

International Logistics Pioneers – Team 6

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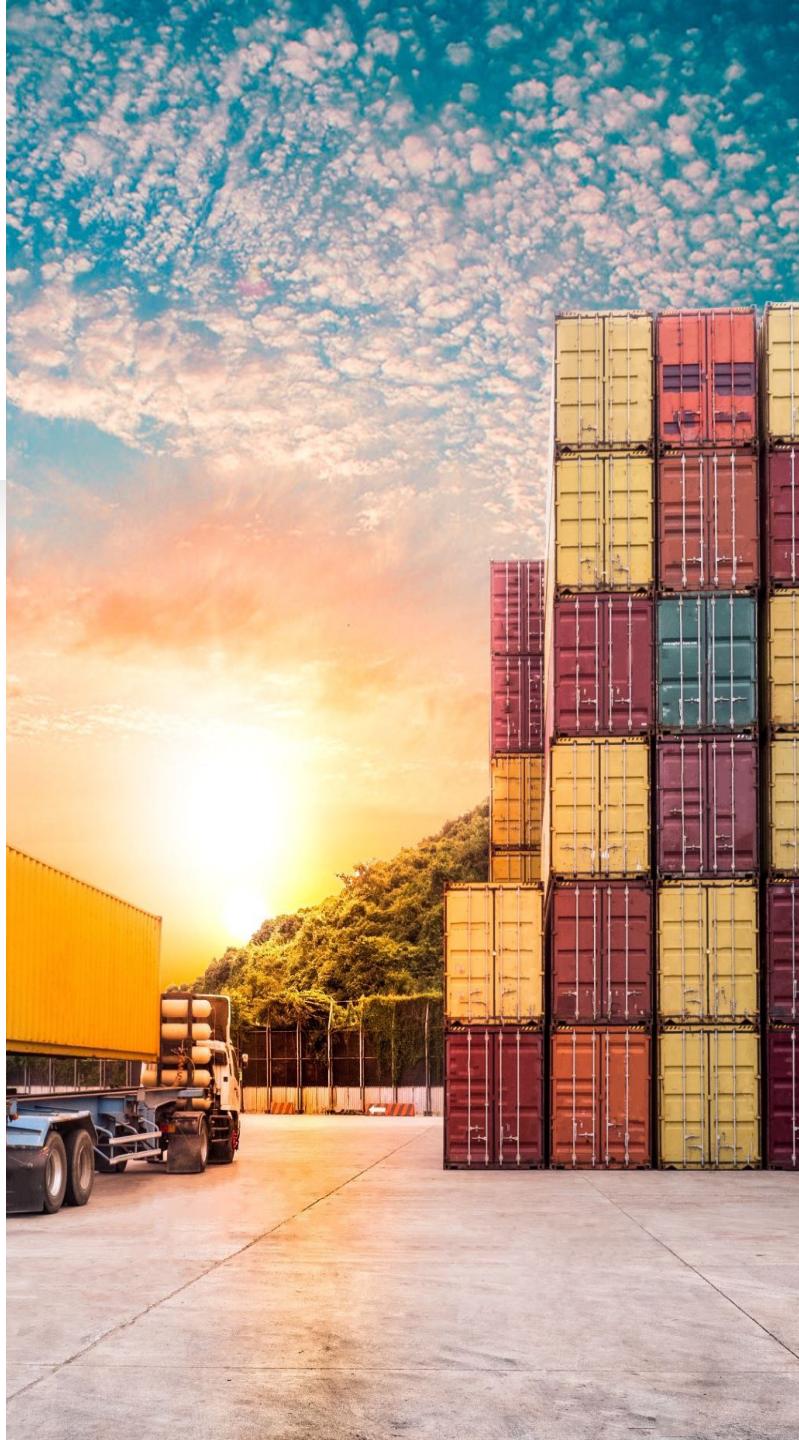
**Global Supply Chain
Management**

University of New Haven



Agenda

- Overview of the project scope
- Brief introduction to Toyota Logistics and its global operations
- Logistic Challenges: The Semiconductor Shortage & Longer delays in the supply chain
- Impact & Consequences
- Solutions implemented
- Our recommendation for the future: AI
- Q&A



Toyota Logistics Network – Introduction

Lean Logistics

Efficient Supply chain Network

Advanced Inventory Management –
Kanban system

Flexible and Agile Transportation

Supplier collaboration and Development

Digital innovations

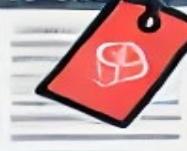
Sustainability and green logistics



TOYOTA

KANBAN

KANBAN



ORDER PLACED

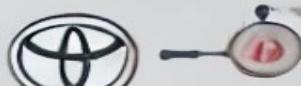


ORDER PLACED

KANBAN SYSTEM IN LOGISTICS LOGICS

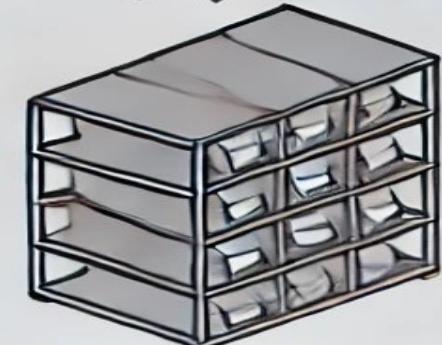


PARTS DELIVERED



PARTS
SIGTEL

PARTS
DELIVERY



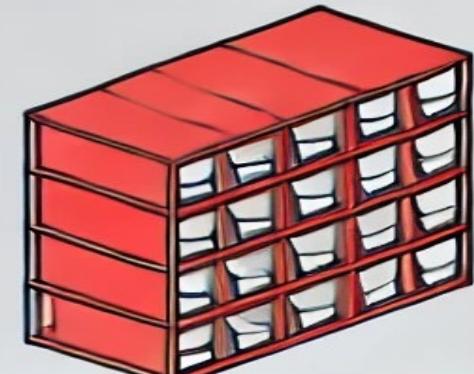
PARTS USED
PARTS USED

REORDER
SIGNAL

TOYOTA



REORDER SIGNAL



REORDER SIGNAL



Key Logistics Challenges

Semiconductor shortages

The covid-19 Disruptions

Slow Delivery speed

Sustainability and environmental impact

Major Disruption Factors



Semiconductor shortage being the most major issue during pandemic.



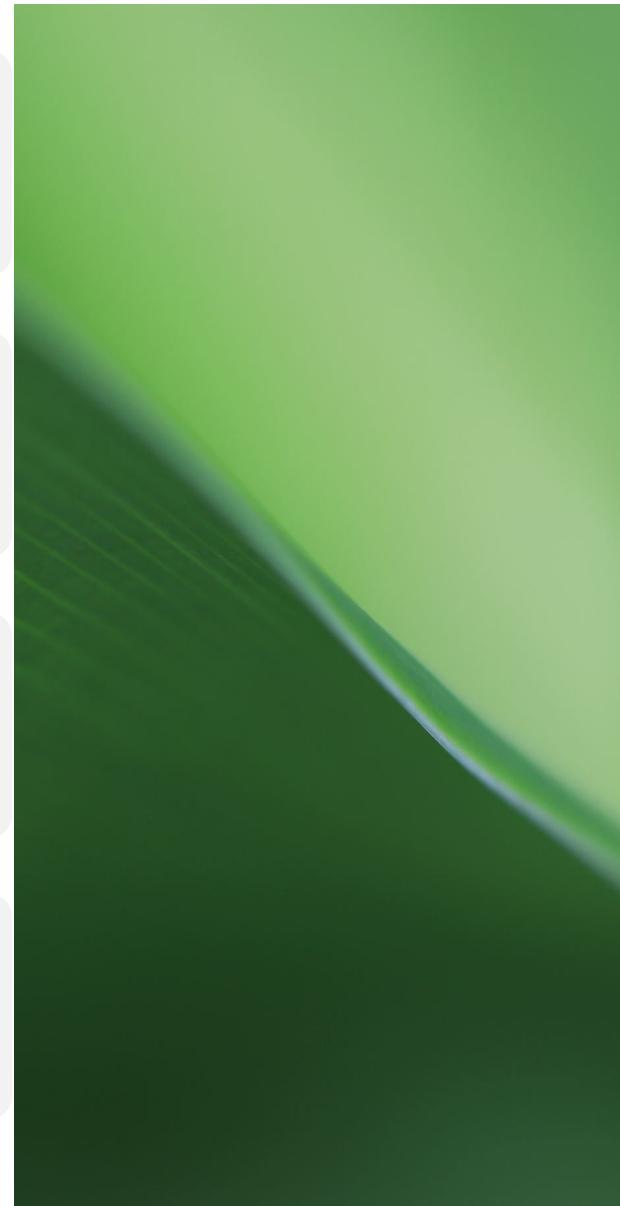
Chip production capacity shifted towards electronics during the work-for-home setup.



Manufacturing hubs got affected.



Increased complexity of chips.



Common Causes of Delays in the Supply Chain

Global
component

Factory
Shutdowns

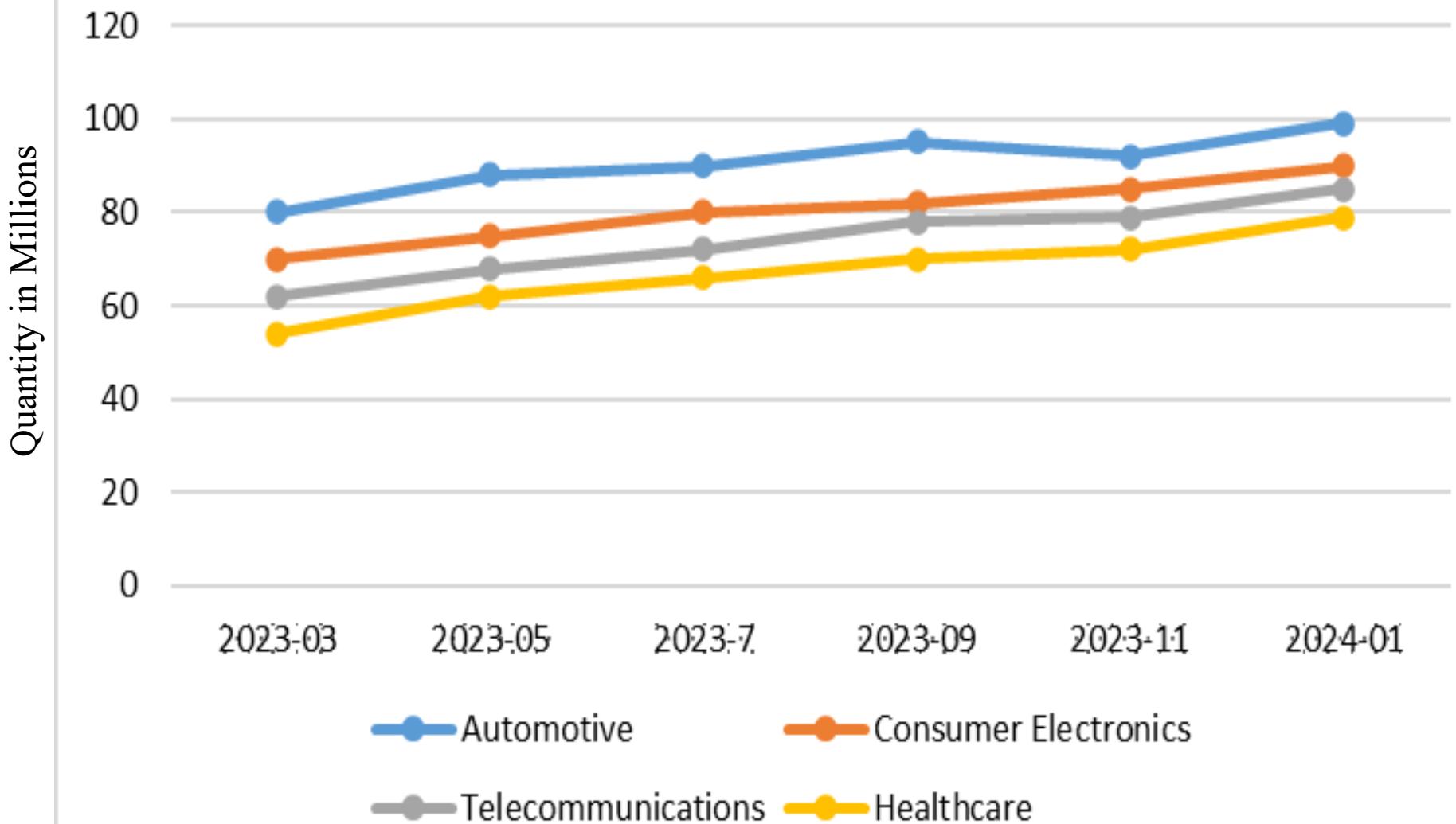
Shipping &
logistics
Challenges

Raw Material
Shortages

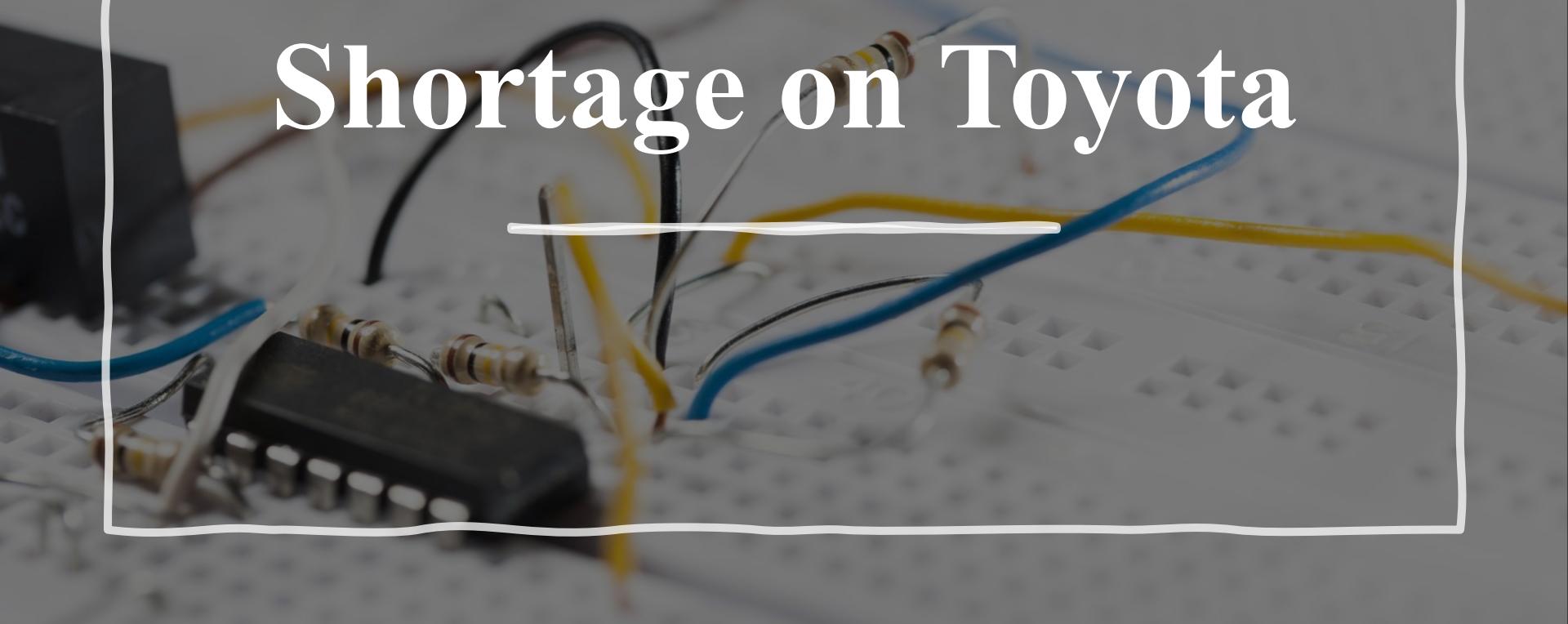
Lean inventory
Limitation



Semiconductors shortage in Industries



Impact of Semiconductor Shortage on Toyota



Impact of Semiconductor Shortage on Toyota



Production Reductions



Decrease In Profit



Delayed Deliveries



Operational Adjustments



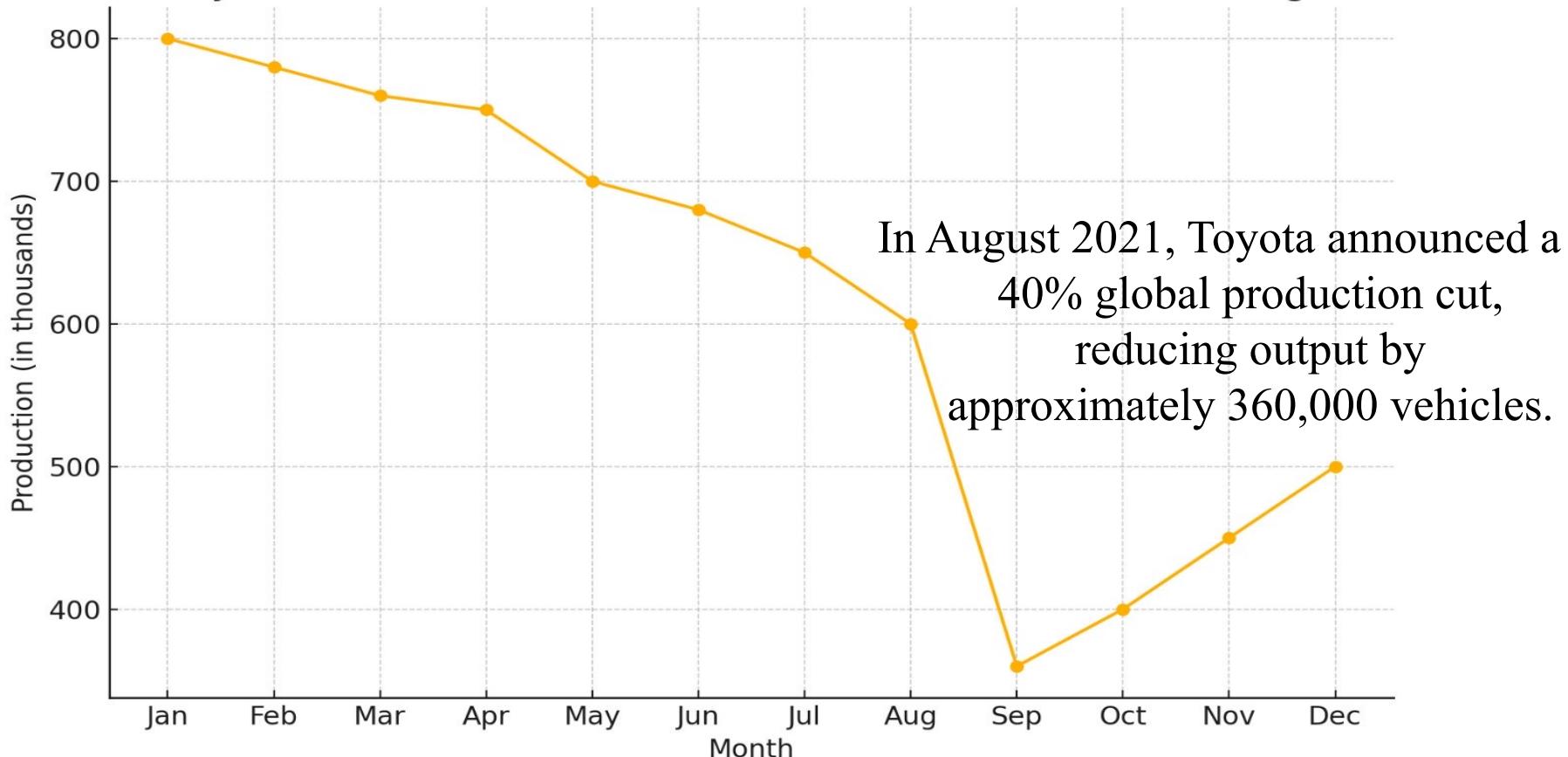
Market Share Impact



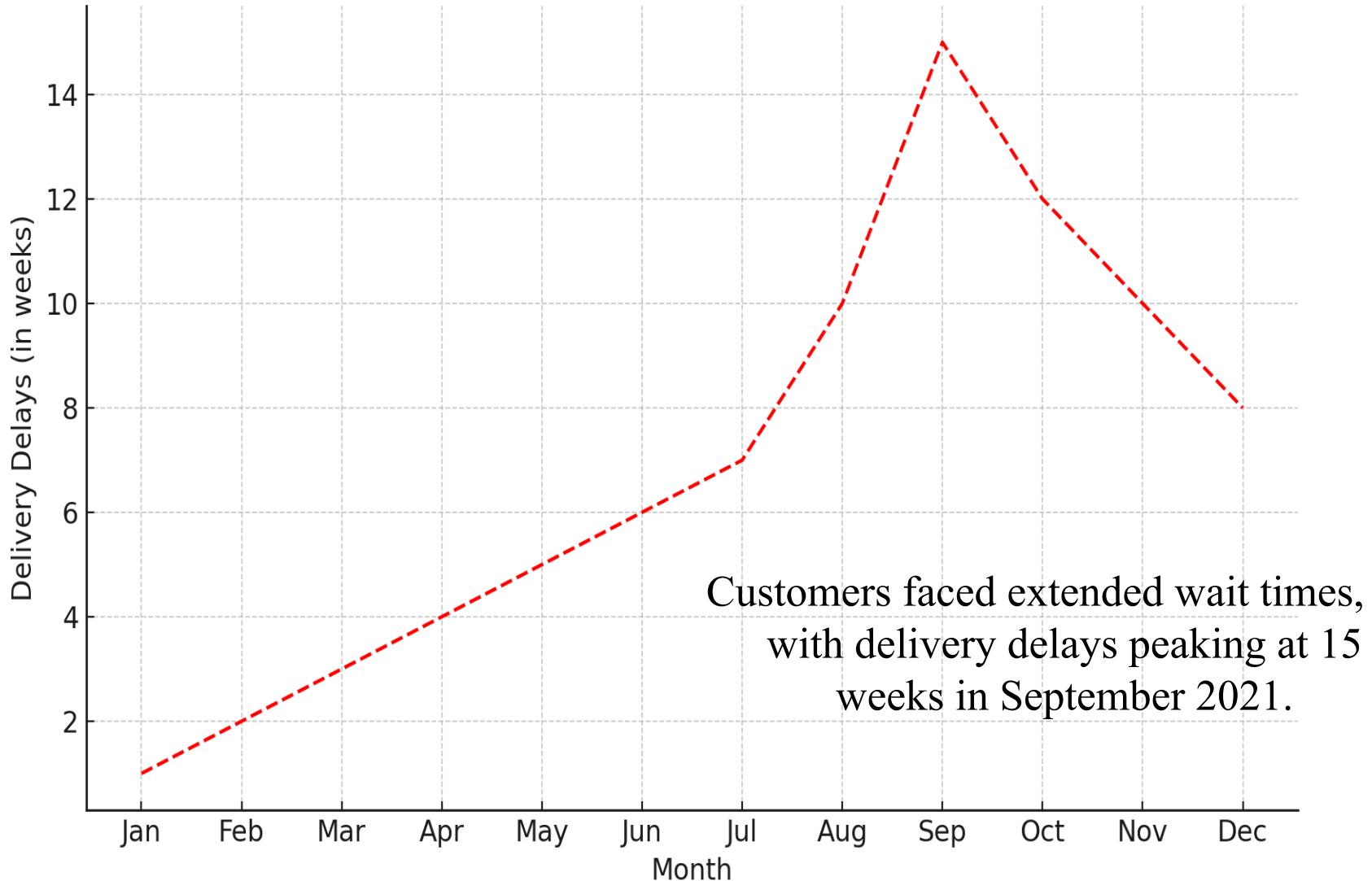
Increased Costs

Impact and Consequences:

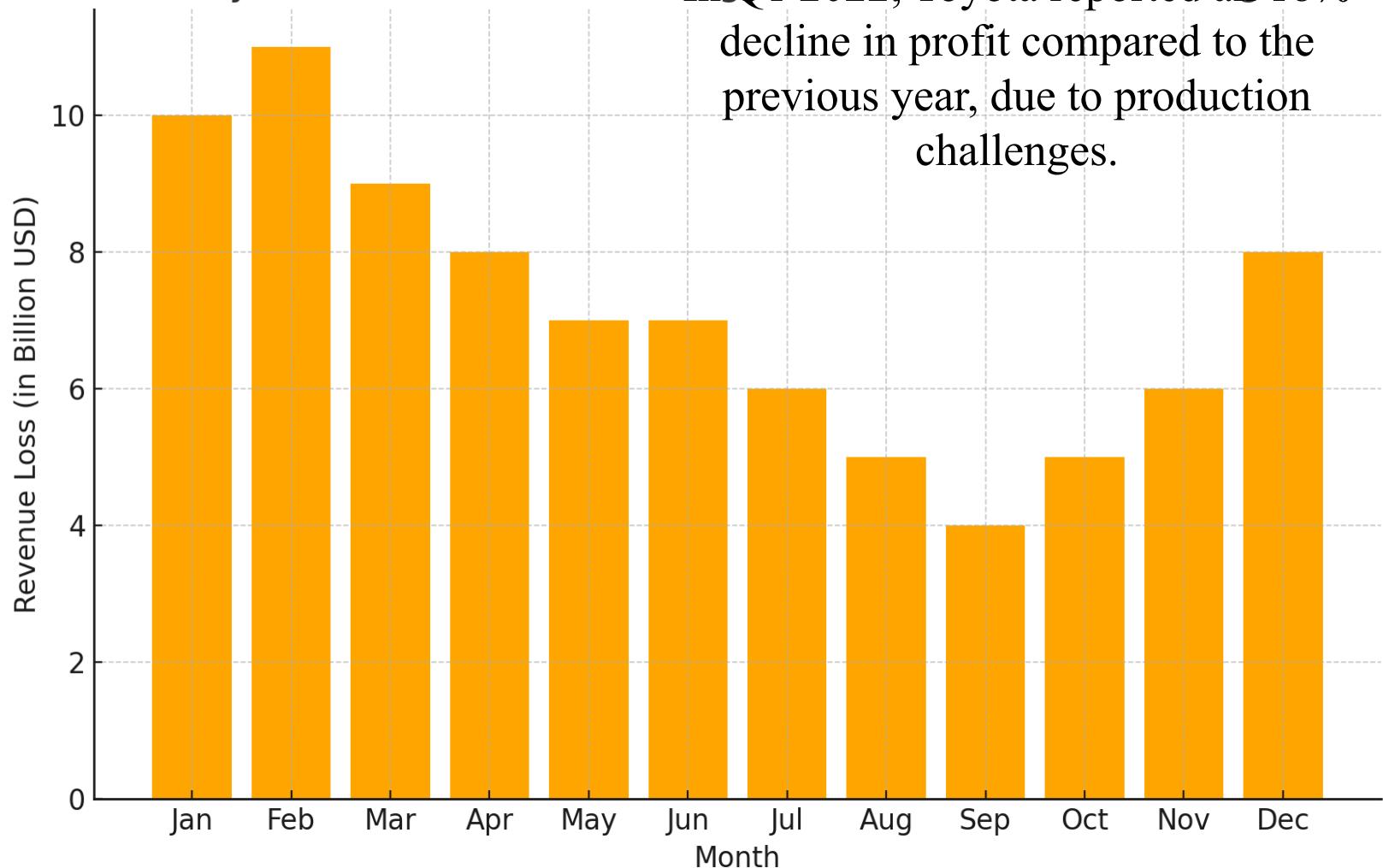
Production Reductions:



Delivery Delay



Decrease In Profit



Data Table:

Toyota Semiconductor Issue

Month	Production Reduction (in thousands)	Decrease in Profit (in Billion USD)	Delivery Delays (in weeks)
Jan	800	10	1
Feb	780	11	2
Mar	760	9	3
Apr	750	8	4
May	700	7	5
Jun	680	7	6
Jul	650	6	7
Aug	600	5	10
Sep	360	4	15
Oct	400	5	12
Nov	450	6	10
Dec	500	8	8

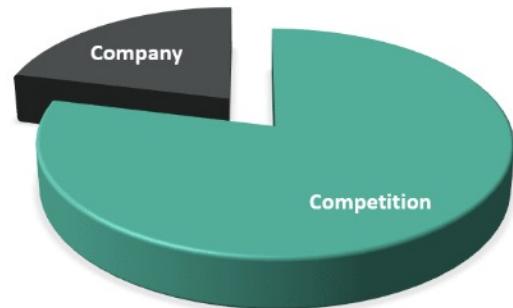
Operational Adjustments



Toyota implemented just-in-time inventory practices, but the shortages forced the company to reevaluate its supply chain strategy.

Market Share

Limited vehicle supply allowed competitors better positioned in terms of semiconductor availability to capture market share in some regions.



Increased Costs:

Costs increased due to the need for expedited logistics, premium pricing on scarce components, and adjustments in production processes.



The Solutions Implemented

Toyota has built a strong and flexible supply chain by diversifying its suppliers, keeping extra stock, reducing locally, working closely with suppliers, focusing on key products, and planning for the future. This strategy helped Toyota to stay prepared and competitive in today's market.



1. Diversified Supply Chain



2. Increased Inventory



3. Regionalization of Product



4. Supplier Collaboration



5. Production Prioritization



6. Long-term Strategies

Diversified Supply Chain

Toyota doesn't depend on one supplier, instead it works with multiple suppliers from different areas. This way, if one supplier has a problem, Toyota can still get the materials it needs to keep production going



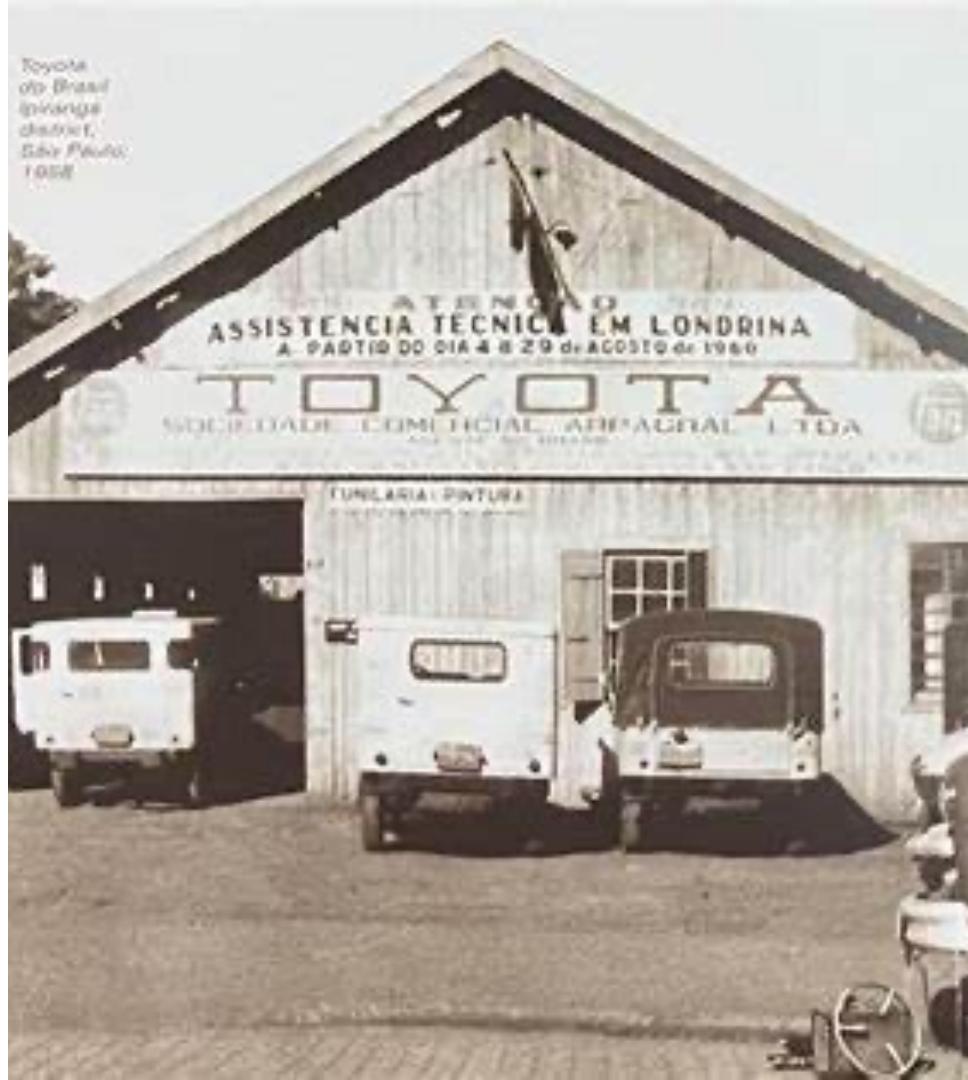
Increased Inventory

Toyota used to keep only a small amount of stock with the just-in-time system. After COVID-19, it began storing more parts to avoid delays and keep things running, even though this approach increases cost and reduces efficiency compared to the original (JIT) system



Local Production

Toyota makes and gets parts from nearby factories. This reduces the time and the cost of shipping. Avoids problems caused by global disruption.



Supplier Collaboration

Working with suppliers. Toyota works closely with suppliers. They share information and planning together to prevent issues. This builds trust and improves communication.



Production Prioritization

Focus on important products. Toyota focuses on making the most needed products first. For example, its priority cars that are in high demand



Long-term Strategies

Planning for the future. Toyota invests in new technology, builds strong relationships with suppliers, and focuses on sustainable practices. These long-term plans help Toyota handle unexpected challenges in the future.



Our Suggestions: AI Implementation on Logistics

Route optimization

Automated Warehouse Operations

Inventory Management & Forecasting

Sustainable Logistic Network

Predictive Maintenance

Route Optimization

Traditional Cost:

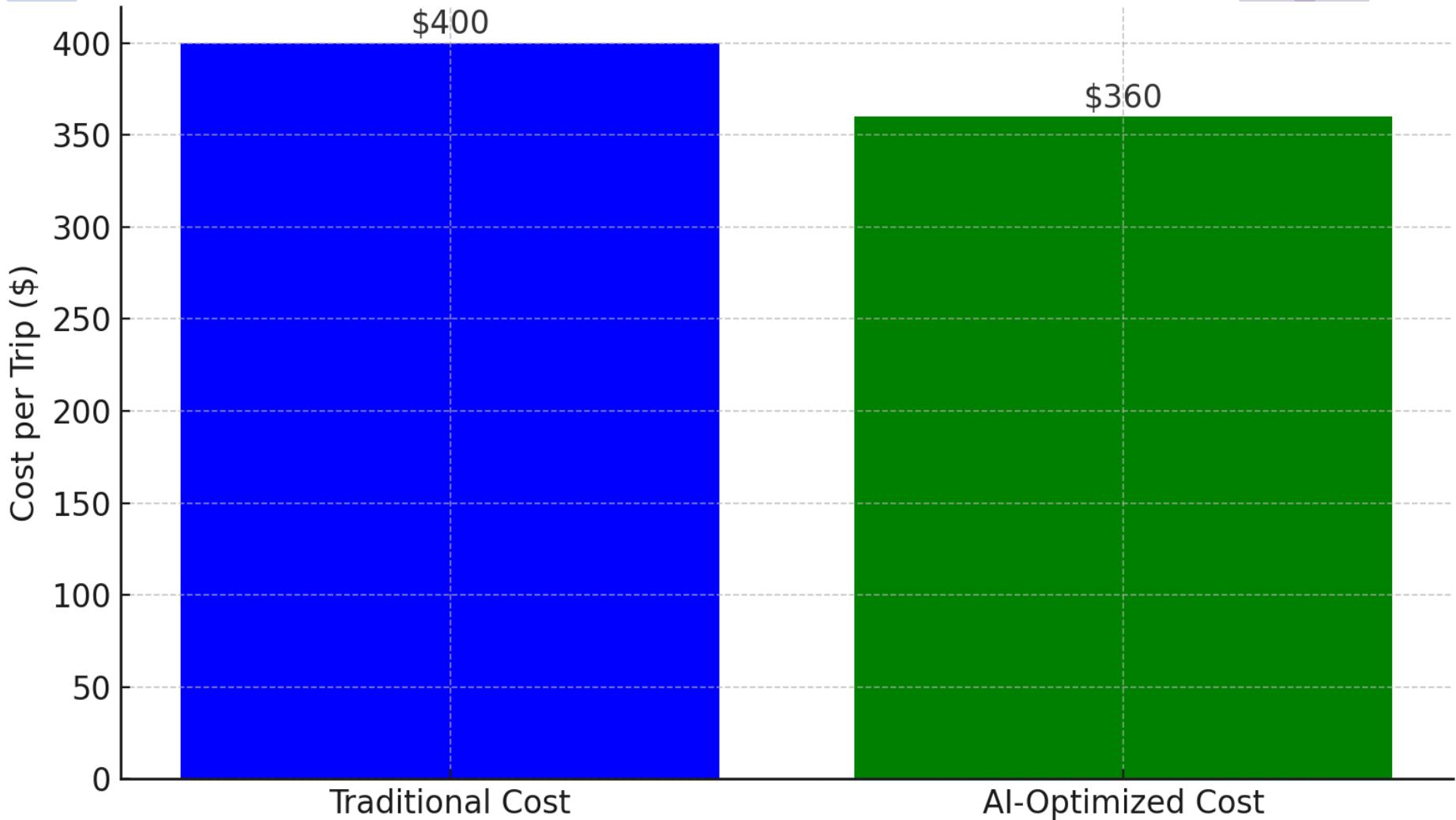
- Shipping from Alabama to Kentucky (**600 miles**) using diesel trucks costs **\$400 per trip** (fuel cost at \$4/gallon, truck efficiency of 6 mpg).
- AI-powered tools: **Google OR-Tools, identify faster or shorter routes.**

Savings:

- By **reducing distance by 10%** (to 540 miles), the new fuel cost is \$360 per trip, **saving \$40 per trip.**



Cost Comparison: Traditional VS AI-Optimized Cost



Automated Warehouse Operations

Current Situation:

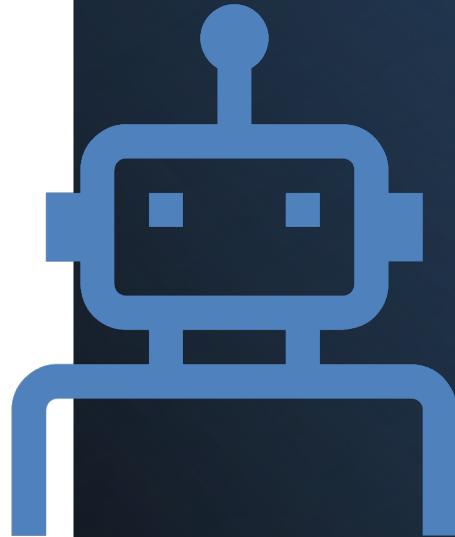
- Manual warehouse processes cause high labor costs, slow processing, and inaccuracies.

AI Solution:

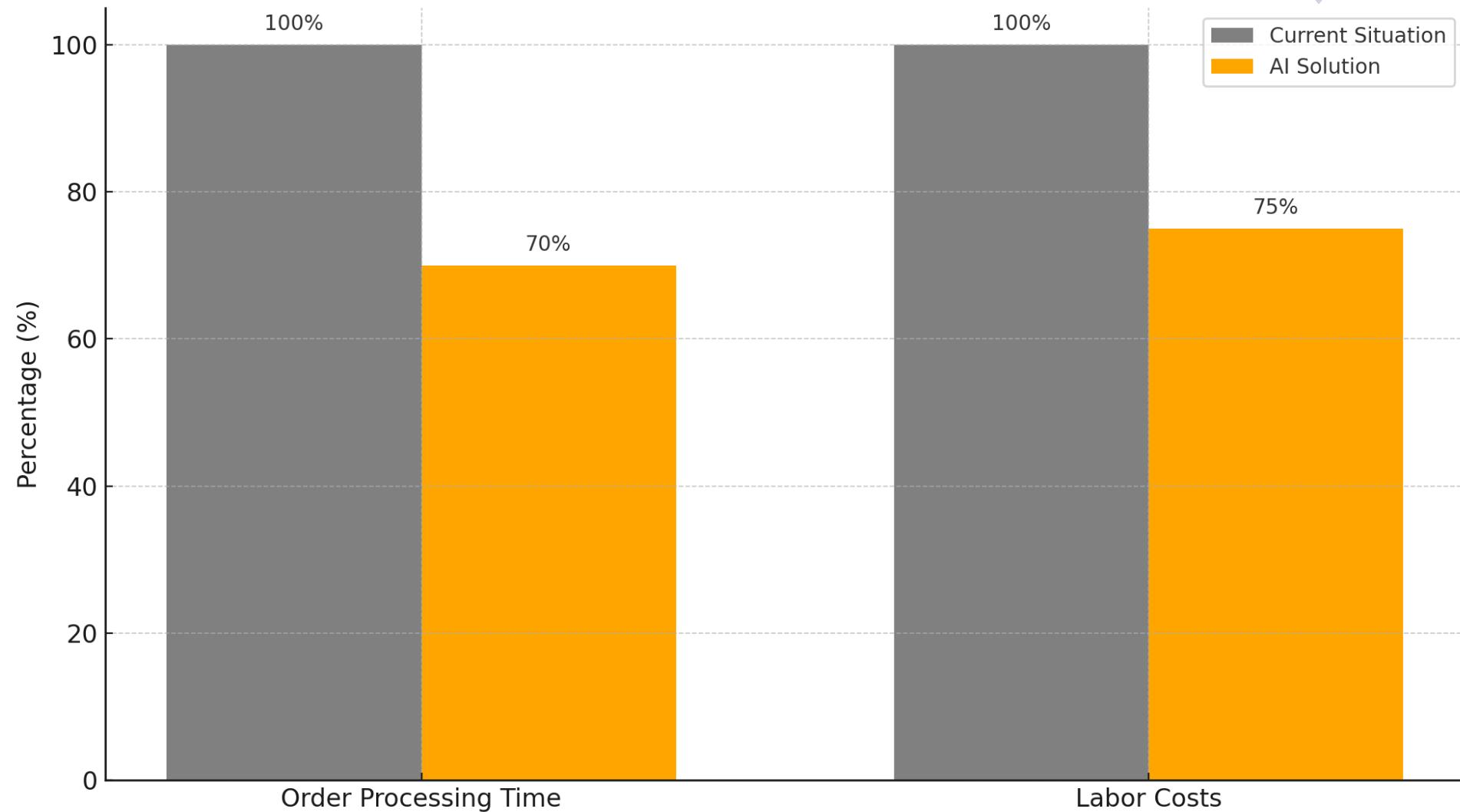
- Use AI-driven robotics and computer vision for tasks like sorting and packing, improving accuracy and inventory control.

Benefits:

- Faster processing, lower labor costs, enhanced safety, and reduced errors.



Impact of Toyota's adoption of AI-guided Robots:



Inventory Management & Forecast

Current Situation:

- Inaccurate demand forecasting causes over/understocking, high costs, and stockouts.

AI Solution:

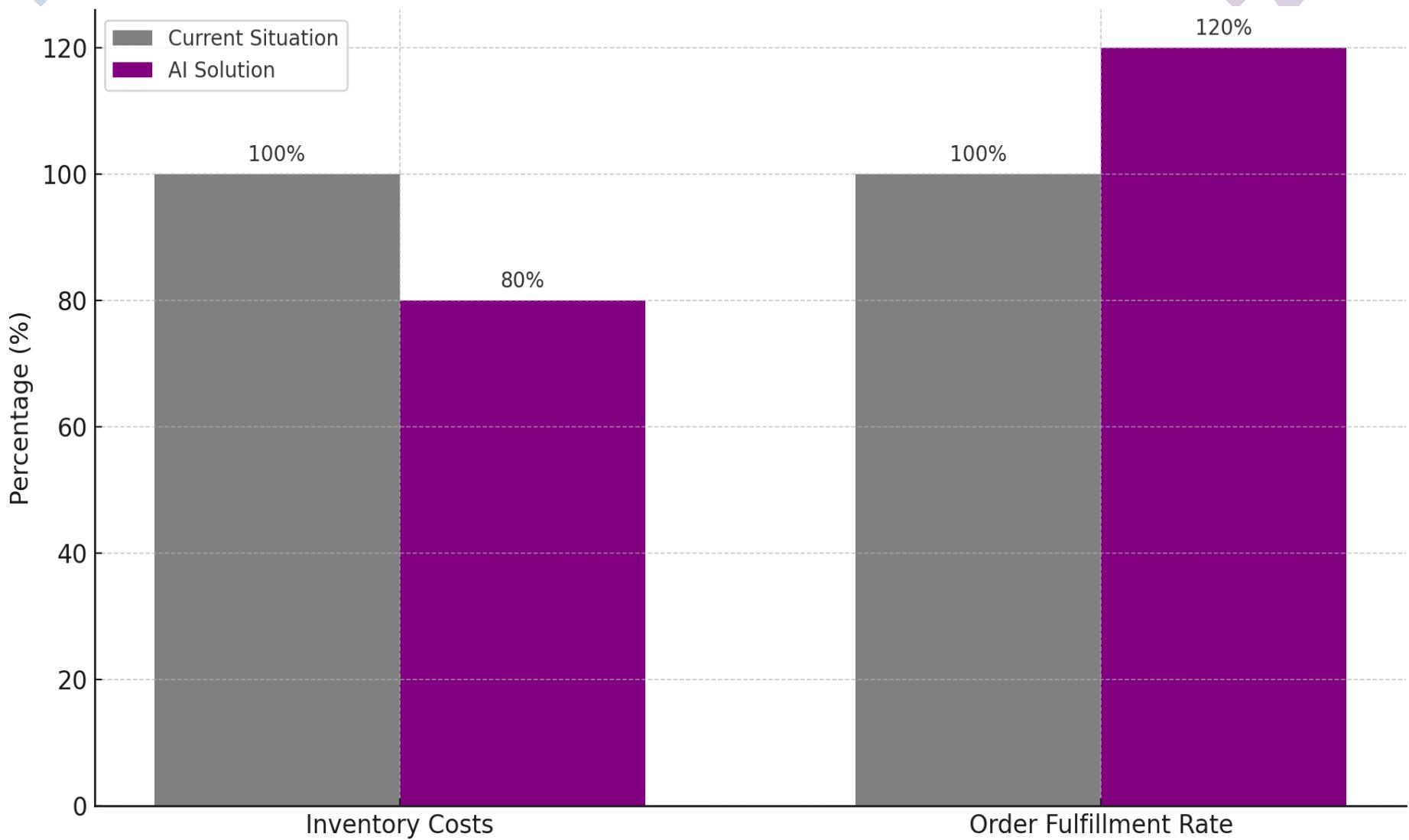
- Predictive analytics improve forecasting using historical data and trends.

Benefits:

- Optimize stock levels, cut inventory costs by 15-20%, reduce excess inventory by 20%, and improve supplier coordination and fulfillment rates.



Impact of Inventory Management & Forecast



Sustainable Logistic Network

Current Situation:

- Logistics operations contribute significantly to carbon emissions due to high fuel consumption and inefficient route scheduling.

AI Solution:

- Implement AI-powered fleet scheduling and electric vehicle (EV) routing systems to optimize travel distances and minimize fuel consumption.

Benefits:

- Reduces carbon emissions through efficient scheduling and improved load capacity utilization.
- Toyota's pilot program with AI-optimized EV logistics **reduced fuel consumption by 20% and emissions by 15%**.
- Supports Toyota's goal of achieving a **15% reduction in CO₂ emissions by 2030**.



Predictive Maintenance

Current Situation:

- Reactive maintenance leads to unexpected downtime and higher repair costs.

AI Solution:

- Integrate AI-driven predictive maintenance by analyzing real-time vehicle data (e.g., engine diagnostics, mileage, wear and tear).
- Alerts for proactive maintenance before a failure occurs.

Benefits:

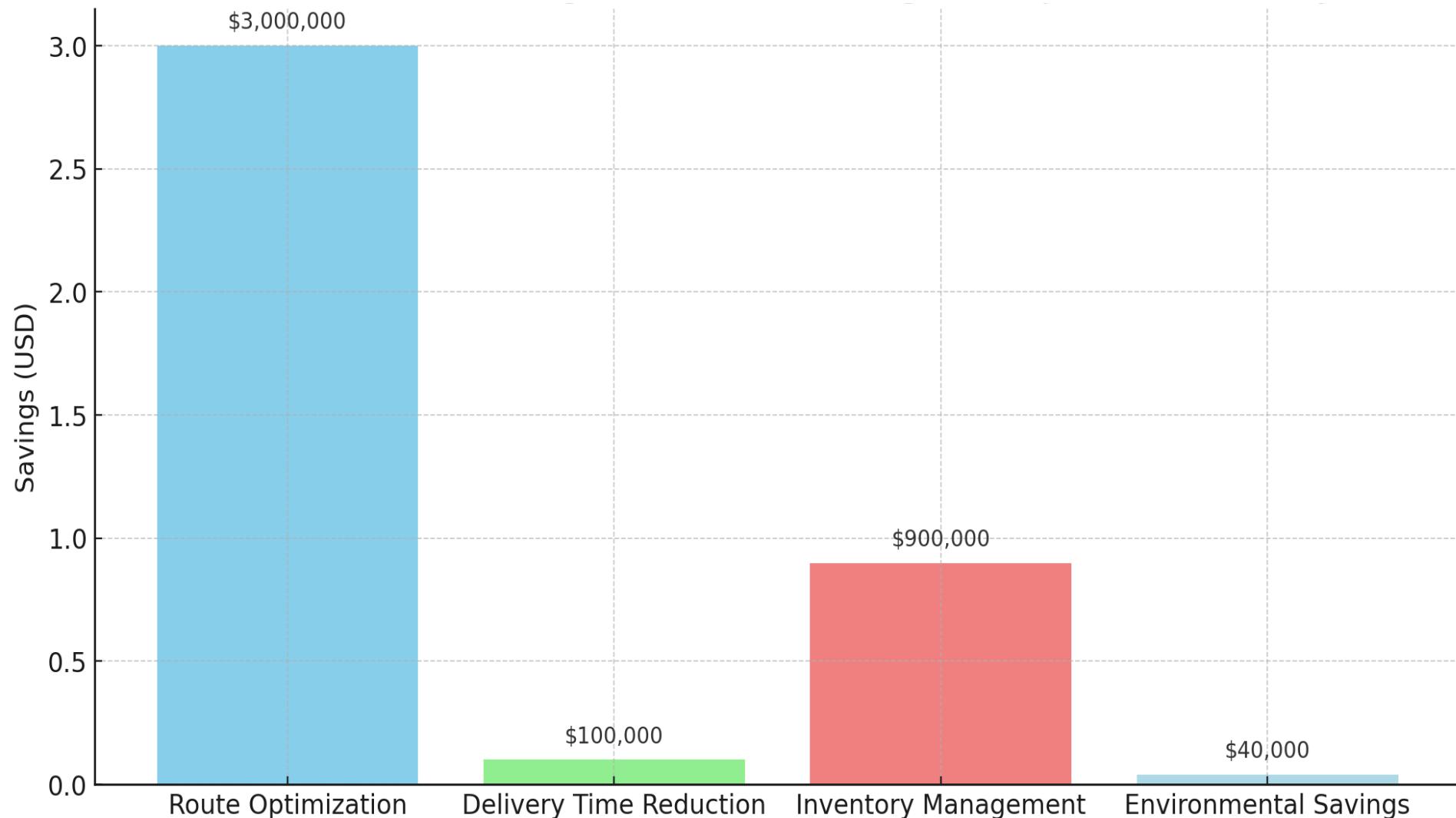
- Minimizes unplanned downtime, extends vehicle life, and reduces repair costs.
- Increases fleet availability by identifying issues early.

Example:

- Predictive maintenance has **cut maintenance costs by 30%** and **improved fleet uptime by 25%**, optimizing overall logistics efficiency.



Estimated Annual Savings from AI-Driven Logistic Optimization



Any
Questions?





Thank you!

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