



Tierra del Fuego

Root Cause for Late Deliveries

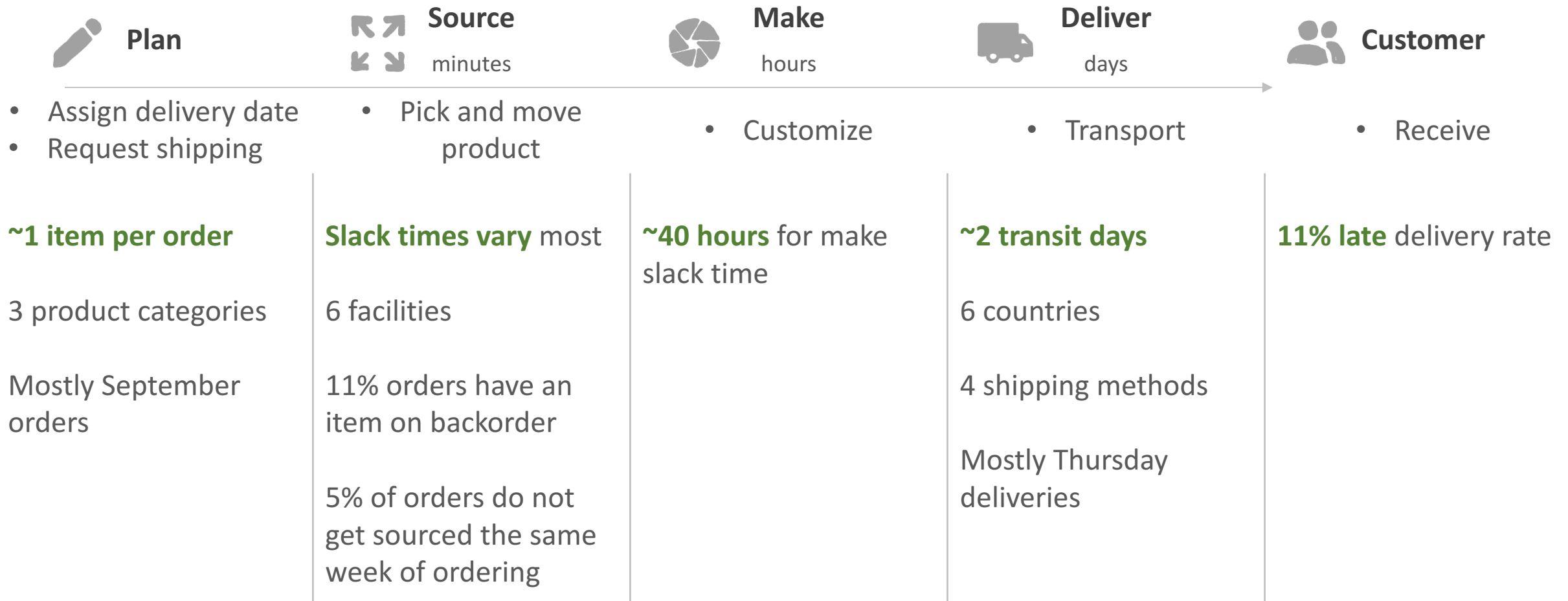
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Executive Summary

11% of all orders have late deliveries and customers are turning to competitors.

Approach	Key Insight	Solution
<ul style="list-style-type: none">• Explore data within supply chain phases• Create new features that connect supply chain• Gain prediction accuracy of late deliveries and variable importance from boosted tree	<ul style="list-style-type: none">• The most common late deliveries are ground transports in Germany	<ul style="list-style-type: none">• Balance delivery of days of the week by mapping out slack times <p><i>Specifically benefits Germany (56% of deliveries)</i></p>

Supply Chain Process



Goal: 1) Connect Supply Chain 2) Find Root Cause of late delivery

Approach & Methodology

What do we know?

Explore Data



- Use descriptive statistics to answer questions
- Which orders?
- Where?
- When?
- How?

What can we add?

Feature Engineering



- Connect data through supply chain
- Temporal features (duration, proportions, calendar)
- 15 additional features created

What can we learn?

Modeling & Results



- Run tree models
- Evaluate prediction accuracy
- Find feature importance

What can we do?

Recommendations



- Learn from key features
- Analyze LOE and impact for recommendations

Exploratory Analysis

Why do late deliveries occur?

What do we know about late deliveries?

		Action
Which?	<ul style="list-style-type: none">Product categories and on sale show ~equal pass/fail rateBackorder items have higher late deliveries	1) Add features about failures by location (country, facility)
Where?	<ul style="list-style-type: none">Mostly GermanyBelgium has the highest proportion of failures at 23%	2) Add features about time (phase duration and proportions)
When?	<ul style="list-style-type: none">Mostly Thursday deliveries, Saturday ordersMostly October orders, rather than most popular month of September	3) Investigate Germany
How?	<ul style="list-style-type: none">Mostly by Ground for countries with at most 2 shipping methodsMostly ground then Next Day in UK and 3 Day in Germany for countries with 2+ methods	4) Investigate Ground transport

Integrate New Information

Add new features that add to the location and temporal nature of the data.



Plan

- Month of order
- Day of the week of order



Source

- Duration since last failure for that facility



Make



Deliver

- Duration since last facility for that country
- Day of the week of delivery



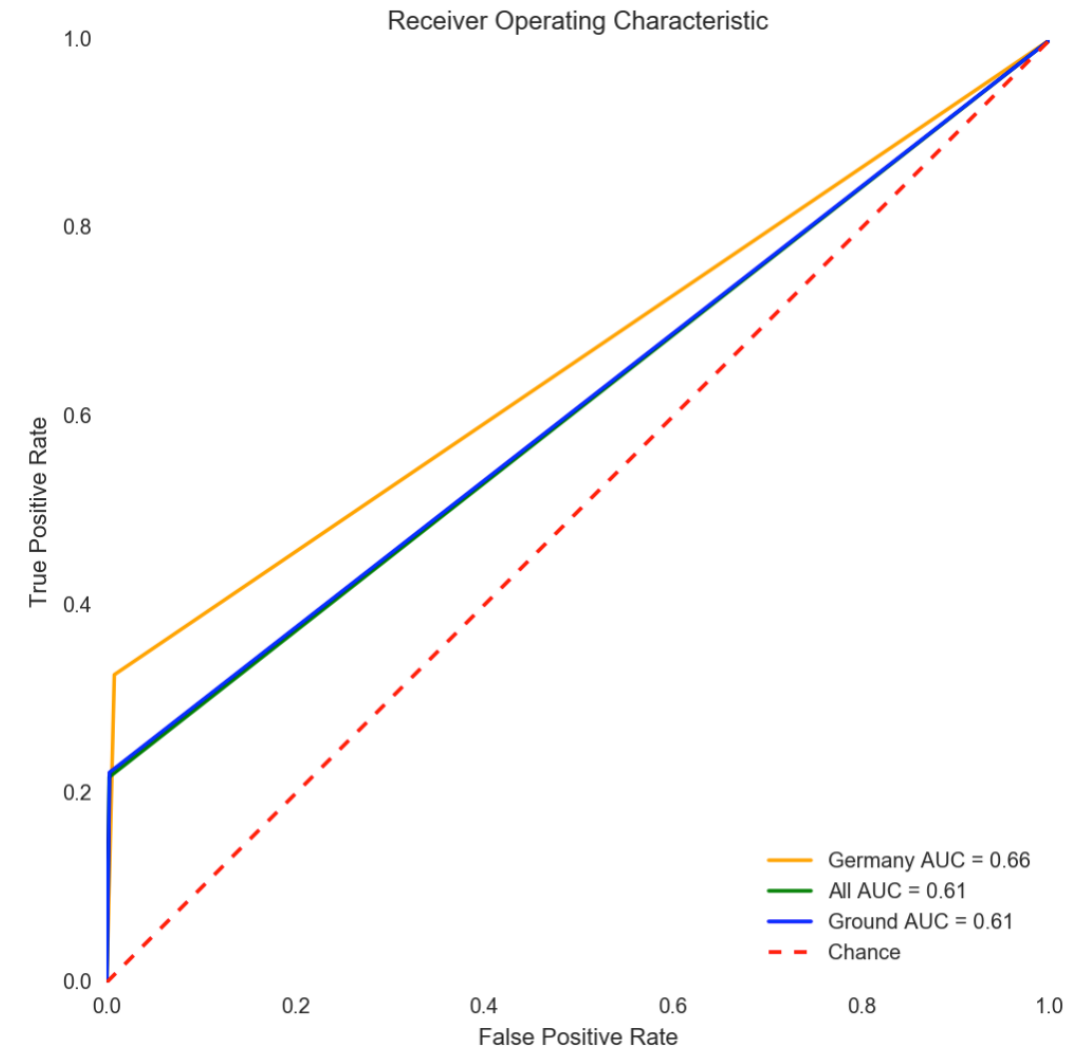
Customer

- Duration of each phase
- Duration of each phase as percentage of total time
- Work week difference between phases (phase overlaps more than 1 work week)

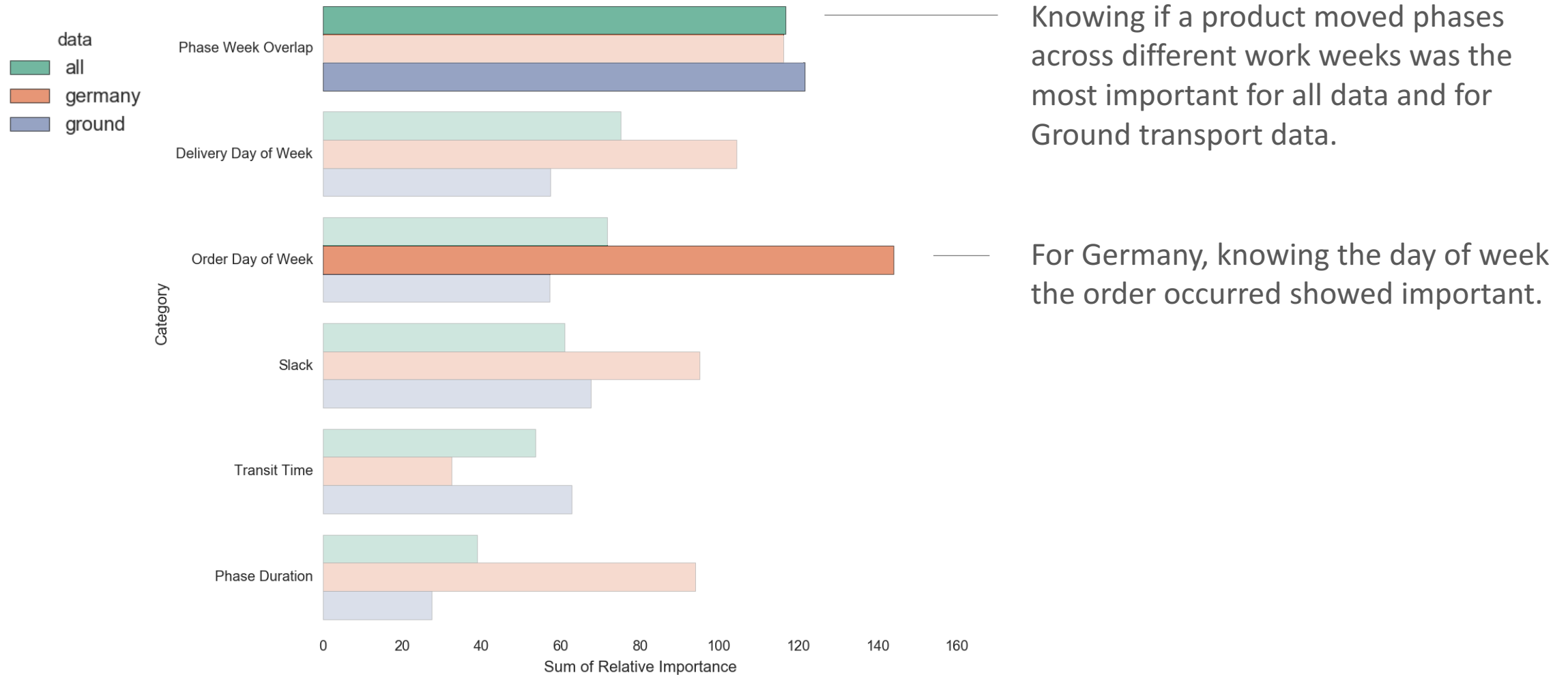
Predict Late Delivery

- Evaluate tree based models to attain feature importance and prediction accuracy
- Subset data to model on all orders, as well as individually on Germany deliveries and Ground transports




Data	Observations	AUC
All	110,000	0.61
Germany	62,000	0.66
Ground	77,000	0.61



Top Features that Impact Late Delivery



Recommendations & Adoption Plan

Recommendation	Adoption	LOE & Impact
Factor backorder in to the planned delivery date or notify customer	Show which items are on backorder on website	
Balance delivery dates by planning ahead for supply chain	Optimize a balanced delivery schedule for all orders within a region and timeframe <i>*Possible down time, but minimizes overall late deliveries</i>	
Balance delivery dates by offering customers incentives for adding delivery days	Offer incentives through monetary or extra perks that gives a window of time for delivery	
Plan to complete phases within a work week	Create alerts to track when completion status and time remaining in week reach certain threshold	