Business Statement: Swire Coca-Cola Predictive Maintenance Project

1. Business Problem Statement:
Swire Coca-Cola produces approximately 192 million beverages annually across six plants in 13 states. Unplanned machine breakdowns have become a critical challenge, reducing production capacity to 94.4% and resulting in an estimated $60 million annual loss. These unpredictable failures cause frequent downtime, delaying production and increasing costs due to the unavailability of spare parts, further disrupting operational efficiency and hindering production targets.
One significant challenge for the engineering team is identifying equipment lines that experience the most frequent and costly breakdowns. Without a predictive maintenance system, unexpected mechanical failures create bottlenecks, impacting production and operational performance.

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2. Proposed Solution:
To address these challenges, we propose implementing a **predictive maintenance system** powered by data analytics. Our solution will forecast equipment failures, enabling proactive maintenance to prevent breakdowns and optimize resources.
Key benefits of our solution:

- **Optimized equipment usage** and reduced production bottlenecks.
- **Minimized unplanned downtime** through proactive maintenance scheduling.
- **Increased production capacity**, improving efficiency from 94.4% to 98-100%.
- **Reduced financial losses**, mitigating a significant portion of the $60 million annual cost.
- **Actionable insights** on high-risk equipment lines, focusing engineering efforts on critical areas.

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3. Success Metrics:
The success of the project will be evaluated using the following metrics:

- **Production Capacity Increase**: Targeting an improvement from 94.4% to 98-100%.
- **Reduction in Downtime**: Significant decrease in frequency and duration of unplanned downtime.
- **Optimized Spare Parts Inventory**: Faster repairs and reduced downtime through better inventory management.
- **Enhanced Production Output**: Monitoring the number of cases produced per hour before and after implementing predictive maintenance.

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4. Analytics Approach:
We will leverage historical machine breakdown data to build predictive models and employ survival analysis techniques.

- **Regression Modeling**: Estimate downtime durations when failures occur, enabling precise planning.
- **Survival Analysis**: Evaluate the time-to-failure for critical equipment, identifying patterns to forecast breakdowns.

Key insights will be benchmarked against a **production rate of 1,000 cases per hour** to assess improvements post-implementation.

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5. Scope:

- **In Scope**:
  - Developing predictive models for diagnosing machine failures and estimating downtime.
  - Creating insights to optimize spare parts inventory and maintenance planning.
- **Out of Scope**:
  - Analysis of planned maintenance activities.
  - Financial modeling for direct cost savings.
- **Future Enhancements**:
  - Real-time tracking devices and IoT sensor integration for more accurate data collection.
  - Automated maintenance workflows driven by predictive insights.

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6. Team, Timeline, and Milestones:

- **Team Members**:
  - Richard Lim
  - Ketki Kulkarni
  - Anusha Vivekanand
  - Vedika Garg
- **Timeline**:
  - **Business Statement Due**: September 15
  - **Exploratory Data Analysis (EDA) Notebook**: October 6
  - **Modeling Notebook**: November 3
  - **Final Presentation**: November 27
  - **GitHub Portfolio Completion**: December 8