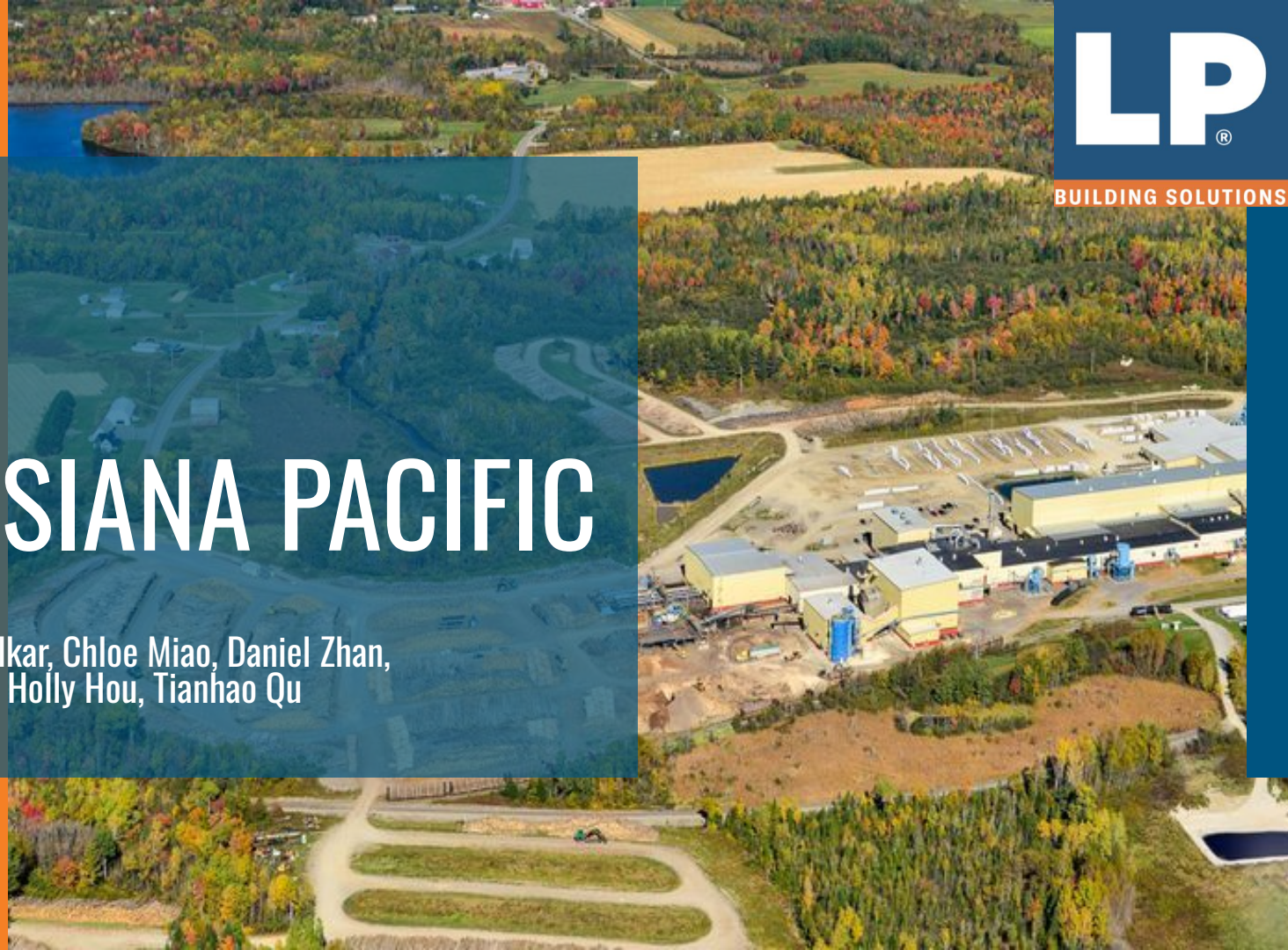
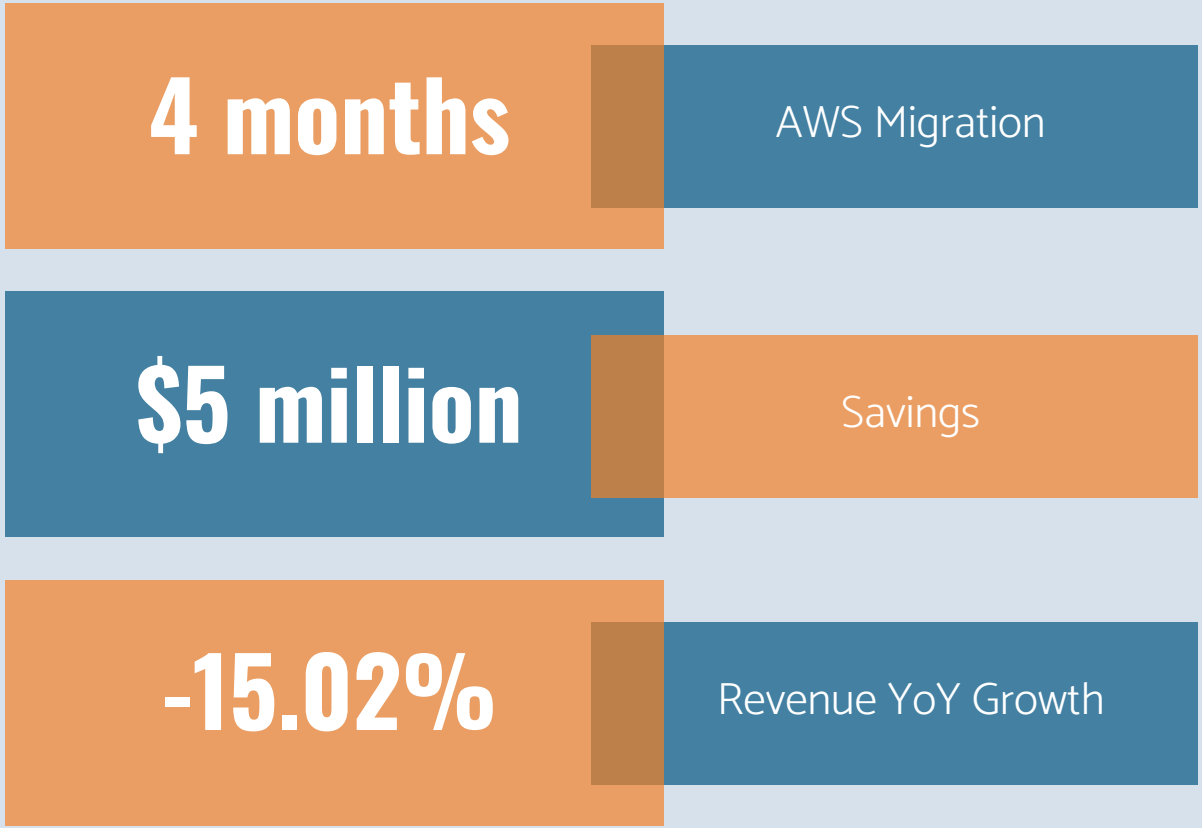
LOUISIANA PACIFIC

Ananya Nimbalkar, Chloe Miao, Daniel Zhan,
Eleanor Beers, Holly Hou, Tianhao Qu




4 months
AWS Migration
$5 million
Savings
-15.02%
Revenue YoY Growth

Problems

Opportunity

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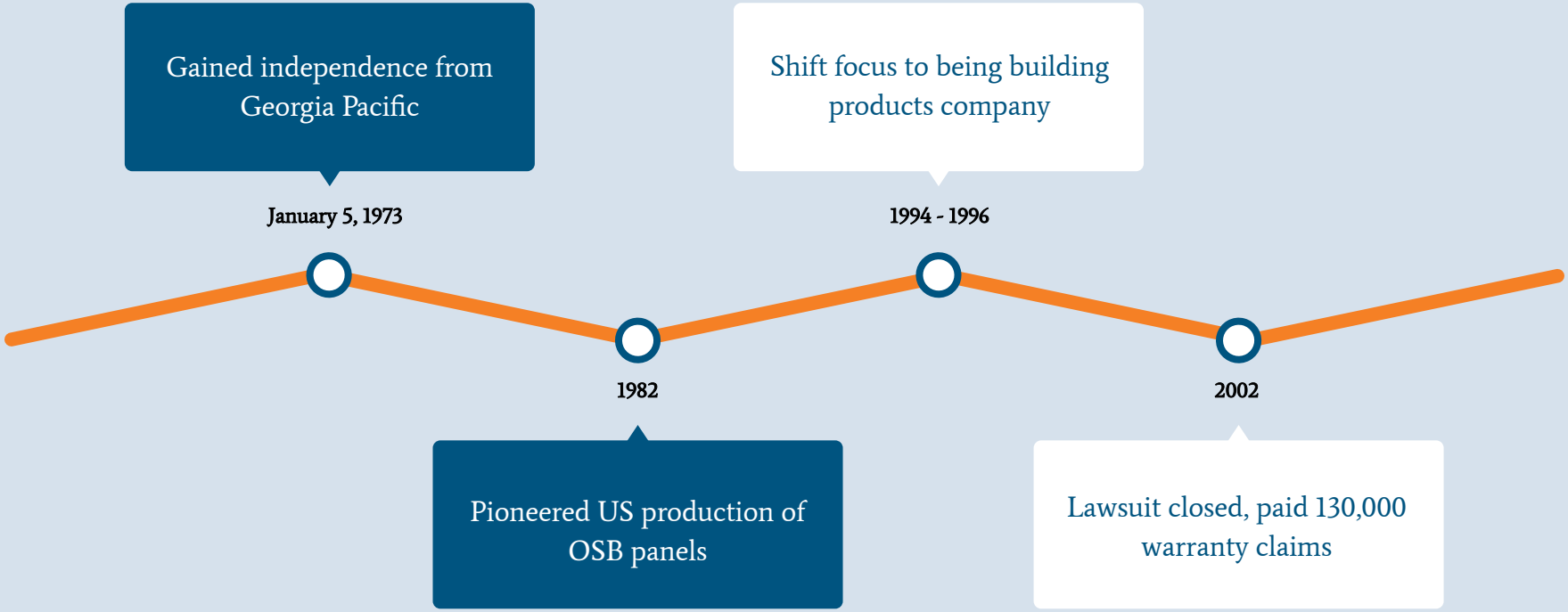
TABLE OF CONTENTS

Background Information

- Building materials manufacturer
- Provides building solutions
  - Builders
  - Remodelers
  - Homeowners
- Major Products & Services:
  - Oriented Strand Board (OSB)
  - Engineered Wood Products (EWP)
  - Plywood & Veneer Sheets
  - Wood-based Panels & Laminates

History


Gained independence from Georgia Pacific
January 5, 1973
1982
Pioneered US production of OSB panels
Shift focus to being building products company
1994 - 1996
2002
Lawsuit closed, paid 130,000 warranty claims

Business Model

Main Components

- Product Portfolio
  - Specializes in manufacturing engineered wood products (EWP)
- Manufacturing & Distribution
  - Facilities in North & South America
- Innovation & Product Development
  - Invests in R&D
  - Focuses on durability & efficiency
- Sustainability & Compliance
  - Adheres to environmental standards

Divisions

Siding

Manufacturing & distribution of siding products

LP SmartSide Trim, Siding

OSB

Produces & sells OSB structural panel products

Largest contributor towards revenue

EWP

Products used for structural framing, beams, & other construction applications

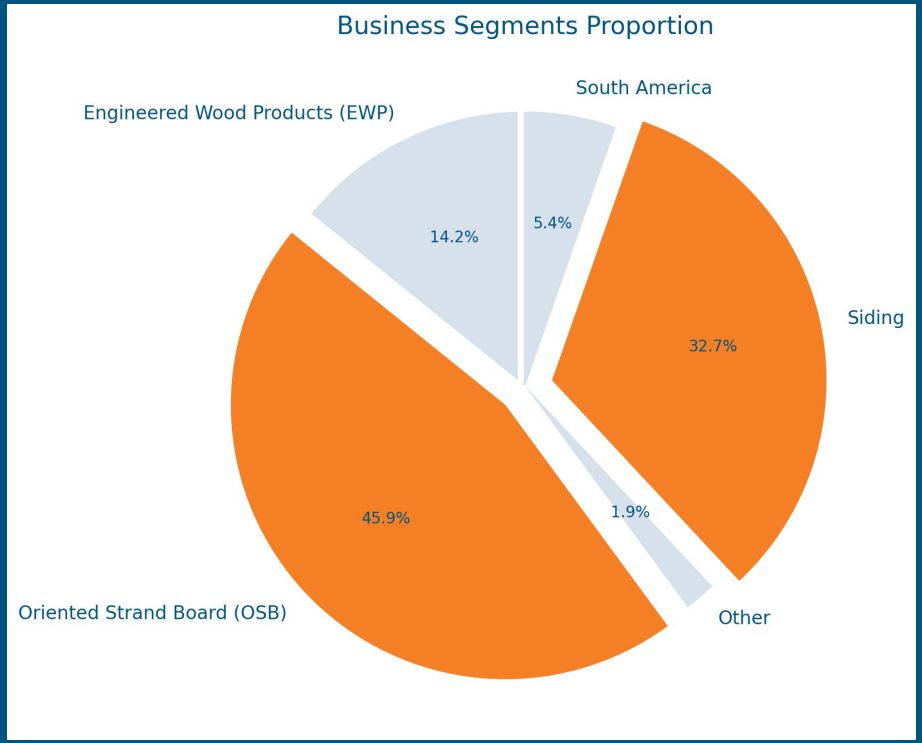
LP SolidStart LVL I-Joists, & LSL

SA

Operations in South America

Products tailored to region

Proportion of Business Segments



Customers & Marketing

- Customers:
  - Homeowners & Homebuilders
  - Contractors & Builders
  - Architects & Designers
  - Retailers & Distributors

Competitors

- Weyerhaeuser Company
- Boise Cascade Company
- MasTec
- Companies in construction sector

Competitive Advantage

- Innovative products
  - OSB, LP SmartSide
- Sustainability focus
  - LP Foundation
- Strong distribution network
- High ratio of free cash flow to sales
  - 27%
- Strong reputation

Culture & Hiring Strategy

- People come first
  - Most important asset
- Healthy, safe workplace for all employees
  - Won 85 safety awards since 2010
- Support veteran hiring initiatives
- Values-aligned work environment

Industry Outlook

Outlook 1

Expected continued growth driven by housing and commercial construction

Outlook 2

Technological advancements in wood product manufacturing

Outlook 3

Potential impact of global economic conditions on construction and remodeling sectors

Data Science at LP

- Team structure
  - 1 data scientist, works across all sectors of the company
  - Dr. Joy Carleen Garnett, Senior Data Scientist
- Role
  - EDA – Identify areas of improvement & develop proof-of-concept projects
  - Acquire funding & approval for new projects
  - Data engineering, ML, operations analysis
    - SQL, Python
  - Reporting & presenting results, financial impact to stakeholders
- Use cases
  - Stack Test Failures
  - Dryer Machine Anomaly Detection System
  - Sustainability Efforts

https://www.linkedin.com/in/joycarleen/

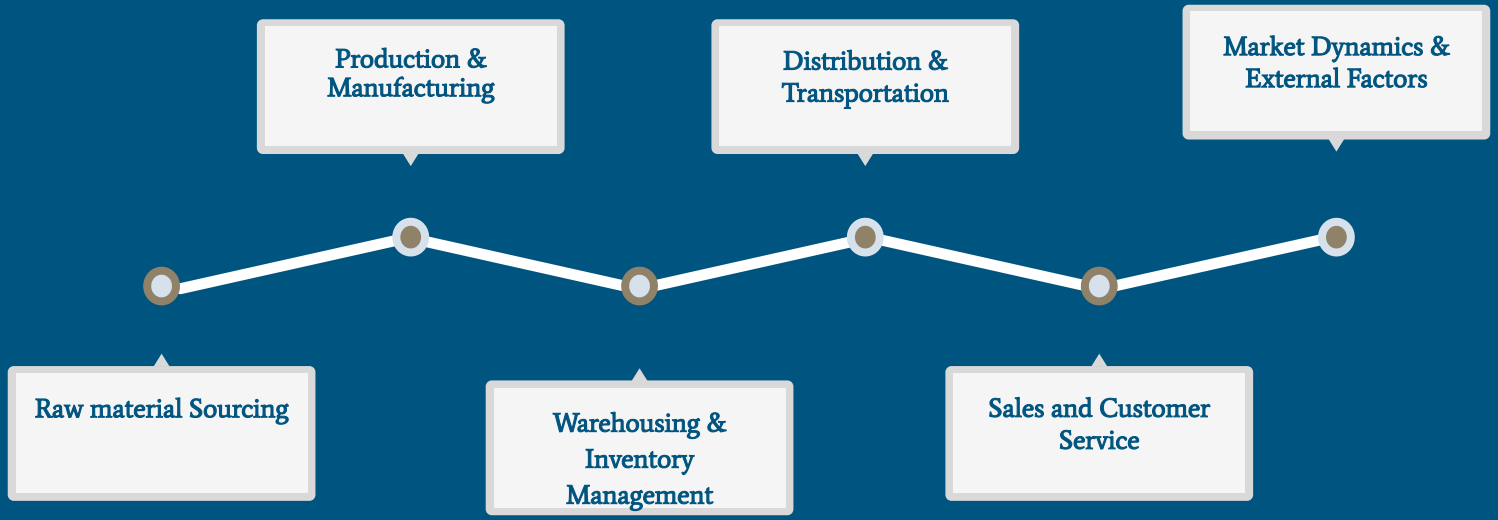
Use Case 1: Stack Test Failures

- Goal
  - Identify issue(s) contributing to stack test failures in mills
- Problem
  - Mills that failed stack tests would have to shut down
  - Significantly impacts production
- Method
  - Wide-scale analysis of entire production process
  - Allowing environmental management team to identify issues upstream in production process
  - Remove or replace defective equipment contributing to stack test failures
- Outcome
  - Passed stack tests at much higher rate
  - No revenue loss from mill shutdowns

Use Case 2: Dryer Anomaly Detection

- Goal
  - Identify which issues upstream have the largest impact on dryer system
- Problem
  - Equipment failure
- Method
  - Incorporate anomaly detection models into a warning system
  - Maintenance team can respond to before the equipment breaks
- Projected Outcome
  - Decrease unplanned downtime
  - Costs the company millions
    - Loss of production time
    - Shipping of replacement parts

Lengthy Supply Chain Vs. Swift Market Demand Fluctuations



Real Scene Challenge in Supply Chain

Inspired by Stack Test Failure

Potential Revenue Loss

- Factory will be shut down
  - Ranging from 1 week to 2 months
- 15 trucks of OSB will not be delivered in time
  - Per mill
  - Per day
- Loss of production
  - 11.35k sq. ft. of OSB
  - Per day

Facts

- 11 OSB manufacturing locations
- 13 Siding manufacturing locations

Manufacturing locations

Siding Manufacturing Locations

- Bath, New York
- Dawson Creek, British Columbia
- Green Bay, Wisconsin
- Hayward, Wisconsin
- Houlton, Maine
- Newberry, Michigan
- Panguipulli, Chile
- Roaring River, North Carolina
- Sagola, Michigan
- St. Louis, Missouri
- Swan Valley, Manitoba
- Tomahawk, Wisconsin
- Two Harbors, Minnesota

OSB Manufacturing Locations

- Carthage, Texas
- Jasper, Texas
- Clarke County, Alabama
- Hanceville, Alabama
- Roxboro, North Carolina
- Watkins, Minnesota
- Maniwaki, Québec
- Lautaro, Chile
- Panguipulli, Chile
- Peace Valley, British Columbia
- Ponta Grossa, Brazil

- Oriented Strand Board (OSB)
- Administrative Offices
- Engineered Wood Products (EWP)
- Siding

Potential Solution: CarpenCare Maintenance Forecaster (CCMF)

Objective

Detect machine failures, part wear & tear

Determine which components/machines are critical for prediction model

Data Collection

Sensors
Temperature, vibration, sound, etc.
Historical maintenance records

Data Quality
Accurate, consistent, & comprehensive
Integration
Same platform, unified format

Data Processing

Data Cleaning
Feature Engineering

Extract relevant features
Operating hours, load, environmental conditions, hardness of wood

CarpenCare Maintenance Forecaster (CCMF)

Exploratory Data Analysis

Pattern recognition
Visualization

Find out patterns/correlations related to the maintenance

Model Selection

Algorithm Choice
Regression, decision trees, neural network

Using time-series analysis or LSTM (Long Short-Term Memory) networks

Model Training & Validation

Training
Cross-Validation

Techniques like k-fold cross-validation to validate model's performance

CarpenCare Maintenance Forecaster (CCMF)

Performance Metrics

Accuracy
Precision and Recall

Check costs of:
False positives (unnecessary maintenance)
False negatives (missed maintenance)

Implementation

Integration
Real-Time Processing

Ensure model can process data in real-time or as required

Monitoring and Updating

Feedback Loop
Re-training

Continuously monitor model's performance
Upgrading parts, new materials, regulatory changes, & workforce skills

Feasibility Analysis of CCMF

Practicality

- **Easy Data integration**
  Self-operated mills with uniform platforms & machines
- **Cost efficient**
  Low-cost sensors
  Manageable workflow modification

Challenges

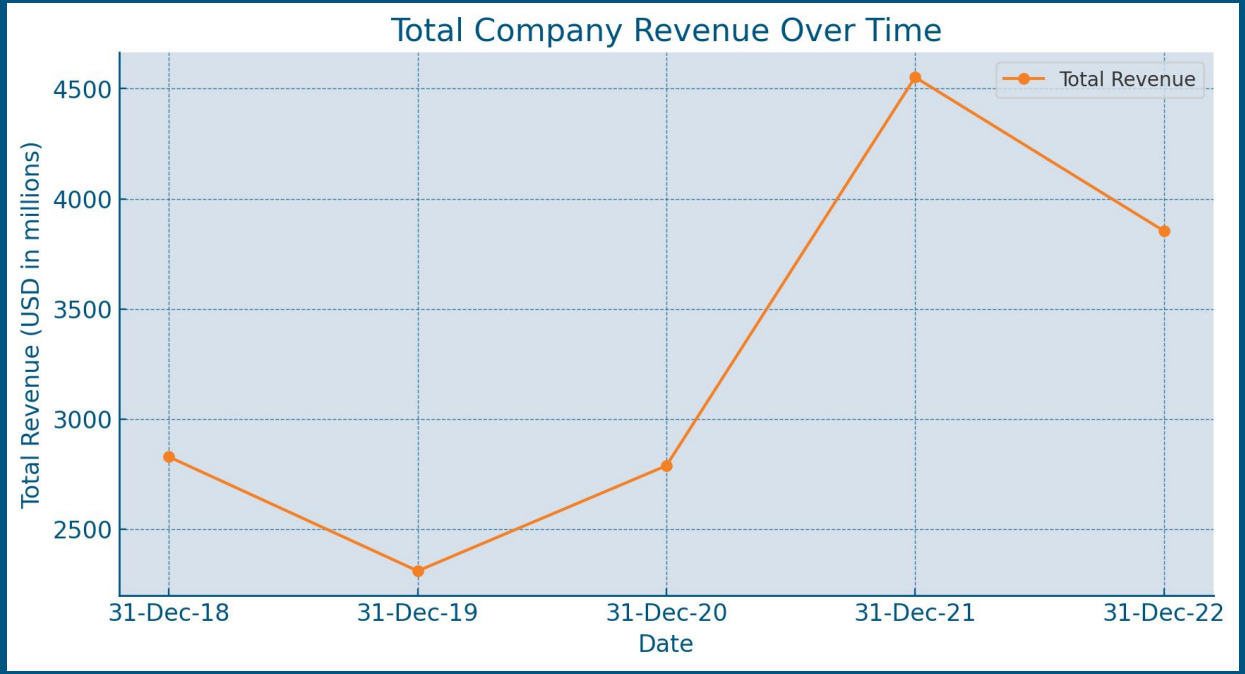
- **Regional differences**
  Regulation
  Labor Capacity
  Natural resources
- **Communications**
  Willingness to change
  Knowledge gap
- **Historical Data Accuracy**

Benefits

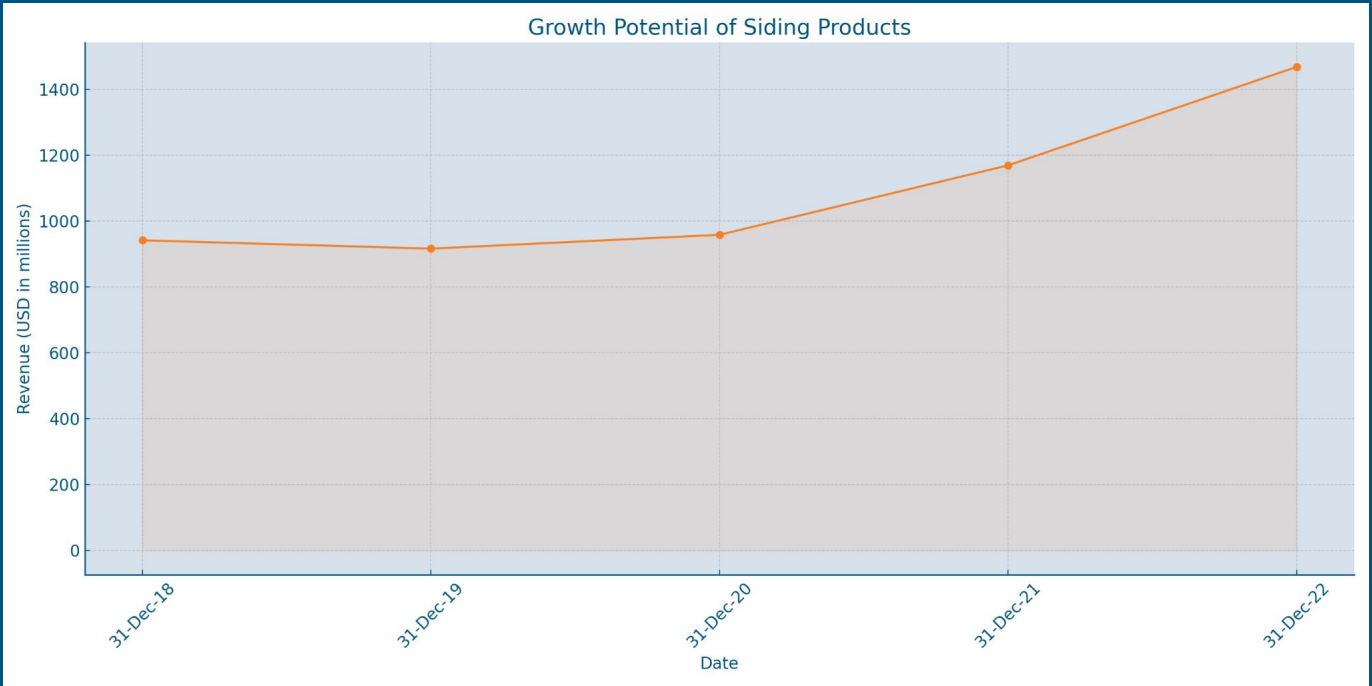
- **Reduce downtime**
- **Extend Equipment life**
- **Cost saving**
- **Assure product quality**
- **Improve safety**
- **Human Resources Optimization**
- **Reduce environmental impact**
- **Support data-driven decision**

Problem: Market Fluctuation

- Supply Chain Disruptions
  - Lumber shortage
- Economic Challenges
  - Inflation
  - Labor expense
- Demands Decrease
  - Single-family housing



Robust Growth of Siding Products



Smart Siding

- Ease of Installation & customization
- Diverse Color Options
- Longevity and Durability
- Comprehensive Warranty
- Advanced Manufacturing Processes

SWOT Analysis: Siding Products

STRENGTHS

Manufacturing Capabilities:

Louisiana-Pacific has robust manufacturing capabilities

WEAKNESSES

Limited Geographical Presence:

The company's presence is limited geographically, which could impact the market reach

OPPORTUNITIES

New Contracts:

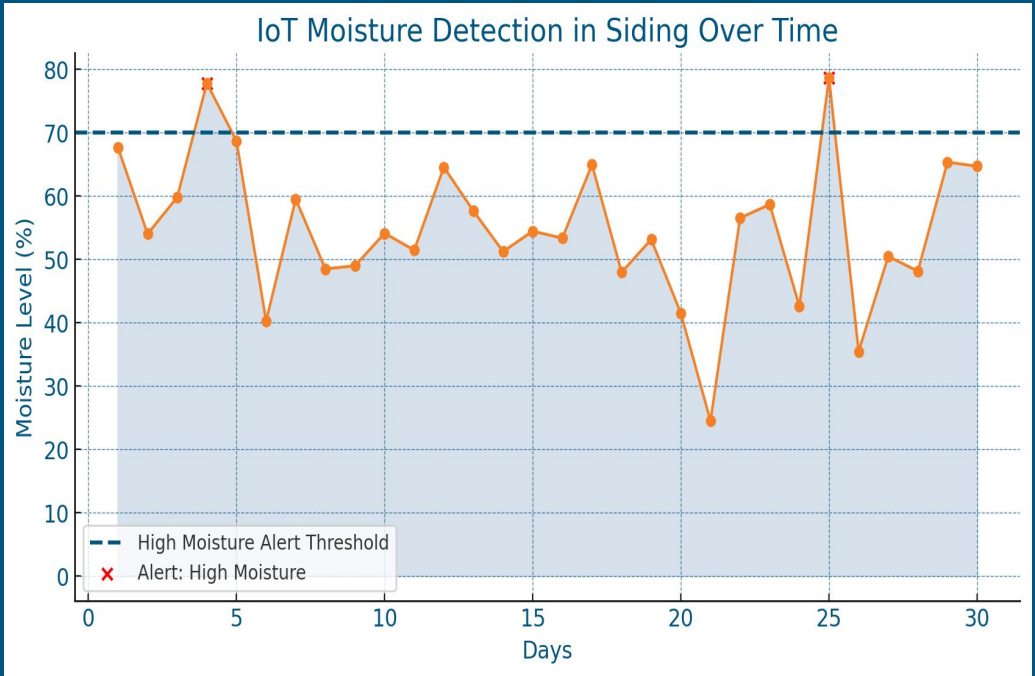
There are opportunities for growth in the form of new contracts, which can potentially increase the market share

THREATS

Risks Related to Competitive Bidding:

The company faces risks related to competitive bidding, which could affect the profitability and market position

Make it Smarter (IoT)



- Moisture Detection
- Temperature Monitoring
- Structural Integrity Alerts
- UV Exposure Tracking
- Wind and Impact Sensors

SWOT-Based Actions

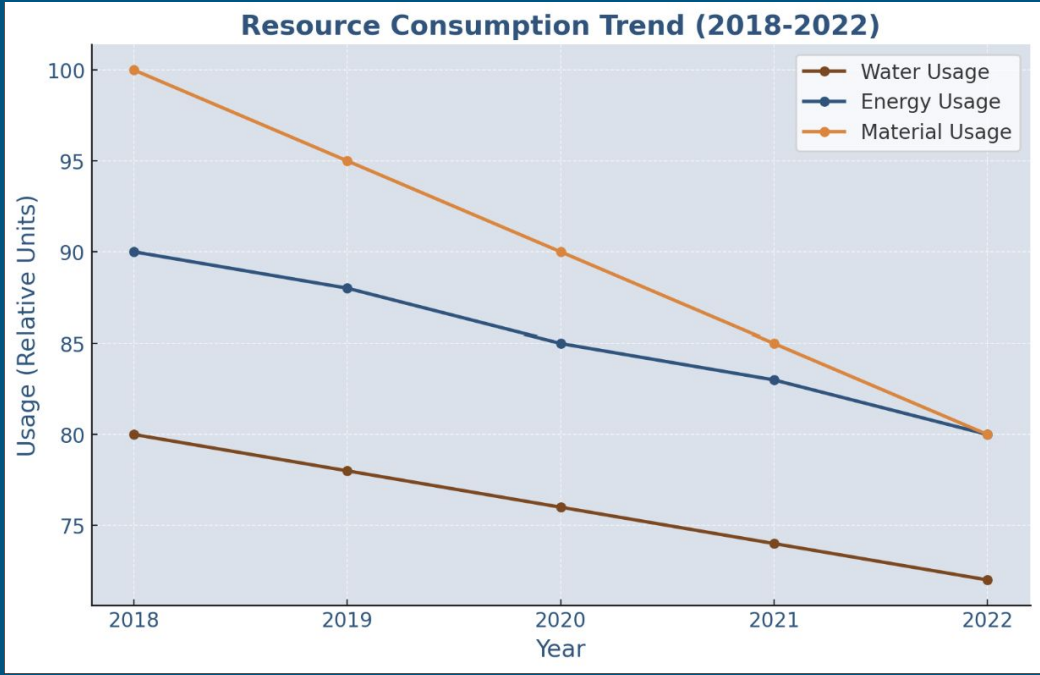
Leverage manufacturing capabilities

Expand market reach

Capitalize on new contracts

Mitigate competitive bidding risks

Opportunity: EcoVision Analytics



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Green Stream Intelligence

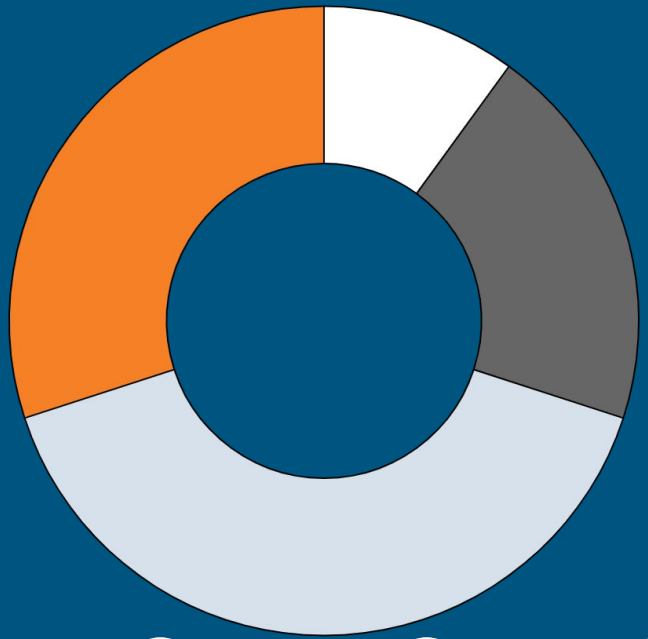
- Resource usage optimization algorithm
  - Optimize use of resources
  - Reduce environmental impact & costs
- Predictive Analytics
  - Time series forecasting
- Process Optimization
  - Machine learning models
  - Historical data on resource usage
  - Weather conditions
- Real-Time Monitoring
  - IoT
  - Immediate adjustments

Opportunity: EcoVision Analytics

Carbon Clarity Metrics

- Carbon Footprint Analysis
  - Understand & reduce carbon footprint
  - Better align with regulations & expectations
- Emission Tracking
  - Data aggregation (Supply Chain, Production)
- Emission Reduction Scenarios
  - Simulation models (Monte Carlo)
  - Shows how operational strategies impact carbon emissions
- Regulatory Compliance
  - Statistical Analysis & Reporting Tools
  - Ensure accurate tracking

Emission Sources Breakdown



PRODUCTION	40%
TRANSPORTATION	30%
FACILITIES	20%
WASTE MANAGEMENT	10%

Next Steps: Chatbot

- Use of LLMs
  - Helps customers differentiate between products
  - Eliminates contact with live agent
- Fine-tuned on company product data
- Erases overhead of customer service representatives
- Financial models necessary to run
  - Estimate if investment is sound

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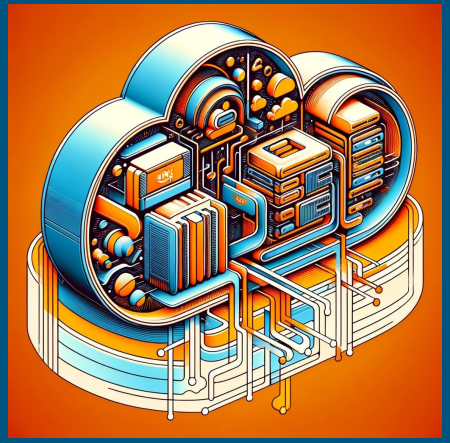
Next Steps: Technology Partnerships



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AWS

- Migrated data to AWS in 4 months
- Possible use of Amazon Bedrock
- Utilize AWS data scientists & experts

Amazon

- Amazon minimally contributes towards LP's revenue
- Strengthen presence on Amazon
- Use of customer data
- Allows LP to utilize Amazon's delivery team
  - Supply chain improvements

Takeaways

Main points

- Long history of success within industry
- Strong existing use of data science
  - Successful migration to AWS
  - Implementation of data science solutions (use cases)
- Build off of existing anomaly detection processes
- Capitalize on sustainability initiatives
- Expand into new markets
  - Geographic markets
  - Product markets

Thank you

Appendix (Articles)

- https://lpcorp.com/about-lp/sustainability/our-people
- https://assets.lpcorp.com/images/pages/about-lp/sustainability/our-communities/lp-foundation/disaster-relief.jpg
- https://investor.lpcorp.com/news-releases/news-release-details/lp-building-solutions-reports-fourth-quarter-and-full-year-2021
- https://home.howstuffworks.com/home-improvement/construction/green/osb.htm#:~:text=OSB%20uses%20the%20wood%20from,treated%20with%20wax%20and%20binders.
- How long does it take for trees to grow enough wood to be used as lumber or plywood, etc.? - Quora
- https://lpcorp.com/about-lp/about/locations
- https://lpcorp.com/blog/leading-the-way-in-supply-chain-innovation
- https://lpcorp.com/blog/efficiency-on-and-off-the-jobsite-tips-from-the-pros
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- https://stockanalysis.com/stocks/lpx/revenue/
- https://encycolorpedia.com/companies/us/louisiana-pacific
- https://www.webfootpainting.com/blog/lp-siding-recall#:~:text=Unlike%20non%2DOSB%20wood%20siding,to%20hold%20up%20long%2Dterm.&text=Over%20time%2C%20the%20glue%20began,%2C%20absorb%20water%2C%20and%20expand

Appendix (Images & Generative AI)

- https://lpcorp.com/media/8140/specs-oversized-osb.jpg
- https://assets.lpcorp.com/images/pages/products/exterior/siding-trim/products/lap-siding/why-lp.jpg
- https://mma.prnewswire.com/media/321594/weyerhaeuser_company_logo.jpg?p=facebook
- https://s3.amazonaws.com/handshake.production/app/public/assets/institutions/24547/cover/hs-emp-branding-image-data.?1509755511
- https://assets-lbmjournal-com.s3.us-east-2.amazonaws.com/2021/09/06LPLegacy.jpg
- https://www.capgemini.com/ca-en/wp-content/uploads/sites/30/2021/03/LP-hard-hat-capture-1540x385-1.png
- https://yt3.googleusercontent.com/HRJKaJg70sqBrCNh7Tf2RSjXTb_5hCUn7Hht7mxUJMg77EWkihh55JklD-KhwAMhwY31ox5O=s900-c-k-c0x00ffffff-no-rj
- https://cdn.britannica.com/86/3886-050-2785B482/South-America-political-continent.jpg
- Generative AI used for preliminary research and generating some visuals
- Generative AI Prompts:
  - “What is Louisiana Pacific's business model and competitive advantage?”
  - “What are the divisions of Louisiana Pacific’s business model and how do they compare amongst each other?”
  - “I am a business student researching how Louisiana Pacific uses data science to combat their business problems. First, please tell me what Louisiana Pacific does and what their business problems are.”
  - “Can you please give me examples of why these are problems the business is facing?”
  - “How can data science be used to overcome these challenges? Please be specific and reasonable in providing potential solutions that make the most sense for the firm and their business model.”