

Big Data at Owens Corning

A Case Study on Deriving VOC from 1.4 Million Words of Free-Form Text

Tina V. Pickerel

CSB Global Quality Program Leader

Owens Corning

Keith Bowers

President

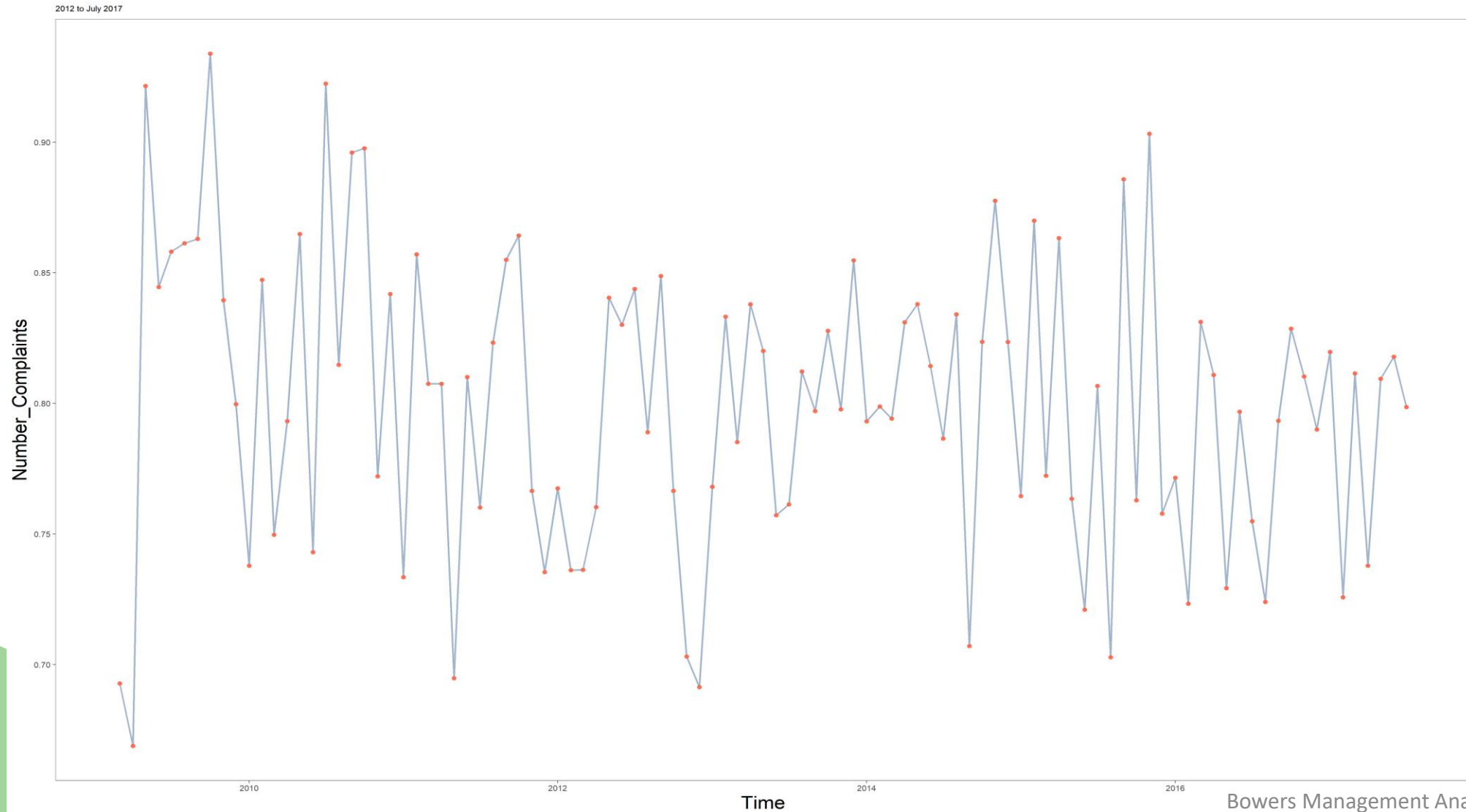
Bowers Management Analytics



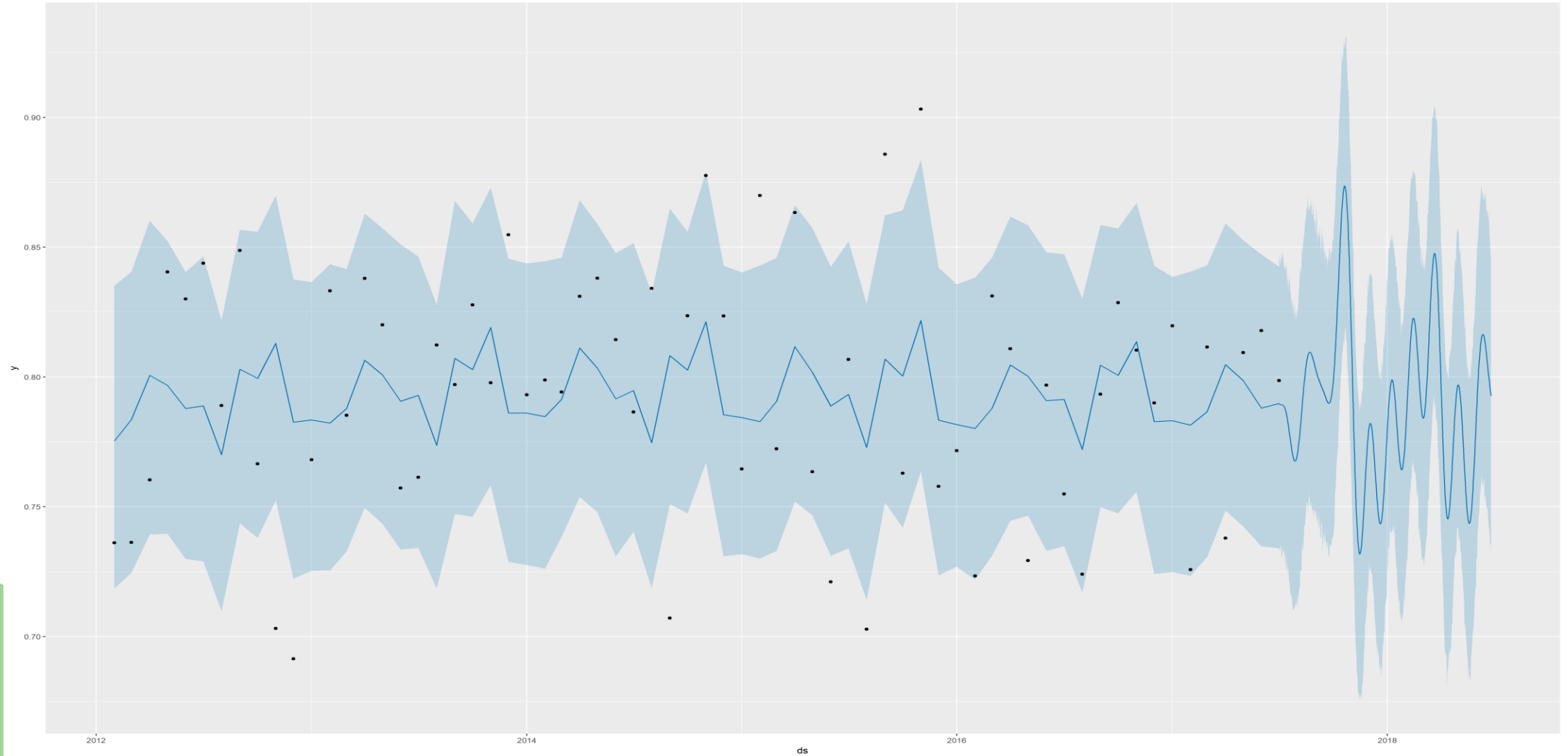
Bowers

MANAGEMENT ANALYTICS

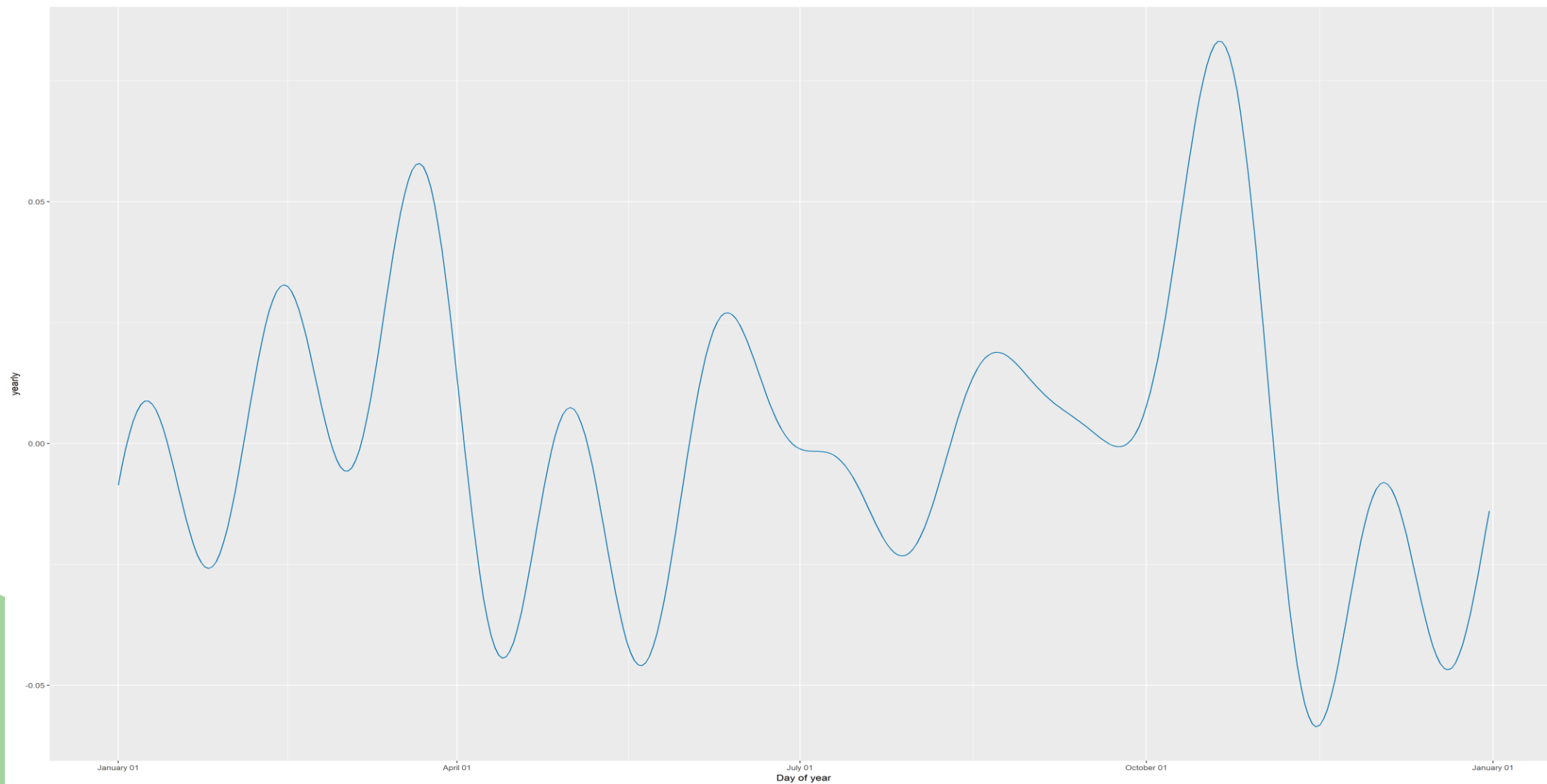
Can you predict the next event?



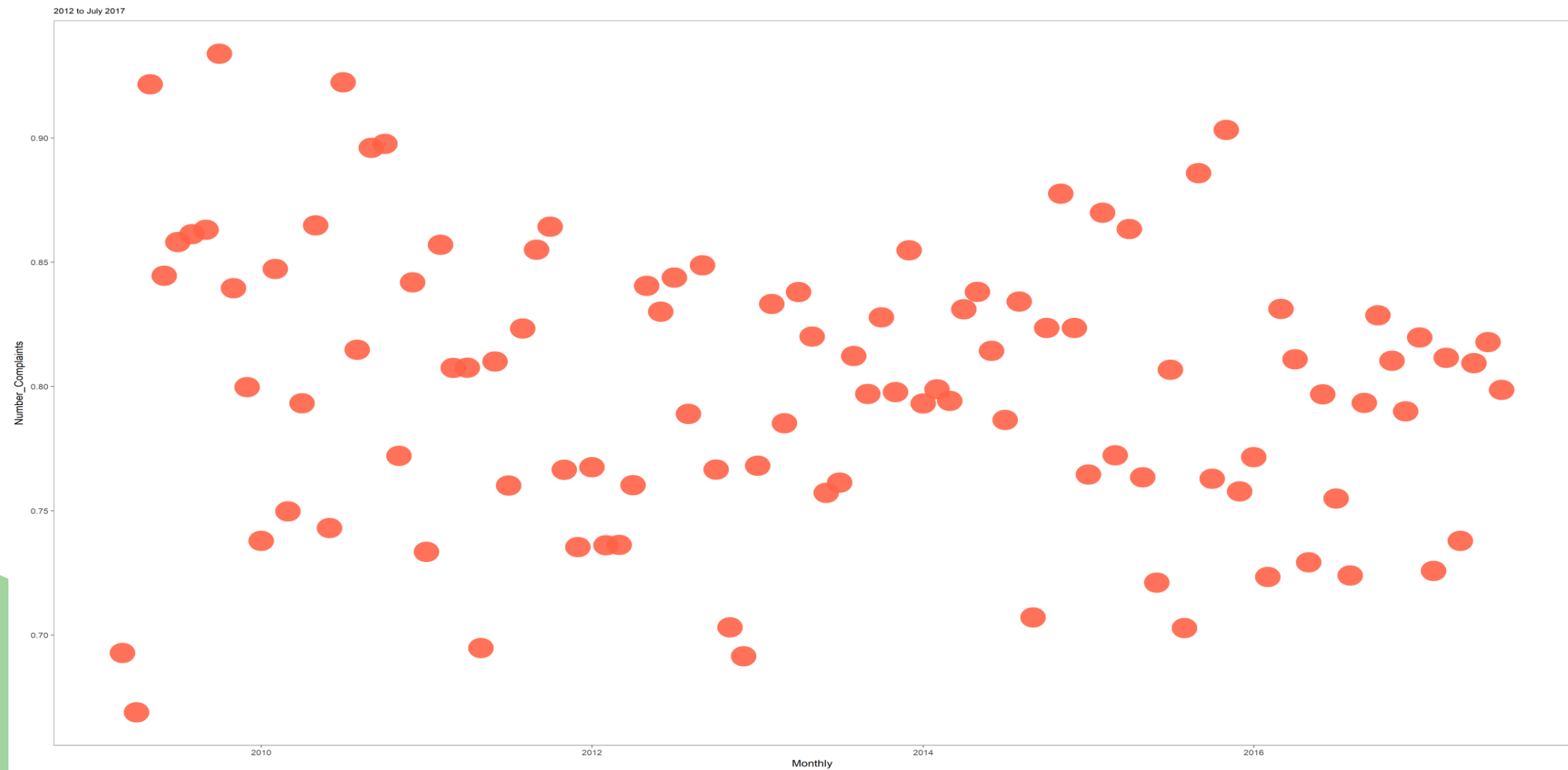
Machine Learning Model Result



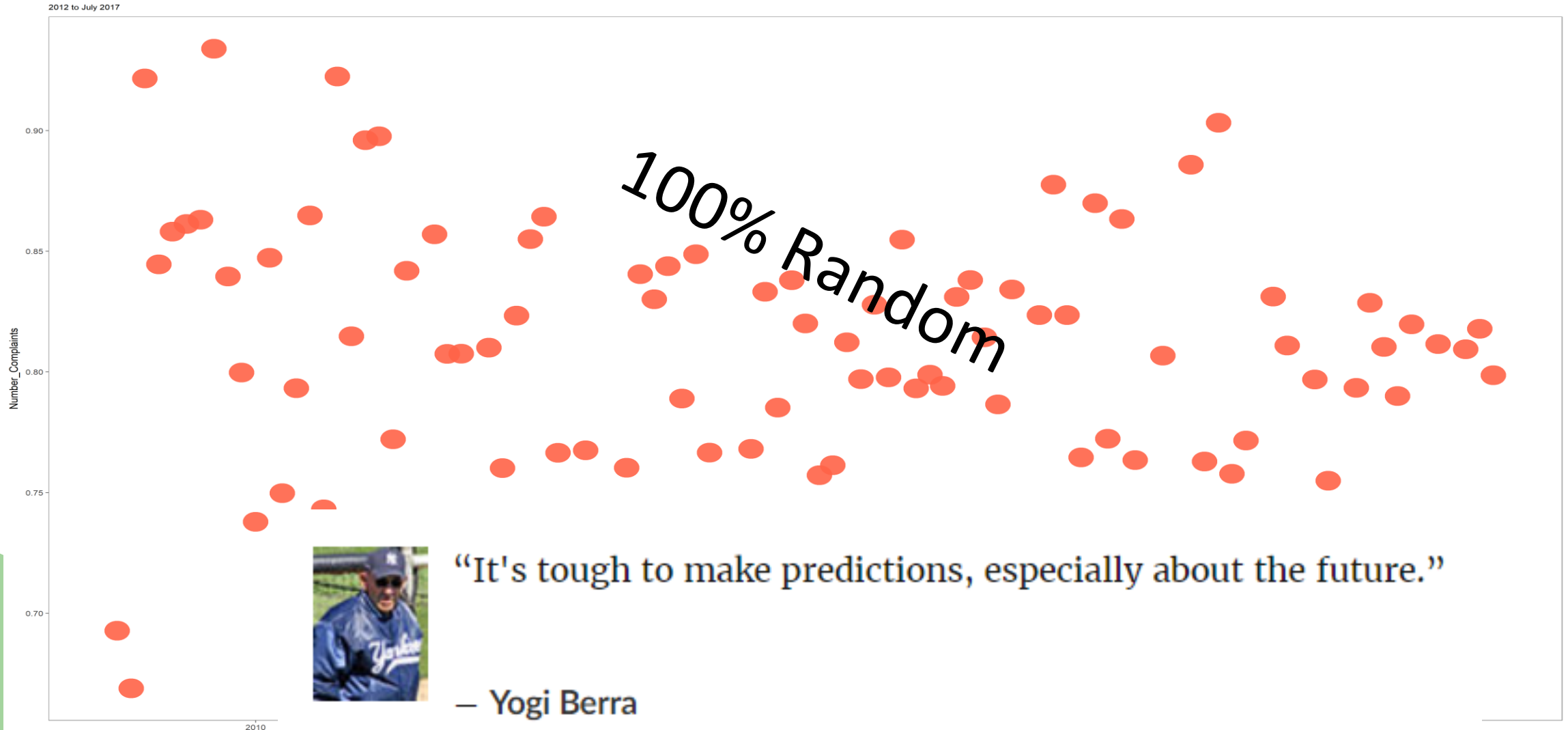
Annual Pattern Learned from Data



Original Data



Original Data



Owens Corning Case Study

- 100+ facilities in 25 countries
- 15,000 people
- A Fortune 500 company every year since the list was created in 1955
- Tina V. Pickerel, Global Quality Leader

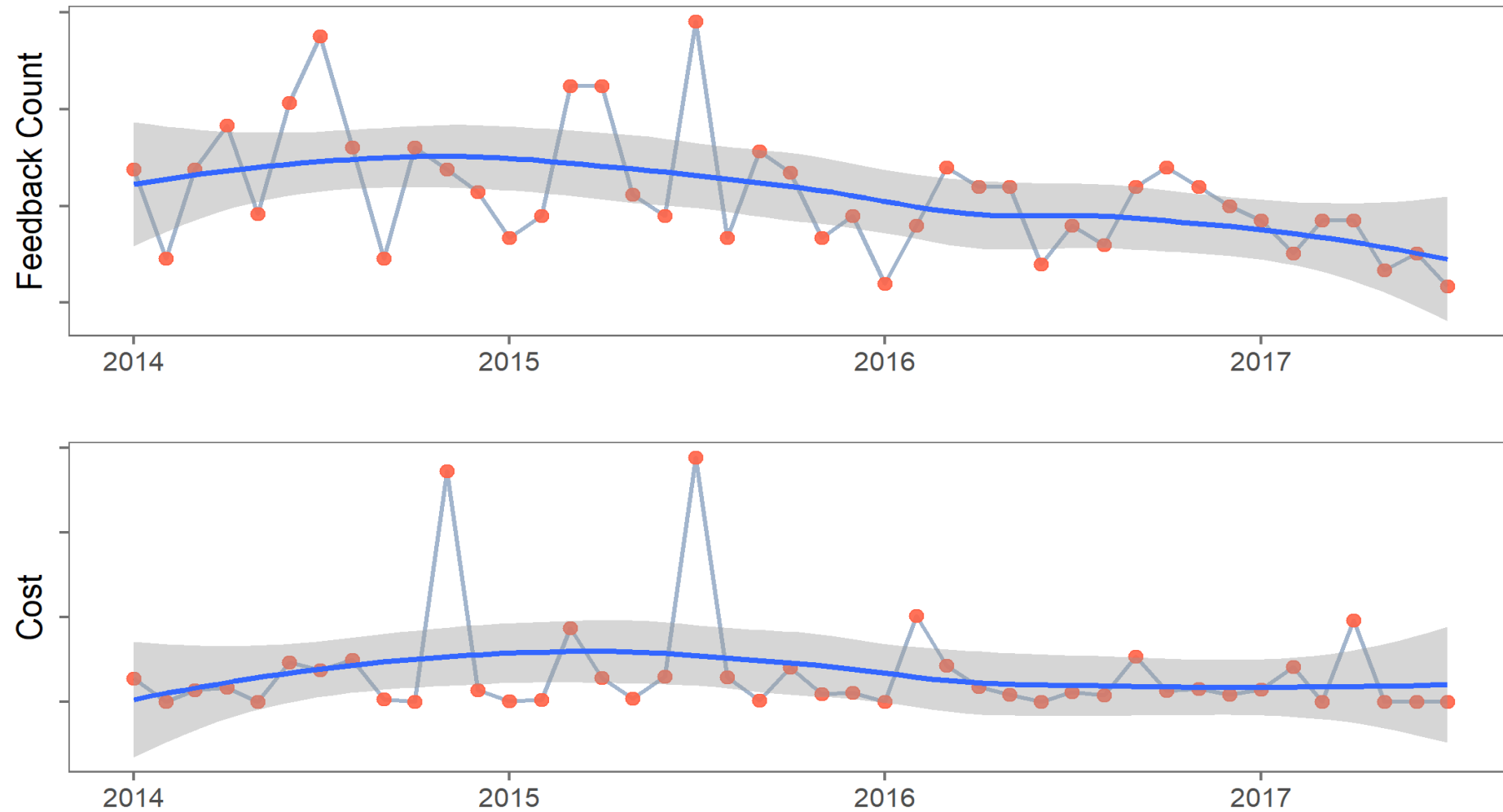


Owens Corning Case Study

- Composites Solutions Business (CSB).
- Customers are primarily large manufacturers.
- Structural reinforcing material with factories located worldwide.
- Strong systems, good quality processes and drive for continuous improvement.
- The site names have been changed.



Problem: how to continue improvement?



Product Return Records

- Returns not characterized
- No practical way to use the huge amount of customer information contained in the product return files
- Pivot tables and traditional methods don't work well

	A	B
1	Row Labels	Sum of Total_Cost
2	Commercial	\$18,114,193.96
3	Technical	\$30,129,757.01
4	Grand Total	\$48,243,950.97



Product Return Records

- Reports for over 11,000 product returns
- from 70+ Locations in 6 Languages
- Too much to read
- About a 4 foot tall stack of reports

Status	Closed
Type	Technical
Subtype	Manufacturing
Plant	TransContinentalLogistics
BU	Reinforcement
Family	RSP Specialties
Product_Line	XXXXXX
Credit_Amount	\$1,469.63
Total_Cost	\$1,469.63

Document

There is a difference between the weight invoiced and the real weight of the pallet - the plant has discovered this issue after the delivery by the customer A credit note will be establish to the customer. Reimbursement of the customer for the difference Credit due to overcharge due to incorrect pallet weights in SAP There is a difference between the weight invoiced and the real weight of the pallet - the plant has discovered this issue after the delivery by the customer Pallet and invoiced weights exceeded sum of individual roll weights...

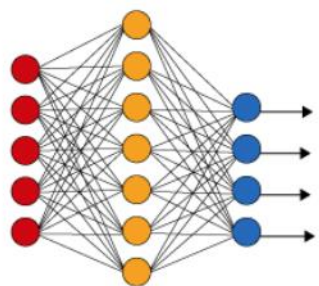
Once we have enough free form text to be valuable it is too big to read and understand!

[illegible]

Two core algorithms for analyzing product return text.

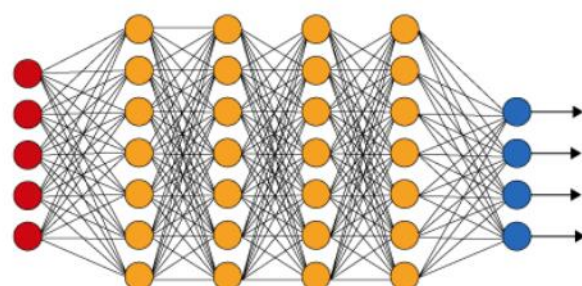
Deep Learning

Simple Neural Network



● Input Layer

Deep Learning Neural Network



● Hidden Layer

● Output Layer

Latent Dirichlet Allocation

incident text

frequency of all words from all documents

	<u>knife</u>	<u>steps</u>	<u>hand</u>
Incident 1	2	0	1
Incident 2	0	2	0

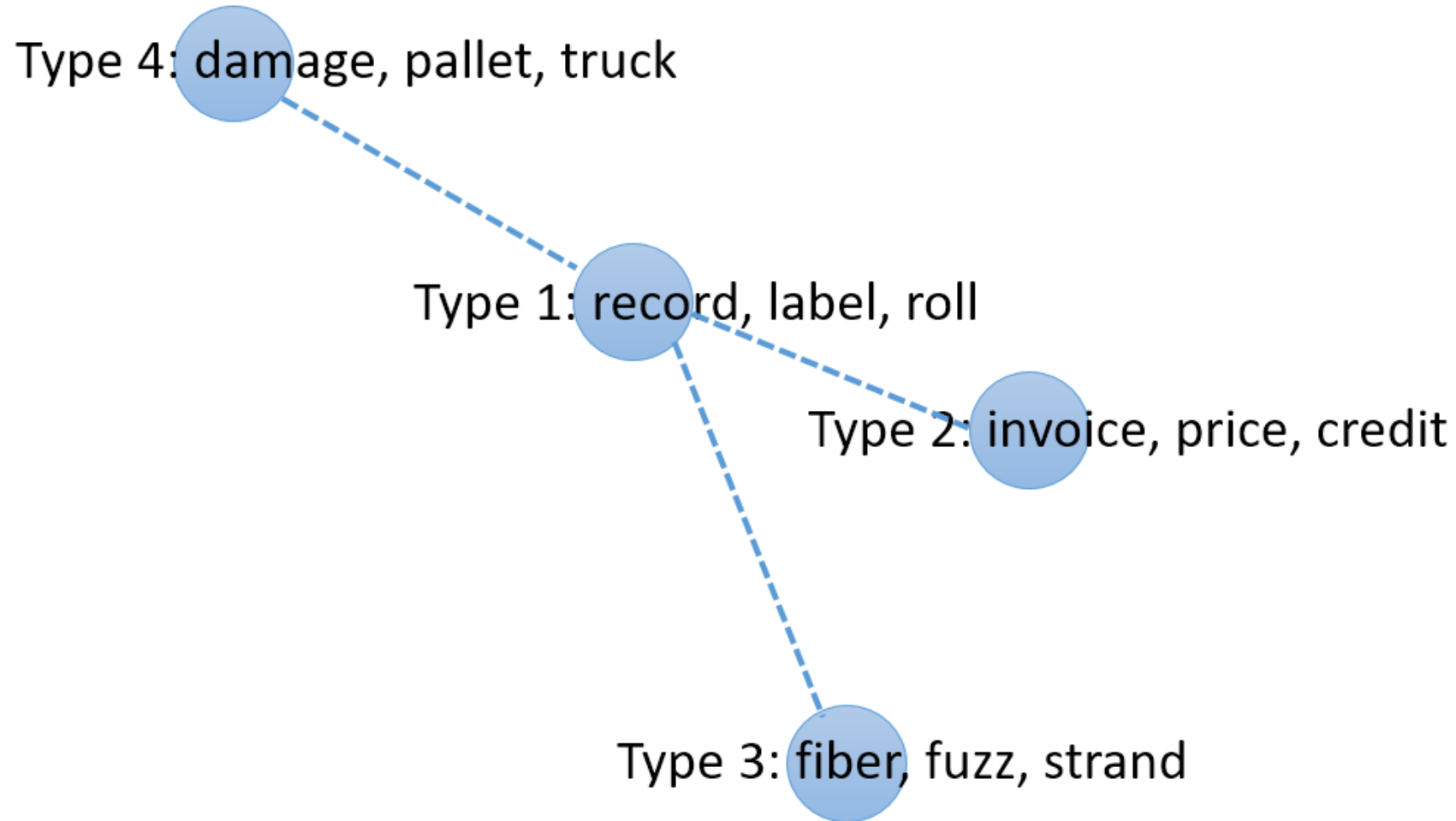
TOPIC 1
knife, hand, laceration,
right, cut, employee

TOPIC 2
steps, back, slip, fall,
ice, down

<u>Incident 2332</u>	<u>Topic 1</u>	<u>Topic 2</u>
Bob fell down the steps and cut his hand on the guard rail.	40%	60%

High Level Network Diagram of Complaint Types

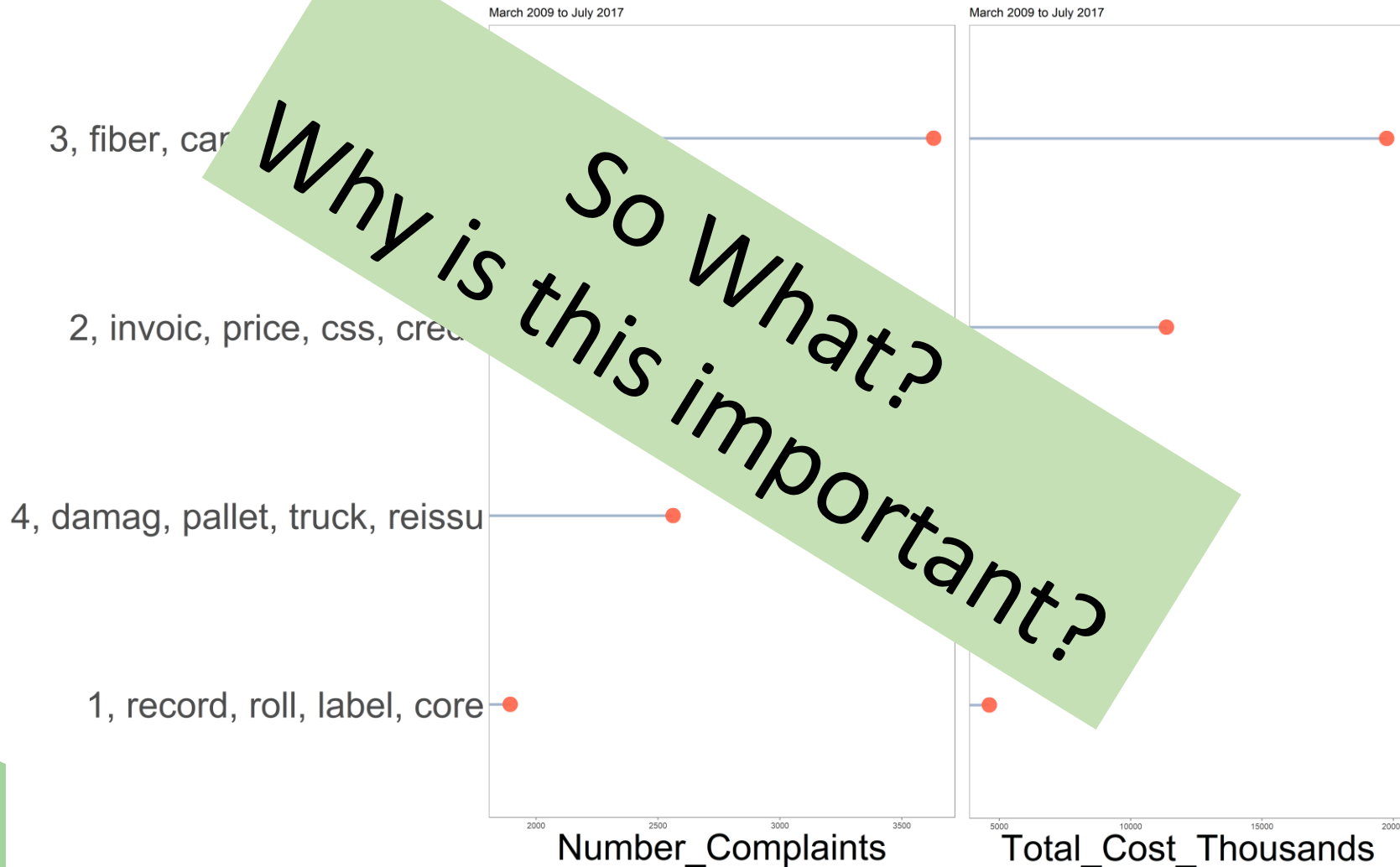
Voice of the Customer learned from customer words and their actions



Cost and Count of High Level Return Types



Cost and Count of High Level Return Types



AI/Big Data analysis for Quality Data: Why do we need it?



Availability Bias hinders reliable estimation of probabilities by giving preference to events that are more recent, that were observed personally, and were more memorable.

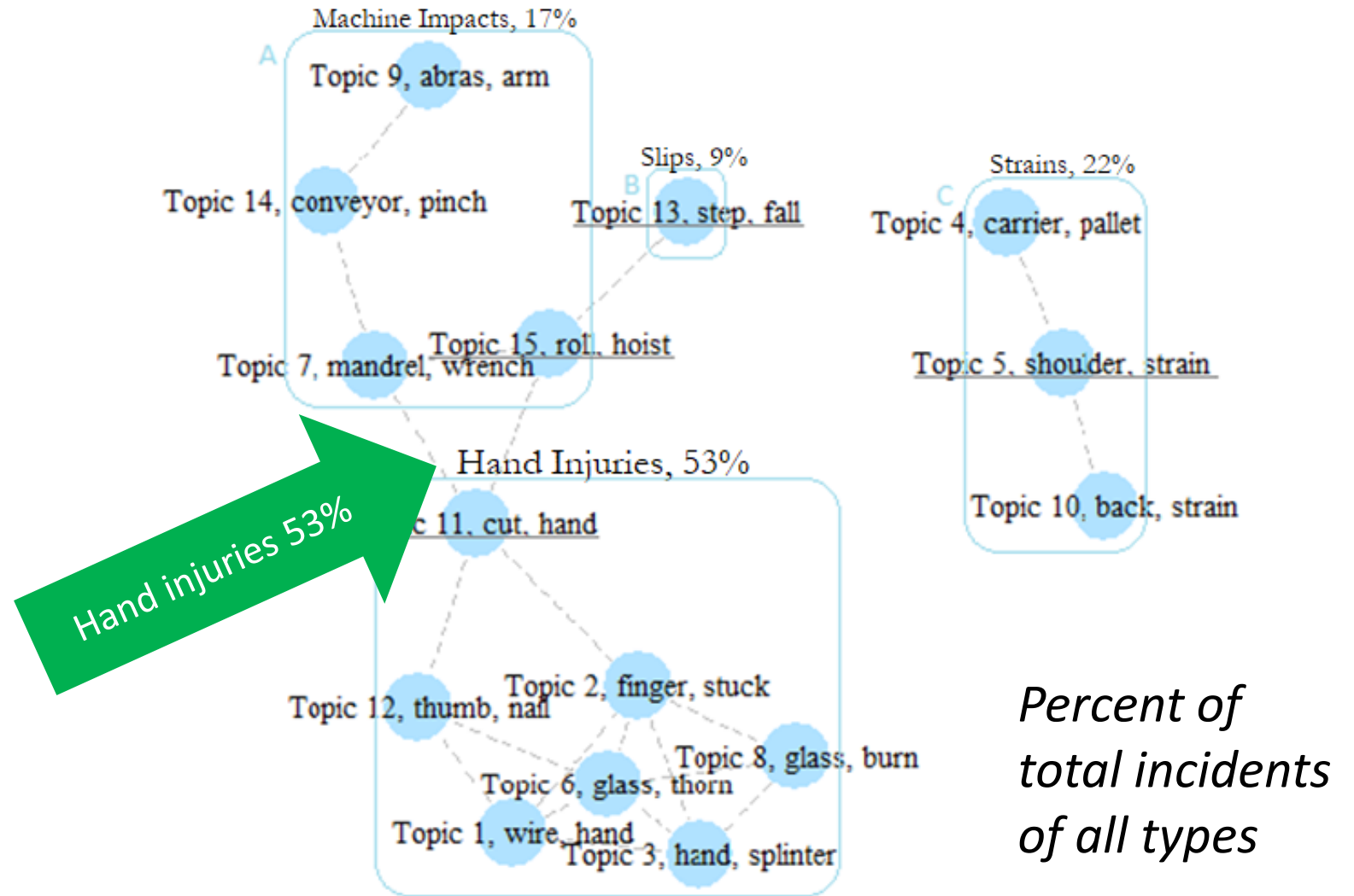
For example, most people will estimate that shark attacks are a significant risk for an ocean swim, but simple drowning is a much, much bigger risk. (Drowning is the third leading cause of unintentional injury death globally.)

Daniel Kahneman, Nobel prize winner and originator of the field of Behavioral Economics proposed and tested the concept.

Availability Bias: High-frequency events drive perception of risk

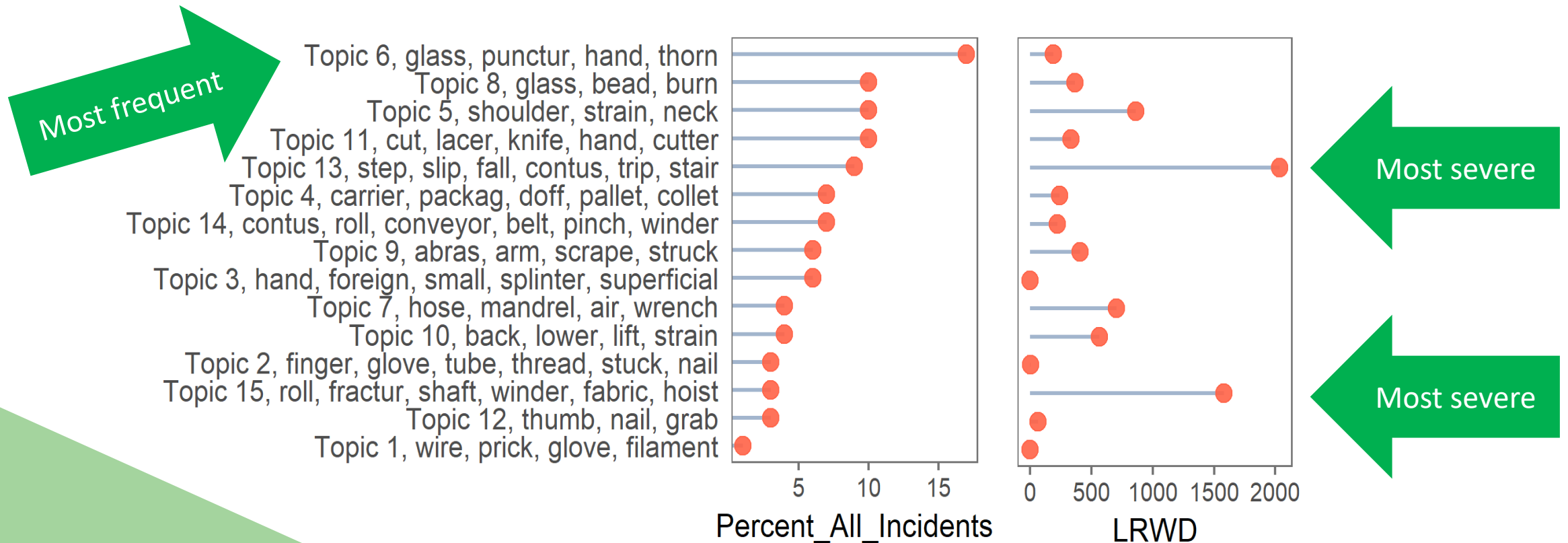


Availability Bias

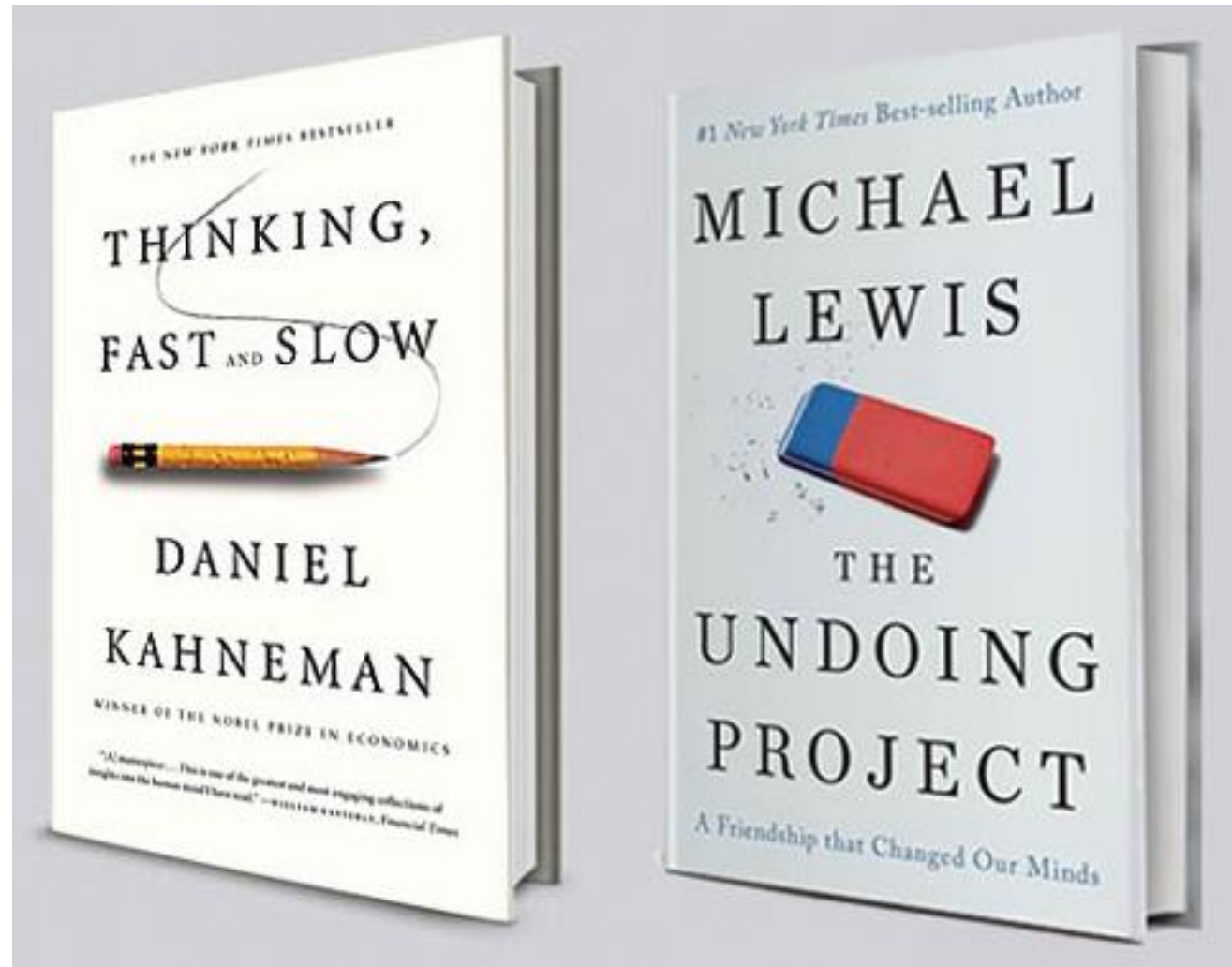


Advanced Analytics helps overcome cognitive biases

Overconfidence can be a sign of cognitive bias!

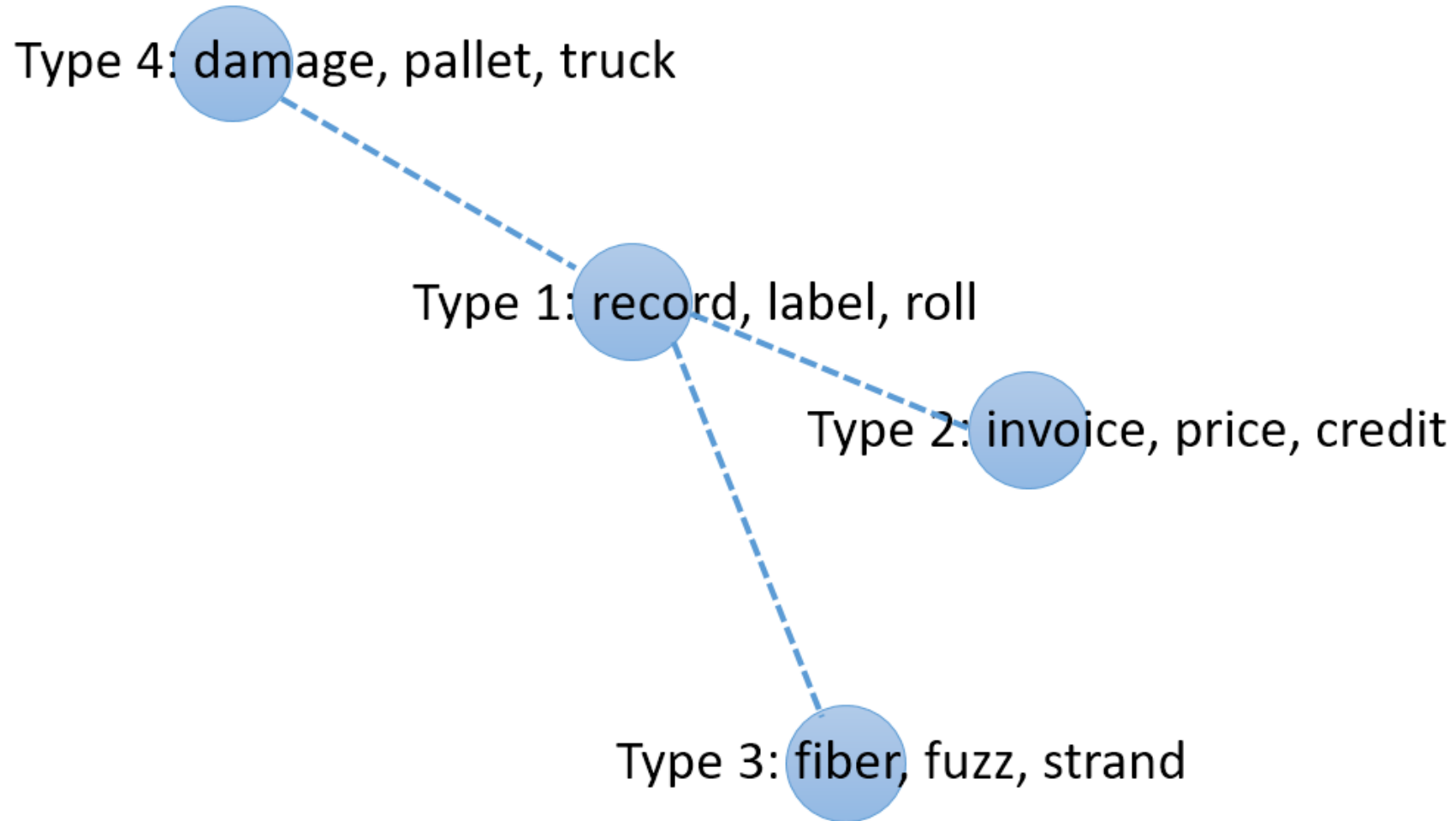


For more on availability bias and cognitive biases in general

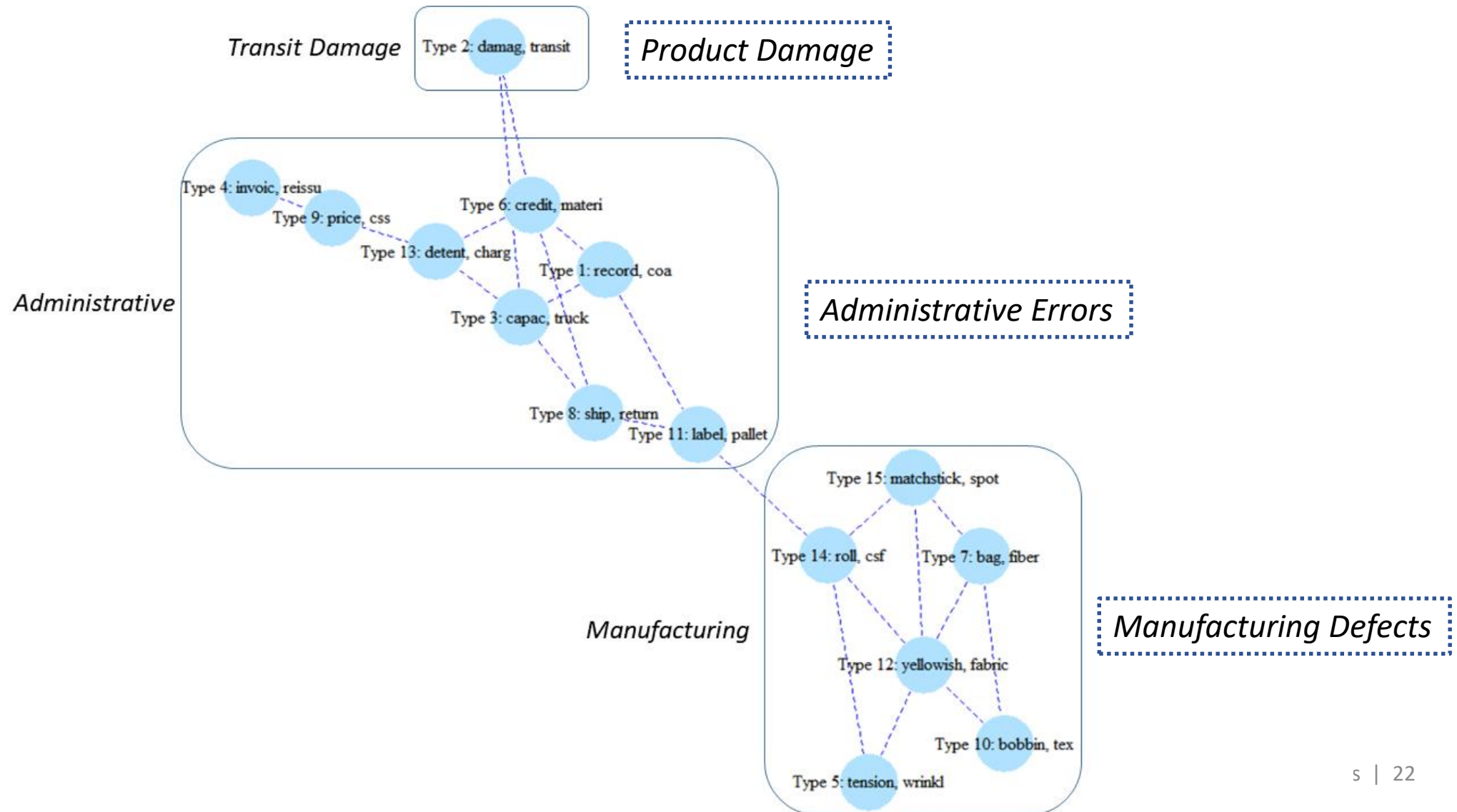


High Level Network Diagram of Complaint Types

Voice of the Customer learned from customer words and their actions



Zoom In - Detailed Network Diagram



Detailed Cost and Count



Detailed Cost and Count



Kind vs. Wicked
environments
or
Why we need
data in addition
to professional
judgement

Kind Environments provide frequent, reliable feedback to train intuition.

In **Wicked Environments** experience doesn't reliably improve intuition

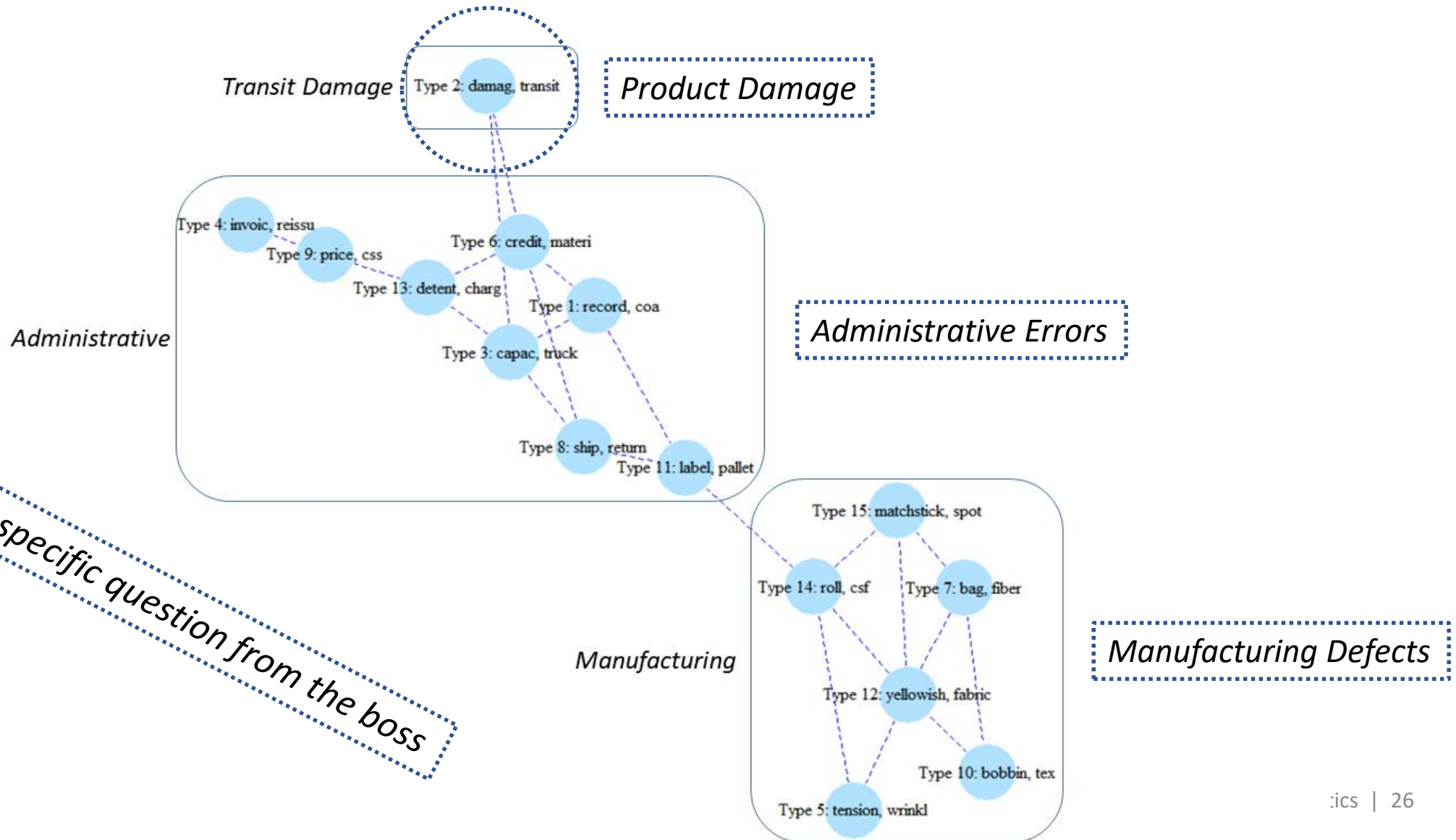
Quality can be a wicked environment since many defect types are rare and we often can't see immediate consequences from many quality initiatives.

See Robin M. Hogarth's book, ***Educating Intuition***.

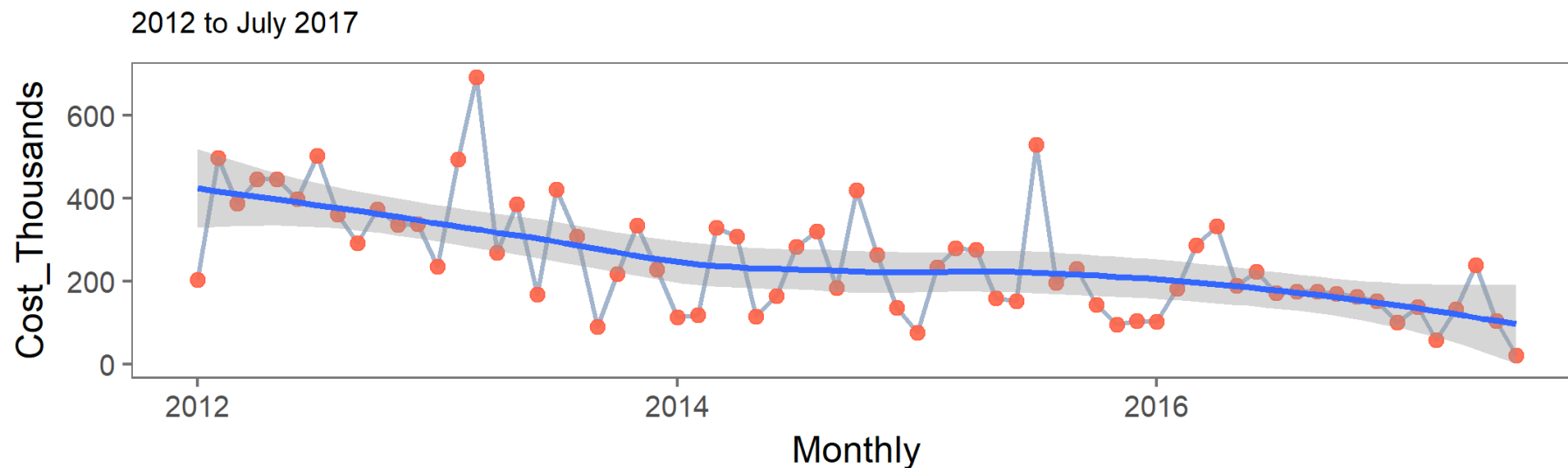
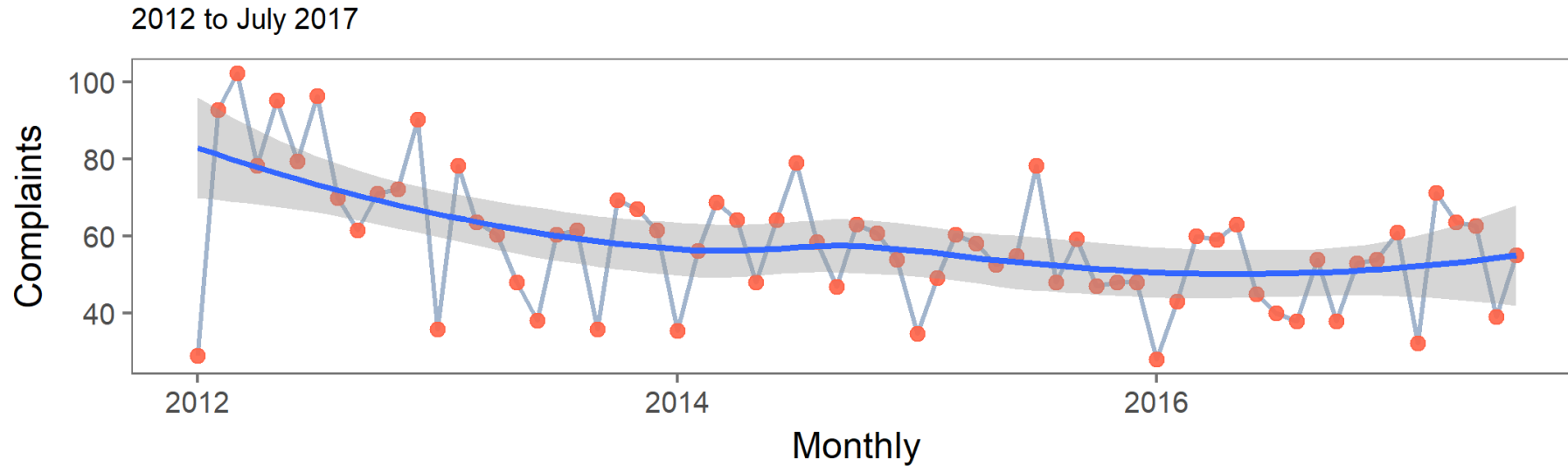
We must rely on data to guide our strategy!



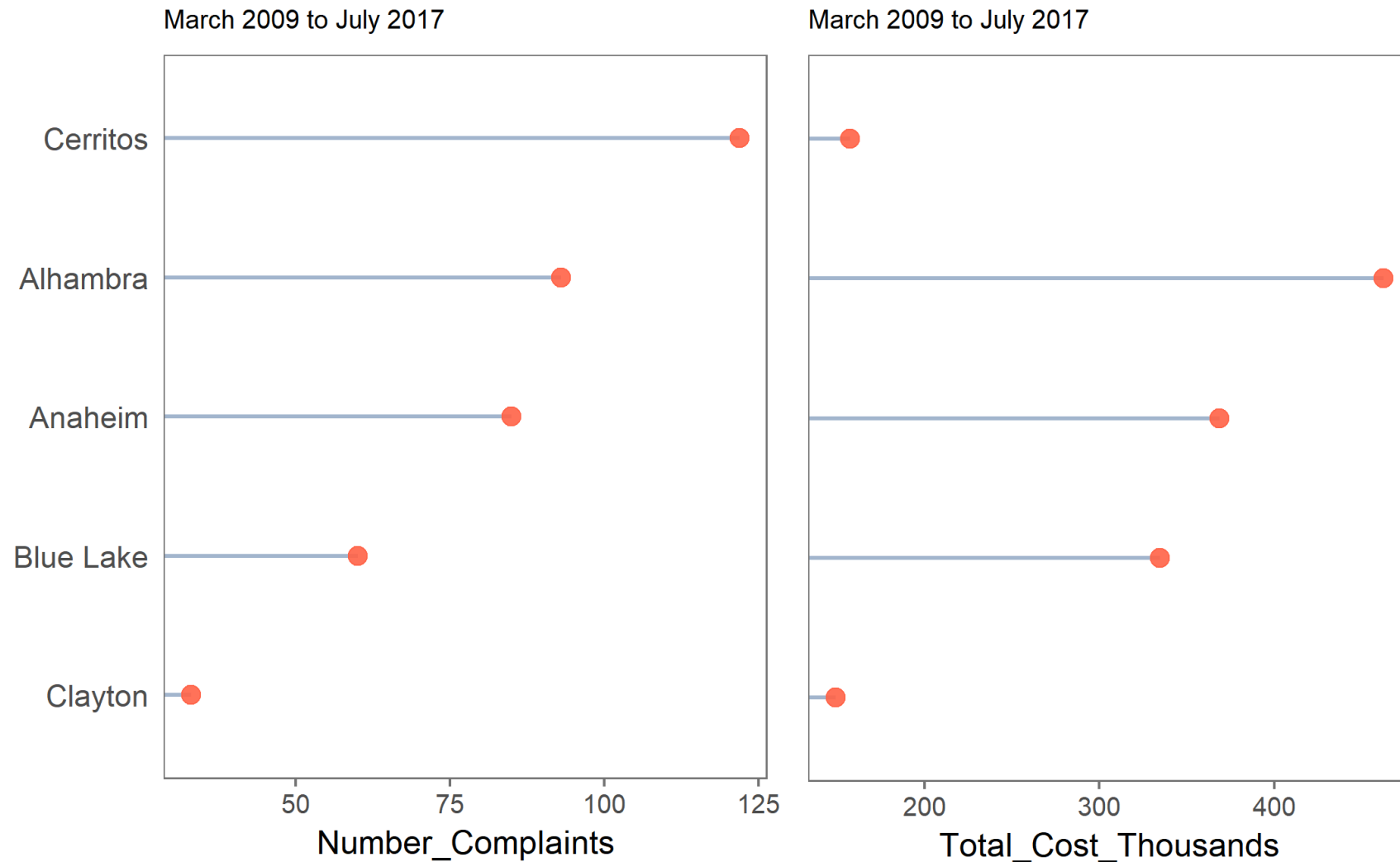
Investigation into Product Damage



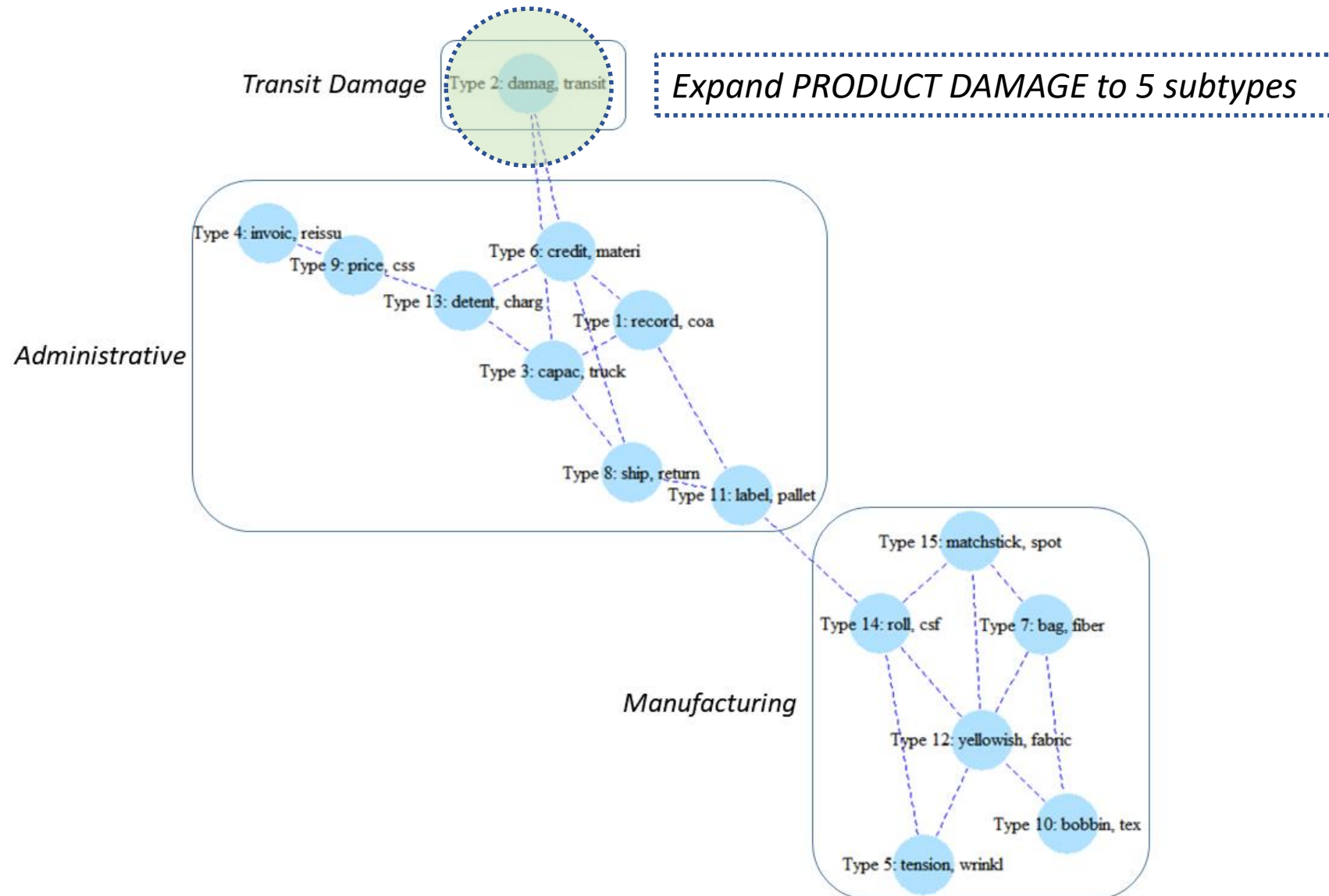
Trends in Product Damage Returns



Top Sites for Product Damage Returns



Root Cause - Zoom in on Product Damage



Damage from Transport or Manufacturing?

manufacturing related damage

Type 2: transfer, tack, doff, wrap

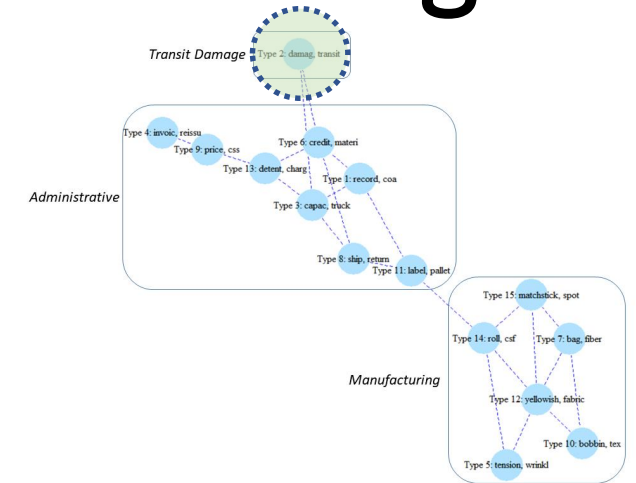
Type 1: intern, transit, damag, materi

Type 4: rain, wet, water, leak

transport related damage

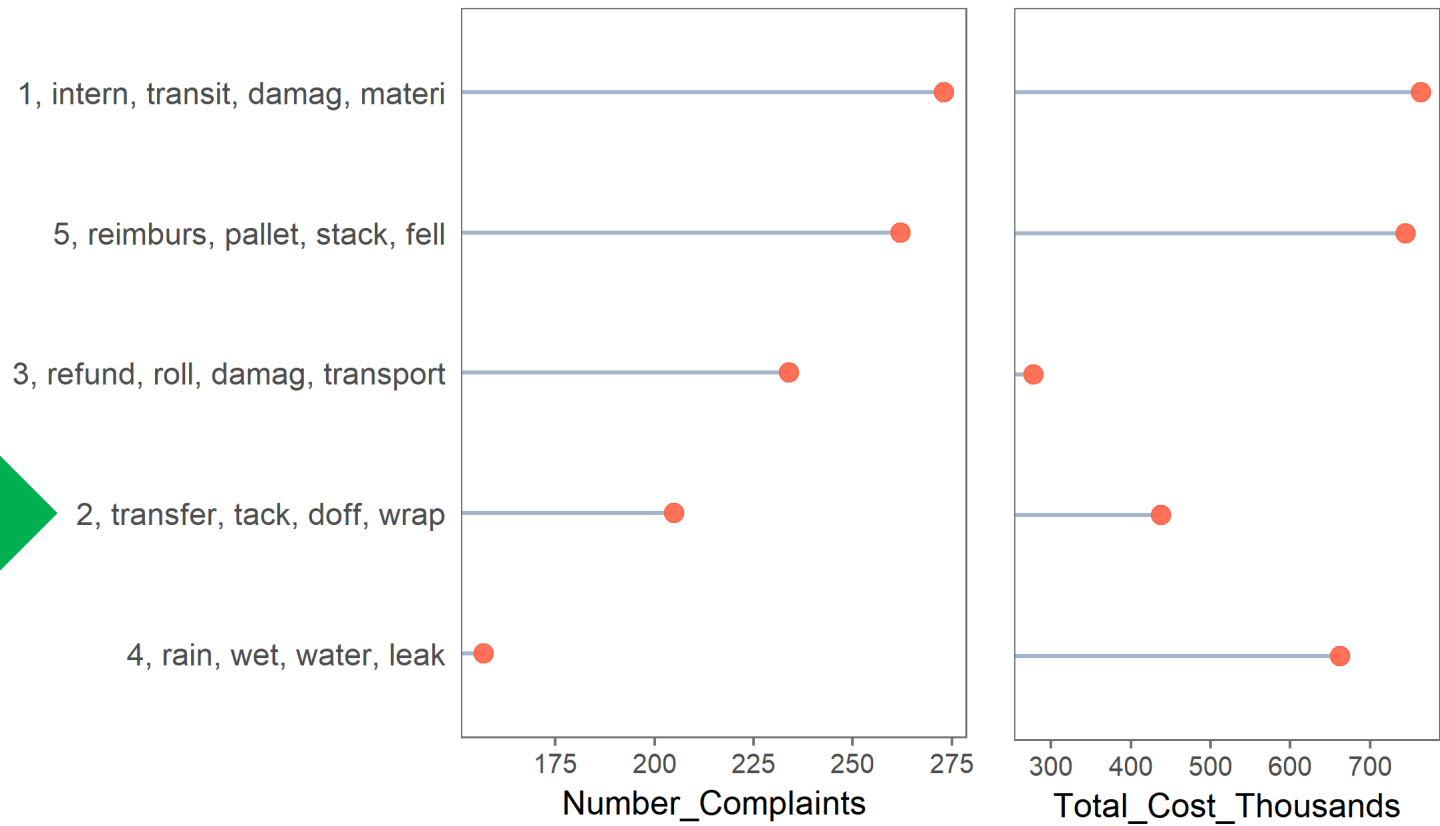
Type 5: reimburs, pallet, stack, fell

Type 3: refund, roll, damag, transport

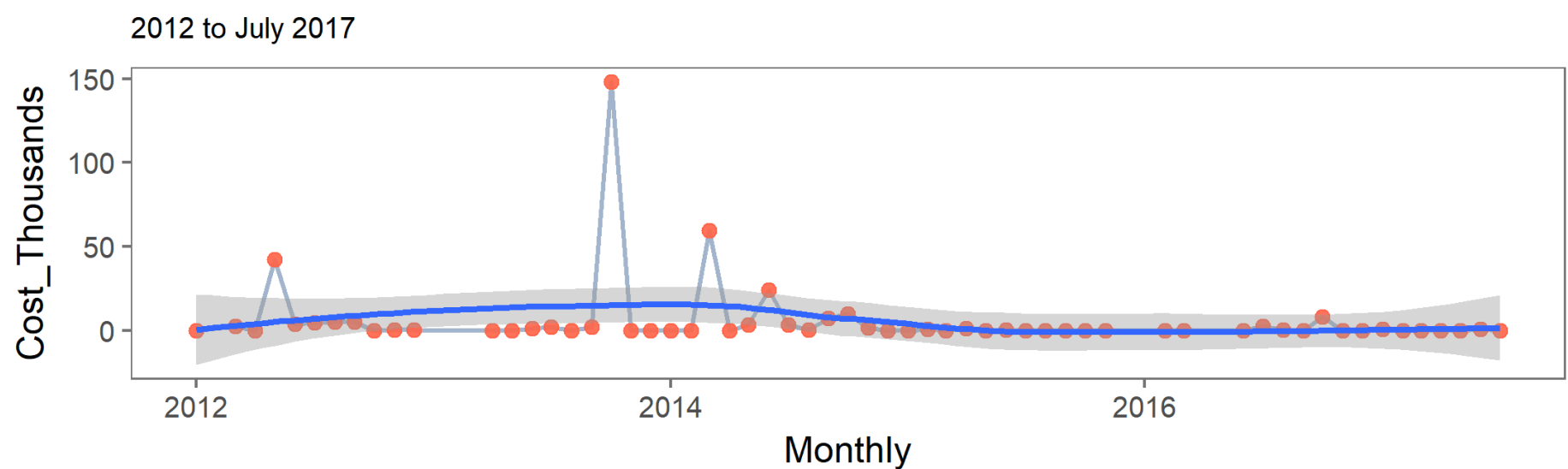
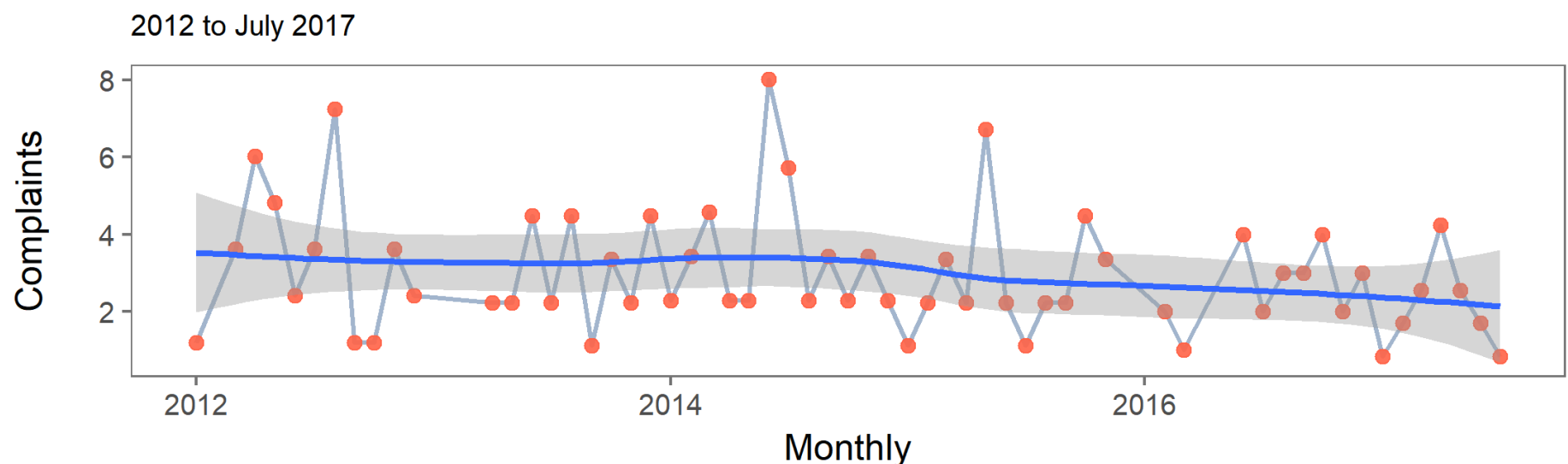


Manufacturing vs Transport Related Product Damage – Cost and Count

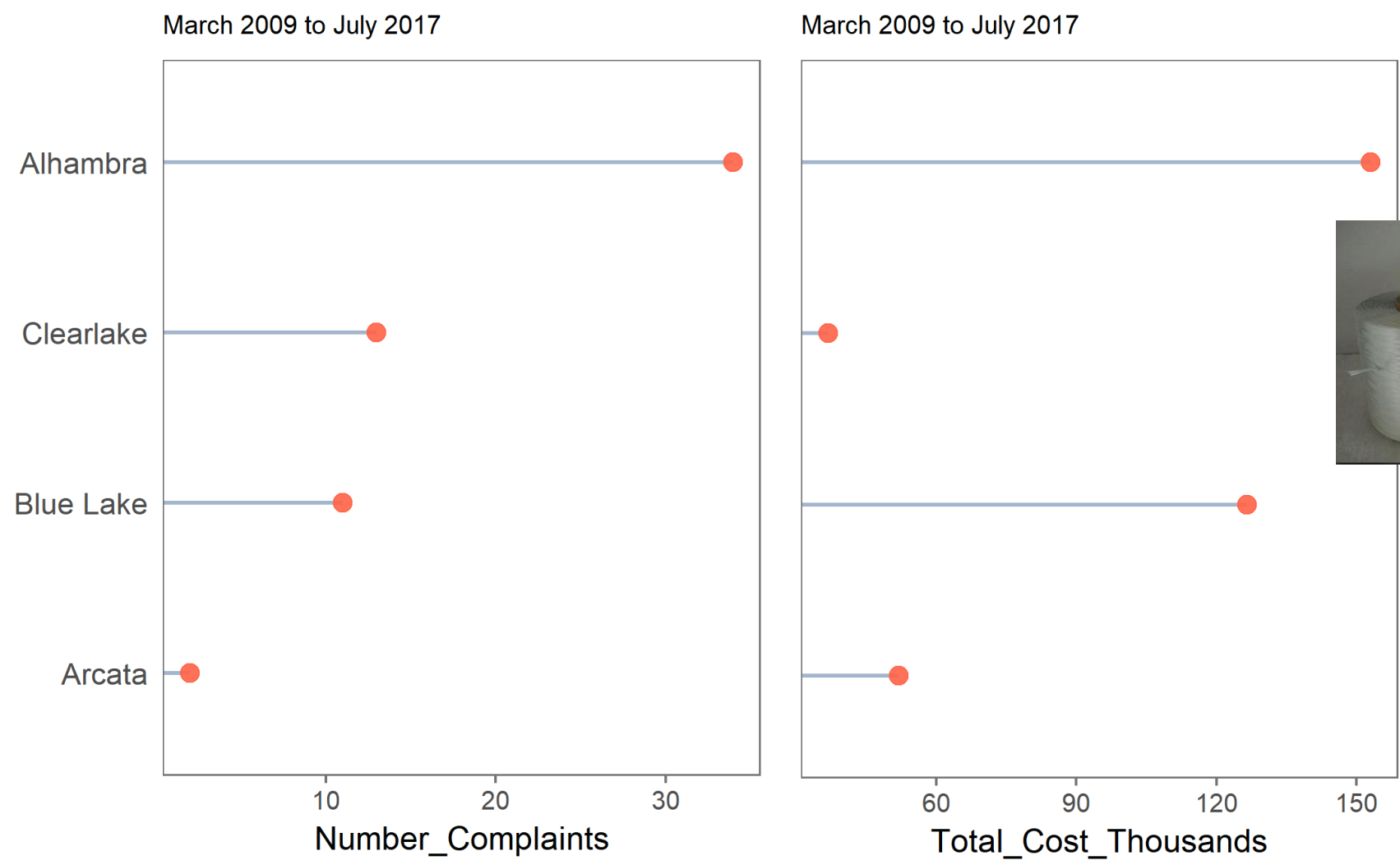
Manufacturing
Related



Manufacturing Related Product Damage - Time Series

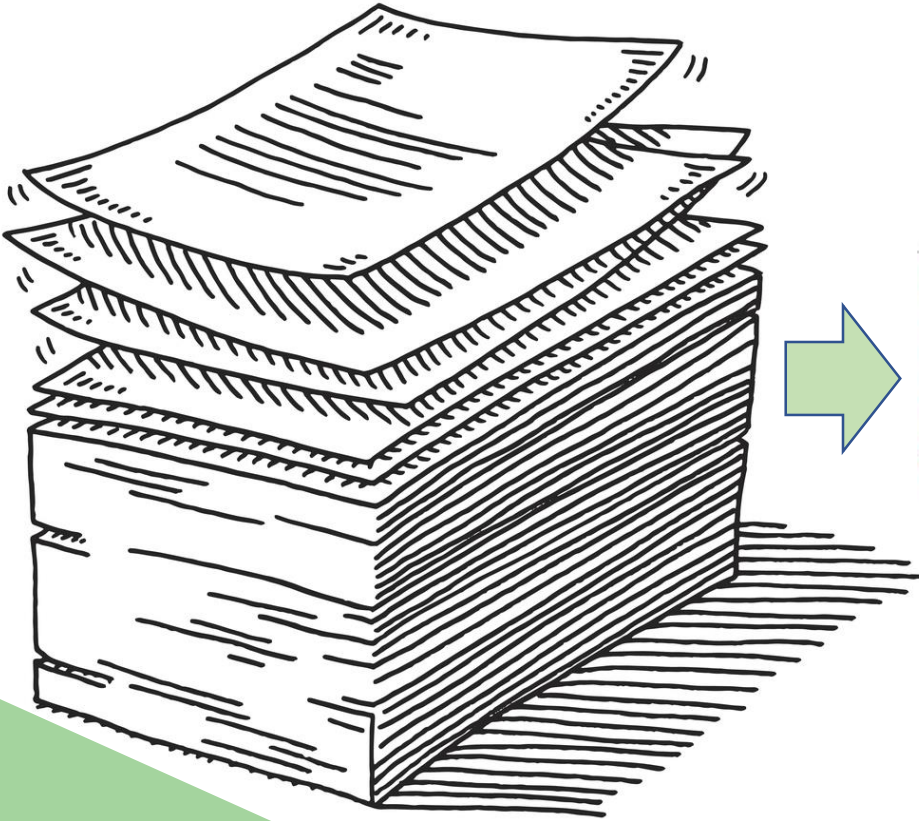


Manufacturing Related Product Damage – Top Locations

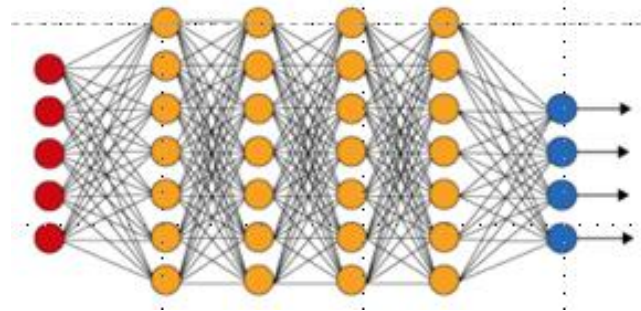


New Technology provides New, Actionable Information

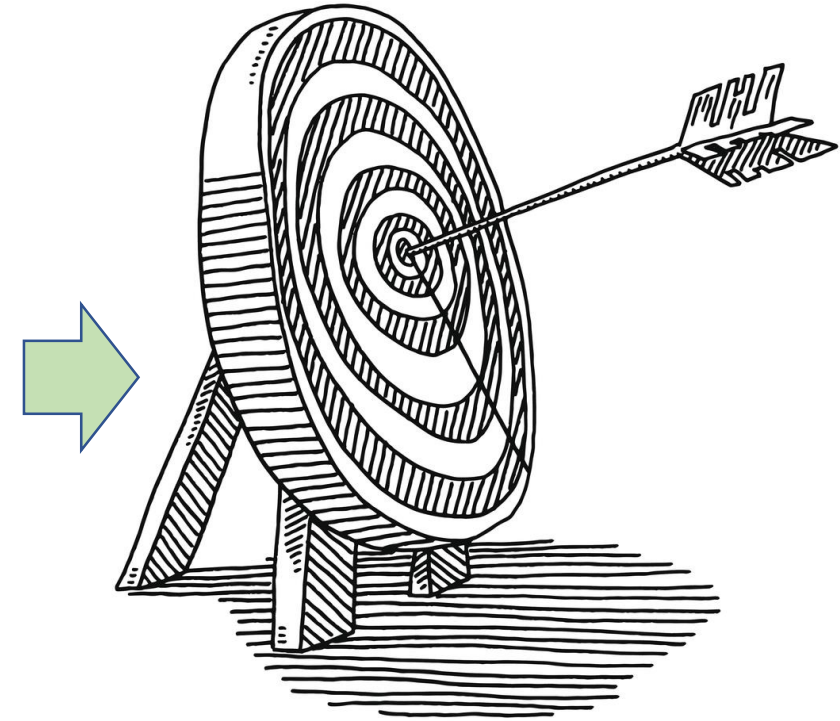
Untapped information



Good Data Science
(AI and Language Models)



Faster, Better Quality Results



Thank You
BmaQuality.com



Keith Bowers
PRESIDENT

480.648.8416
keith@bowersma.com
www.bowersma.com

Preprints available for
8 Tips for Success with VOC 4.0
appearing in 2019 in ASQ's QP magazine