# Scenario Planning with Data On Steroids

Frank Corrigan
Director, Decision Intelligence @ Target
Sept 30, 2021

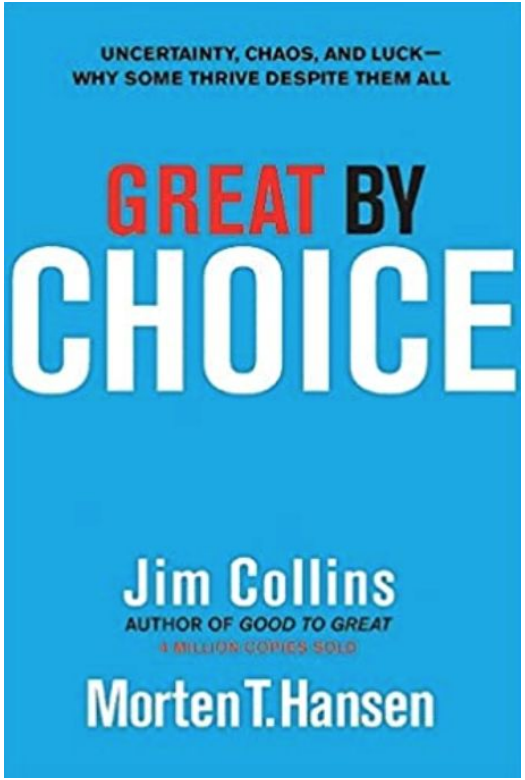
# Preface


Three chapters:

1. Context & Framework
2. Implementation
3. Delivery

# There is No “New Normal”

*We believe there will be no new normal. There will only be a continuous series of not normal times.* ***The dominant pattern of history isn’t stability, but instability and disruption****.*



# Supply Chain Disruption

*The ports of LA/LB have faced considerable delays over the past year.*

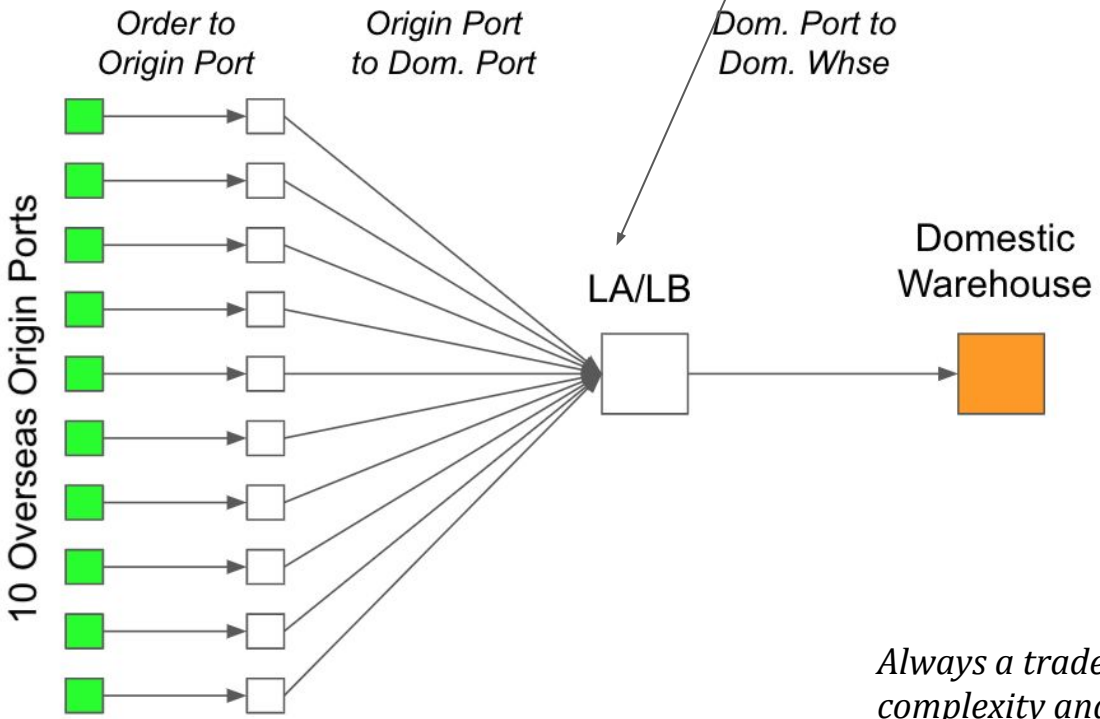
*In order to estimate the impact of port delays on supply chains we can use MC's.*

*And we can build these MCs with R.*


Photo 191733456 / Cargo © Sheila Fitzgerald | Dreamstime.com

# Understanding the System Flow

*In this demo, this is where the delay is happening… it reality, we are seeing delays everywhere...*




*~x units are ordered from each origin node each day...*

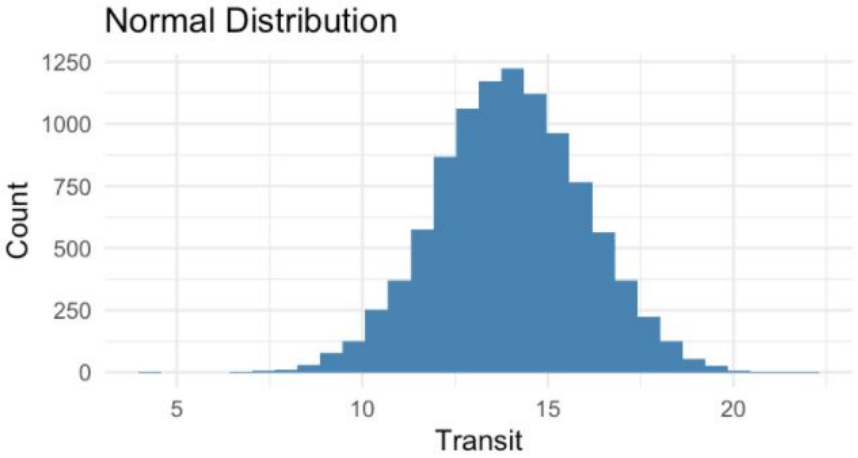
*Always a trade-off between complexity and usefulness. All models are wrong...*

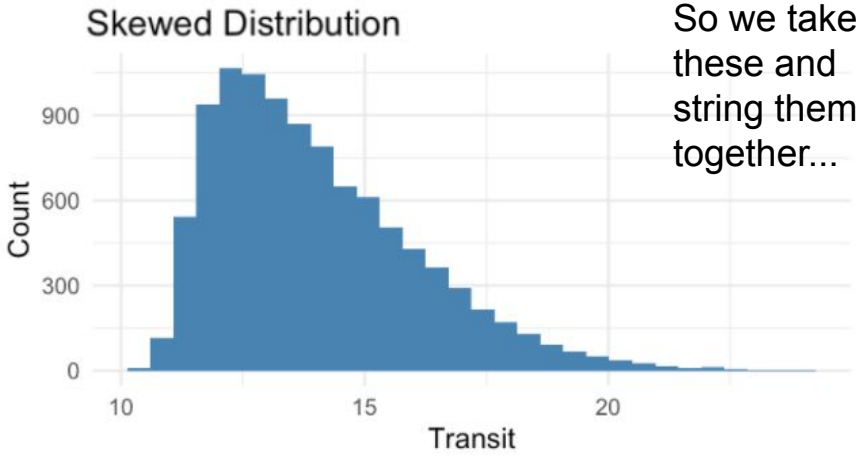
# Understanding Variability in Components of the System

*Distributions are the building blocks*

The speed through each component of the supply chain is variable. Each has a distribution of speeds over time.

Instead of using averages, looking at distributions gives us a better understanding of possibilities when considering alternative futures.

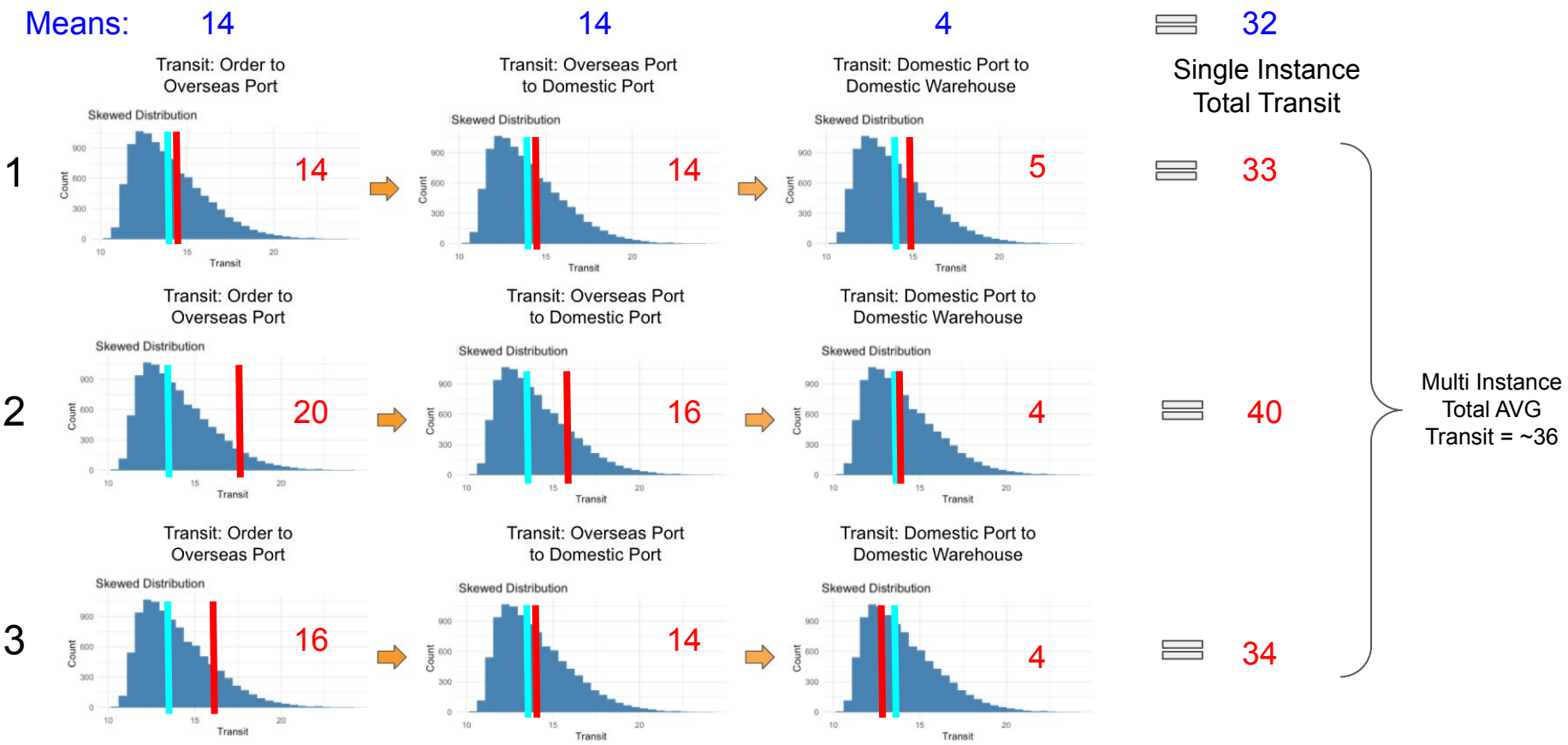



So we take these and string them together...

# Understanding Variability in Components of the System

*Sample sequence of distributions*



# Framework for Repetition

*What does the data look like for a single instance?*

| date_range | order_volume | order_oport | oport_dport | dport_dwhse | the_full_transit | dwhse_arrival_date |
|---|---|---|---|---|---|---|
| 2020-12-01 | 1002 | 12.83476 | 15.55464 | 3.765540 | 32 | 2021-01-02 |
| 2020-12-02 | 999 | 13.37339 | 15.58531 | 3.882902 | 33 | 2021-01-04 |
| 2020-12-03 | 1000 | 17.29094 | 15.74620 | 3.424605 | 36 | 2021-01-08 |
| 2020-12-04 | 999 | 14.78484 | 12.89926 | 2.889395 | 31 | 2021-01-04 |
| 2020-12-05 | 1001 | 14.04611 | 14.75850 | 3.180346 | 32 | 2021-01-06 |
| 2020-12-06 | 999 | 13.34096 | 15.43478 | 4.048189 | 33 | 2021-01-08 |

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-02 | 1002 |
| 2021-01-03 | 0 |
| 2021-01-04 | 1998 |
| 2021-01-05 | 0 |
| 2021-01-06 | 2002 |
| 2021-01-07 | 0 |

# Framework for Repetition

*What if you did it over and over again?*

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-02 | 1002 |
| 2021-01-03 | 0 |
| 2021-01-04 | 1998 |
| 2021-01-05 | 0 |
| 2021-01-06 | 2002 |
| 2021-01-07 | 0 |

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-02 | 0 |
| 2021-01-03 | 2001 |
| 2021-01-04 | 0 |
| 2021-01-05 | 0 |
| 2021-01-06 | 0 |
| 2021-01-07 | 1999 |

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-02 | 0 |
| 2021-01-03 | 1000 |
| 2021-01-04 | 1002 |
| 2021-01-05 | 1000 |
| 2021-01-06 | 2001 |
| 2021-01-07 | 999 |

# Framework for Repetition

*The pipeline...*

*After X number of iterations, inspect the results*

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-02 | 1002 |
| 2021-01-03 | 0 |
| 2021-01-04 | 1998 |
| 2021-01-05 | 0 |
| 2021-01-06 | 2002 |
| 2021-01-07 | 0 |

Distribution

Distribution

Single Instance

Distribution

Add to a Master DataFrame

| dwhse_arrival_date | dwhse_arrival_volume |
|---|---|
| 2021-01-06 | 0 |
| 2021-01-06 | 1999 |
| 2021-01-06 | 0 |
| 2021-01-06 | 0 |
| 2021-01-06 | 1999 |
| 2021-01-07 | 1999 |
| 2021-01-07 | 1000 |
| 2021-01-07 | 0 |
| 2021-01-07 | 3002 |
| 2021-01-07 | 1001 |