exhibit 1: Spice Clothing store Branches in Kolhapur, India.

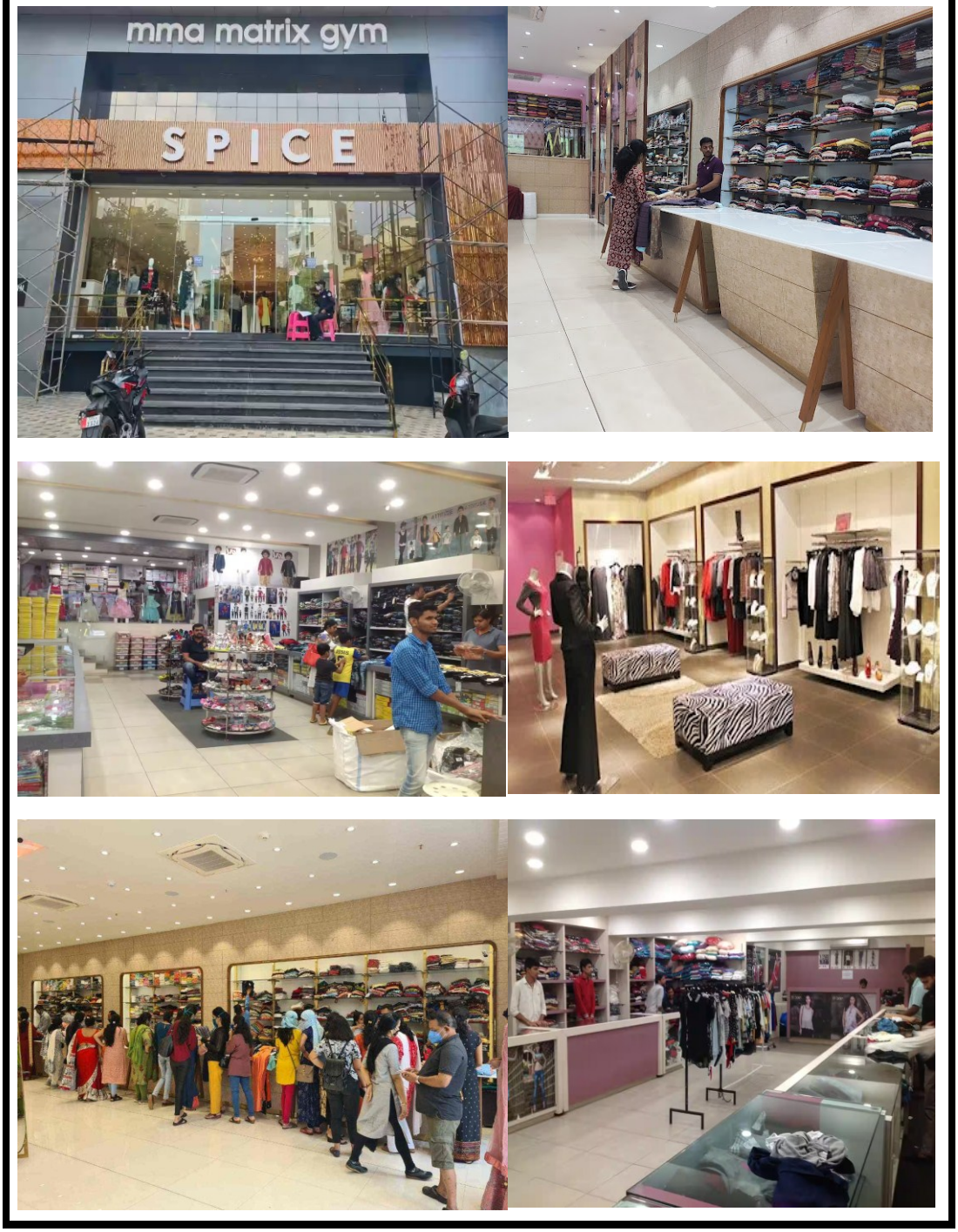

Exhibit 2: POS systems at: Spice Clothing store Branches in Kolhapur, India.

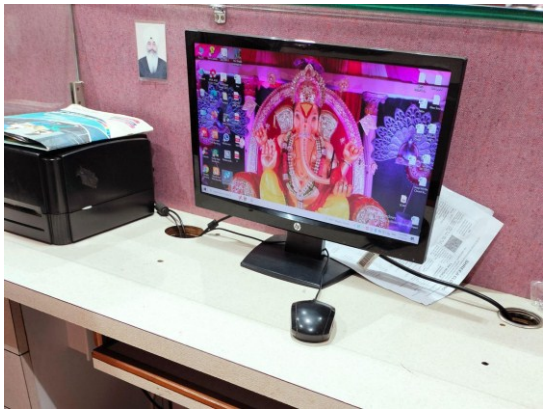

Exhibit 3 : Sample barcode Labels

[redacted]

RFID TAGS /Labels

Passive RFID /Labels

Theft tags

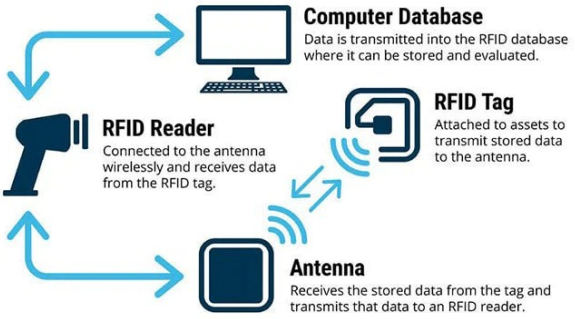

Exhibit 4 : Working of RFID

Exhibit 5 : RFID Printers

RFID Printers for All Your Needs

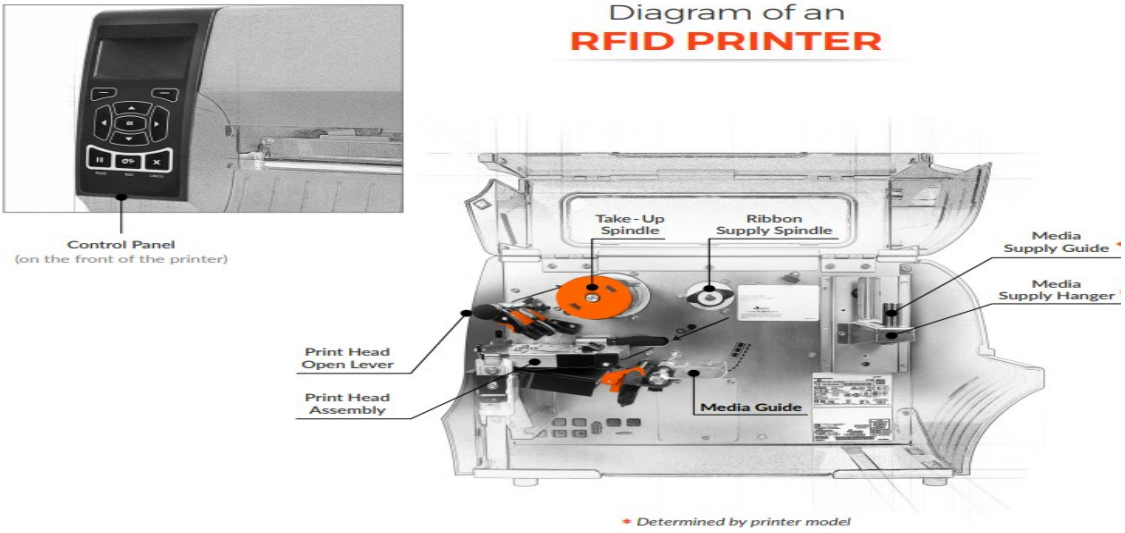

Exhibit 6 : https://www.atlasrfidstore.com/a-guide-to-rfid-printers/

Exhibit 7 :RFID Hardware, S/w & ERP integrated Solutions

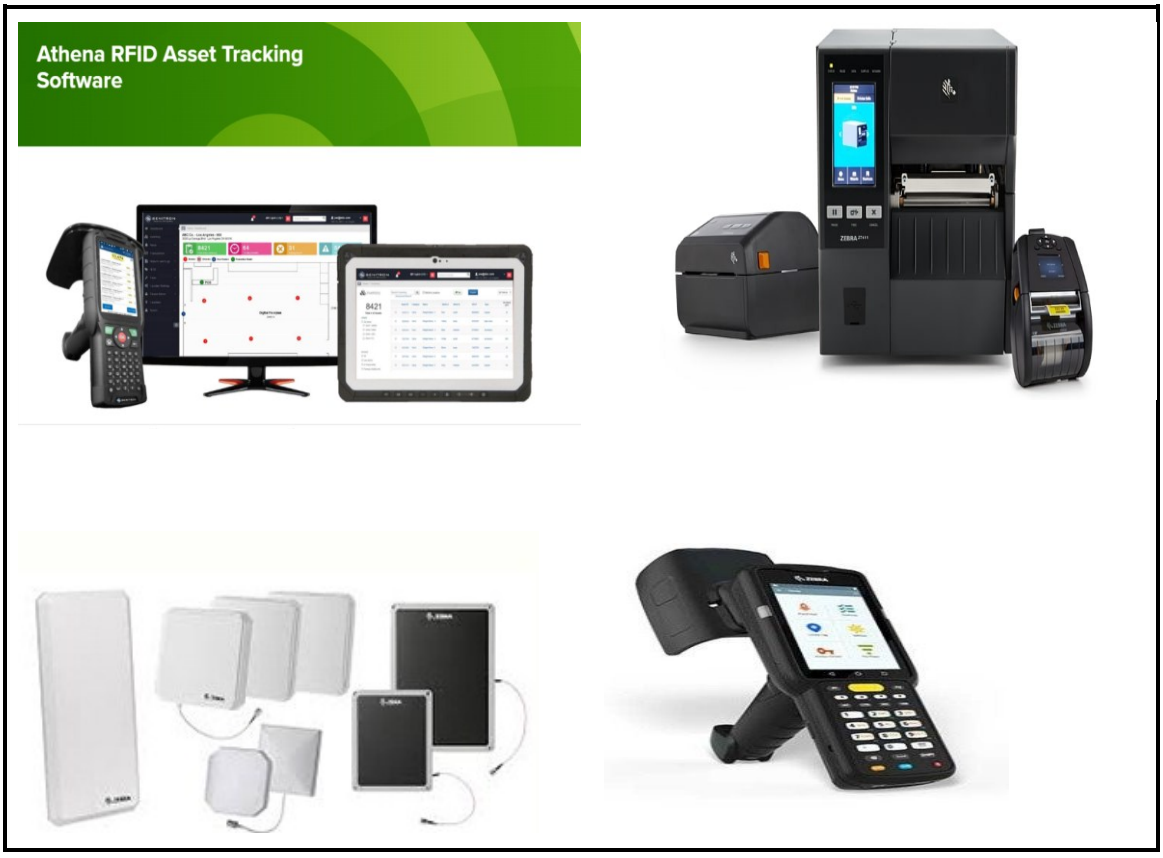

Exhibit 8: https://www.zebra.com/ap/en/products/supplies/rfid-labels-tags.html

RFID Printers

Zebra's mobile, desktop, industrial and card RAIN RFID printers produce traceable RFID tags to optimise asset visibility and management in a variety of applications.

View Solution

Handheld RFID Readers and RFID-enabled Scanners

Zebra's handheld RAIN RFID readers and RFID-enabled scanners are suited for all enterprise and various rugged environments.

View Solution

Fixed RFID Readers and Infrastructure

Zebra RAIN RFID fixed readers help you identify, track and store your inventory, maintaining total control of your operations.

View Solution

RFID Antennas

Exhibit 9: https://rmsomega.com/rfid/senitron/athena-rfid-software/

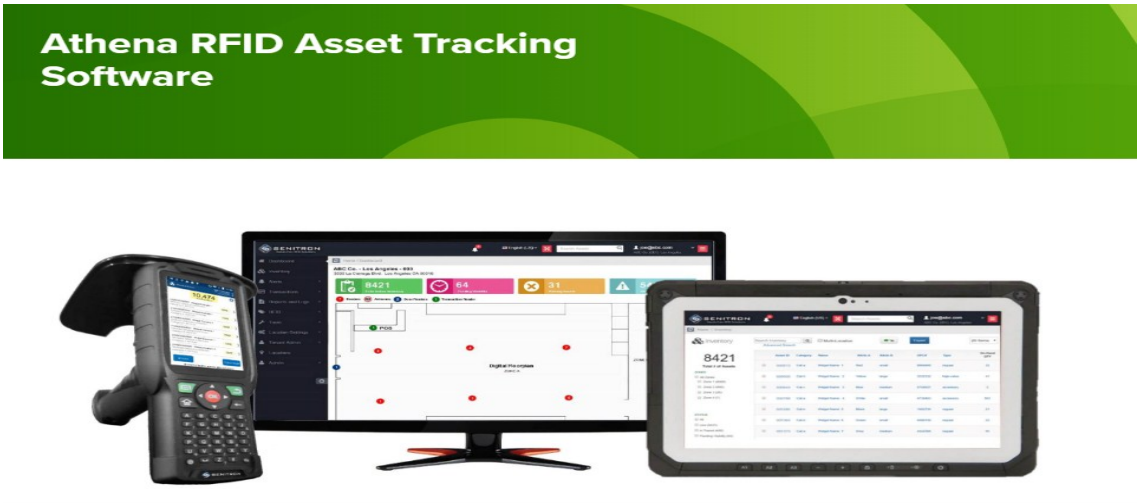

Exhibit 10:RFID Solutions

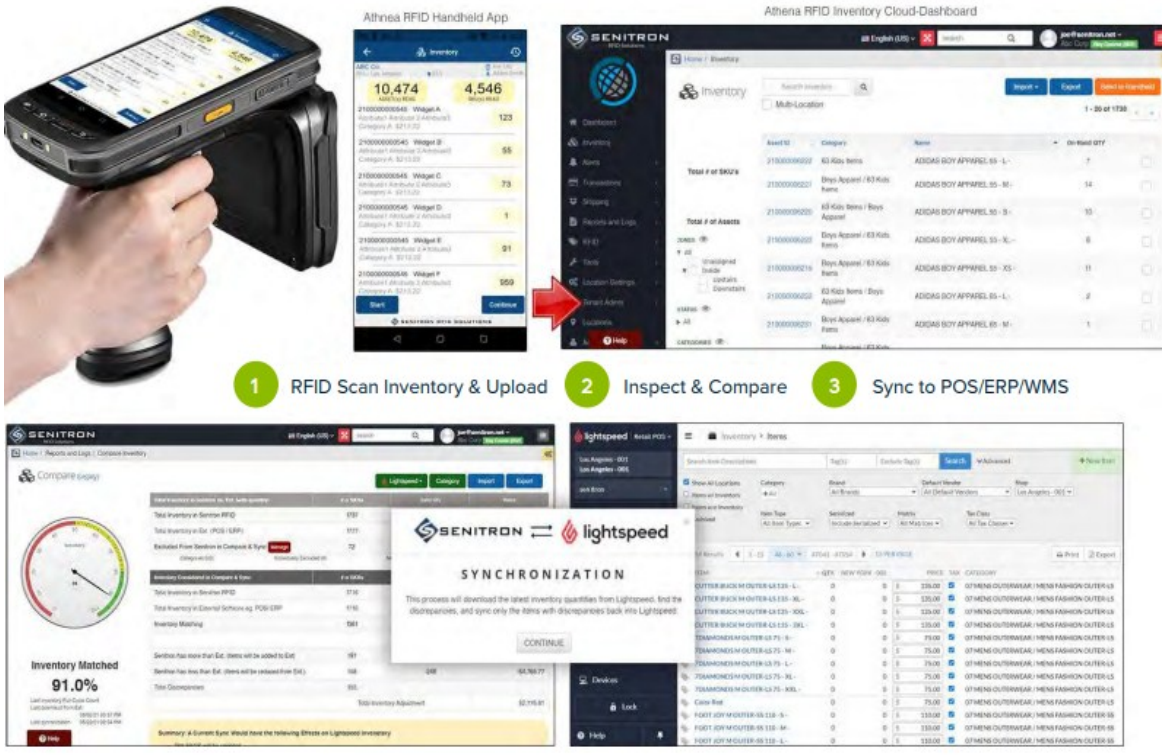

Exhibit 11 "RFID Technology Is Replacing Barcode with More Accuracy. Quick real time inventory count and theft control at Shop Floor" ***https://techlinkcanada.com/rfid-in-apparel/***

Teaching Note:

Objective:

The case focuses on SPICE Store, a modern clothing retail store in Kolhapur, and its strategic decision to upgrade the store with the RFID technology for inventory management. The case explores the background of the store, its current barcode-based system, and the potential benefits and challenges associated with transitioning to RFID.

Key Learning Objectives:

- Understand the process of sales ,purchases and billing in the stores
- Differentiate between traditional barcode systems and RFID technology.
- Learn the implementation of of RFID technology in stores and Inventory Management
- Learn the sensors, RFID, RFID TAGS,Readers and all the devices in RFID stores

Introduction: Briefly introduce SPICE Store and its prominence in Kolhapur.

Current Inventory Management : Discuss the store's infrastructure, layout, and use of technology in the current barcode system.Emphasize the strengths and limitations of the existing system

Provide the Introduction to RFID: Discuss how RFID technology works and its potential advantages over traditional barcodes.

RFID Implementation Steps :

- Dive into the detailed implementation plan of RFID into the SPICE Store.
- Explore how RFID tags are read, processed, and integrated into the Point of Sale (POS) system.
- Outline the steps involved in implementing RFID, from tagging items to ongoing maintenance.
- Discuss the potential challenges and benefits at each step.

Class Discussion : Facilitate a class discussion on the feasibility, challenges, and pros and cons of RFID system implementation for SPICE Store.Encourage students to analyze the case from different perspectives, considering the store's goals and potential impact on customer experience.

Conclusion and Future Outlook :
Summarize key takeaways from the case.

Refer all the Exhibits for solving the case

1.Implementing RFID technology in SPICE,

In comparison to standard barcodes, implementing RFID technology at SPICE Store provides a strategic option for successfully managing the issues associated with a diverse inventory. RFID's ability to simultaneously scan many tags at a distance enables quick and non-line-of-sight inventory counts. This considerably decreases the time and labour necessary for manual scanning, making it especially useful in a store with a large selection of apparel items. Another significant advantage is real-time insight into inventory movements, Due to RFID's ability to track quickly and automatically without requiring a direct line of contact, stockout or overstock scenarios are less likely to occur.

Furthermore, RFID technology improves accuracy by reducing the human error inherent in manual barcode scanning operations. The automated reading of tags minimizes the chance of miscounts or misidentifications, resulting in more accurate inventory data. The efficiency with which low-stock products are identified enables timely restocking, ensuring that popular or fast-selling items are consistently present on the display racks. RFID's quick identification and verification capabilities help to speed the return and exchange process, adding to an overall improvement in inventory management techniques.

RFID's capacity to accommodate huge data than barcodes is useful for providing full product information. Each RFID tag holds the data such as product characteristics, size, color, pricing, and even batch or manufacturing data. This larger dataset provides a more thorough perspective of the inventory, allowing for improved decision-making and stock management. Furthermore, RFID helps with loss prevention by detecting anomalies between reported inventory levels and physical stock. This aids in the early discovery of theft or losses, improving the overall security of the store.

From a technical standpoint, RFID's flexibility to large-volume situations makes it ideal for the needs of SPICE Store, which has a diverse assortment of apparel goods and substantial foot traffic. The ease of interaction with existing Point of Sale (POS) and inventory management systems guarantees a smooth transition to RFID technology. Overall, RFID implementation at SPICE Store shall transform inventory management procedures by delivering a scalable and efficient solution that corresponds with the store's objectives of accuracy, real-time visibility, and increased customer happiness.

The shift from barcodes to RFID at SPICE Store is expected to have a substantial influence on the consumer experience during the purchasing process, providing various advancements that will speed and elevate the whole shopping experience. Here's how the deployment of RFID technology may affect the customer journey:
(Exhibit 11)

The transition from barcodes to RFID technology at SPICE Store is set to transform the consumer experience during the purchasing process. RFID installation speeds up the checkout process by allowing numerous items to be scanned along with, lowering wait times at the checkout counters. This efficiency

extends to returns and exchanges, where RFID enables speedy identification and verification of objects, expediting transactions and giving customers a smooth experience. The integrity of pricing information embedded in RFID tags provides transparent and precise billing, reducing discrepancies and contributing to a more reliable shopping experience. Furthermore, RFID's real-time tracking capabilities improve stock availability, reducing customer annoyance with out-of-stock items and providing a more favorable shopping experience.

Beyond operational gains, the transformation to RFID solutions allows for a more personalized and engaging consumer experience. RFID tags retain detailed product information, providing customers with deeper insights into their chosen things, such as size, color, and unique characteristics. This improves the whole buying experience by making customers feel more educated and satisfied. Furthermore, RFID enables the seamless integration of loyalty programmes, allowing customers to easily earn and redeem points, building a sense of appreciation and devotion to the SPICE Store. The upgradation to RFID technology not only improves operational efficiency, but it also improves customer connection with the store, establishing SPICE as a forward-thinking and customer-centric retailer.

Plan for Implementation of RFID Technology at Store (Exhibits 3-10)

RFID H/w & S/w +ERP solutions: (Exhibits 3-10)

Sr.No	Contents
1	RFID Readers
2	Integrated Portals
3	RFID Tags
4	RFID Printers & Encoders
5	Antennas
6	RFID software & ERP s/w integration

Tags are of various types RFID tags can be placed on during manufacturing as well in the stores the passive UHF tags can be pinned with the clothes by printing them in the store itself, the company can acquire complete RFID S/w & H/w solutions & transform the store.

RFID printers print & encode information on RFID labels, they also encode each tag. RFID printers can print alphanumeric human readable, graphics 7 barcode also.RFID printers are categorized according to RFID tag compatibility, frequency or tag types. Most of the RFID printers are UHF passive RFID printers, they use Thermal transfer printing which uses thermal transfer ribbon they are long ink lifespan.it is assembled with the Host API which comes with the protocols & tools needed to interact with the device,it consists of script written to print & encode the tags .RFID printer software provides an interface to create & send data for printing & encoding tags. Printers are calibrated to work for specific tags, Printers must be calibrated, cleaned periodically,

Selecting RFID Tags / Labels: To ensure traceability, RFID labels are an easy way to identify a product or object so that it may be detected wirelessly. An RFID tag is a compact, intelligent gadget that can send data via radio frequency signals and store data. They give the data kept at the back-end system and receive RF signals from readers and antennas. Both active and passive tags are possible. Active tags send a signal to the reader using a separate battery source.

We have RFID inlays -it contains chip, tag antenna on an adhesive-coated section of film

- RFID labels- peel & stick applications
- Hard tag- Encase RFID inlay in a case
- RFID card -embedded in plastic card & encoded important information

The store can prefer Passive tags so that they can print & encode the tags for clothing in-house, Tags that are passive are powered-free and rely solely on the reader's RF signal to activate them.

RFID Readers: Readers is a network connected device that uses radio waves to transmit signals that activates the tag & reads the related information. Readers are network-connected devices that send signals via radio waves to activate tags and read associated data. Its selection depends upon the frequency range, fixed, wireless, handheld, UHF RFID readers, integrated readers etc., connectivity & end-user capabilities. Fixed readers are deployed in high volume inventory & material flow, it brings visibility & more accuracy in tracking inventory & assets & provides more accuracy.

RFID antennas : they provide link between fixed readers and tags ,they enable to capture ,move & manage critical information, they act as bridge between in the network that connects the hardware & software, they are fixed in the Ceilings,walls,doorways,checkpoints,RF challenging environment. We have UHF antennas, patch antennas and other we have to finalize it depending upon the application.

RFID softwares: It's a point-of-sale system (POS) where the data gathered from readers is examined, controlled, and analyzed. It's in sync with the store's inventory, which aids in keeping the inventory updated.RFID software offers comprehensive inventory management, automated inventory counts, real-time notifications, and asset tracking all under one roof. It is essential for joining all of the RFID system's components together and operates in the background. All the tools required for managing and controlling every RFID device and transferring data to the back-end system are provided by middleware, also known as ERP integration software.

RFID Security: The use of RFID theft tags and RFID door sensors can prevent shoplifting because all transactions are conducted at the point of sale (POS) and no things are allowed to be taken out of the store until the RFID theft tags are removed.

Although barcodes are extensively utilized in clothes store inventory management and invoicing systems, there are certain limitations that may affect their effectiveness and precision.. To overcome these drawbacks, many clothing stores are adopting RFID technology, which offers advantages such as non-line-of-sight scanning, higher data storage capacity, RFID tags' longevity and inventory visibility in real time. Barcode systems have limitations that RFID can solve, resulting in more precise and effective inventory management and billing procedures.

Since the advent of RFID technology, inventory-related issues have become less common and the amount of time spent on inventory has decreased dramatically. Which has been revolutionary for the retail apparel industry. The applicability of RFID in the retail section is sufficient to convince the clothing retail sector that implementing the technology is a crucial next step in the sector's development.

There are several different RFID solutions available for the retail clothing market. Retailers may gain from better customer service, quicker checkout times, and more accurate inventory management with the correct technology in place. However, it's imperative that you select the greatest choice for your unique needs.. The IT consultant suggests that SPICE can expand using the RFID Solution as they have five branches. RFID solutions would lead them to come up with brand SPICE worldwide.

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When Unwanted Thoughts and Repetitive Behaviour seize: Dealing with OCD of a Married Woman, India

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Rucha (for confidentiality purpose, name has been changed) was a 24-year-old married woman and the mother of 14 months old child. She had a c section for delivery which was quite complicated. Actually she had having anxiety-related problems for So many years; she had never pursued professional help. Those concerns had been tried to sort out by family members and friends. A bit period, those had been solved. Approximately more than two and half months, she had become more and more depressed; her family doctor finally suggested seeking psychological help and thus she had seen Counsellor.

Since several months, Rucha had been experiencing disturbing, repetitive thoughts that were about her child's safety. She frequently use to imagine that a serious accident happened, and she was not able to handle these thoughts. On one such occasion, Soham (for confidentiality purpose, name has been changed) had day cared to his Grandparents, she imagined that her son had broken his hand while playing. There was no reason to believe that an accident had occurred, but Rucha worried about the possibility until she finally called Soham's grandmother to see if Soham was all right. Even after receiving reassurance that he had not been hurt, he had playing happily without any problem; she was somewhat surprised when he later arrived home unharmed.

In another incident when he had gone with his father, she imagined that Soham had swallowed a key of toy car which he was carrying and had faint and breathless. She had sweating and palpitations. She had called her husband and had yelling and cried. Once she had seen him normal and unharmed, she had felt normal.

Rucha also noted that her daily routine was seriously hampered by an enormous series of counting 'Japa' or other rituals that she performed throughout each day. Moreover she found that by continuously counting the numbers was interfering her ability to do daily chores even. One example was grocery shopping. Sneha believed that if she selected the item by touching her hand (e.g., a box of cereal) on the shelf, something terrible would happen to her child. Thus, specific items had to be avoided to ensure the safety of her children. Rucha's number counting activity extended to other activities. For example If she drank one cup of coffee, she felt forced to drink four.

Rucha was aware the irrationality of chanting and rituals but though she felt much more comfortable when she did them conscientiously. When she was unable to do so, she experienced anxiety. Actually, occurring the small accidents are normal in everyone's life. But Rucha's strong believed that she was whole and soul responsible because she did not observe the numerical rules. In addition to this, Rucha conveyed dissatisfaction of her married life and problems to manage her child. Her husband, Vikas (the name has been changed for confidentiality purpose), met the severe accident 8 months prior to her first visit to the mental health care clinic. Although he was only 28 years old, he had made his mind to give up the job and start new venture of the business. She had been disagreed but already he had taken that decision. The capital amounts had been collected through the loan. Since he left his job, he had to be at home whole the time. Despite working on business proposal, He used to seat on the couch, watching reels on the mobile and did nothing fruitful in his waking hours. He declared that Rucha should be responsible for all the household work and family concerns.

Her days were so engrossed to get the child dressed, fed, cleaning the home; washing; shopping grocery; and preparing breakfast whenever Vikas needed a snack. The inequity of this situation was apparent to Rucha and was extremely frustrating, yet she found herself unable to handle it effectively. Rucha was getting more and more distressed as she felt disabled to handle this. Vikas was least bother about this all. From past many weeks, she used to spend more time in crying in her bedroom.

Rucha was raised in Kolhapur City by typical Hindu parents. She was the first of three children. Her family was deeply religious, and she was raised to be a devout Hindu religion. She attended ritual varg (class) from the first grade. Through high school and was a reasonably good student. She remembered the strictness in the school. The rituals of the 'Varg 'also played an important role. In the childhood, Rucha was taught that she had to follow whatever had taught within the varg (remaining pure veg., do chanting daily without fail, do not watch a movie, television, and so forth). She was told that her strict adherence to these norms would confirm the safety of her immortal soul and disobedience of it would be punished.

The depth of her belief and the severity of its consequences can be seen in her life in so many incidences. She remembered her parents' and teachers' warnings that if she does anything against her rituals, her soul would be banished to hell for eternity. This threat was still vivid in Rucha's mind many years later. Despite the terror aroused by these circumstances, Once Rucha intentionally had watched a romantic movie and she lived with intense guilt about this omission for several years and could remember having occasionally terrifying nightmares that centered on imagined punishments for going against the rituals. In subsequent years, Rucha strengthened her efforts to abide by even the minutest details of regulations in all rituals, but she continued to hold the belief that she had done the sin in her childhood.

Rucha described her parents' very strict disciplinarians. Her mother was dispassionate and rigid person who had made Rucha to maintain the order and cleanliness of their house. She was very much strict to get follow all religious rules and regulations and have punctuality in meals and other routine activities. If the children broke the rules or guidelines, they got severely punished. Rucha didn't even remember her parent's affection as a couple in front of their children. Once Rucha graduated, she married Vikas and she became pregnant after two months. During this pregnancy, she observed one accident of neighborhood family member, a small girl. The girl was severely injured and was hospitalized for several weeks. After this incidence, Rucha started experiencing the repetitive, disturbing thoughts. She started imagining to her herself, injuring herself. Throughout the day, she would think of jumping out of terrace, standing in the middle of the highway, and other hazardous behaviors. These thoughts were scary to her, but she could not resist them. When such thoughts did come, she tried very hard to get rid of it by chanting, quickly repeating the 'Prarthana' that she is a child of supreme God and then begging God to forgive for such a sinful thoughts. This procedure was successful for a temporary time to distract, but it did not avert the repetitive, intrusive thought.

The frequency and trouble of the thoughts of self-injury became less after the birth of her child, Soham, probably because Rucha got preoccupied with all the responsibilities of the baby. When She got married, they both had planned to move to the area, where they could get afford a house. She was feeling proud and happy to have the new home but in other hand she was missing her all old friends. She got depressed to realize unavailability of her friends' .Rucha's situation got more and more unpredictable and critical, the next few years. By the time she was 22 years old, she gave the birth to baby. She found those responsibilities as overwhelming because of that she was feeling unhappy all the time. The relation of this couple was completely devastated but they both were agree

to be together for the child. They did not fight openly but they were mindful of such tensed, critical and separation saturated situation of their relationship. Vikas was least bothered about household chores and refused to take responsibilities of child raising things. Rucha had formed keen and specific guidelines for the disciplined home but understood clearly that she was unable to force it to family members. She continued to be distant from Vikas and rejected most of his attempts of physical affection. Thus, overall, Rucha was chronically hopeless, sad, and disappointed with her life.

This unhappy, yet tolerable, steadiness was disturbed by Vikas's one sided decision of quitting job and starting new business. Rucha became more and more depressed after Vikas began staying home during the day. It was peak time that unreasonably, she started to get fearful about the child's safety. She started execution of counting rituals. Rucha realized that her situation was getting more and more desperate as she felt that she had lost control of the behaviour, she was feeling considerably anxious and started performing rituals at higher level. Finally, she decided and planned to seek the professional help.

Obsessive Compulsive Disorder:

Resource:https://scrichmondblog.wordpress.com/2017/12/03/superstition-or-ocd/, accessed on June,4,2023

Obsessive-compulsive disorder (OCD) is included in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*; APA, 2000, pp. 462–463) under the general heading of anxiety disorders. Kindly find more details i.e., Definition, types, signs, OCD cycle, Correlation with depression in that.

In many ways, Rucha was a typical OCD patient. She had been raised in a strict family. As a child, she was anxious and very much concerned with order and rituals. In her adolescence, Rucha had trouble with intrusive, repetitive ideas which made her she distressed. She was very much close to serious depression. Rucha had family case history among the biological relatives of obsessive-compulsive patients.

It has been found that many obsessive-compulsive patients carry the same parenting style which reflects on their child in such a way. In Rucha's case, her mother was typical in ritual following, rigid and had moralistic behaviour. It impacted to develop such symptoms.

Recommendation -Treatment:
The therapist found the ritualistic behaviour is one part of Rucha's overall difficult situation. By counting compulsion, she was trying to make control on her life. Instead of doing the religious things she did as a kid or learning how to handle social situations well, she went a different way. For example, when dealing with Vikas, she didn't stand up for herself. Instead, she quietly agreed to whatever he wanted, even if it wasn't fair. But inside, she felt more and more frustrated and upset, trying to find small ways to make things fair again she also found it hard to say thank you to Vikas, even when he did something nice for her, which was not often.

Initially Treatment was aimed to develop the interpersonal skills
At first, Rucha's treatment focused on helping her learn how to deal better with people around her. The goal was for her to have control over the life without relying on superstitions or ineffective methods. The hope was that if she could improve her relationships with the husband and child, she wouldn't feel the need to resort to those methods anymore. Rucha realized she needed help in this area, but she couldn't change on her own. So, she and her therapist decided to work on a plan together. Assertive Training has been planned as the part of her treatment.

They started with sessions where they looked closely at times when Rucha didn't speak up for herself. She has been ask to keep a journal of these situations, noting who was involved and how she felt about it, her perception. They figured out common problems and practiced how she could respond differently, more assertively. They also talked about why Rucha was scared to assert herself. She worried that if she did, people wouldn't like her anymore. These worries were holding her back from being assertive. Once Rucha got better at these exercises during therapy, she started using them in real life outside of the therapy sessions.

After seeing good changes from assertion training, the therapist started teaching Rucha better ways to manage her child- **effective child-management skills**. They mostly used a method called **instrumental learning (operant conditioning)**, where certain actions lead to rewards or consequences. For example, Rucha learned to ignore her child when he was stubborn and to praise him when they played nicely together. At first, they tackled easier behaviors to change. The trickier problems, like dealing with the child's stubbornness during meals, were saved for later when Rucha had learned more about how to manage her child.

In addition to the skill training, the therapist talked with Rucha about her worries regarding religion. Rucha still found rituals important, but felt guilty for not attending religious services regularly. She also felt uneasy because her husband wasn't involved in religious activities. She feared that without God's protection, something bad might happen to her family. To help her feel more comfortable, the therapist suggested she visit different gurus at nearby temples. Most gurus had modernized their practices, but one older guru, further away, still followed traditional rituals. Rucha met with him and felt relieved. He explained some changes in rituals and why they were made, which made sense to her.

The Guruji, who shared Rucha's worries about leaving traditional practices, made her feel more comfortable than the liberal Guruji at her nearby temple. Soon, she started attending rituals regularly with her child again. With assertion training, parent education, and a revived interest in rituals, Rucha's mood improved significantly. After 3 months, she felt more confident and noticed better family life. Her anxiety also decreased a bit. Though she still did her rituals, she didn't do them as often. If she missed counting routines, she wasn't as upset as she was before starting treatment. At this point; Rucha's rituals were directly addressed using a treatment called **exposure and response**

prevention (ERP). This method involves deliberately exposing the person to things that make them anxious for a long time, while stopping them from doing their usual calming rituals.

For example, Rucha was asked to drink just one cup of tea at the start of a therapy session. When she felt anxious and started worrying about her child after finishing the tea, she wasn't allowed to have another cup. This prevented her from using her usual way of calming down and controlling her thoughts. The therapist knew that facing the anxiety-provoking situation for a long time would eventually reduce Rucha's anxiety. This process continued for four sessions, each lasting two hours. Rucha was encouraged to practice the same response-prevention technique on her own between sessions. Once she had successfully managed the tea consumption issue, the procedure was expanded the treatment ended after 22 sessions. For the last four weeks, Rucha hasn't been feeling sad, and she's stopped her compulsive counting routines.Her child's behavior at home got better, and Rucha planned to make more changes in how she manages it. Her relationship with Vikas also got a bit better. Even though Vikas was upset at first when Rucha started standing up for herself, he became more helpful as he saw the positive changes in her.

Case Questions:

1. What are Rucha's Key concerns? Are they related to each other?
2. Elaborate your view.
3. Being AS A Therapist, which therapy would you prefer to treat OCD? Illustrate it.
4. According to you, what should be Vikas's role for Rucha to cope up with O.C.D.?
5. 'Family plays a vital role to deal with O.C.D.' do you agree with this? Sustain your answer.
6. Lots of people have quick intrusive thoughts, impulses, and images often. Is it helpful for us to have these kinds of thoughts from an evolutionary standpoint? When do these thoughts become a problem instead of being helpful?

Teaching Note & Procedure

Sr.No	Content	Resource	Teacher's Activity	Student's Activity	Mnts
1.	**Introduction**	-	To make students aware about psychological conditions	to listen	5
2	**Presentation of session objectives**	-	To make students understand the objectives of the session	to listen	5
3	Phase I **factual part** Rucha's case	Exact half part of the case in Printed or soft copy format	To form the group of students. To ask the students to read the case individually	To read the given case. Mark the vital points and to make the notes of it.	30
4	Phase II- **Root cause of case** Reflecting on Question part-	Question part of the case in Printed or soft copy format	To ask students to discuss the case study first. To ask students to read the questions and reflect in the group	To discuss the case study in the group with the pointers made. To read the questions and reflect on it by discussing in the group.	40
5.	Phase III- **Recommendations/ Treatment**	Recommendation or treatment part of the case in Printed or soft copy format	To ask the students 2. To discuss the recommendation treatment, therapy selection part	To discuss the recommendation treatment, therapy selection part	30
6.	Phase IV- **Presentation**	-	To ask 1participant of each group to present the reflections in front of all students. To ask other groups and participants to give inputs on presentation.	To select one presenter among the group. To participate and reflect on the discussion.	40
7.	**Key learning, Summary & closing statement**	-	To elaborate, summarize the case.	To note down the summary.	5

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Building a Chocolate Brand in Competitive Market: A Case Study on Dark Bite - Chocolate of Choice, India.

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One chilly evening in December, coming back from office early, Mihir sat in his garden, enjoying the comforting warmth of the sun's rays to keep his body warm. He breathed in deeply, smelling the lovely scent of the blooming flowers in his garden. His thoughts went to his chocolate business Dark-Bite. It had been a challenging journey so far.While sipping coffee, Mihir closed his eyes and let his mind wander. Memories of the challenges he encountered in the early days of Dark-Bite flooded his thoughts. He remembered the obstacles, the uncertainties, and the sleepless nights spent figuring out the complexities of the chocolate industry. However, despite the progress made, there were still lingering issues and challenges in the business that needed to be addressed. Major challenge was to beat Dairy Milk in local markets; another was packaging issue of chocolate.

With few thoughts in mind, Mihir picked up his notebook and began scribbling down his ideas, sketching out branding strategies, and mapping out his vision. He knew the road ahead would be filled with challenges, but he was prepared to face them head-on. As the sun set, casting a golden glow over garden, Mihir felt a renewed sense of purpose and excitement for the future of Dark-Bite. He was determined to craft a brand that not only satisfy taste buds but also touch hearts. With the aroma of chocolate in the air and his vision taking shape, Mihir was ready to embark on the next chapter of his chocolate-making adventure, confident that Dark-Bite would soon become a force to be reckoned with in the markets of Western Maharashtra.

About Mihir:
Mihir hails from Solapur, his ancestral hometown, where his family has roots. Although his father relocated to Devgad, Maharashtra, for employment purposes, Mihir's father, a highly educated individual with a doctorate, now serves as a Professor at a Senior College, imparting knowledge to M.Sc students. On the other hand, Mihir's mother is an active and influential figure in society. For the past 13 years, she has been conducting cooking classes and is well-known in Kolhapur. Additionally, she holds a prominent position as one of the founding members of the Grow Business Network (GBN), a group dedicated to assist entrepreneurs across various industries in establishing and expanding their business networks.Growing up in an environment that emphasized education and entrepreneurship greatly influenced Mihir's aspirations and determination to succeed as a businessman. Mihir was born in Karad, Maharashtra in January 1995. Although he completed his schooling in Devgad, he departed from there in pursuit of further education.

Mihir obtained his Mechanical Engineering degree from the prestigious Government College, Karad, one of Maharashtra's leading technical institutes. Mihir's journey echoes that of many accomplished entrepreneurs; he encountered failure during his first year of engineering. However, his unwavering passion for education and his desire to acquire new knowledge propelled him to successfully complete his engineering degree in 2017.During his engineering days, Mihir actively participated in various Robotics competitions, showcasing his skills and passion. His exceptional talent led him to emerge as the victor in the prestigious All India Robotics Competition hosted at IIT Bombay. Throughout his graduation period, Mihir engaged in a total of 12 competitions, triumphing in 11 of them and securing the runner-up position in another. Remarkably, he possessed a collection of seven robots that he had acquired and built during his time as a student. In fact, Mihir even designed a robot specifically tailored to assist him with tasks within his hostel room, demonstrating his ingenuity and resourcefulness.

Mihir's major hobby revolves around collecting car scale models. He has an extensive collection of over 1000 rare and valuable car scale models, which amount to a significant value in the hundreds of thousands of rupees. But Mihir is not just a collector, he is also an adventurer. Mihir likes riding. He started riding from 2012 with KTM bike. Now has Hero X-Plus 200. He loves to ride his bike across different parts of India and explore new places and cultures. He has travelled around 1 lakh kilometres on his bike, covering states like Gujarat, Rajasthan, Madhya Pradesh, Karnataka, Goa, Kerala and Tamil Nadu. He enjoys the thrill of riding on different terrains and meeting new people along the way. Mihir got married in December 2022. Mihir says that his wife is his best friend, who supports him in his hobbies and business. They often go on long rides together and plan to visit more places in the future.

Starting of Entrepreneurial Journey:

After completing his education, Mihir got a good job opportunity as a Quality Inspector for four districts from a reputed company when he was in the final year of engineering. The salary package was very attractive and he accepted the offer and joined the company. He worked there for 9 months. Simultaneously he was experimenting with chocolate making. He was very keen in chocolate making because he had seen his mother who used to take chocolate making classes. But he soon realized that his heart was not in the job and he wanted to do something on his own. He quit the job and invested all his hard earned money into becoming the super-stockist of one of the chocolates company for Sangli and Satara districts. He used to travel to Satara from Karad on his bike with boxes of chocolates on the backside. He enjoyed the business venture but unfortunately the company winded up its operations and shut down its manufacturing plant. The problem was with the company's product which was high priced compared to its competitors. But this experience helped Mihir to understand the insights of chocolate market. He understood how exactly this business works, what is the margin structure, how is the distribution channel, what retailers wants etc.

Mihir did not lose hope and decided to focus more on his own chocolate making. One pleasant day, a friend of Mihir's, who managed a café in Karad, approached him with an interesting proposal - to place his chocolates for sale at the café. Delighted by the opportunity, Mihir graciously accepted. Given that it was the initial week of February, Mihir decided to craft heart-shaped Strawberry-flavoured chocolates, carefully packaging them in heart-shaped boxes. Placing ten of these delightful boxes in his friend's café, Mihir eagerly awaited the outcome. To his joy, within a mere hour, every single box was sold, marking a significant milestone and his first taste of success in this venture. He registered his company Dark Bite Food and Beverage Pvt. Ltd. In September, 2018 and launched his brand Dark-Bite in the market. He started selling these chocolates at different retail shops in Karad. He introduced 13 different flavours of chocolates which received huge response from the customers. After looking at son’s interest in chocolate business, his mother suggested him to shift to Kolhapur as it was a more suitable market for his products and entrepreneurial skills. Mihir shifted to Kolhapur in 2019.

Mihir embarked on his chocolate-making venture by renting a small space to establish his production setup. His focus was on capturing the markets of Kolhapur, Sangli, and Kokan. Determined to make an impact, he diligently visited retailers in these districts, distributing samples of his delectable creations. The market responded positively, and Dark-Bite, his brand, began to gain popularity. However, in July 2019, Kolhapur experienced torrential rains that brought unexpected misfortune. During a particularly stormy day, Mihir's manufacturing facility was struck by lightning, resulting in damage to his machines and refrigerators. It was a significant setback, prompting him to relocate his setup. With resilience in his heart, he purchased new machinery and repaired the damaged equipment. Unfortunately, his new facility fell victim to theft, where the company's refrigerator, bike, and printer were stolen. This financial blow was particularly devastating as Mihir had solely relied on the profits of his business and had not taken a single rupee from his parents for the chocolate manufacturing enterprise. Despite the challenges, Mihir persevered, rebuilding his operations and overcoming a one-month production halt due to a lack of capital. Just as life and business began to normalize, the world was hit by the COVID-19 pandemic. Mihir faced yet another obstacle as he

had to discard almost 300kg of chocolates due to the lockdown and lack of orders. However, Mihir's unwavering patience and determination shone through as he utilized this period to experiment with different flavors and remained hopeful. When the first lockdown ended, Mihir's resilience paid off, and he started receiving orders again. Throughout these numerous setbacks, Mihir's indomitable spirit and refusal to give up proved instrumental in his entrepreneurial journey, as he defied the odds and emerged triumphant. In addition to his Dark-Bite Chocolate manufacturing business, Mihir has also taken on the role of an authorized franchisee for GoWaterless in Kolhapur City, operating under the name Mihir Auto Care. GoWaterless is a professional car care brand that offers a groundbreaking product for cleaning vehicles without the use of water. Mihir recognizes the significance of this innovation, considering the growing water crises in various parts of the Kolhapur. Alongside this venture, Mihir has established a syrup manufacturing facility in Dapoli, operating under the brand name Veda Foods. This facility specializes in producing uniquely flavored syrups. Although distribution of this product has not yet commenced, Mihir has plans to offer distributorships in the future. Currently, the syrups are exclusively available for sale in the Devgad region. Mihir says that his parents are his role models and inspirations, who taught him to be humble, respectful and hardworking. He says that he owes everything to them and tries to make them proud with his achievements. Mihir is an example of someone who follows his passion and lives life to the fullest.

About Dark Bite:
Before launching Dark Bite, Mihir diligently conducted comprehensive market research to gain valuable insights into customer preferences, purchasing behavior, and the overall perception of popular chocolate brands like Cadbury Dairy Milk. The objective of this research was to identify gaps and unmet needs within the market that Dark Bite could effectively target. Through his research, Mihir made a significant realization - there was not a single company in the market offering dark chocolate at pocket-friendly prices and in convenient sizes. This presented a barrier for middle-class individuals and students who were interested in purchasing dark chocolate but found the existing options to be prohibitively expensive. Mihir also identified another gap in the market - the absence of small-sized dark chocolate bars. Customers looking for a smaller portion had limited options available to them. Furthermore, Mihir noticed that dark chocolate bars priced at 10 rupees were virtually non-existent in the market. Cadbury offers Dairy Milk which is plain chocolate, Perk is wafer based chocolate; other non-healthy local chocolate brands were present in the Western Maharashtra Market. These insightful findings became the driving force behind Dark Bite's mission to provide affordable, pocket-sized dark chocolate options that catered to the needs of middle-class individuals and students. Dark Bite, founded in September 2018, takes pride in using high-quality, dark chocolate at reasonable pricing.

The turnover of firm which was around 6 lacs in opening year, now has reached to 12 lacs per annum. Despite the company's dedication to quality, it struggles to gain significant market share due to the overwhelming presence of Cadbury Dairy Milk, a long-established and highly popular brand. The company utilizes semi-automatic manufacturing machinery, employing it for tasks such as melting and moisture removal. However, the pouring and packaging processes are conducted manually. To handle the packaging aspect, the company has a team of three dedicated employees, while Mihir personally oversees and manages the operation of the machinery and pouring tasks. To differentiate Dark-Bite from Cadbury Dairy Milk, Mihir focuses on product innovation, packaging, weight and margin across the distribution channel. He actively seeks feedback from customers, distributors, retailers and industry experts to refine his products and strengthen his brand.

Product:
At present, Dark-Bite provides an array of distinctive flavors such as Coffee Chocolate, Crunchy Chocolate, and Rum Chocolate. Notably, the company offers Crunchy chocolate without employing a wafer base, ensuring a unique experience for customers. Mihir possesses the capability to manufacture approximately 30 distinct flavors of chocolates. However, due to the limitations of a small setup and

financial constraints, he is unable to introduce all these flavors to the market. Additionally, Dark-Bite treats its customers to limited edition collections during festive seasons like Diwali and Ganesh Festival, adding an element of exclusivity and delight to the product offerings.

Price:
Dark-Bite chocolates offer a range of variants, all priced at 10 rupees per packet. These variants are available in the delightful dark chocolate flavor, with each packet containing 14 grams of pure indulgence. In comparison, Cadbury Dairy Milk provides 11 grams of plain chocolate for the same price. When asked about other chocolate brands like Perk, which offer larger-sized chocolates at 10 rupees, Mihir expressed his perspective that wafer-based chocolates are not true representations of authentic chocolate. According to him, genuine chocolate lovers always prefer the essence of real chocolate without the inclusion of wafer components.

Place:
At present, Dark-Bite primarily serves the region of Western Maharashtra, Kokan region, although it has yet to fully penetrate all semi-urban and urban areas in the region. The company experiences substantial sales in Dapoli (Ratnagiri), attributed to Mihir's strong network in the Kokan region through his family connections. Following Dapoli, Sangli District stands as another significant market for Dark-Bite. Surprisingly, despite having a manufacturing setup in Kolhapur, the company has struggled to capture the local market in Kolhapur itself. Mihir attributes this challenge to the limited manufacturing capacity, which hampers their ability to cater to a broader market. Dark-Bite has received considerable interest from potential distributors eagerly waiting to collaborate; however, due to their current limited capacity, the company's hands are tied, preventing them from fully meeting the market demand.

Promotion:
Mihir has skillfully crafted a captivating brand identity for Dark-Bite, paying meticulous attention to detail in developing a name and logo that effectively convey the company's values and commitment to quality, resonating with the target audience. While Dark-Bite maintains a modest presence on social media, the brand's promotional efforts are limited due to financial constraints. Consequently, the company relies primarily on its existing distribution channel partners and satisfied consumers as the primary brand ambassadors. Dark-Bite actively participates in various exhibitions as part of its strategy to enhance brand awareness and reach a wider audience.

Packaging:
According to Mihir, one of the distinguishing features of his product is its eco-friendly and recyclable packaging. However, this type of packaging presents a challenge during the summer season, as it can lead to moisture buildup and chocolate melting due to the higher temperatures. To address this issue, the company is compelled to temporarily suspend operations for approximately two and a half months. Dark-Bite delivers its chocolates to distributors and retailers in plastic jars, with each jar containing 60 chocolates. These jars are of high quality, allowing retailers to reuse them once they are empty, thereby offering convenience. In contrast, Cadbury Dairy Milk chocolates are packaged in boxes of poor quality, which cannot be reused by retailers. This creates difficulties for distributors when it comes to storing the product in their warehouses.

Distribution Channel:
In order to effectively target the desired market, Mihir explores diverse distribution channels. As of now, Dark-Bite does not have any super-stockists or warehouses established in any specific region. Instead, the company follows a system of appointing distributors at the Taluka level, who then supply the products to retailers and, ultimately, to the end consumers. By not relying on super-stockiest, Dark-Bite can offer attractive profit margins to both distributors and retailers. Mihir believes that this strategy is crucial for

Dark-Bite to compete effectively against Cadbury Dairy Milk at the local level and gain a significant market share. To achieve this, the company provides distributors and retailers with at least 10% more profit margins compared to what Cadbury Dairy Milk offers.

Chocolate Market in Western Maharashtra:
Western Maharashtra is not only known for its rich cultural heritage but also for its thriving chocolate market. Chocolates have become a popular indulgence among the residents of Kolhapur, offering a delightful experience for people with a sweet tooth. In this informative article, we will explore the chocolate market in Western Maharashtra, highlighting its growth, diverse product offerings, and the impact it has on the local economy.

- **The Growing Popularity of Chocolates:**
  Over the years, chocolates have gained immense popularity in Western Maharashtra, becoming a favored treat for people of all ages. The rich and decadent taste, coupled with their availability in various forms, has contributed to the widespread admiration for chocolates in the city. Whether it's children enjoying chocolate bars, adults savoring artisanal creations, or families exchanging chocolate gifts, chocolates have become an integral part of celebrations and everyday life in Western Maharashtra. The chocolate market in this region has witnessed remarkable growth over the past few decades. The market size is projected to reach significant heights due to various factors, including a burgeoning young population, urbanization, rising disposable incomes, and the influence of Western culture.

- **Diverse Range of Offerings:**
  The chocolate market in Western Maharashtra offers a diverse range of products to cater to the varied preferences of consumers. From traditional milk chocolates to dark chocolates, white chocolates, and assorted flavors, there is something to suit every palate. Both local and international brands have established their presence in the market, offering a wide selection of high-quality chocolates. Additionally, Western Maharashtra has witnessed the rise of artisanal and gourmet chocolate makers who craft unique and indulgent creations, incorporating local ingredients and flavours. Both domestic and international chocolate manufacturers have capitalized on the growing demand in Western Maharashtra. Renowned global brands such as Cadbury, Nestlé, Mars, and Ferrero Rocher have established a strong presence and continue to dominate the market. Simultaneously, domestic players like Amul, Parle, and ITC have also made significant inroads, offering a diverse range of chocolates tailored to local tastes.

Key Players in the Chocolate Market:
Cadbury:
Cadbury, a household name synonymous with chocolates in India, has a strong presence in the market. It offers a wide range of products catering to various consumer preferences, including Dairy Milk, Silk, Bournville, and Celebrations.

Nestlé:
Nestlé, a global leader in the food and beverage industry, has a significant presence in the Indian chocolate market. Popular brands from Nestlé include KitKat, Milkybar, Munch, and Bar-One, catering to different consumer segments.

Ferrero Rocher:
Ferrero Rocher, known for its premium chocolates, has gained a strong foothold in the Indian market. Its flagship product, Ferrero Rocher, along with other brands like Kinder Joy and Nutella, has captivated the taste buds of Indian consumers.

Mars:
Mars, another global confectionery giant, has a strong presence in the Indian chocolate market. Popular brands from Mars include Mars, Snickers, Twix, and Galaxy, offering a wide range of choices to consumers.

Amul:
Amul, a renowned Indian dairy cooperative, has diversified into the chocolate market with its brand of chocolates. Amul offers a range of milk chocolates, including dark and fruit-nut variants, leveraging its strong brand reputation and distribution network.

Local Artisans and Brands:
In recent years, local artisans and homegrown brands have played a significant role in shaping the chocolate market in Western Maharashtra. These talented chocolatiers infuse their creations with regional influences, creating chocolates that reflect the local culture and traditions. This emphasis on local flavors and craftsmanship has garnered attention from both residents and tourists, contributing to the growth of the local chocolate industry.

- **Market Size and Growth:**
  The chocolate market in India has experienced robust growth in recent years. According to industry reports, the market was valued at approximately USD 2.8 billion in 2020 and is projected to reach USD 4.3 billion by 2026, growing at a CAGR of around 7% during the forecast period. Western Maharashtra market will have good say in this market share.

- **Economic Impact:**
  The chocolate market in Western Maharashtra has a notable impact on the local economy. It provides employment opportunities for chocolatiers, confectioners, packaging professionals, and sales personnel. The growth of the chocolate market has also led to an increase in demand for raw materials, generating business for local suppliers and farmers. Moreover, the popularity of chocolates in Western Maharashtra attracts visitors from nearby areas, positively impacting the tourism industry and supporting related sectors such as hospitality and transportation.

Factors Driving Growth of Chocolates in Western Maharashtra:
Several factors contribute to the soaring popularity of chocolates in Western Maharashtra:

- **Changing Lifestyles:** With an increase in urbanization and a fast-paced lifestyle, chocolates have become a convenient and delightful treat for consumers on-the-go.
- **Gifting Culture:** Chocolates have become a popular gift choice during festivals, birthdays, and other special occasions, contributing to heightened demand.
- **Rising Disposable Incomes:** As disposable incomes rise, consumers are willing to indulge in premium and gourmet chocolates, driving the market for higher-priced offerings.
- **Evolving Consumer Tastes:** The introduction of new and innovative flavors, as well as a growing preference for organic and healthy options, has attracted a diverse consumer base.
- **Marketing Strategies:** Clever marketing campaigns, celebrity endorsements, and innovative packaging have significantly influenced consumers' purchasing decisions.

Future Prospects:
The future of the chocolate market in Western Maharashtra appears promising, with immense untapped potential semi-urban and rural areas. As consumers become more health-conscious, the demand for organic and low-sugar chocolates is expected to rise in urban areas. Furthermore, the introduction of premium and

luxury chocolate brands and the increasing popularity of dark chocolates indicate continued growth in the market. The future of the chocolate market in India looks promising, with several factors indicating sustained growth:

- **Growing Health Consciousness:** The demand for organic, sugar-free, and healthier chocolate options is expected to rise as consumers become more health-conscious.
- **Product Innovations:** Manufacturers are likely to introduce new flavors, unique combinations, and premium offerings to cater to evolving consumer preferences.
- Expansion into Untapped Markets: Semi-urban and rural offer significant growth opportunities, as increasing disposable incomes and changing lifestyles drive chocolate consumption beyond urban centers.
- **E-commerce and Online Sales:** The rise of e-commerce platforms provides an additional avenue for chocolate manufacturers to reach a broader consumer base, especially in remote areas.

Way Forward:
Mihir has set his sights on establishing Dark-Bite as a formidable contender in the local chocolate market, despite being a relatively new player. The company specializes in producing high-quality dark chocolates. However, it faces significant hurdles in gaining a substantial market share, primarily due to the dominant presence of Cadbury Dairy Milk, which boasts a loyal customer base and an extensive distribution network.

The primary challenge Mihir's company faces revolves around raising capital. Approximately 30 lakhs are needed to upgrade the manufacturing facility to meet the growing demand. Although the company receives a surge in orders, its limited manufacturing capacity and semi-automatic machinery hinder its ability to cater to distributors and retailers effectively. Additionally, there is a pressing need to address packaging concerns, as the current packaging necessitates a plant shutdown during the summer season.

Creating a distinct brand identity and positioning that sets Dark-Bite apart from Cadbury Dairy Milk is a critical challenge that requires serious attention. The company must develop effective promotion and branding strategies to attract customers and foster brand loyalty, ultimately expanding its market share within the local market. However, achieving this goal also necessitates a significant allocation of the annual budget to support these endeavours. Mihir’s strong educational background, combined with his family's entrepreneurial influence, work experience in marketing, and hands-on business experience, positions him as a competent and determined entrepreneur. His journey represents the challenges and aspirations of many entrepreneurs striving to establish their brands in competitive markets. Mihir’s mind buzzed with ideas to elevate Dark-Bite and make it a brand that stood tall against the competition, including the mighty Cadbury Dairy Milk. He knew he had to find a way to capture the hearts and taste buds of the local market.

Case Questions:
1. Critically evaluate the qualities of Mihir as an Entrepreneur.
2. Can Dark-Bite survive and grow in Western Maharashtra against reputed and well established brands? Justify.
3. Differentiate Dark-Bite from Cadbury Dairy Milk, considering factors such as flavours, packaging, product innovations, and promotion and distribution strategy.
4. What are the main challenges Mihir facing in managing his chocolate manufacturing business?
5. What recommendations would you provide to Mihir to further strengthen the Dark-Bite brand and increase its market share in the local chocolate market?

Teaching Note:
This case study revolves around a local chocolate manufacturing company called "Dark Bite," which aims to challenge the dominance of Cadbury Dairy Milk in the local market. Dark Bite is led by its passionate founder, Mr. Mihir, who has a deep love for chocolate and a vision to create a successful local brand that can rival Cadbury Dairy Milk. The purpose of this case study is to explore the challenges faced by Dark Bite in competing with Cadbury Dairy Milk, a well-established and popular brand in the local market. This case study will focus on the branding strategies adopted by the Dark Bite to increase its market share and challenge the dominance of Cadbury Dairy Milk. By developing effective branding strategies, the company can create a distinct brand identity, attract customers, and increase its market share.

Recommendations:
Market Research 1:
Conduct a thorough analysis of the local chocolate market, including customer preferences, purchasing behavior, and perception of Cadbury Dairy Milk and other chocolate brands. Identify gaps or unmet needs in the market that can be targeted by the local chocolate company.

Brand Positioning:
Define a unique brand positioning for the local chocolate company that sets it apart from Cadbury Dairy Milk. This may involve highlighting the company's commitment to local sourcing, quality ingredients, or innovative flavors.

Brand Identity:
Develop a compelling brand identity for the local chocolate company that resonates with the target audience. This includes creating a memorable brand name, logo, packaging, and visual elements that convey the company's values and product attributes.

Marketing Channels:
Identify effective marketing channels to reach the target market. This may include a mix of traditional advertising, digital marketing, social media campaigns, and partnerships with local influencers or food bloggers.

Product Differentiation:
Explore ways to differentiate the local chocolate company's products from Cadbury Dairy Milk. This could involve introducing unique flavors, packaging designs, or product innovations that cater to specific customer preferences.
Based on the analysis, develop a set of recommendations for the local chocolate company to strengthen its brand and compete with Cadbury Dairy Milk. These recommendations should consider the company's resources, market dynamics, and long-term growth objectives.
Strategy: Enhancing Brand Awareness and Customer Engagement
Objective: Increase brand recognition and customer loyalty for Dark-Bite.

Develop a Strong Online Presence:
Create an engaging and user-friendly website that showcases the brand story, product range, and emphasizes the local and sustainable aspects of Dark-Bite.
Optimize the website for search engines to improve online visibility.
Establish active and engaging social media profiles on platforms like Instagram, Facebook, and Twitter to connect with the target audience.

Content Marketing and Influencer Collaborations:
Create high-quality content, including blog articles, vlogs, videos, and social media posts, that educate, entertain, and inspire customers about the world of chocolate, sustainability, and local sourcing. Collaborate with local food influencers or bloggers who align with Dark-Bite' values to promote the brand and its products.

Engage in Community Events and Partnerships:
Participate in local food festivals, fairs, and community events to introduce Dark-Bite to a wider audience and establish connections with potential customers. Forge partnerships with local businesses, such as cafes, hotels, or gift shops, to feature Dark-Bite products and cross-promote each other.

Customer Loyalty Program:
Implement a customer loyalty program that rewards repeat purchases, referrals, and social media engagement with exclusive discounts, special offers, or early access to new product releases.
Collect customer feedback and use it to continuously improve products and services.

Plan:
Month 1:

- Design and launch a visually appealing and user-friendly website for Dark-Bite.
- Develop a content calendar for blog articles and social media posts, focusing on local sourcing, sustainability, and chocolate-related topics.
- Identify and approach local food influencers or bloggers for potential collaborations.
- Research upcoming community events and register Dark-Bite for participation.

Month 2:

- Launch Dark-Bite' social media profiles and begin posting engaging content regularly.
- Collaborate with selected influencers or bloggers to create content featuring Dark-Bite' products and values.
- Participate in the first community event to introduce Dark-Bite to the local audience.

Month 3:

- Implement a customer loyalty program with clear rewards and benefits.
- Gather customer feedback through surveys or reviews and analyze it to identify areas of improvement.
- Evaluate the effectiveness of the content marketing strategy and adjust the content calendar based on engagement and audience response.

Month 4 and Ongoing:

- Continue engaging with customers through social media, responding to comments, and actively participating in conversations.
- Regularly update the website with new product launches, special promotions, and compelling content.
- Evaluate the impact of the influencer collaborations and explore new partnerships with local businesses.
- Monitor the customer loyalty program's performance and make necessary adjustments to enhance its effectiveness.

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Coping with ADHD: A story About Helping a Child with Attention-Deficit / Hyperactivity Disorder, India.

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Primary Case History of Ashwatth:
Ashwatth (for confidentiality purpose, name has been changed) was his parents' first child. He was born after a normal, uncomplicated pregnancy, an especially healthy baby who grew rapidly and reached the Standard developmental milestones—sitting, crawling, standing, walking, and so forth—either at or before the expected ages. He was a real motor (who raced around the house, filled with a curiosity that led him to grab, examine, and frequently destroy almost anything that wasn't nailed down.

Ashwatth's Primary Observation:
During his toddler period, Ashwatth's parents had no hint that his activity level was at all unusual and, in truth, in many ways it was just an exaggeration of tendencies that most toddlers exhibit. His parents felt exhausting to handle him Ashwatth's mother, Soumya, (for confidentiality purpose, name has been changed) had expected doing some freelance accounting at home to earn extra money. However, with her very first project she realized that this was completely unrealistic. Soumya wanted ti keep Ashwatth in a Day care while she worked, but she found that he wouldn't tolerate such detention for more than 2 minutes before he was yelling to get out. Once out, he was a travelling accident scene. Within minutes, Soumya would hear a crash or some other noise that demanded investigation.With the arrival of Ashwatth's sister, Shravani, Soumya and Sudarshan developed a budding awareness that their problems in handling their son might not be due entirely to their inadequacy. As an infant Shravani—unlike Ashwatth—did not try to turn and break free every time she was held. Later, there were other differences. As a toddler, she used to sit quietly for long time by just playing with her toys. She used to listen whole story told by mother Soumya, whereas Ashwatth would lose his concentration and start fidgeting.

When Ashwatth reached school age, and Soumya and Sudarshan received more objective feedback about his situation, their sense of his difficulties became more defined. After his first day of school, his kindergarten teacher described him as "quite a handful"; then, at the parent-teacher conference, the teacher informed Ashwatth's parents that his activity level was well above that of the other children. In the first and second grades, as the academic component of the curriculum increased and the demands on the children for behavioral control increased correspondingly, Soumya and Sudarshan started to get yet stronger complaints from his teachers. In addition, Ashwatth's academic progress was slowed because of his problems with attention. Although he eventually learned to read, he didn't really begin to master the skill until the second grade. Now 8 years old and in the third grade, Ashwatth was falling behind the other children in a wide range of academic tasks. With encouragement—actually, insistence—from his teacher, Mrs. Vrusha, his parents decided to seek help for him at the Child Development Center.

A Parent's Perspective regarding Ashwatth
By age 8, Ashwatth rarely carried out his parents' requests or instructions, or he carried them out only partially before becoming caught up in some other activity. One evening in November was illustrative: Ashwatth's mother had just finished preparing dinner when she went to her son's room and asked him to stop playing his video game, wash his hands, and take his place at the dining room table. "Okay, Mom," Ashwatth answered."Thank you, Ashwatth," Soumya said as she went back down to the kitchen to do some final preparations. However, 5 minutes later she realized she still had not seen Ashwatth. She went back up to his room and found he had never turned off the video game."Ashwatth, I mean it. Stop playing now!" she told him."Oh, all right." he said, and turned the game off.Although this was Soumya's second effort,

for once Ashwatth was coming without too much of a struggle, so his mother was relieved. “Go wash your hands,” she reminded him.“Okay,” Ashwatth replied. He headed down the hall toward the bathroom, but caught a glimpse of his 5-year-old sister already seated at the dining room table, holding a new doll. Shravani was pulling a string that made the doll talk.“Hey, neat!” Ashwatth exclaimed. “Let me try.” He ran over, grabbed the doll from Shravani’s hands and pulled the string. The doll spoke in a squeaky voice, while Ashwatth’s sister complained that she wanted her toy back. “Does the doll say anything else?” Ashwatth asked, ignoring Shravani’s protests. He began to pull the string over and over in rapid succession until, finally, it broke off.“Uh, oh,” Ashwatth observed.“Mommy, he broke my doll!” Shravani cried.

Ashwatth’s mother came from the kitchen to find him holding the broken doll while his sister wept. What had begun as a simple attempt to get Ashwatth to wash his hands and seat himself at the dinner table had ended in a tumultuous scene. And so it would go. Unless Ashwatth was attended through every task of the day, he would get unfocussed, and it usually ended with an argument or something getting broken. Because of that, his parents usually found it easier to do things for Ashwatth— like make him eat, wash his hands— because getting those tasks by himself was itself a great task. In spite of that Ashwatth’s behavior was disruptive in many ways. If his mother was busy in other work or on call, he would start yelling out , throwing the things to grab the attention.

Even playing out in the yard was not a solution, because if Ashwatth wasn’t watched closely, within a flash he might run out into the street after a ball, without any regard for traffic. When playing indoors with neighborhood children, Ashwatth was behaving like boss, continually grabbing their toys or refusing to share his own. Because of these problems, Ashwatth had few friends. Instead, most of his leisure time was spent watching television or playing video games, activities that Soumya and Sudarshan were reluctant to encourage, but which they felt forced to accept since the 8-year-old could do little else without supervision

Ashwatth’s third-grade teacher, Mrs. Vrusha, found his behavior intolerably disruptive in school. She found that his behavior was getting hurdle some in his learning though he was cleaver. His attention span was less and he has several severe behavior problems due to that he used to fail to complete his study. He was reluctant to do whatever he wanted to do irrespectively the planned tasks. Out in the schoolyard during recess, Ashwatth’s difficulties continued. As the children lined up for turns on the slide, Ashwatth pushed to the head of the line, almost knocking one child off the ladder as he elbowed his way up. While playing basketball, he pushed other students and grabbed the ball. The supervising teacher told Ashwatth to behave properly and give the ball back, but Ashwatth kept denying, finally, she took the ball away from him, and Ashwatth wept in complaint.

“Hey, give that back!” he insisted.“You took this ball from someone else,” the teacher explained. “But you took it from me. That’s not fair!” Ashwatth argued. The teacher sent Ashwatth to sit on a bench for the rest of the recess period. This was an average day for Ashwatth at school. On some of his better days, he was less physically disruptive, but he still had his problems, particularly in attending to and completing his schoolwork. In a typical case, Mrs. Vrusha would give the class an assignment to work on, such as completing a couple of pages of arithmetic problems. While most of the children worked without supervision until the assignment was completed, Ashwatth was easily distracted. When he was about to complete first page, he would lose his attention and, rather than continuing, would begin fiddling with some object on his desk. Other times, if another child asked the teacher a question, Ashwatth would stop his own work to investigate the situation, getting up to view the other child’s work and failing to complete his own.

Finally, at a PTA meeting, Mrs. Vrusha told Ashwatth’s parents that she thought Ashwatth’s problems might be attributable to an attention-deficit disorder. Concerned about Ashwatth’s growing academic and social problems. Soumya and Sudarshan decided to seek professional assistance. They arranged for a consultation at the Child Development Center.

Criteria in DSM-5 for a diagnosis of attention-deficit / hyperactivity disorder,
Kindly go through DSM -5 for the details given below-
combined type-Diagnostic Criteria for Inattention, Hyperactivity and impulsivity, Severity, Diagnostic Features, Associated Features, Development, Risk and Prognostic Factors, Culture-Related Diagnostic Issues, Sex- and Gender-Related Diagnostic Issues, Diagnostic Markers, Association with Suicidal Thoughts or Behavior, Functional Consequences of Attention-Deficit/Hyperactivity Disorder, Oppositional defiant disorder. Intermittent explosive disorder. Other neurodevelopmental disorders, Differential Diagnosis.

Recommendations:

1. **Observation Schedule for Parents, Teacher, Pediatrist:**

After repeatedly observing a child's activities, inattention, and recklessness, teachers or parents often conclude that he or she suffers from **attention deficit/hyperactivity disorder (ADHD).** However, 25 years of practice had taught child psychiatrist Dr. Yogesh that such a conclusion is often premature and inaccurate, leading to incorrect and even harmful interventions. Thus, when Ashwatth's parents brought him to the Child Development Center, Dr. Yogesh was master to conduct lengthy sessions, interviews with the child, his parents, and his teacher; to arrange for Ashwatth to be observed at school, on ground or at home by an intern; to do physical examination by a pediatrician to find out any medical conditions (for example, lead poisoning) that might be causing the child's symptoms and to administer a battery of psychological tests.

Assessment-Testing:
In addition to obtaining a description of Ashwatth's current problems and his history from his parents, Dr. Yogesh had Ashwatth's mother respond to questions from different assessment instruments: behavior problems, and Parenting scale, which contains questions specifically for assessing ADHD. Similarly, Dr. Yogesh sent the *teacher's Checklist* to Mrs. Vrusha. Ashwatth's battery of tests included the *Wechsler Intelligence Scale for Children and the Wechsler Individual Achievement Tests* (to provide scores in reading, mathematics, language, and written achievement). The results of these tests confirmed the impression already supplied by Ashwatth's parents and Mrs. Vrusha: Ashwatth's intelligence was above average, and his academic achievement was lower than his intelligence scores would predict. These findings established that Ashwatth's academic problems were not due to intellectual limitations.
After completing this comprehensive assessment, Dr. Yogesh was confident that Ashwatth's difficulties met the criteria in DSM-5 for a diagnosis of attention-deficit/ hyperactivity disorder, combined type. He exhibited a majority of the symptoms listed both for inattention (for example, difficulty sustaining attention, failure to follow instructions, oblivious to verbal commands, easily distracted) and for hyperactivity-impulsivity (for example, difficulty remaining seated, excessive motor activity in inappropriate situations, difficulty waiting his turn).

Progress in Ashwatth's case:
Dr. Yogesh had come to believe that a combination of the interventions increases a child's chances of recovery. By helping the child to focus better and slow down, the medications may help him or her to profit from the procedures and rewards used in the behavioral program. Subsequent research has shown that all children—both those with and those without ADHD—experience an increase in attentional capacity when taking stimulant drugs, resulting in behavior that is more focused and controlled. This may create the appearance of sedation, but the children are actually not sedated at all.
Unfortunately, the drugs are not effective for all children, and only partially effective for others. And even when a drug is optimally effective, other areas of behavioral adjustment may still need to be addressed, because the ADHD child may have little practice in the more appropriate behaviors that he or she now is theoretically capable of producing. This is where behavioral programs may come into play.

- **Behavioral Programme- Therapeutic Procedure**

In the ideal case, both parents and teachers are involved in implementing a behavior modification program, which is based on the *ABC model of behavior*. The A in the model denotes *activating events,* the conditions that provide the occasion for a particular behavior; the B denotes the *behavior* itself; and the C denotes the *consequences* of the behavior. Thus, a given behavior is seen as prompted by certain activating events, and maintained by its consequences. It was maintained, according to the model, by the rewarding effect of viewing the airplane, which was much greater than the punishing effect of Mrs. Vrusha's warnings or even of being sent out of the room. In a behavior modification program, the usual strategy is to increase the rewards for engaging in alternative behaviors under the same antecedent conditions. Thus, if the reward for remaining seated can be made to exceed the reward for viewing the airplane, then, theoretically, the child will be more inclined to remain seated.

Learning alternative behaviors may involve more than just adjusting incentives or activating events. Some skills may have to be taught directly. A child who is not polite at all, need to learn the skill before he or she gets hyper. behavioral skills training follows a typical sequence. First, the child receives an explanation of the skill; next, he observes a model demonstrating the skill; then, he practices performing the skill, first through role-playing in the training session and then through real-life behavioral practice. After the skill is learned, teacher and Parents can prompt the child to employ it in a given situation. For example, after the skill of sharing is well learned, the parent can prompt the child to "share" in a situation calling for cooperation with another child, and then praise the child appropriately for so doing. Theoretically, the more the skill is employed and reinforced in a variety of appropriate circumstances, the more the child will use the skill spontaneously, receiving naturalistic positive reinforcement in the form of friendly or gratified reactions from others.

Thus, Dr. Yogesh outlined for Ashwatth's parents four treatment components:
(a) Stimulant medication,
(b) Parental training in the use of behavioral modification principles,
(c) Social skills training for Ashwatth,
(d) Token economy in the school environment.

Dr. Yogesh explained that stimulant medication was important for increasing Ashwatth's attention and impulse control; this, in turn, would enhance his capacity to do what was expected of him, in general and in the mode of response to the behavior modification plan. The parental training, he explained, would acquaint Soumya and Sudarshan with principles of behavior modification, allowing them to deal optimally with any remaining behavior problems, as well as with Ashwatth's behavior during periods when he might not be taking medication (so-called drug holidays).

Skills training seemed necessary, Dr. Yogesh said, in light of Ashwatth's problems in getting along with other children and in cooperating at home. Finally, he explained that, since a large portion of Ashwatth's difficulties occurred in the class, it would be helpful for both Ashwatth and Mrs. Vrusha to have a behavioral program operating in that environment.

Dr. Yogesh spoke to Mrs. Vrusha about the matter, and the teacher was agreeable to instituting a program provided it wasn't too burdensome; but given Ashwatth's problems up to now, Mrs. Vrusha said that almost anything seemed less burdensome than simply doing nothing.

Actual Implimentaton of Ashwattha's Medication and Therapy-Results:
Out in the schoolyard, Ashwatth was now less inclined to rush into other children's games or push others aside. But he still did not have a good social sense. Either he drifted off by himself or, if he did join a game,

he failed to abide by the rules consistently, which ended up provoking arguments. For example, in joining a game of catch with four other children, Ashwatth was inclined to keep the ball after he received it; he would then hold it and giggle, in spite of the other children's yells that he was supposed to throw the ball to the next receiver.

At home, Ashwatth seemed physically calm. He sat at the dinner table for whole lunch, without interruption and without grabbing things or to play under the table. Also, his passion for jumping on the beds was gone, and he became more dependable in carrying out instructions. For example, if his parents sent him to wash up and sit at the table, they now could count on his following through 75 percent of the time (as opposed to 25 percent, as before). Tendencies such as stubbornness and defiance remained a problem, however; it remained a struggle to make him to do chores, to get started on his homework, or to follow household rules in general. He continued to run to his mother when she was on the call, shouting for the things, snacks, toys, and videos. Overall, however, the medication seemed advantageous.

Parental training

To gain some knowledge of behavioral management techniques, Ashwatth's parents enrolled in a training group for the parents of ADHD children (at about the same time that Ashwatth began taking medication). The group, led by psychologist Dr. Suyash, was designed to educate parents about both ADHD and the principles of behavior modification for managing it. Group sessions were held three times a month, and once a month Dr. Suyash met alone with Ashwatth's parents to discuss the child's individual situation.

At the very first group session, Ashwatth's parents found comfort in learning that other parents' experiences closely paralleled their own. All the parents were able to share their experiences and found that they were all dealing with very similar concerns. Many parents saw humor in some of the situations, and this helped to soften the impact of what they had all been going through.

It also helped Soumya and Sudarshan to know that some of their marital disputes were shared by the other parents. Like the others in the group, Ashwatth's parents often argued over how to deal with their child. Although it didn't solve the problem, it helped them to know that even their arguments were "normal," given the circumstances.

In additional group sessions, Soumya and Sudarshan were progressively introduced to the ABC principles of behavior management. Among the points they found helpful was the idea that parents can become unduly focused on discouraging problem behaviors through criticism or punishments; the punishments, in turn, are often ineffective. A different approach, Dr. Suyash explained, was to think about the alternative behaviors (B) that parents would like their children to perform under the same Activating event(A), and to provide praise and rewards (C) accordingly.

Ashwatth's parents explored this principle in greater detail in individual sessions with the group leader, as they felt it applied particularly to the way they were handling (or mishandling) many situations with their son. For example, a regular problem with Ashwatth was that he interrupted his mother when she was on the call. She had to lock herself in the bedroom in order to have a coherent conversation with a pediatrician, repairman, friend, or relative. Often, even locking herself in was not enough to ensure peace and quiet, as Ashwatth might start pounding on the door in order to convey his demands, in spite of repeated scolding.

To address the problem, the psychologist asked Ashwatth's parents to think of specific, alternative actions they would like Ashwatth to carry out under these conditions. At first, all Soumya and Sudarshan could think of was "not interrupt," but Dr. Suyash reminded them of the stipulation that they think of a tangible alternative behavior for Ashwatth to carry out under the same circumstances. After some discussion, they came up with the idea of having Ashwatth write down his requests whenever his mother was on the call. They noted that their son loved to write notes, so this might be a tangible thing he could do to satisfy his demands temporarily, and allow him to resist interrupting. With further discussion, Ashwatth's parents and

the psychologist worked out the following procedure: Before Soumya made a call or answered the phone, she would hand Ashwatth a special message pad, reminding him to write down any questions or problems that he had while she was talking; Soumya would then give prompt attention to Ashwatth's messages as soon as she was off the phone; finally, if Ashwatth succeeded in using the pad, instead of interrupting, for the majority times in a given week (his mother would keep a checklist to tabulate Ashwatth's compliance), he would be given a special reward on the weekend (such as eating out at his favorite restaurant).
This was the first behavioral plan that Ashwatth's parents put into effect, and after smoothing out a few folds, Ashwatth was able to follow the procedure, even to the point of fetching the message pad himself whenever the phone rang. Eventually, he stopped interrupting almost entirely.After these successful milestone, other behavioral plans were put into effect for such as household chores and homework completion. In both cases, Ashwatth's parents found an effective formula by reversing antecedent conditions and behavioral consequences. For example, they saw to it that television viewing would always follow the completion of homework, rather than vice versa.

Social Skills Training
Soumya and Sudarshan also enrolled their son in a class where he could learn skills for getting along better with other children. The class was composed of other children receiving treatment at the center for ADHD.
During each class the focus was on learning one particular social skill, such as sharing. First, the group leader explained the concept of sharing, and then asked the children their own opinions of what it meant. Next, she demonstrated the implementation of the skill with several children in different, contrived, situations: sharing toys, sharing food, or sharing a seat. Then each child came up,
one by one, and practiced sharing in each of these hypothetical circumstances. The group leader and the other children then gave the child corrective feedback on how well he or she had shared. Similar classes were devoted to other social skills like cooperating, speaking calmly, making polite requests, and following rules.

Ashwatth's parents and Mrs. Vrusha received written guidelines for discussing the social skills training sessions in the school, at the home and for guiding Ashwatth to use the skills in everyday situations. Many of the opportunities to prompt him arose at home in his interactions with his 5-year-old sister. With continued prompting, Ashwatth started to share things with his sister spontaneously on many occasions, which increased the harmony in the household.
Because of these successes, and Ashwatth's additional successes using the social skill of cooperation, Soumya and Sudarshan finally felt confident enough to invite one of Ashwatth's schoolmates over for a play date. The last time a child had come to their house, it had been a disaster, as Ashwatth had refused to offer any of his toys to his guest. Needless to say no child was likely to return after such treatment. Although this play date was far from perfect and needed Soumya's attention, it turned out to be reasonably pleasant.

Token Economy
The token economy is an element of the ABC behavior modification system; it uses tokens, rather than immediate, tangible rewards, to reinforce desired behavior. The tokens are exchanged for an actual reward at the next time. Token reinforcement is particularly advantageous for ADHD children, who can get so wrapped up in the attractiveness of the actual reward that they find it difficult to remain mindful of the behaviors that the reward is designed to encourage.

Mrs. Vrusha thought that some form of behavior modification might assist her in regulating several of Ashwatth's behaviors. Accordingly, she and the therapist decided to focus on encouraging three specific school behaviors in Ashwatth: raising his hand to answer questions (instead of blurting out answers), staying in line, and finishing in-class assignments. As token reinforcers, Mrs. Vrusha would use dinosaur stickers affixed to a piece of paper, various stickers in each of three columns reflecting Ashwatth's

compliance with the three behavioral objectives. According to the plan (explained to Ashwatth in a meeting with his parents and Mrs. Vrusha), Mrs. Vrusha would keep track of Ashwatth's compliance separately for the morning period and the afternoon period, and award him one sticker if he achieved full compliance with a given behavioral objective in a given period. He would receive morning stickers in the lunch break, and his afternoon stickers when school got over. The stickers could then be redeemed at home for special privileges (going out to eat, going out to a movie, an extra half hour of television or a video game, and so forth).

Ashwatth liked the idea of getting stickers so he agreed to the plan. On the first morning of the program, he received only one sticker: for finishing his assignment within the allotted time (he had blurted out a couple of answers and had wandered off the line going to art class). In the afternoon, however, he received two stickers: for staying in line and for finishing assignments. After a few more days on the program, Ashwatth was averaging five stickers per day, a level that he enables to maintain, and which reflected a substantial improvement in all three areas.Within 2 months of the combined treatment program, Ashwatth had improved considerably. He was conforming to classroom rules by staying in his seat, not talking, and mostly finishing his assignments. When he deviated, he required only gentle reminders from Mrs. Vrusha to get back on track. Similarly, at home, he was less hectic. He could carry out instructions more dependably, and he usually accepted his household responsibilities without too much argument. In peer relations, Ashwatth was still learning the culture of give and take, but with periodic guidance and further experience he was becoming increasingly effective. As a result, he was getting along well with his sister, and he now had a couple of friends who would come over regularly to play, and who invited him to their homes as well.

Getting back to the Old p\Patterned Behavior:
Unfortunately, after about 4 months of this improved functioning, Ashwatth began to slip into some of his old patterns both at home and at school. His parents felt that the problems had to be addressed, as he seemed to be losing ground. The recurrence of problems seemed to coincide with the birth of his new baby brother. In a discussion with Dr. Yogesh, Ashwatth's parents wondered whether their total preoccupation with the birth of the baby, and their consequent inability to implement many features of the behavioral program (including not following through on redeeming Ashwatth's dinosaur stickers), was responsible for the slippage in his progress. A renewed effort by the parents to apply the behavioral program, and an adjustment in the dosage of Ashwatth's medication, helped him to regain his previous achievements within a few weeks.

Conclusion:
After 16 sessions of parental training in group (over a 6-month period), 6 sessions of individual parent training, 6 sessions of social skills training for Ashwatth, and 2 meetings at school with Ashwatth's teacher, his ADHD symptoms stabilized at an improved level. Ashwatth reported that he was happier at school and enjoying time at home with his family. He still took medication and saw Dr. Yogesh for a checkup every 4 months.
Ashwatth's parents planned to give Ashwatth a drug holiday in the summer and felt confident of their ability to manage his behavior during that time with just the behavioral techniques. They were a family again—sometimes laughing, sometimes crying— but, overall, enjoying their lives and activities together.

Case Questions:

1. When did Ashwatth's parents begin to suspect that Ashwatth might be having a behavioral disorder?
2. Describe behaviors that suggest that Ashwatth's activity level is higher for a child his age.
3. When did Ashwatth's family finally receive more objective feedback about Ashwatth's behavior?

4. How much time did it take for Ashwatth's teachers to suggest professional help regarding Ashwatth's disruptive behavior?
5. Why did Dr. Yogesh feel the importance of conducting assessment of Ashwatth before diagnosing ADHD?
6. Describe some ADHD assessment techniques used by Dr. Yogesh .
7. What were the assessment results that directed Dr. Yogesh to diagnose ADHD in Ashwatth?
8. Why did Dr. Yogesh decide to go through medication and behavioral therapy to handle Ashwatth?
9 What are the side effects of stimulant medications in treatment of ADHD?
10. What is the ABC model of behavioral therapy. give examples.
11. What were the treatment components formed for Ashwatth's treatment?
12. Why is it important for Ashwatth's parents to be a part of the treatment plan?
13. Elobarate the ABC plan which was developed by Ashwatth's parents to control his "interrupting" behaviors.
14. What other childhood behavioral diagnoses are often comorbid with ADHD?
15. What is a token economy.
16. What event disrupted Ashwatth's progress?
17. What was the final outcome of sessions of group parenting

Teaching Note & Procedure:

Sr. No	Content	Resource	Teacher's activity	Student's Activity	Mnts
1.	**Introduction**	-	1. To make students aware about psychological conditions	1. To listen	5
2	**Presentation of session objectives**	-	2. To make students understand the objectives of the session	**1.** To listen	5
3	Phase 1- **factual part** Rucha's case	Exact half part of the case in Printed or soft copy format	1. To form the group of students. 2. To ask the students to read the case individually	1. To read the given case. ii. Mark the vital points and to make the notes of it.	30
4	Phase II- **Root cause of case** Reflecting on Question part-	Question part of the case in Printed or soft copy format	1. To ask students to discuss the case study first. 2. To ask students to read the questions and reflect in the group	1. To discuss the case study in the group with the pointers made. 2. To read the questions and reflect on it by discussing in the group.	40
5.	Phase III- **Recommendations/ Treatment**	Recommendation or treatment part of the case in Printed or soft copy format	1. To ask the students to discuss the recommendation treatment, therapy selection part	1. To discuss the recommendation treatment, therapy selection part	30
6.	Phase IV- **Presentation**	-	1. To ask 1participant of each group to present the reflections in front of all	1. To select one presenter among the group.	40

			students. 2. To ask other groups and participants to give inputs on presentation.	2. To participate and reflect on the discussion.	
7.	**Key learning, Summary & closing statement**	-	1. To elaborate, summarize the case.	1. To note down the summary.	5

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Impact of Ichalkaranji Textile Industries Effluent on Surface Water Contamination: A Case Study of Southern Maharashtra, India.

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Increasing industrialization and urbanization lead to environmental pollution. Moreover, the pollution of the aquatic environment causes extremely serious environmental damage and consequently negatively affects living organisms. The effluent generated by the industries is one of the sources of pollution. The nation's currently shorter lifespan may be primarily related to polluted water, air, and soil from industrial wastewater (IWW) (WHO, 2002). These chemicals are connected with a variety of health issues. (WHO, 2003). The discharge of hazardous WW from different parts of society has an unfavourable effect on aquatic creatures, soil health, the sustainability of ecosystems, and water quality. Textile industries are one of the largest water consumers and polluters resulting in high wastewater generation. Textile processing industries largely employ dyes and discharge a large volume of wastewater after the dyeing process. These dyes are aromatic hydrocarbons, derivatives of benzene, toluene, naphthalene, phenol and aniline and the use of dyes in textile processing industries releases organic and inorganic pollutants in the environment. Textile dyes in the effluent are toxic, highly stable and contain heavy metals that are carcinogenic. Heavy metal pollution is an ever-increasing problem of our rivers, lakes, and ocean.

These heavy metals showed a remarkable effect on the aquatic plants and animals which through bio magnification enters the food chain and eventually affects human beings. Worldwide occurrence of heavy metal accumulation in oysters, fish, sediments and other components of aquatic ecosystems have been reported. Despite their capacity to create soluble compounds that release metal ions readily accessible for living creature absorption, these hazardous metallic elements that are reaching water bodies absorb into particulate matter (PM).20% of the WW produced globally comes from the fashion sector, and dyeing textiles is ranked as the 2nd most significant global water polluter. Industries implement a great amount of water to make apparel and everyday items, and the WW that stays behind has a detrimental effect on the natural world. Impacts soil/groundwater contamination, people, creatures, and ecosystems. A 2019 study by the World Bank said that "a few investigations have indicated that around one-fifth of the world's water contamination is triggered by the textile sector."

The textile sector consumes a lot of water for techniques like browsing, whitening, and coloring. The main culprit of the pollution element is WW. WW can lower oxygen levels that may prove detrimental to aquatic creatures and the aquatic environment as a whole, if it fails to undergo treatment prior to being added to the basin. One important substance that is used in the clothing sector is cotton. To create cotton T-shirt and a couple of jeans, about twenty thousand gallons of water is needed. Furthermore, by using a lot of nutrients and pesticides, traditional cotton farming may adversely affect nearby water sources. Compared to other crops, cotton farming uses the highest level of insecticides. The impact is substantial if cotton is used to make plenty of different textile goods. Regretfully, waterborne illnesses threaten the existence of over 3,575,000 individual's year (Sweety et al., 2018). These figures mainly consist of youngsters. Individuals may acquire multiple illnesses if they consume or utilize polluted water for different reasons due to the incorporation of formaldehyde, chlorine as well, and toxic metallic substances in the textile sector. Toxic elements' adverse impacts on rivers are being tackled right now by a number of the largest companies in the world, such as Nike, Adidas, and H&M.

Maharashtra boasts the most contaminated rivers in the nation & is the largest manufacturer of textiles and clothing for the nation. According to a 2019 report by the Maharashtra Pollution Control Board (MPCB), contamination is a problem in roughly 67% of textile mills. Commercial units in Maharashtra are given an

icon rating that ranges from one to five, reflecting the magnitude of their particle emissions. A single star indicates substantial waste and failure to comply, whereas a total of five stars indicate conformance. According to MPCB, a total of 20 textile companies in Maharashtra were been designated as "two star" components, whereas 23 fabric plants have being classified as "one star" operations. A water issue, suggests Devyani Hari, Director of Programs at the Center for Responsible Business (CRB), originated several initiatives and changes in the water industry have been developed as a consequence of people's worries about the Maharashtra water scarcity. The Maharashtra Water Resources Regulatory Authority (MWRRA) was established in 2005, following the implementation of the State Water Strategy scheme in 2003. With the basin of rivers serving as an organizational unit, these efforts and changes seek to enhance the handling of water through the adoption of a multi-sector approach. Currently, companies operating in areas under the Maharashtra Industrial Development Corporation (MIDC) are required to recover as much as half of the WW that they use. Thus, the creation of approaches to the issue regarding water contamination is the primary goal of this case study.

River water is often very drinkable at its original location, but as it is being used for various reasons and gets contaminated, it comes into contact with other contaminated water and becomes considerably less suitable for aquatic creatures to flourish. Polluted water from rivers and WW need to be regulated before being used across distinct zones. Panchganga River flows from Kolhapur City to Shirol, further meets to Krishna River at Nrusinhawadi. Since the River Bhogawati confluences with five other rivers—Kumbhi, Dhamani, Tulsi, and Bhogawati—it is now known as Panchaganga from Prayag Chikhali. Because of its clothing sector, Ichalkaranji has a reputation as Manchester City in Maharashtra. Ichalkaranji, which was a small village in the eighteenth century has now grown into a good-sized city. It is situated midway between Kolhapur and Miraj railway line. This railway line was built in the later part of the nineteenth century. Ichalkaranji is 9.6 Km. South of the railway station Hatkanangale and it is 29 Km. from Kolhapur. Kolhapur is its district place. Ichalkaranji is situated on latitude 16°-4$^{0'}$ North and longitude 74°-32' East. To the North of Ichalkaranji is Sangli district. To the West is the district Sindhudurg, to the South and the East is Belgaum district of Kamatak state.

Textile Industry in Ichalkaranji:

Certain villages in Maharashtra were well-known for their weaving. This art has been well-known for over a century in Ichalkaranji and the surrounding villages. Currently, Ichalkaranji is referred to as the Manchester of South Maharashtra. According to historical sources, Ichalkaranji itself had 236 of the 636 handlooms in Hatkanangale Taluka of Kolhapur State in 1845 A.D. Even after 37 years in 1882 in Kolhapur State have 2102 total number of weaving looms and of these 688 were in Alta 654 in Gadhinglaj, 422 in Karvir, 397 in Shirol, 350 in Ichalkaranji, 226 in Panhala, 179 in Kagal, 86 in Bhudargad, 58 in Bavda, and 32 in Vishalgad. Besides these, 17 looms functioned in Kolhapur jail factory which weaved all sorts of cloth including towels and table cloth. It means that within 37 years 114 handlooms increased in Ichalkaranji. The important cause was that the plantation of the Kumtha cotton was 15 the major crop in the neighbouring villages.

A new period in Ichalkaranji history began in the year 1892. In the state of Ichalkaranji, Narayan Babasaheb was installed this year. Ichalkaranji in the district of Bombay became one of the major weaving centres thanks to his capable leadership and enthusiastic participation. The number of looms is listed in the 1895 report of an industrial study in Kolhapur State. There were 447 looms producing cotton fabric in Ichalkaranji Jahagir by 1895, up from 337 in 1882. There is no doubt that Ichalkaranji will soon develop into a hub of thriving and significant trade as a result of its large population, dry climate, weekly bazaar day, and most importantly, the village's educated and cultured ruler Shrimant Babasaheb, who is responsible for protecting its interests. If other towns in Kolhapur State follow Ichalkaranji's lead, they will gain significantly. Babasaheb was a foresighted king who enthusiastically supported the industrialization

of his Jagir city. He created a separate Municipal Council in 1873 to oversee civic matters. Ichalkaranji's rapid expansion has been aided by the Municipal Council.

Narayan Babasaheb and Textile Industry:

We have already stated about the vision of Babasaheb in industry especially in textile-field, Babasaheb invited some weavers (Koshti) families from neighbouring villages to Ichalkaranji sanctioned lands for their residence-cum-factories and gave them initial financial assistance to produce cloth on handlooms. This plan of Babasaheb has met with great success and "Ichalkaranji was known for its cloth production especially for its Patagi and Kunabau sutade." The Galichas (woollen carpet) of Ichalkaranji were famous in those days.

The economic condition of the Koshtis was not sound so, Babasaheb often advanced money through the state treasury. He gave concessions in even tax. He passed laws and created a healthy atmosphere for the growth of the weaving industry. He supplied at concessional rates plots of land for the weavers. In this way he gave full support to those who were genuinely interested in this new job.Upto 1892, only the handloom industry expanded, but under constructive leadership the power loom industry started in Ichalkaranji. At the beginning, with the help of power loom grey cloth was produced. The first power loom factory named as Vyankatesh Rangtantu Mills was started by Vitthalrao Datar. For the expansion of every industry, finance is a crucial component. The first bank in Ichalkaranji, named "The Ichalkaranji Central Cooperative Bank" (Ichalkaranji Urban Cooperative Bank), was founded in 1929 for this reason and with Babasaheb's backing. Ichalkaranji was able to establish itself as a significant power loom weaving hub and ultimately earn the nickname "Manchester of South Maharashtra" thanks to Babasaheb's vision and unwavering backing. "Shrimant Narayanrao Babasaheb has been a pioneer in fostering and developing women's education in Ichalkaranji and encouraging rural cooperative credit societies and Grain Banks in the villages," The Times of India, Bombay said. Additionally, he has supported the state's weaving industry. In essence, Ichalkaranji grew to be a significant weaving hub because of the patronage of Babasaheb.

Textile Industry after Independence

After independence some enterprising persons brought from Bombay and Ahmedabad, old power looms discarded by the Mills and laid the foundation of a booming industry in Ichalkaranji. The cooperative movement also frolicked a significant role in the weaving industry. Success of sugar cooperatives inspired and emboldened cooperators to organise cooperative spinning mills also and accordingly the 'Deccan Cooperative Spinning Mill, was established at Ichalkaranji in 1962 as the first cooperative venture in the state to commence production. Marwari merchants have also been instrumental to the growth of the weaving industry. They built up a market for power loom sarees and dhoties. Further the labour became familiar with the techniques of industry and in a short period a high standard of workmanship developed. Now Ichalkaranji produces 20 lakh metres of cloth per day and yam consumption stands at 140,000 Kg. per day. The total number of looms is 40000 which employs about 60,000 workers, 22 almost one third of the total population of the town. Besides there are 95 sizing units, machine processing houses 10 hand processes and three spinning mills. About 750 traders are busy in the purchase and sale of yarn and cloth.

A number of cooperative 23 institutions and banks are busy helping the industry. Ichalkaranji is the biggest industrial centre producing cotton cloth on powerlooms. Dhoti, saree, poplins, cambric mulls, khadi etc. are the different varieties of cloth manufactured here. It is because of this, since the last ten years, it has become the country's biggest cloth centre. It has started providing facilities for printing in a variety of colours. It has thus become a centre of attraction for national as well as foreign traders. The special facilities in the city start from making yam to all sorts of processing of the produced cloth. There are certain problems before the weaving industry in Ichalkaranji. The main handicap of the power loom industry is under-utilisation of capacity. This is due to various reasons such as inadequate supply of yarn at reasonable prices, non-availability of working capital crippling effect due to the master weaver system, sub-standard

looms discarded by Mills etc. Unless prompt and effective steps are taken to solve these problems, the power looms may not be able to fulfil the target allocated to it. Ashok Mehta Committee in 1964 and the sub-working Group constituted by the Ministry of Commerce (Department of Textiles) to prepare draft of the fifth Plan has reported on the necessity of establishing cooperative spinning mills of power loom weavers. Schemes for financial assistance to the spinning cooperatives of growers and handloom weavers should also be made applicable to the cooperative spinning mills of power loom weavers. This is the brief history of Ichalkaranji, textile looms. In due course of time it has established itself as a textile centre and the growth of the same can be felt.

The increasing industrialization and urbanization lead to environmental pollution. Moreover, the pollution of the aquatic environment causes extremely serious environmental damage and consequently negatively affects living organisms. The effluent generated by the industries is the source of pollution. Contaminated soil, air, and WW from the industries are associated with various disease problems and this is the reason for the current smaller life probability in the country. The release of WW from diverse industries unfavourably affects water resources, aquatic organisms, soil fertility, and ecosystem integrity

Textile industries are one of the largest water consumers and polluters resulting in high wastewater generation. Textile processing industries largely employ dyes and discharge a large volume of wastewater after the dyeing process. These dyes are aromatic hydrocarbons, derivatives of benzene, toluene, naphthalene, phenol and aniline and the use of dyes in textile processing industries releases organic and inorganic pollutants in the environment. Textile dyes in the effluent are toxic, highly stable and contain heavy metals that are carcinogenic. Heavy metal pollution is an ever-increasing problem of our rivers, lakes, and ocean. These heavy metals showed a remarkable effect on the aquatic plants and animals which through bio magnification enters the food chain and eventually affects human beings. There have been reports of deposits of heavy metals (HM) occurring globally in aquatic life, oysters, debris, and other watery ecosystem elements. Despite their capacity to create complexes insoluble that release metal ions which are accessible for living creature absorption, these hazardous HMs that are reaching water bodies have been absorbed onto particulates.20 % of the WW produced globally comes from the clothing industry, and dyeing clothing is the next greatest global water polluter. Producers utilize a lot of water to make apparel and appliances, and the wastewater that is left over has a bad impact on the natural world, soil groundwater contamination, individuals, and ecosystems.

The World Bank noted in a 2019 report that "some studies have found that the textile sector is responsible for around one-fifth of worldwide water contamination. The textile business uses a lot of water since it is necessary for the scrolling, decolorizing, and coloring processes. The contamination is primarily caused by wastewater. Wastewater can lower the oxygen concentration in the reservoir if it is not treated before being added, which might be damaging to aquatic creatures and the ecosystem as a whole. A significant raw material in the textile sectors is cotton. A cotton T-shirt and pair of pants require roughly 20,000 litres of water to manufacture. The extensive use of pesticides and fertilizers during conventional cotton growing might damage nearby water sources. In comparison to other crops, cotton cultivation uses the most insecticides. The impact is significant when cotton is used to make a wide variety of textile items. Due to its reliance on pesticides, herbicides, and fertilizers, cotton cultivation accounts for 2.8% of the world's yearly water usage. Even still, cotton farming accounts for 10% of the 25% global pesticide consumption rate. As a result, those who work in the cotton industry are more likely to be exposed to hazardous substances. At this point, the spread of insecticides may put individuals at danger of infection.

River water is often very drinkable at its original location, but as it is utilized for other reasons and becomes contaminated, it eventually mixes with other contaminated substances and becomes considerably less suitable for aquatic creatures to survive. Polluted waterways and WW need to be cleaned beforehand being used throughout various zones. The Panchganga River originates in Kolhapur City to Shirol, further

meets to Krishna River at Nrusinhawadi. Since the stream Bhogawati converges with five other rivers—Kumbhi,Tulsi, Kasari, Dhamani, and Bhogawati—it has come to be referred to as Panchaganga from Prayag Chikhali. Because of its textile sector, Ichalkaranji is referred to as Manchester City in Maharashtra. This River has been contaminated near Ichalkaranji and Shirol, in addition as an outcome of the combination of industrial WW that hasn't been properly handled. At the moment, in Ichalkaranji there are 384000 residents. Currently, the Krishna River provides the town with roughly 50 million L of water / day (MLD), while about 35 MLD of residential WW is produced. With devices comprising a screening unit, grit area, air circulation, secondary clarifier, chlorine treatment, and sludge thickened that serve 50% of the city, Ichalkaranji Municipality Council has supplied a STP that has a 20 MLD capability. Subsurface drainage channels cover around 50% of the land, while the rest of the 23%, or roughly 23 MLD, of the land is used to create sewage that enters the nallah before it reaches the Panchganga River. Several textile mills release their effluents into the Panchganga River via an Industrial Estate Area Chandur nallah. Fishes and other creatures of the water are most significantly affected by the convergence of the Nallah with the River Panchganga. The Chandur nallah empties into the River Panchganga after flowing by the fiber mills and rising from the slopes close to Hatkanangale. In this case summarized information is provided regarding the current scenario of Kolhapur water pollution due to discharging of untreated or partially treated textile waste water, its challenges and suggested solutions to reduce water pollution.

Current scenario

- There are up to 68 processing facilities in Ichalkaranji.
- Approximately 10–12 processing units are still disconnected from CETP.
- Units process cloth using a variety of dangerous chemicals.
- The CETP can process 12 million L of WW every day.
- Locals in the Lal-nagar neighbourhood, where the CETP is situated, have voiced complaints that untreated water is being dumped into the nullah.

Sampling and Analysis:

The study was done on the Panchganga river. Three sites on the river were selected for the collection of water samples. Three sites represented as site 1, located 1 km upstream of confluence site i.e. Three locations were chosen: a pre-confluence premises, a location 2 wherein the clothing sector's effluent from Chandur nallah converges with the Panchganga River, and a post-confluence location situated 2 km downhill from the point of convergence site. During the survey, all points of three sampling sites were noted on the bank of the river. Details about the sampling sites are as follows: site 1 where the water sample was collected at a point upstream. This sample represents a point in the river before effluent from textile industries released in the river. The water sample collected at site 2 where effluent from textile industries are discharged into the Panchganga river through Chandur nallah. Site 3 where a water sample was collected 2 km downstream to the confluence site.

Table 1: Physico-chemical parameters of water sample

Parameter	Site 1	Site 2	Site 3
pH	5.5 – 7.8	6.5 - 8.6	5.4 – 7.1
EC (µmhos/cm)	1.678	0.890	0.734
TDS (mg/l)	650	625	610
Turbidity (NTU)	8	7	8
DO (mg/l)	2.10	2.80	3.20
COD (mg/l)	357	253	210
BOD (mg/l)	110	98	54
Pb (mg/l)	0.0058	0.41	0.37
Cr (mg/l)	0.05	0.25	0.10

Ni (mg/l)	0.07	0.30	0.21
Co (mg/l)	0.08	0.29	0.21
Fe (mg/l)	0.20	0.71	0.32
Cd (mg/l)	0.03	0.17	0.12
Zn (mg/l)	0.02	0.21	0.02

In this study, samples collected from three study sites of river Panchaganga were analysed for physico – chemical characterization and for heavy metals analysis. The monthly average values of physico – chemical, and HM content of sites are represented in Table 1. The data gathered from Table 1 indicates that the physicochemical features have greater values. The primary cause of the increased level of pollution is contaminants from the textile sector that have become mixed into the waterways. Table 1 shows that the primary contributor to extremely contaminated river water is a mixture of unprocessed industrial contaminants from Ichalkaranji city.

Effective Strategies for Management of Water Pollution:

Industrial wastewater reuse – an effective strategy

Utilizing purified municipal water and treating industrial effluent are tried-and-true methods that can assist enterprises in conserving water and lowering their environmental impact. To eliminate contaminants from wastewater to the level required by state/central regulatory agencies, a textile wastewater treatment system typically consists of primary, secondary, and tertiary treatment units. Conventional treatment methods can efficiently remove organic pollutants, but inorganic salts still remain in the treated wastewater and must be removed using sophisticated methods in order to make the water suitable for reuse in industry. The Zero Liquid Discharge (ZLD) technique provides an efficient, if expensive, remedy.

Necessity and viability of ZLD systems

Zero Liquid Discharge is a method of engineering in which wastewater is treated in stages, primarily using primary, secondary, Reverse Osmosis (RO), and thermal evaporation systems, before being recovered for reuse as pure water and other valuable resources. As a result, there is no wastewater discharge from the industry. In general, important aspects like

(i) Water cost
(ii) Water scarcity
(iii) Regulations
(iv) Input

Characteristics of the wastewater determine the requirement for and viability of ZLD.95–98% of the pure water by volume and 80–90% of the salts by weight from wastewater can be recovered by a ZLD–based textile treatment facility. In light of resource scarcity, this makes it a highly sought-after technology. The primary disadvantage of ZLD systems at the moment is their expensive cost; a traditional tertiary treatment facility costs around Rs 4 crores per Million Litres per Day (MLD) capacity, whereas a ZLD system might cost close to Rs 18 crores/MLD. Small and medium-sized businesses find it extremely challenging to invest in this technology due to the extreme pricing disparity.Additionally, entrepreneurs must keep in mind that ZLD is not a universally applicable solution. The final equipment selection and process flow are affected by a number of variables, including the wastewater volume, salt kinds, color/dye content, etc.

Government Support and regulations for development of wastewater treatment facilities

Numerous programmes and incentives are offered by the federal government as well as numerous state governments to encourage businesses to adopt water-saving and pollution-control practices. The Integrated Processing Development Scheme (IPDS) provides vital financial assistance to Micro Small Medium

Enterprises (MSME) textile wet processing units, many of which lack the resources to establish independent treatment facilities.

Sometimes rules must be passed by the government in order to push industries towards environmental sustainability. The Tamil Nadu Pollution Control Board (TNPCB) had ordered fabric treating units in Tirupur to implement ZLD System-based ETP to purify and reuse the WW in the staining process due to the harmful effects of textile wastewater on the environment. The worsening water condition in Tamil Nadu, which has had little rain for many years, was what led to this legislation. Municipal SWW is cleansed to industrial standards by some governments and local governments, and it is then given to population centres close to the municipalities. One such instance is the Gujarati city of Surat.

Water stewardship – a responsibility for all

Whereas lawmakers and the private sector are the main actors in eliminating contamination and preserving water on a big scale, everyone involved must actively participate in the global effort to avert a potential water crisis. Decisions taken by the business environment are subject to significant impact from customers. Organizations and brand makers will be encouraged to implement ethical supply-chain procedures if customers ask for greener commodities—i.e., items made with fewer resources such as energy, water, contamination, etc.—and without racial bias.

It is a comprehensive strategy that emphasizes the significance of cooperation between all stakeholders. Water is a valuable resource that cannot be adequately handled by one stakeholder alone. The private sector (business), governmental entities, customers, and farmers must work together to more effectively divide up resources and duties. This strategy will ensure that this priceless resource is not lost to future generations.

Case Questions:

1. Critique in detail about history of Ichalkaranji Textile Industries
2. Elaborate in brief about development of Ichalkaranji Textile Industries after Independence
3. Critically evaluate environmental impacts of Ichalkaranji Textile Industries and suggest an effective management strategy to reduce environmental impacts.
4. Evaluate in brief the current scenario of Ichalkaranji Textile Industries, and effluent treatment plants.
5. Elaborate in detail lawmaker Support and rules for expansion of WWT facilities.

Teaching Note:

Textile industries are a major economic zone of India. The bulk of the population depends upon the textile industries. But textile industries became more problematic as they are considered the most polluting industries. The toxic heavy metal concentration damages the aquatic system mainly. For the production of color pigments of textile dyes, HM such as Lead (Pb), Chromium (Cr), Copper (Cu) and cadmium (Cd) are widely used. Lead is referred to as interfering with several body purposes and it is chiefly disturbing the hematopoietic, central nervous, renal and hepatic structure creating serious disorders (APHA 2009). Generally, the crucial source of lead in the freshwaters is atmospheric fallout. The maximum level of heavy metals concentration in water will have a serious impact on the environment. The discharge of textile industrial effluent water into the Panchganga river invariably results in the presence of high concentrations of heavy metals in the water. Water samples from mainly two sites (sites 2 and 3) have also been found to be containing almost all toxic heavy metals above permissible limits. Pb originated to be present in concentrations higher than the standards from all studied sites. The Cr is present in higher than the WHO in the site 2 and 3 of the river and site 1 showed lower concentration than standard as it is upstream to the confluence site. The amount of Cd, Ni, Co, Fe were found to be high at the confluence site due to the discharge of effluent in the river. Zn was found to be present in concentrations lower than (WHO, 2011) in

all studied sites of the river which showed the water to be safe from Zn toxicity. Overall findings specified that the textile WW is mixing in river water and results of samples are above permissible limit so without prior treatments we should not use that for irrigation and domestic purposes. This result reveals that Ichalkaranji faces heavy metal pollution; they are rendered not good for human use without adequate treatment. Thus there is a need for proper management to minimize the toxic level of these metals.

Recommendations:

1. Since a long time ago, Ichalkaranji has struggled to combat the issue of textile water pollution. The recipient of the Magsaysay Award, Hon. Rajendra Singh, who worked hard to save water in Rajasthan, which frequently has droughts, has urged the business people in the textile town of Ichalkaranji to look into recycling whatever pollutants they produce while processing.
2. Singh stopped at the CETP in Ichalkaranji on Monday during his two-day trip to Kolhapur to evaluate the state of the Panchganga River. He cautioned the government officials and business owners to recycle the pollutants since failing to do so would endanger not only the industry but also the river. Singh appreciated the initiatives made by the town's textile processing facilities and advised them to be truthful with themselves rather than relying on the MPCB or the CPCB.
3. It's your town and river. You must look after the river and its water. When I went to the CETP, I saw that sincere attempts were being made to create a river free of pollutants. However, it's insufficient. Given the level of pollution in our river, it will take a lot of time and work to completely clean it up, Singh added.
4. The sludge produced by the facility is being sent to Ranjangaon in the Pune region, according to Singh's conversation with Giriraj Mohta, the CETP chairman "We have asked the MPCB to provide us the technology to turn sludge into bricks. He told Singh, who recommended the CETP members to look for additional measures to ensure that no pollutants are leaving the plant, that if we can reuse the sludge, we may lessen the pollutants leaving the plant. "If you continue to prioritize profits over the environment, you will eventually pay the price for it. A particularly challenging period is being experienced by the nation's textile industries. At that time, the manufacturers should focus on eco-friendly techniques for dispensation or else they will not exist," Singh said.
5. The Ichalkaranji Municipal Council's main officer, Sunil Pawar, stated that a bund will be built at Kala Nala, a stream that conveys water from CETP to the river. Reusing water for agricultural land is another strategy. To make sure the water isn't harming the land and crops, we shall first conduct a survey. The proposal calls for a chemical study of the CETP water. The municipal government has been ordered by farmers to start a pumping station at the bund. He said to Singh and NGO activists, "We are taking into consideration their request.

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