

Increasing Business Won and Reducing Turnaround Time by Modifying ArcBest's Bid and Proposal Processes

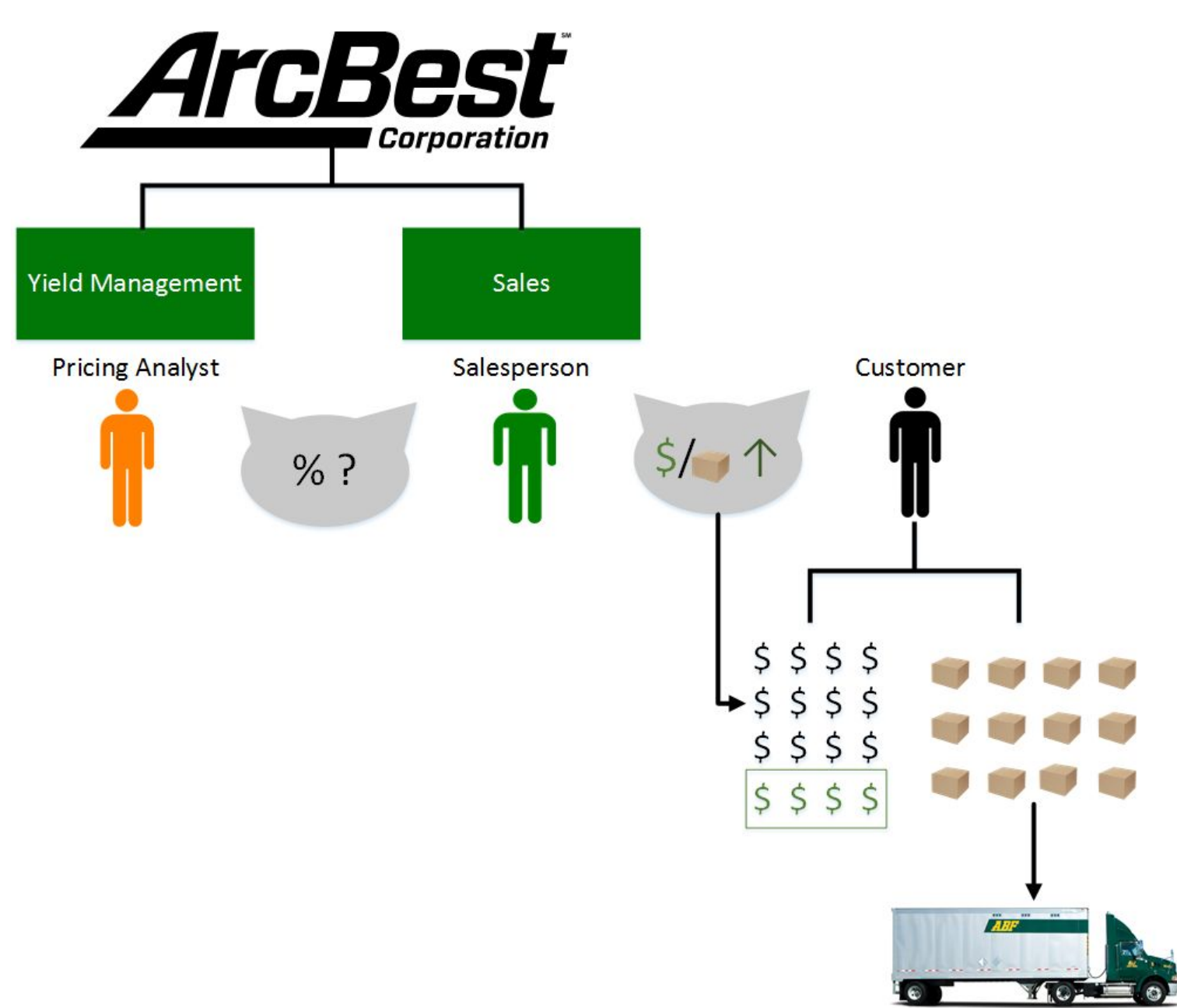
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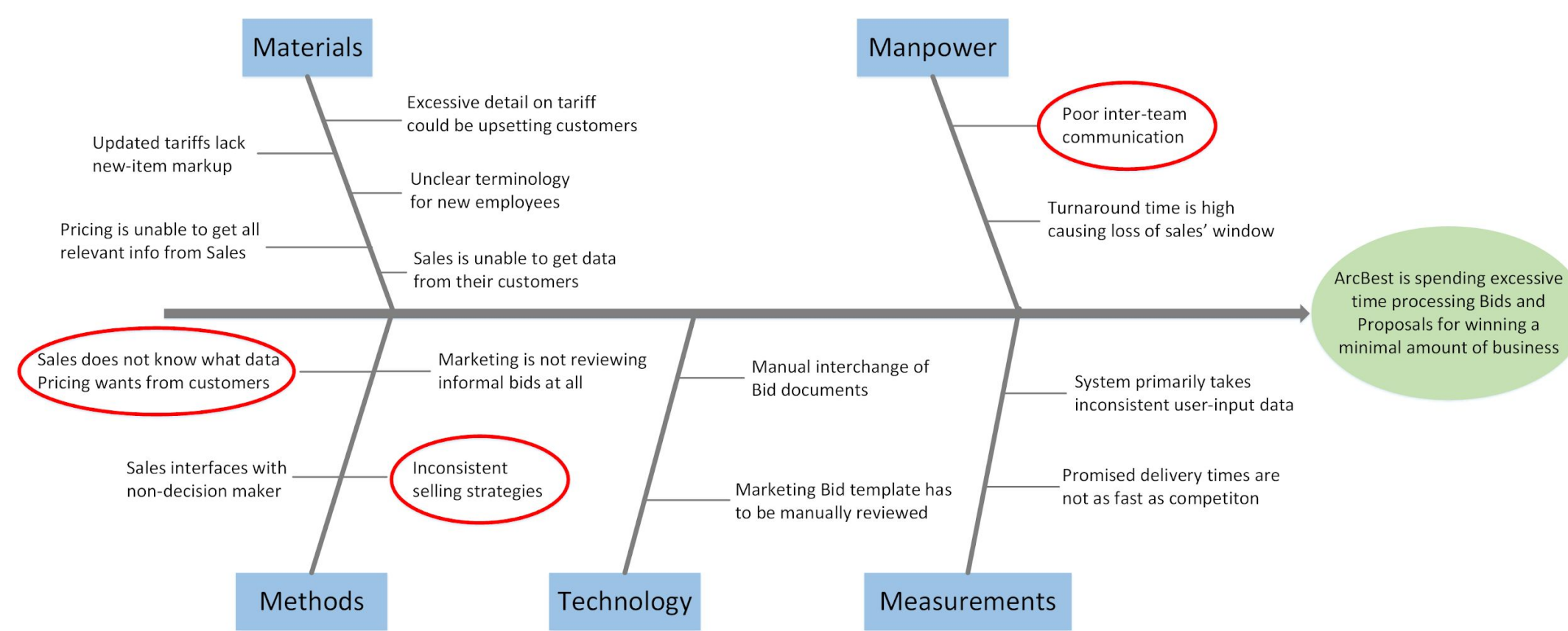
Overview

ArcBest is a multi-billion dollar logistics company with an extended history of delivering creative solutions to their customers. Their less-than-truckload subsidiary, ABF Freight, is seeking to improve their new business decisions process to increase the amount of business won and reduce the turnaround time for the bid and proposal processes. Currently, the premium carrier only wins a small proportion of shipping opportunities. The main objectives of this project are to improve the communication between ArcBest teams and better identify and prioritize business opportunities. Root cause analysis, interviews, surveys, and data analysis were conducted to evaluate the existing bid and proposal systems within ArcBest. The recommended changes to the process are expected to generate \$31,214.87 annually for a 0.1% increase in offers won and likely reduce the turnaround time by five days, which will free an estimated 1,890 hours of company time.



Methods

Root cause analysis, including interviews and surveys with ArcBest stakeholders, was conducted to evaluate the current bid and proposal system.

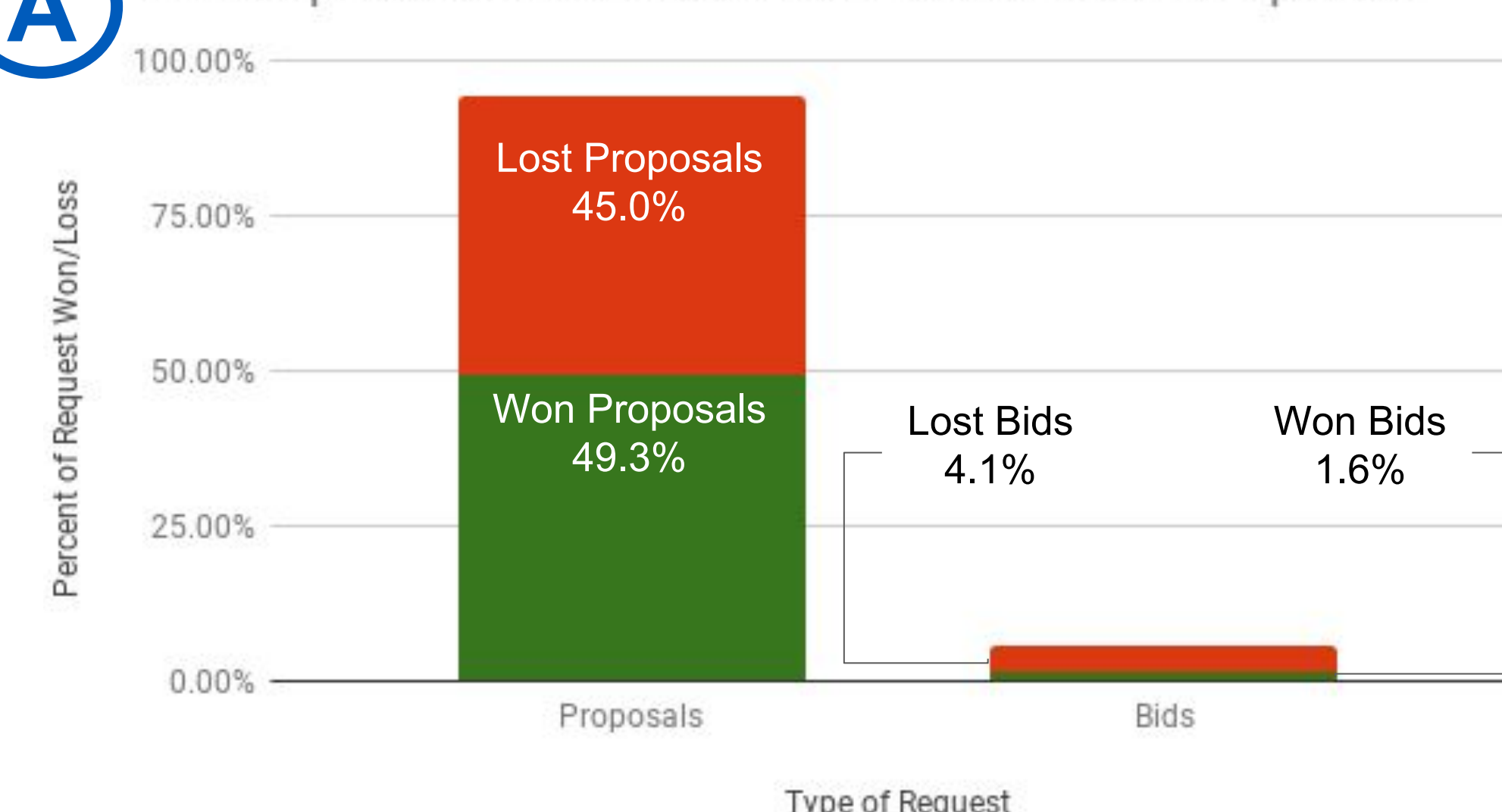


Data Analysis

Initial data analysis indicated that ArcBest is losing a large proportion of each type of deal [See Figure A]. Several techniques were utilized to evaluate the data.

- **Linear Regression** was unable to provide sufficient predictive power from the data [See Figure B].
- **Random Forest** was able to describe more variation in the data but would be too costly to implement for a result with low predictive power [See Figure C].
- **Logistic Regression** was able to describe the most variation. These models have around 70% predictive power [See Figure D].
- **K-Fold Cross Validation** was used to test how well the logistics regressions will hold in practice. The model for business won is around 67% accurate while the profitable model is around 88% accurate [See Figure E].

A A Comparison of the Win Rates for Bids and Proposals



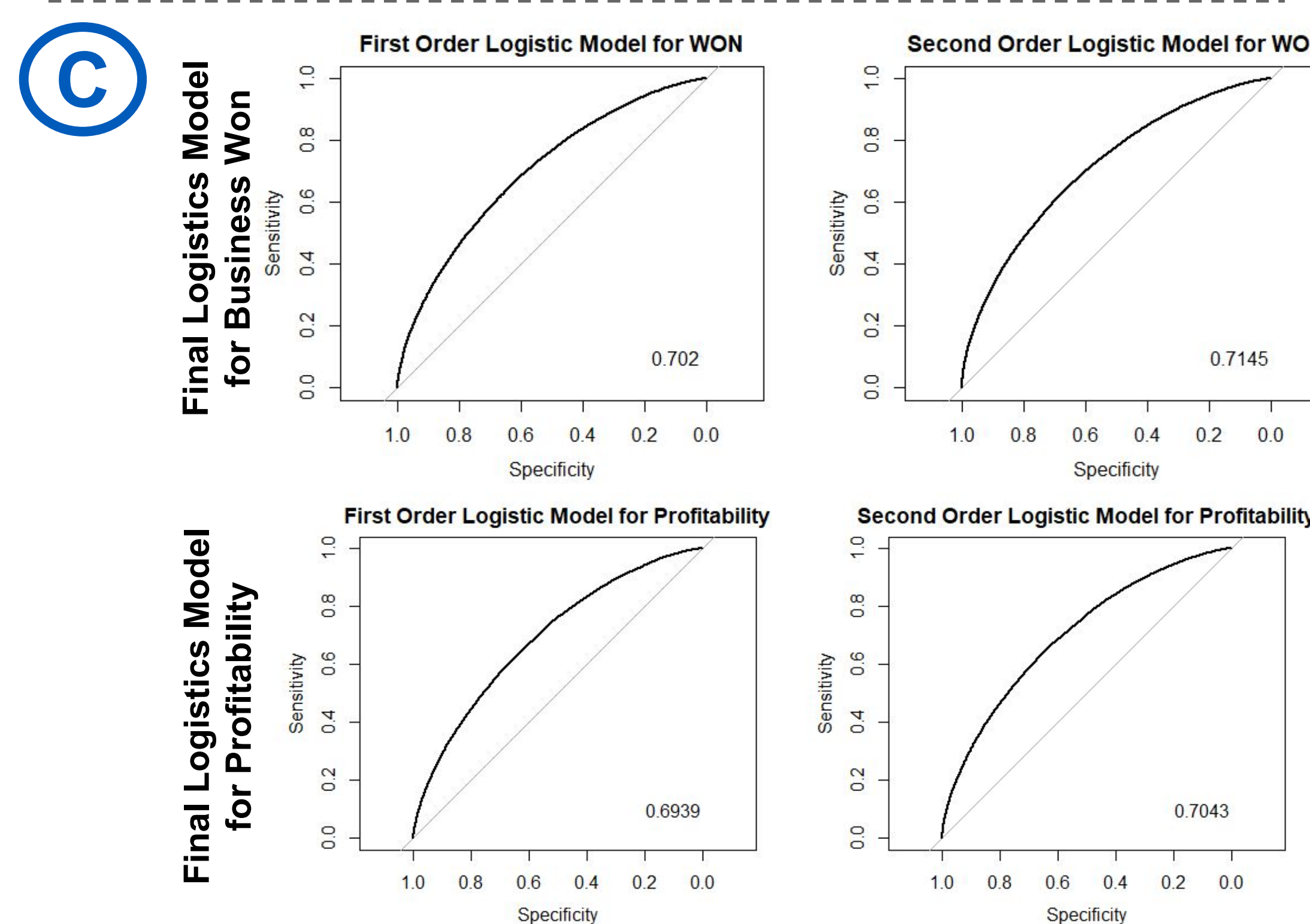
B

Final Linear Model for Won Business	
Residual Standard Error	0.4639 on 71529 DF
Multiple R-squared	0.1224
Adjusted R-Squared	0.1059
P-Value	< 2.2e-16

Final Linear Model for IOR	
Residual Standard Error	23.98 on 28202 DF
Multiple R-squared	0.1228
Adjusted R-Squared	0.08484
P-Value	< 2.2e-16

D

Random Forest Regression for IOR	
Number of Trees	200
Number of Variables Tried at Each Split	7
Mean Squared Residuals	331.82
% Variation Explained	47.19



E

```
> confusionMatrix(data=pred, data$WON)
Confusion Matrix and Statistics

Reference
Prediction 0 1
0 36296 116307
1 7155 13118

Accuracy : 0.6781
95% CI : (0.6746, 0.6814)
No Information Rate : 0.5962
P-value [Acc > NIR] : < 2.2e-16

Kappa : 0.296
McNemar's Test P-value : < 2.2e-16
```

```
> confusionMatrix(data=pred, data$PROFITABLE)
Confusion Matrix and Statistics

Reference
Prediction 0 1
0 108 44
1 3196 26077

Accuracy : 0.8899
95% CI : (0.8863, 0.8934)
No Information Rate : 0.8877
P-value [Acc > NIR] : 0.1203

Kappa : 0.0531
McNemar's Test P-value : < 2e-16
```

Deliverables

ArcBest's main objectives of improving inter-team communication and better prioritizing business requests can be accomplished with the following deliverables:

1. **Glossary** of unfamiliar terms and pricing calculations to speed interactions between sales and pricing
2. **Justification Form** for bids and proposals to collect pertinent information from customers upfront
3. **Prioritization Model** formulation for implementation inside the pricing systems

ArcBest Terminology Glossary

Absolute Minimum Charge (AMC) - The minimum value a carrier will charge a customer decided by ArcBest Pricing.

CHRYSLER - Change in payment terms - this is an add-on fee for changing the payment terms after a shipment has been billed.

Costing/Costing Analysis - The analysis done to determine the cost of shipping a particular load or loads from one location to another.

Cubic Minimum Charge (CMC) - A minimum threshold rate for shipments based on the space they occupy - establishing an absolute minimum price per cubic foot for LTL shipments.

District Sales Manager (DSM) - This is a sales manager that is responsible for district with a particular region.

Effective Discount - The actual discount that the customer receives that includes all modifications when compared to an undiscounted amount.

Freight of All Kinds (FAK) - An agreement between the customer and carrier to rate some freight at a rate different than what it would be identified as by the National Motor Freight Traffic Association (NMFTA).

Fully Allocated Operating Ratio (FAOR) - A metric for determining the profitability of a shipment calculated as follows: (Total Cost/ Total Revenue)*100. This is to differentiate from incremental operating ratio (IOR) which only includes incremental costs that can be associated to the shipment such as the cost of diesel, handling time, etc.

Fuel Surcharge (FSC) - The percentage applied after all other charges to cover fuel costs during initial and delivery (drayage).

Inbound Collect (IBC) - The customer will pay for the shipment upon receiving it, not the sender at the origin.

Incremental Operating Ratio (IOR) - A metric for determining the incremental profitability of a shipment calculated as follows: (Incremental Cost/ Incremental Revenue)*100. This is to differentiate from fully allocated operating ratio (FAOR) which includes fixed costs that can be associated to it as well.

Opportunity - Account Background, i.e. Relationship, Business Model (Ex. Mfg., Retailer, 3PL, Distributor, E-commerce, etc.)

Who are their customers?

Problem(s) identified with current supply chain (Ex. Damages, transit time, chargebacks, production line shut down, missed delivery, poor SOP with current provider, operational inefficiencies, safety). What is the motivation for change?

Freight Profile

Are you aware if ABF handled this business in the past with a profit/volume relative to this PPM? If yes, during what time frame?

Profile details

ABC# - Item

Typical dimensions of a shipment

Average weight per shipment

Average weight per handled piece

Price from (Pricing, zones, etc.)

% AMC

Percentage breakdown of each class/NMFC for FAK/EXC pricing (should add up to 100%)

Market

Information about competitive landscape

How are they routing the freight today? Is a TMS in place?

How were you able to verify the competitive price?

Requested Pricing

Target price vs. competition

$$\text{Profit} = -0.0001 \cdot OB_{AVGCHG} + 0.0092 \cdot IB_{SECTRY} - 0.9392 \cdot REGION1 - 1.6728 \cdot REGION10 - 1.5801 \cdot REGION11 - 1.9587 \cdot REGION2 - 1.4189 \cdot REGION3 - 1.3595 \cdot REGION4 - 1.069 \cdot REGION5 - 1.9385 \cdot REGION6 - 2.533 \cdot REGION7 - 0.9235 \cdot REGION8 - 1.0675 \cdot REGION9 - 0.9484 \cdot REGION10 - 1.1205 \cdot REGION11 - 1.2471 \cdot REGION12 - 1.7523 \cdot REGION13 + 0.5009 \cdot REGION14 + 0.1248 \cdot ENTER_REASON02 + 0.1207 \cdot ENTER_REASON03 + 0.082 \cdot ENTER_REASON04 - 0.2502 \cdot LASTCARINCREASE01 - 0.114 \cdot LASTCARINCREASE02 - 0.3427 \cdot LASTCARINCREASE03 - 0.488 \cdot LASTCARINCREASE04 - 0.6505 \cdot BID1 + 0.1602 \cdot NATIONAL - 1.2905 \cdot OB_{CLCAP} - 0.8824 \cdot IB_{CLCAP} - 1.2989 \cdot OB_{CLCAP} - 0.7283 \cdot IB_{CLCAP} - 1.0947 \cdot OB_{CLCAP} - 0.7861 \cdot IB_{CLCAP} - 1.3926 \cdot OB_{CLCAP} - 0.7153 \cdot IB_{CLCAP}$$

$$\text{Won} = 0.0001 \cdot OB_{AVGCHG} - 0.0111 \cdot IB_{SECTRY} + 0.0065 \cdot IB_{SECTRY} + 0.7972 \cdot REGION1 + 0.4631 \cdot REGION10 + 0.9631 \cdot REGION11 + 0.6204 \cdot REGION2 + 0.5083 \cdot REGION3 + 0.8727 \cdot REGION5 + 0.7299 \cdot REGION6 + 1.2499 \cdot REGION7 + 0.9272 \cdot REGION8 + 0.9252 \cdot REGION9 + 0.5755 \cdot REGION10 + 0.5009 \cdot REGION11 + 0.1248 \cdot ENTER_REASON02 + 0.1207 \cdot ENTER_REASON03 + 0.082 \cdot ENTER_REASON04 - 0.2502 \cdot LASTCARINCREASE01 - 0.114 \cdot LASTCARINCREASE02 - 0.3427 \cdot LASTCARINCREASE03 - 0.488 \cdot LASTCARINCREASE04 - 0.6505 \cdot BID1 + 0.1602 \cdot NATIONAL - 1.2905 \cdot OB_{CLCAP} - 0.8824 \cdot IB_{CLCAP} - 1.2989 \cdot OB_{CLCAP} - 0.7283 \cdot IB_{CLCAP} - 1.0947 \cdot OB_{CLCAP} - 0.7861 \cdot IB_{CLCAP} - 1.3926 \cdot OB_{CLCAP} - 0.7153 \cdot IB_{CLCAP}$$

Recommendations

In addition to the deliverables above, the following items are also recommended:

- **Improve Data Collection Methods:** Current data collection methods are prone to user input error. The SCAC code field for example should provide a drop down menu for possible answers.
- **Provide users with success metrics** Each user should be able to view his or her performance.