MIT Supply Chain MANAGEMENT

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Predicting Freight Performance

Motivation & Background

As inventory costs rise and consumer service level expectations grow, transportation efficiency is increasingly becoming a critical component of business strategy for shippers.

US Trucking Industry Overview

Buyer Power
- Difficult for a single shipper to influence market price

Barriers to Entry
- Low Regulations
- Low Investment

Supplier Power
- Limited as market is transactional procurement with many options

Homogeneous Product in Fractured Market with many Carriers

Improving efficiency and profitability in a competitive market is critical to both shippers and carriers for the sustainable development of the trucking Industry.
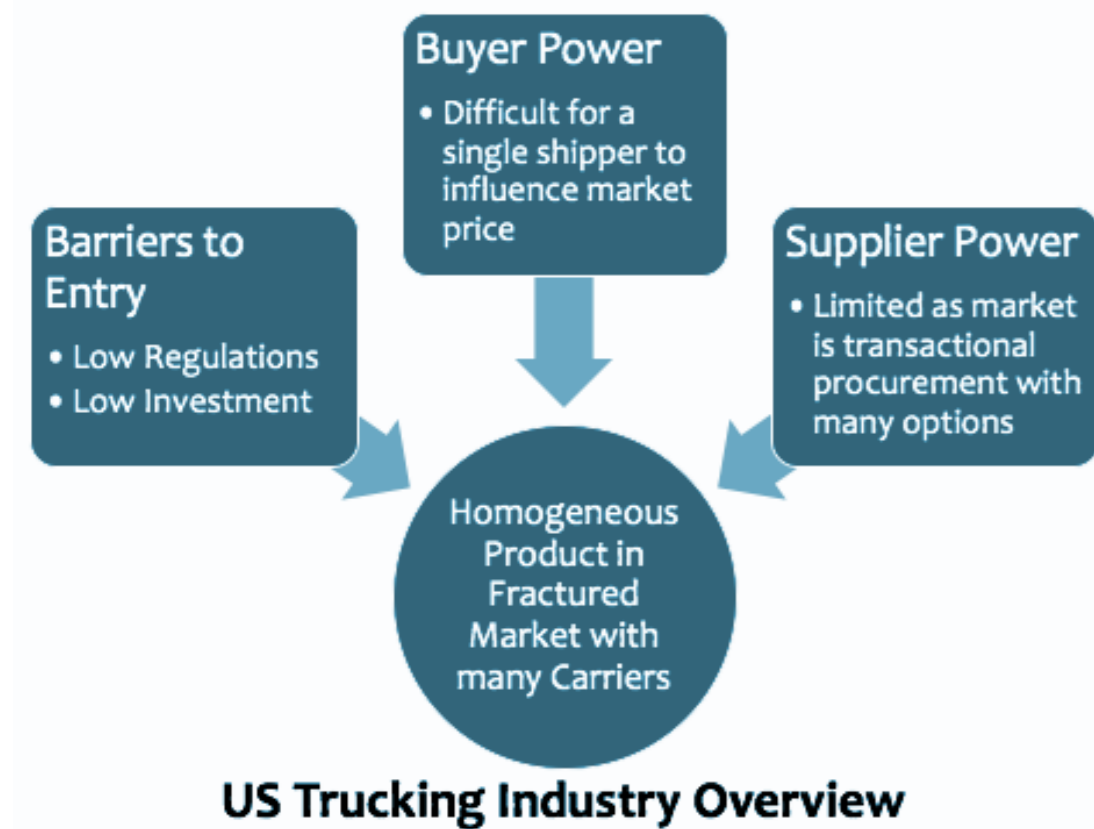
With the digitalization of the industry, key industry players are able to gain new insights to improve business results through data analytics.

Key Question

What factors (ie carrier, distance, lane, location, etc) are the most indicative of high performance success for a truckload shipment?

Key Objectives
➔ Develop explanatory models to identify which business attributes are most indicative for the performance success of a trucking load

➔ Develop profiling models to identify freight profiles that distinguish high (Leaders) and low performance freight (Laggards) from the rest

Target Measurements for Regression
➔ Success of a truck load shipment defined by on-time-delivery & on-time-pickup
➔ The Performance of carrier defined by a combination of three KPIs
  ◆ On-time-Delivery rate (accumulative % of success load in given number of load taken)
  ◆ On-time-Pick up rate (accumulative % of success load in given number of load taken)
  ◆ Acceptance rate (AR) of Load Tender (in given number of tender)

Determining the "drivers" of success through...

Regression

K Nearest Neighbors

Principle Component Analysis

Process & Variable Overview

| RG & Contract | Tendering Truck Load | Load Execution |

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Start

Route Guide: a document from Shipper which lists all the contracted carriers in a certain lane by order of preference

Spot Quote: Shipper goes to the market for a on-the-spot quote for the truck load service

Spot Quote (7)

End

allocate load according to Route-Guide (5)

exhaust contract carrier? — No

yes

Performance measurement

Shipper

RFQ Rate (1)

Contract with Carriers & update Route-Guide (3)

Truck Load Requirement (4)

No

Carrier

Submit Bidding (2)

In trucking industry a contracted carrier can reject a load requirement.

Accept the load? (6) — yes
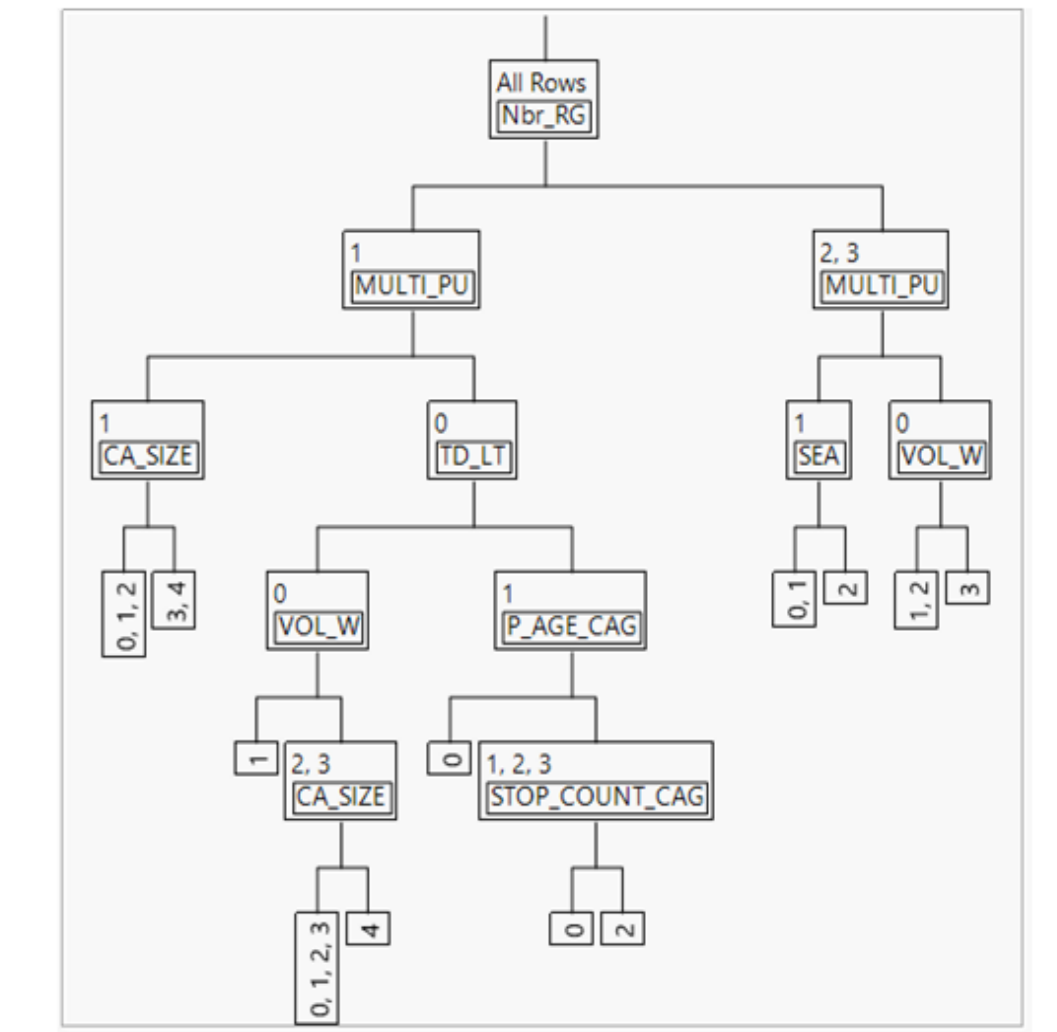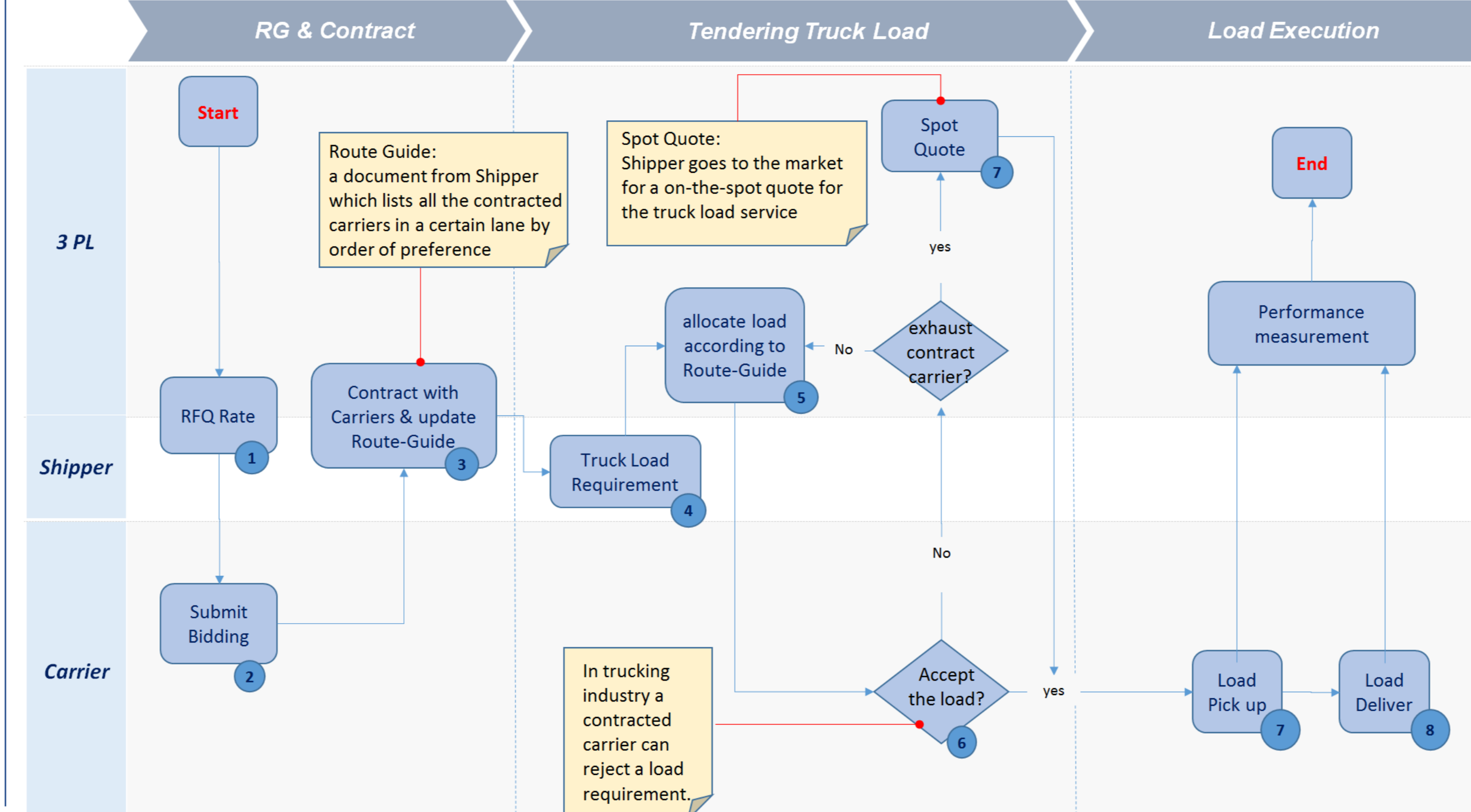
Load Pick up (7)

Load Deliver (8)

Initial Results

Model Targets: OTD,OTP and Acceptance Rate (AR) as measures of performance.

For OTD and AR the initial results on the smaller dataset are shown below.

OTD – Logistics Regression

Effect Summary

Source	LogWorth	PValue
SHIP_IN	16.070	0.00000
CA_SIZE	9.448	0.00000
SEANSON	5.508	0.00000
RATE	3.933	0.00012
SPE_TRUCK	2.460	0.00347
TD_LT	2.077	0.00838
MULTI_DE	1.761	0.01735
Spot_Bid	1.758	0.01747
STOP_COUNT	1.627	0.02360
Nbr_RG	1.625	0.02374
DWELL_VAR	1.529	0.02960
ASSET_OWN	1.405	0.03937
P_AGE_CAG	1.145	0.07163
Dwell Time	0.935	0.11613
WK_DAY	0.863	0.13724
Nbr_STOP	0.706	0.19685
MULTI_PU	0.661	0.21821
WK_SAT&SUN	0.581	0.26231
VOL_W	0.533	0.29276
WK_FRI	0.406	0.39297
FUEL_CAR	0.272	0.53482
HAL_DIS	0.116	0.76639

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AR – Regression Tree

Expected Contribution

Guidance

Efficiency

Strategic Partnerships

Improved Performance

Value Driven Decision Making

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