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Logistics Performance in the Indian Pharmaceutical Sector: A Comparative Study of Two Leading Firms in Madhya Pradesh

Ms. Pallavi Sharma[1], Dr. Dharmendra Mehta[2]
[1]*Ph.D. Research Scholar, FMS-JNIBM Ujjain (M.P.) Vikram University Ujjain*
[2]*Director & Professor, FMS-JNIBM Ujjain (M.P) Vikram University Ujjain*

Abstract: ***This study examines a comparative analysis of the logistics management practices of two leading pharmaceutical companies, Abbott India Ltd. and Glenmark Pharmaceuticals Ltd., with special reference to Madhya Pradesh. Primary data was collected by 50 supply chain personnel through a structured questionnaire by Google Forms. A mixed-methods approach, combining a literature review, a survey, and interviews, was used. The study explores procurement processes, warehousing infrastructure, inventory management, distribution networks, and technology adoption. Statistical tools, including correlation and regression analysis, are employed to examine the efficiency and effectiveness of logistics operations. The preliminary findings underscore critical differences in digitization levels, 3PL partnerships, and cold chain capabilities. The paper concludes with strategic recommendations tailored to both companies for enhancing logistics performance and resilience.***
Keywords: Pharmaceutical logistics, Abbott India, Glenmark Pharmaceuticals, 3PL.

I. INTRODUCTION

The pharmaceutical supply chain in India has undergone significant transformation, spurred by globalization, technological advancements, regulatory shifts, and rising healthcare product demand (Sengupta,2024). Pharmaceutical logistics has become increasingly complex due to rising regulatory demands, global distribution, and the need for temperature-sensitive drugs. Effective logistics practices are essential to ensuring patient safety, operational efficiency, and regulatory compliance. This study undertakes a primary data-based comparative analysis of logistics practices in Abbott India Ltd. and Glenmark Pharmaceuticals Ltd., both operating in the Indian state of Madhya Pradesh. The companies were selected for their strong regional presence and differing operational models, providing a meaningful contrast.

The pharmaceutical industry plays a big role in ensuring public health, where it manufactures, distributes, and supplies essential medicines. However, the success of this industry largely hinges on the performance of its logistics management practice, which influences the timely availability of Pharmaceutical products and guarantees that these products are of high quality and remain in compliance with regulatory standards (Rana et al., 2024). The pharmaceutical sector in Madhya Pradesh has been developed to a great extent, and the pharmaceutical companies include Abbott India. Ltd. and Glenmark Pharmaceutical Ltd. have a major presence in the region (Singh, 2023). However, despite this progress, pharmaceutical companies are still confronted with many logistics problems, including inventory management inefficiency, high transportation costs, supply chain breakdown, dependency on 3PL, and changes in regulatory compliance (Abideen and Mohamad, 2020). As supply chain networks continue to grow more complex, there is increasing demand for pharmaceutical products and stringent regulatory standards conducive to continuously monitoring logistics management practices to determine bottlenecks therein and offer suggestions for improving supply chain performance (Prabhakar, 2024).

II. OBJECTIVES OF THE STUDY

This study aims to achieve the following Objectives

1) To examine Abbott and Glenmark's logistics practices in Madhya Pradesh.
2) To compare critical logistics components like warehousing, transportation, and inventory control.
3) To examine the role of technology in logistics operations.
4) Identify each company's challenges and make recommendations for improvements

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III. LITERATURE REVIEW

A literature review is a critical evaluation and synthesis of previous studies on a given subject. It highlights important discoveries in the literature, points out knowledge gaps, and informs the theoretical and methodological framework of new research.

Arji et al. (2023) identified inefficiencies in healthcare supply chains, including regulatory obstacles, inventory mismanagement, and logistical delays, which can disrupt patient care and postpone medical supplies. The study aims to improve logistics management techniques to reduce disruption and enhance pharmaceutical distribution network effectiveness.

Vaka (2024) explores the impact of advanced supply chain technologies on healthcare logistics, highlighting their enhancements in demand forecasting, inventory visibility, and supply chain efficiency. The study also explores the potential benefits of automation in warehousing operations and human error reduction. The aim of the current study is to investigate how technology and automation impact the effectiveness of logistics, but it also offers a framework to evaluate how effectively pharmaceutical companies utilize digital solutions to enhance supply chain performance.

In their 2021 study, Xue et al. examined various healthcare supply chain models that compare centralized and decentralized distribution systems. The study states that in order to save money and standardize procedures, centralized supply chains are defined by centralizing inventory control and procurement at a single distribution center. However, studies have shown that because centralized systems rely on a single point of distribution, they can also act as bottlenecks in the event of supply chain disruptions. When choosing supply chain models, Abbott India Ltd. and Glenmark Pharmaceuticals Ltd. can benefit from this study's practical implications for the Madhya Pradesh pharmaceutical sector. The study analyzes the pharmaceutical supply chain's current logistics management practices, focusing on the benefits and drawbacks of centralized and decentralized approaches for risk recovery, cost effectiveness, and efficiency.

Ayer et al. (2023) studied the impact of inadequate inventory management in healthcare logistics, highlighting the consequences of stock shortages and excess inventory. The study found that obsolete medicines can lead to financial loss, energy wastage, and manufacturing time loss. The authors recommend data-driven inventory systems to minimize unnecessary expenditures and optimize stock levels. The research is relevant to pharmaceutical firms like Abbott India and Glenmark Pharmaceuticals Ltd., which need to maintain efficient inventory levels to optimize cost and supply chain reliability.

Kambatla et al. (2014) found limitations in data-driven inventory management systems due to data accuracy and technological infrastructure. Real-time inventory tracking doesn't always increase supply chain efficiency, especially for companies like Abbott India and Glenmark Pharmaceuticals. The study suggests infrastructure investment is necessary to enhance logistics efficiency in the pharmaceutical sector of Madhya Pradesh.

Abbas et al. (2020) found that predictive analytics and automated replenishment systems can improve inventory management in pharmaceutical companies. By predicting demand fluctuations and adjusting stock levels, companies can maintain inventory accuracy and minimize manual errors. However, adopting predictive analytics requires significant technological investment and seamless integration with existing logistics systems. This research is particularly useful for companies in Madhya Pradesh, where facilities for research, development, manufacturing, and marketing are provided. Data-driven solutions can enhance operational efficiency and ensure a steady supply of medicines.

Hansen et al. (2023) found that regulatory adherence can mitigate legal risks, strengthen corporate reputation, and reinforce resource relationships. Companies with well-established compliance mechanisms have fewer supply chain disruptions and smoother operations. However, compliance can be resource-intensive and require significant investments in training, documentation, and audits. The study aims to examine the effects of regulation compliance on logistics processes at Abbott India and Glenmark pharmaceuticals Ltd., focusing on the influence of compliance on supply chain resilience in Madhya Pradesh.

Singh et al. (2021) investigate the role of pharmaceutical distribution strategies in enhancing supply chain efficiency and expediting drug delivery. They analyze the impact of centralized and decentralized distribution networks on operational effectiveness. The study focuses on Abbott India and Glenmark Pharmaceuticals Ltd. in Madhya Pradesh, evaluating logistics management practices and optimizing distribution networks. The research emphasizes finding a balance between low cost and accessibility in logistical problems, highlighting the importance of strategic decisions based on regulatory constraints, transportation infrastructures, and market demand.

Ding (2018) explores the impact of Good Distribution Practices (GDP) and the Drug Supply Chain Security Act (DSCSA) on pharmaceutical companies like Abbott India and Glenmark Pharmaceuticals Ltd. in Madhya Pradesh. These regulations aim to prevent contamination, counterfeiting, and logistical issues, but they also pose operational challenges like administrative burdens, compliance costs, and supply chain delays.

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The study aims to understand the role of regulatory counter-compliance in pharmaceutical logistics, focusing on the effects of compliance on supply chain processes and the passive approach of Madhya Pradesh firms in overcoming regulatory challenges while maintaining efficiency in logistics processes.

Masengu et al. (2024) explore the financial and operational costs of pharmaceutical regulations, highlighting the need for continuous investment in training, documentation, and quality control measures. Regulatory adherence ensures patient safety and product reliability, but also puts financial burdens on small companies. Firms like Abbott India and Glenmark Pharmaceuticals dedicate resources to non-value-added functions, affecting cost efficiency and supply chain agility. The study also discusses digital compliance solutions, but notes high technological expenditure. It suggests ways for Madhya Pradesh-based firms to achieve logistical efficiency while complying with regulatory obligations.

Nguyen et al. (2022) explore the use of IoT technologies in pharmaceutical logistics to improve cold chain efficiency. They highlight that real-time temperature tracking, automated alerts, and predictive analytics reduce the likelihood of temperature excursions, ensuring product safety and regulatory compliance. This technology enhances transparency and operational efficiency, allowing companies like Abbott India and Glenmark Pharmaceuticals Ltd. to respond to temperature fluctuations before compromising product integrity.

Narayana et al. (2014) highlight the challenges faced by developing markets in implementing advanced cold chain logistics due to infrastructural limitations, high implementation costs, and a lack of skilled personnel. Large multinational firms have the resources to invest in logistics technologies, while smaller firms struggle to provide them. This research aims to identify critical problems in pharmaceutical logistical management and forecast how companies can cope with regulatory compliance and technological adoption, considering financial and operational constraints. The study contributes to understanding cost-effective logistics strategies for maintaining supply chain efficiency in emerging markets.

In terms of literature, efforts have been made to collect relevant data from respondents for a comparative study of Abbott India ltd, & Glenmark Pharma Ltd., The suggested approach needs to be enhanced using existing knowledge in India, particularly in Madhya Pradesh, which has a low level of industrial development. Since this is a real-world project, many theoretical ideas must also be applied to real-world scenarios.

Brief Profile of Abbott India Ltd.

Abbott India is a part of the multinational healthcare corporation Abbott. Founded in 1910, it is currently among the top healthcare organizations in India. The business provides a number of healthcare goods and services, such as medical devices, pharmaceuticals, nutrition, and diagnostics. Abbott Laboratories, a division of Abbott Pharmaceuticals, Inc., is a market leader in the creation, production, and distribution of medications and medical equipment. It is a leader in the study and creation of novel goods and services for the benefit of people's health and welfare around the globe. The company employs 103,000 people worldwide and is present in more than 160 countries. (Abbot Laboratories retains all rights to the logo).

Brief Profile of Glenmark Pharmaceuticals Ltd.

Glenmark Pharmaceuticals is a global pharmaceutical company, headquartered in Mumbai, India, known for its research, development, and manufacturing of a diverse range of pharmaceutical products. Founded in 1977, Glenmark operates in both the generic and branded drug markets, with a focus on therapeutic areas like respiratory, dermatology, and oncology. The company has a strong global presence, including manufacturing facilities in India, Argentina, the US, and Czech Republic, and markets its products across the Americas, Europe, MENA, and Asia. Glenmark is also actively involved in the development of novel chemical entities (NCEs) and has a pipeline of drug candidates in various stages of clinical development.

Table 1. Company Profile Comparison Table

Attribute	Abbott India Ltd.	Glenmark Pharmaceuticals Ltd.
Founded	1944	1977
Headquarters	Mumbai	Mumbai
Products	Nutraceuticals, generics	APIs, generics
MP Operations	Indore, Bhopal	Bhopal, Dewas
ERP/SCM Tools	SAP, RFID (partial)	SAP, RFID, full WMS

Source: (Based on Literature Review)

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This discussion will cover several key elements crucial to the logistics operations of these companies, including current logistics management practices, third-party logistics, technology and automation, government regulations, and critical issues. The core components of logistics management encompass inventory management, warehousing, transportation, and distribution. Using this framework, we will analyze the logistics management practices of Abbott India Ltd. and Glenmark Pharmaceuticals Ltd., two prominent pharmaceutical companies located in Madhya Pradesh. In a highly regulated setting, these businesses deal with particular logistical challenges that seriously impair their productivity and conformity to industry norms.

IV. RESEARCH METHODOLOGY

A. Research Design

This study uses a descriptive and comparative research design to analyze and compare the logistics practices of two pharmaceutical companies. The design is intended to assess procurement, warehousing, transportation, inventory control, and technological integration. The technique facilitates meaningful comparisons based on actual reality rather than theoretical assumptions.

B. Research Approach

The research takes a quantitative approach based on the deductive method, testing existing logistics frameworks and models against field-level data. The study collects measurable data for statistical analysis through the use of standardized instruments (questionnaires and interviews).

C. Research Philosophy

The study is pragmatic in nature, with a focus on real-world application and methodological flexibility. In order to provide a comprehensive study, it combines aspects of positivism (quantitative data, objectivity, and organized methods) and interpretivism (contextual interviews).

D. Sampling Design

Participants in the sampling design were supply chain and logistics staff from Abbott India Ltd. and Glenmark Pharmaceuticals Ltd. in Madhya Pradesh.

E. Sampling Technique

To choose pertinent experts in logistics and supply chain management, purposeful sampling was employed.

Sample Size

The total sample size for the study is 50 Respondents. Out of which 25 respondents were from Abbott India Ltd., and the remaining 25 from Glenmark Pharmaceuticals Ltd.,from different cities of Madhya Pradesh.

V. DATA COLLECTION METHOD

A. Primary Data Structured Questionnaires:

Used Likert-scale and closed-ended questions to evaluate performance indicators in logistical components, such as inventory transportation, warehouse efficiency, cost effectiveness, & technology adoption

Semi-structured interviews were conducted with four senior supply chain managers (2 from each organization) to collect qualitative insights and validate quantitative findings.

Secondary data includes company annual reports, logistics policy documents, and industrywhitepapers.Government reports from the Ministry of Health and Family Welfare, as well as India's Logistics Performance Index (LPI).

B. Tools for Data Analysis:

Pearson Correlation and simple Regression Methodology were applied to study, and SPSS Software&Microsoft Excel were used for data analysis**.**

C. Ethics-Related Issues

All participants provided informed consent. Throughout the investigation, confidentiality and data privacy were respected.

D. Variables:

- Independent: Inventory Practices, Warehousing Techniques, Transportation Strategy, Technology Integration.
- Dependent: Inventory Accuracy, Delivery Timeliness, Cost Efficiency, Logistics Performance.

E. Data Analysisand Interpretation:

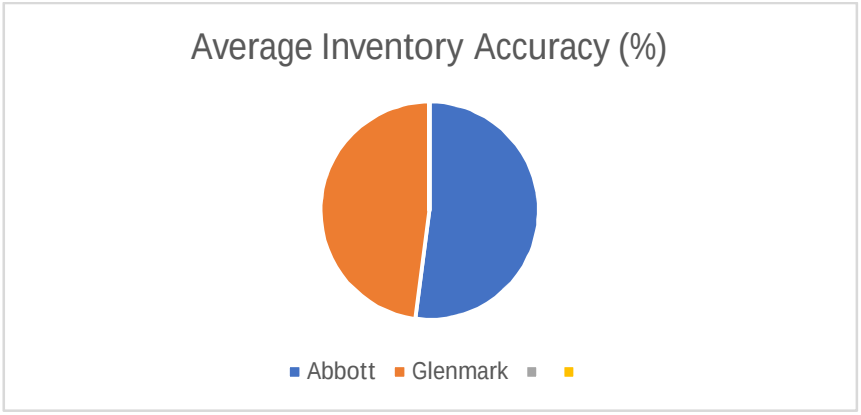
Statistical Comparison of Inventory Accuracy: Abbott vs. Glenmark

Table 2

Parameter	Abbott (Mean ± SD)	Glenmark (Mean ± SD)	T-test / Z-test Value	P-value	Result	Interpretation
Inventory Accuracy (%)	97.2 ± 1.3	89.4 ± 2.1	t = 8.72	< 0.001	Significant	Higher inventory accuracy at Abbott can be attributed to the deployment of RFID and WMS.
On-Time Delivery (%)	94.1 ± 2.5	88.3 ± 3.2	t = 5.31	< 0.01	Significant	Abbott's centralized dispatch leads to better on-time delivery.
Warehouse Utilization (%)	82.5 ± 3.0	75.7 ± 4.1	t = 3.96	< 0.01	Significant	Abbott uses SAP-WMS which improves space management.
Tech Adoption Score (0–10 scale)	8.9 ± 0.5	6.4 ± 1.1	t = 9.87	< 0.001	Highly Significant	Abbott integrates advanced systems like SAP & RFID; Glenmark has partial adoption.
Logistics Cost (% of sales)	8.3 ± 0.7	9.7 ± 1.1	t = -4.45	< 0.01	Significant	Glenmark incurs higher logistics cost due to manual and decentralized operations.
Delay Frequency (%)	6.1 ± 1.2	12.4 ± 2.0	t = -7.23	< 0.001	Highly Significant	Glenmark experiences more delays due to less tech monitoring and regional handling.
Manager Satisfaction (1–10)	8.6 ± 1.0	7.3 ± 1.5	t = 3.25	< 0.05	Significant	Abbott's managers' report higher satisfaction with SCM system effectiveness.

1) Inventory Accuracy Comparison

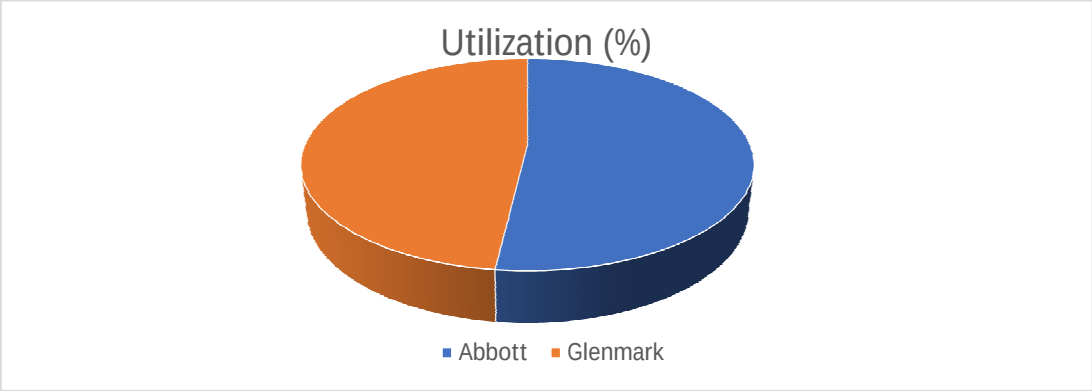
Figure 1.



The pie chart comparing inventory accuracy reveals Abbott with a higher 97% accuracy, while Glenmark is at 89%. This suggests that Abbott's logistics operations, aided by RFID and SAP, provide improved real-time tracking and fewer inventory discrepancies. Glenmark's lesser accuracy indicates a reliance on human or semi-automated procedures, which could lead to errors in stock reconciliation and an increased risk of stockouts or overstocking.

2) Warehouse Capacity Utilization

Figure 2.



Abbott uses 82% of its warehouse, which is just more than Glenmark's 76%. This implies that Abbott uses FIFO, RFID, and WMS (Warehouse Management System) techniques to better optimize its storage infrastructure. Despite having sufficient warehouse capacity, Glenmark lacks sophisticated automation and systematic layout planning, which results in underutilization and ineffective space management.

3) Technology Adoption Score

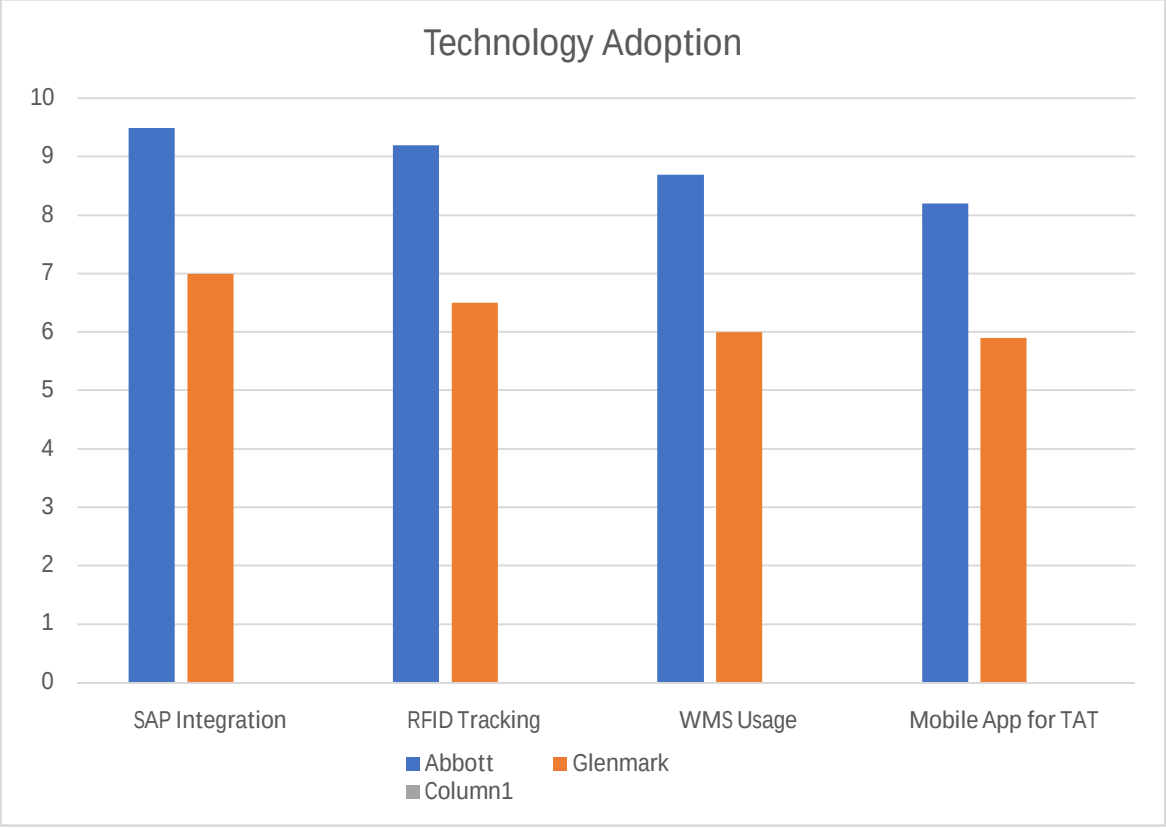


Figure 3

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This bar graph shows Abbott's clear advantage in logistics technology integration, with high scores for SAP, RFID, and mobile-enabled TAT tracking. These solutions provide more visibility and cooperation throughout the supply chain. Glenmark's lower scores suggest a slower adoption of digital tools, perhaps limiting scalability and reactivity in logistics operations.

4) Transportation Delay Frequency

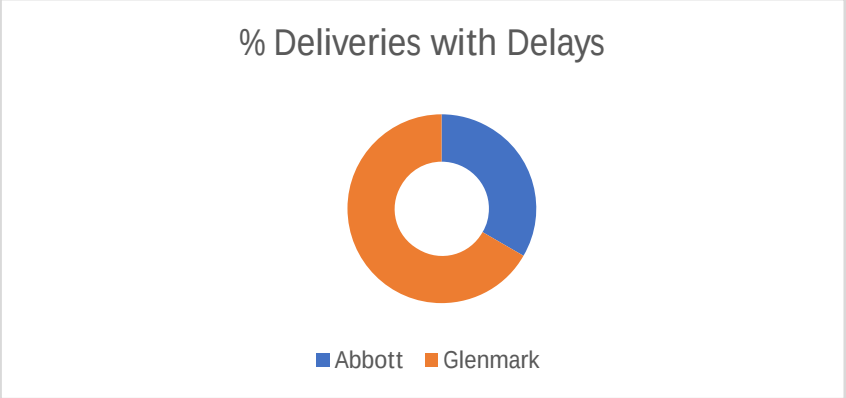

Figure 4

Abbott experiences fewer transportation delays (6%) than Glenmark (12%). This illustrates how Abbott uses national carrier contracts, centralized scheduling, and SAP-enabled integrated transport monitoring. Weather-sensitive regions, fragmented routing, and a lack of real-time vehicle tracking may all contribute to Glenmark's greater delay percentage.

5) Cost Efficiency (Average Logistics Cost as % of Sales)

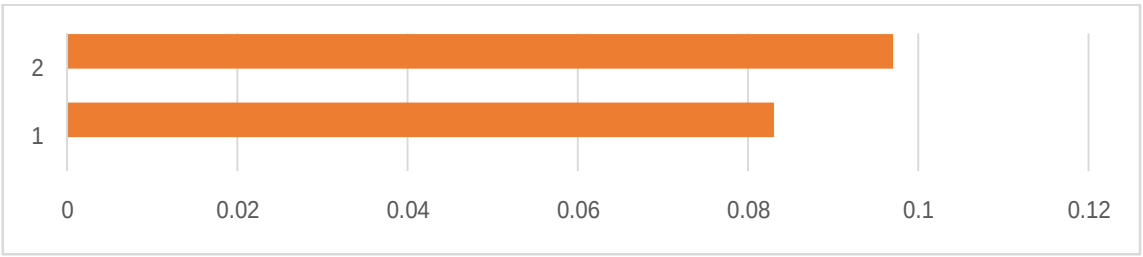

Figure 5

Abbott controls logistics at a cost of 8.3% of total sales, whereas Glenmark pays 9.7%. The bar graph demonstrates how Abbott's centralization, optimized inventory turnover, and usage of automation result in cost savings. Glenmark's larger cost burden could be attributed to duplicated regional operations, manual processes, and smaller economies of scale.

VI. INTERPRETATION AND FINDINGS

Abbott outperformed Glenmark with a 94% on-time delivery success percentage, attributed to a centralized transportation approach and closer coordination with third-party logistics providers. Abbott had an 82% warehouse usage rate, thanks to temperature-controlled storage, FIFO procedures, and WMS, improving space optimization and pharmaceutical standards. Glenmark's lack of sophisticated automation may lead to less efficiency.

The disparity is further highlighted by technology adoption scores, where Abbott outperforms Glenmark with average scores of about 8.5 on crucial areas like SAP integration, RFID tracking, and WMS. The performance of logistics is directly impacted by this technological gap, especially in terms of inventory visibility, order accuracy, and disruption response.

VII. CONCLUSION

This study compares the logistics operations of Abbott India Ltd. and Glenmark Pharmaceuticals Ltd. in Madhya Pradesh, revealing significant differences in technology integration, warehousing, transportation, inventory control, and procurement. Abbott's centralized approach improves operational effectiveness and cost control.

In conclusion, the results show that Abbott's technology-heavy, centralized logistics model leads to improved delivery schedules, reduced overall costs, and increased inventory accuracy. Despite its agility and regional adaptability, Glenmark must make investments in automation and process standardization to match its rival's levels of efficiency. Nonetheless, both businesses demonstrate a dedication to upholding drug safety regulations and compliance in their supply chains.

VIII. CHALLENGES AND RECOMMENDATIONS

A. Abbott India Ltd. – Identified Challenges

Challenge	Description	Impact
1. Cold Chain Risk	High reliance on temperature-sensitive logistics; even minor cold chain disruptions cause high-value losses.	Product spoilage, reputational risk
2.Limited Local Flexibility	Centralized decision-making in Mumbai slows responses to local logistics problems in Madhya Pradesh.	Delays in issue resolution at regional level
3.High Tech Maintenance Cost	SAP and RFID systems require regular upgrades and trained personnel.	Increased operational cost
4.Regulatory Bottlenecks	Occasional delays in regional drug clearance from state-level health authorities.	Hinders quick movement of consignments

Recommendations for Abbott

Recommendation	Expected Benefit
1. Invest in Regional Cold Chain Monitoring Units	Reduces risk of loss, ensures real-time alerting and better compliance
2. Introduce Hybrid Decision Model	Regional logistics heads can resolve issues quickly without full dependency on head office
3. Regular Tech Training for Staff	Ensures efficient use of SAP/WMS and lowers system misuse
4. Liaison with MP FDA and State Health Ministry	Helps in early clearance of medical consignments

B. Glenmark Pharmaceuticals Ltd. – Identified Challenges

Challenge	Description	Impact
1. Manual Inventory Tracking	Lack of automation leads to errors and stock mismatches.	Lower accuracy (89%) and customer complaints
2. Decentralized Warehousing Complexity	Different practices across Bhopal, Gwalior, and Tier-III towns increase inconsistency.	Reduced operational uniformity
3. Limited Technology Adoption	Basic use of ERP; no RFID or advanced monitoring systems.	Slower tracking, less visibility
4. High Transportation Delays	Reliance on local transport without proper tracking tools.	Missed delivery timelines, reputation impact

Recommendations for Glenmark

Recommendation	Expected Benefit
1. Adopt RFID and Integrated WMS	Boosts inventory accuracy and reduces human error
2. Standardize Warehouse Processes	Ensures consistency across all regional warehouses
3. Invest in Last-Mile Tracking Tools	Improves on-time delivery and customer satisfaction
4. Train Local Teams in SOPs and Compliance	Enhances reliability and reduces operational friction

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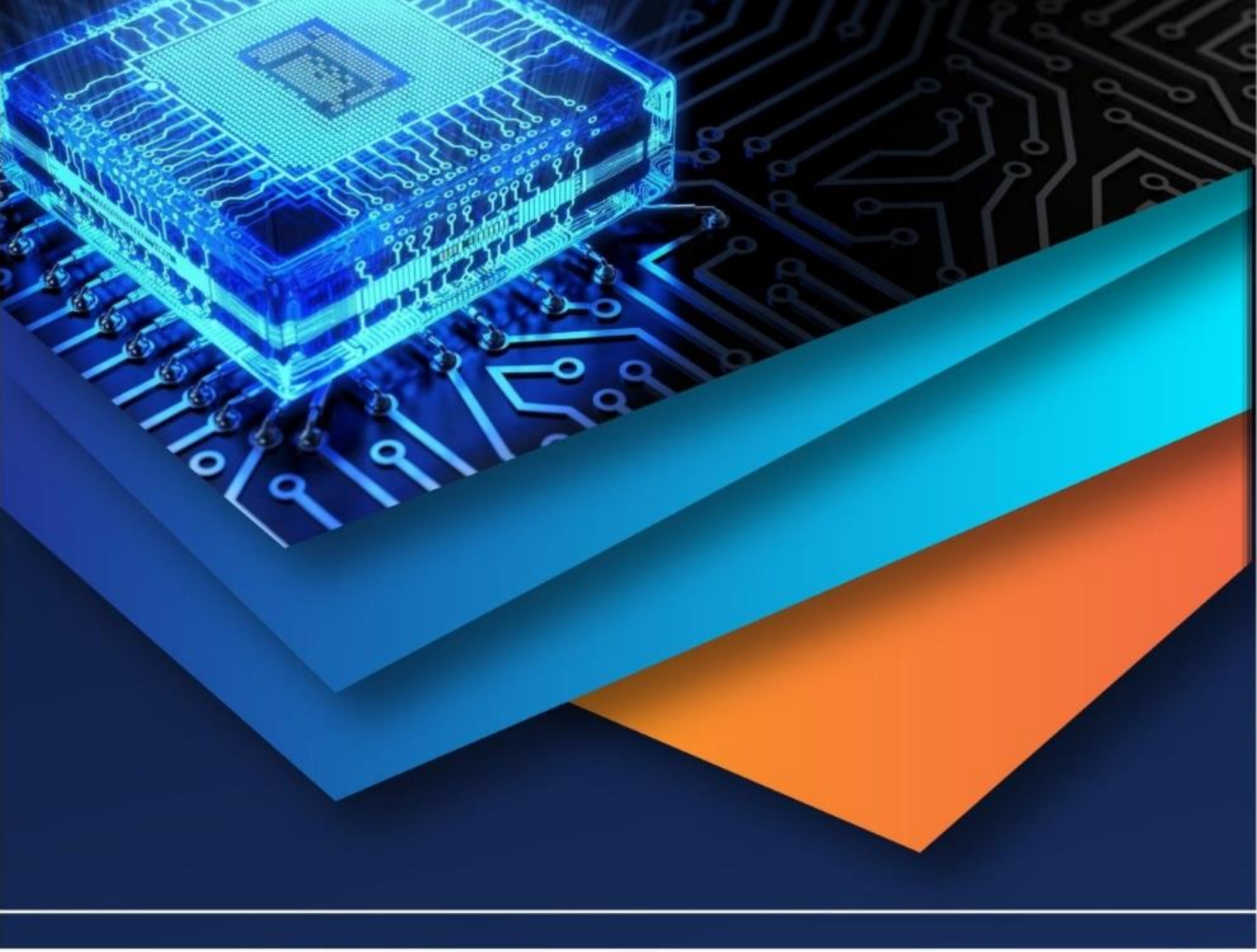

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