

# NUMBER CRUNCHING FOR DUMMIES

Collecting, Identifying, Presenting, and  
Developing an Effective Planning Strategy Amid  
Billions and Billions of Records

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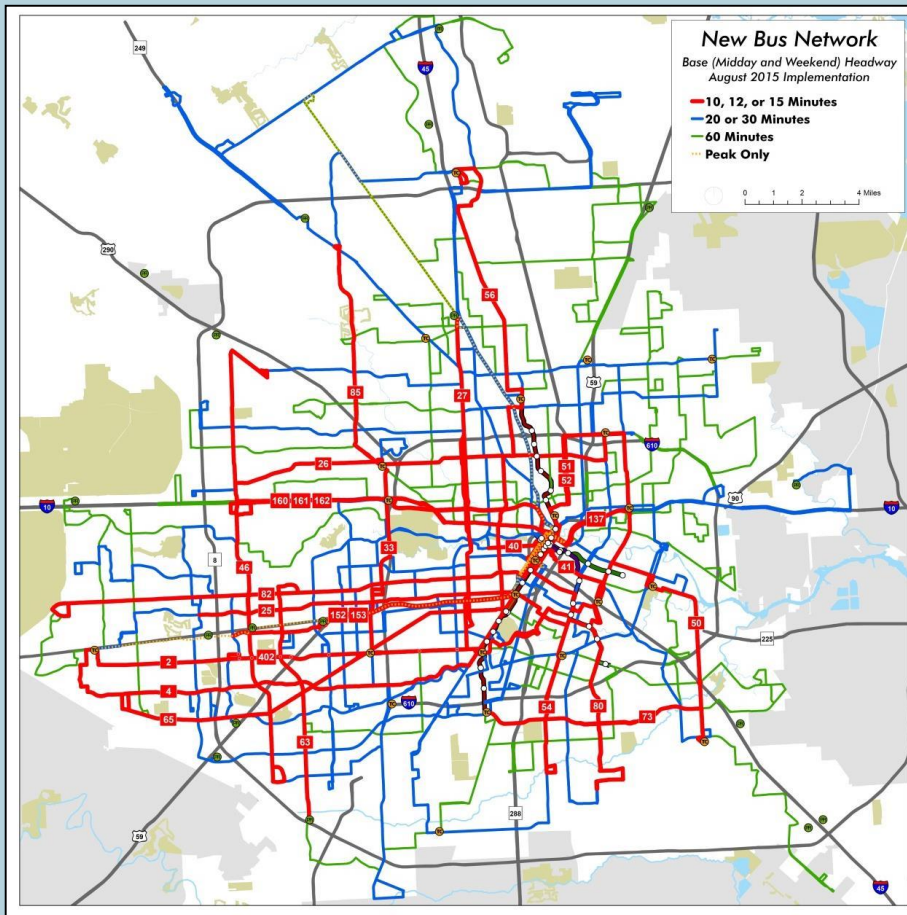
*METRO*

*Houston, TX*

Sustainability & Multimodal Planning Workshop



# Houston METRO



Category	By The Numbers
Service Area	1,303 sq. mi.
Boardings / Routes (FY2016)	
Local Bus	58.9M 83 routes
Park & Ride Bus	8.5M 30 routes
Light Rail	18.5M 3 lines
Paratransit	1.9M
Bus Stops	9,100
Passenger Shelters	2,200

# "IN THE BEGINNING..."

- Operators manually recorded boardings, then transcribed to paper forms
- Traffic checkers manually recorded boardings, alightings, and passenger loads on paper forms
- Data entry clerks entered information entered into computers
- Lots and lots of paper

QUANTITY: Determined by manual staff / staff ability

QUALITY: High variability

DECISION MAKING FOCUS – Data or Professional Judgement? **PROFESSIONAL JUDGEMENT**

The image shows a 'PASSENGER LOAD CHECK' form from May 7, 1972, with a mechanical counter overlaying it. The form is titled 'PASSENGER LOAD CHECK' and includes fields for 'DATE' (MAY 7 1972), 'LOCATION' (KATY BLVD. P&H LOT), 'DAY OF WEEK' (THURSDAY), and 'TIME' (P.M. 6:00-8:25). The form is divided into two main sections: 'A.M. - INBOUND FROM P&H LOT' and 'A.M. - OUTBOUND FROM DOWNTOWN'. Each section contains a table with columns for 'BUS NO.', 'BLK.', 'TIME', 'NO. OFF', 'NO. ON', 'PASSENGERS', and 'STOP'. The 'A.M. - INBOUND FROM P&H LOT' section has 10 rows of data, and the 'A.M. - OUTBOUND FROM DOWNTOWN' section has 10 rows of data. The mechanical counter is a silver, rectangular device with a red knob on the left and a display showing '002-000-000-000-000-000-000'. Below the display are six colored buttons: black, green, red, blue, and two red buttons. The counter is placed over the 'A.M. - INBOUND FROM P&H LOT' section of the form.

# "THOSE WERE THE DAYS..."

- Operators logged in to electronic registering fare boxes / bus card readers
- Traffic checkers manually recorded boardings, alightings, and passenger loads on paper forms for reasonableness checks
- Less paper / more automation
- Information entered into computers by data entry clerks

QUANTITY: Determined by log-in / manual staff size

QUALITY: Less variability

DECISION MAKING FOCUS – Data or Professional Judgement? **PROFESSIONAL JUDGEMENT**



# "BILLIONS AND BILLIONS OF RECORDS"

With automatic passenger counters on 100% of buses, you get:

WEEKDAYS	SINGLE DAY	MONTHLY (20 weekdays)
A. Scheduled Trips	8,807	176,140
B. Average # of Stops	75	75
C. Fields of Data	45	45
D. A x B x C	29,723,625	594,472,500
% Available Next Day	85 – 90%	
% Available 4 <sup>th</sup> Day	90 – 95%	

QUANTITY: High

QUALITY: Minimal variability

DECISION MAKING FOCUS – Data or Professional

Judgement? **DATA / PROFESSIONAL JUDGEMENT**

# SO WHAT'S MOST IMPORTANT?

One approach

APC DATA (Bus)	WHO USES IT
Boardings – Overall	NTD, Board, Planning, Scheduling, Peer
Boardings By Route	NTD, External, Planning, Scheduling, Peer
Boardings / Alightings By Bus Stop	NTD, Planning, Scheduling
Maximum Customer Loads	Title VI, Planning, Scheduling
Seating Capacity Utilization	Planning, Scheduling
# / % of Trips with Standing Loads	Title VI, Planning, Scheduling
Service Reliability By Route	Title VI, Scheduling
Service Reliability By Day	Scheduling
Service Reliability By Segment	Scheduling

# DATA-DRIVEN OR PROFESSIONAL JUDGEMENT?

- It's not a case of one being inherently better than the other
- It's not a case of "either or"
- Whenever possible, use both



# WHEN 1 $\neq$ 1

## *SEATING CAPACITY – 40' Transit Bus*

1997: 45 seats

2007: 38 seats

2017: 34 seats      **We've lost nearly a quarter of our seats!**

## ACTUAL SITUATION:

- Bus route has 40 one-way trips
- Equipment has 25 seats
- ERF reports 1,060 boardings
- Previous month 650 boardings
- Maximum in previous 12 months was 680 boardings
- Staff member enters 1,060      **What's wrong with this picture?**

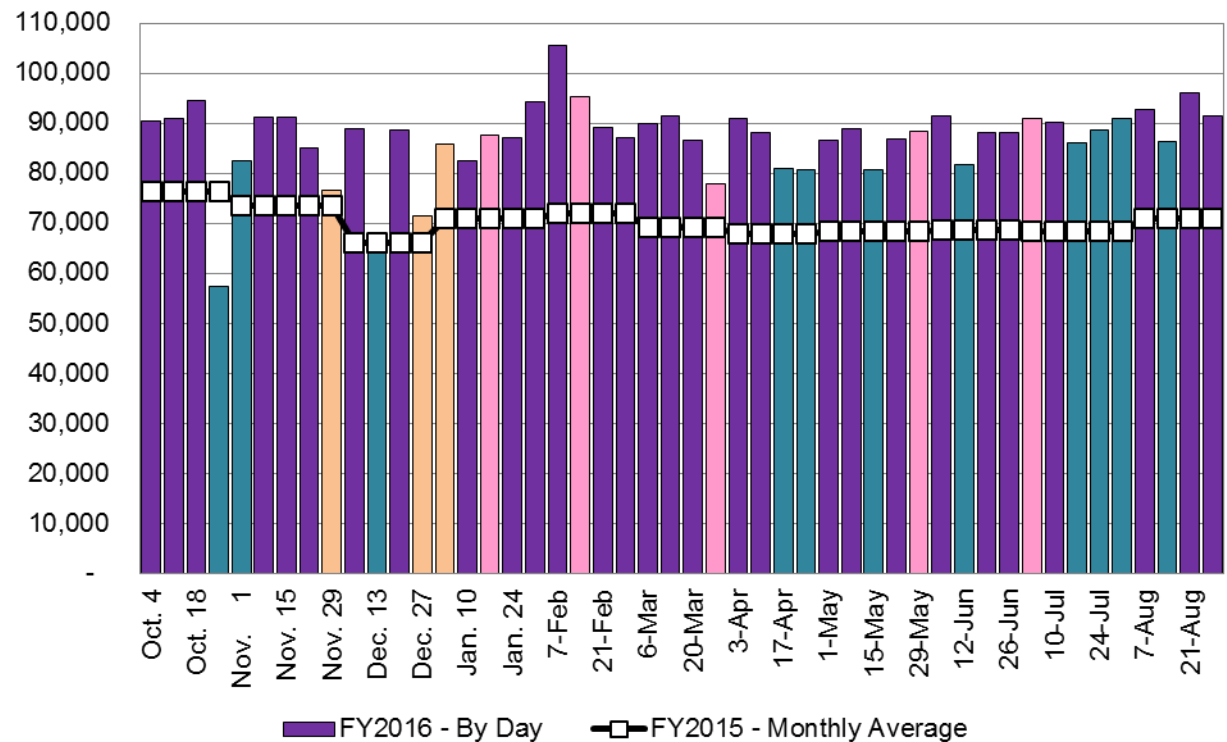


# WHEN IT RAINS...

- Average Sunday ridership was 11% less on days with measureable rain than on non-rain, non-holiday weekends

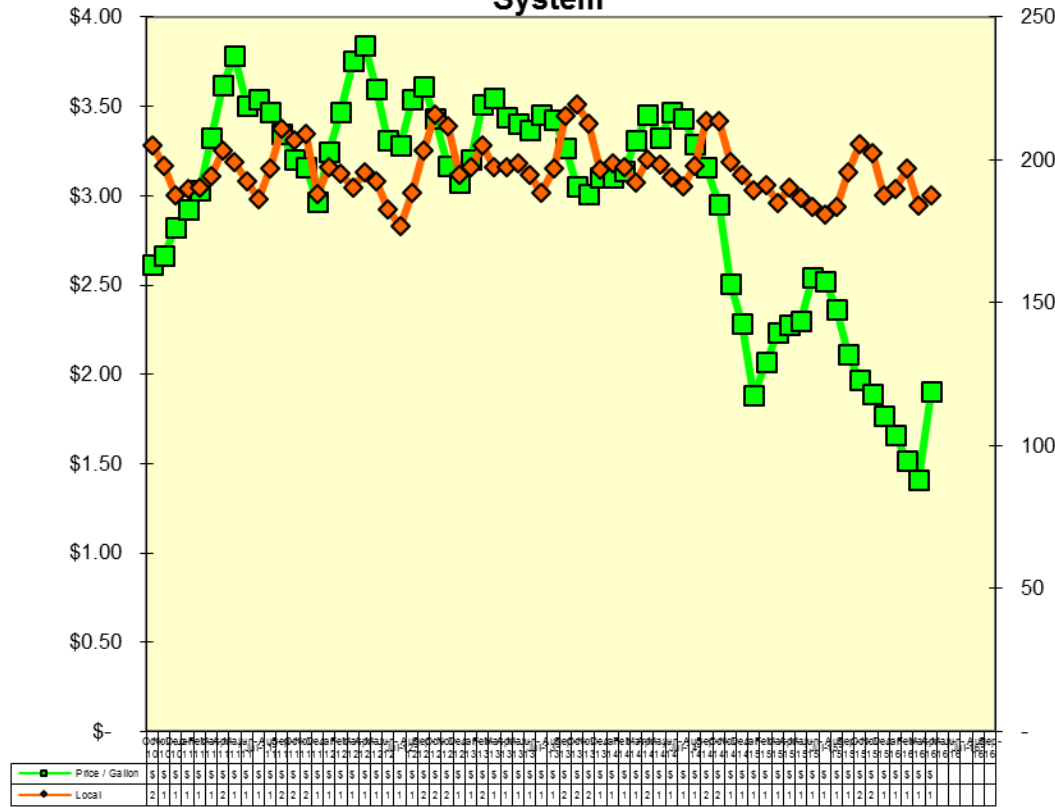
	Description	# of Days
	Average day, no weather or holiday impact	29
	Heavy measureable rainfall	11
	Holiday	5
	Heavy measureable rainfall and holiday	3
	<b>TOTAL</b>	<b>48</b>

**Estimated Daily Bus Boardings  
Daily Ridership FY2016 versus  
Average Daily Boardings FY2015  
Sundays**



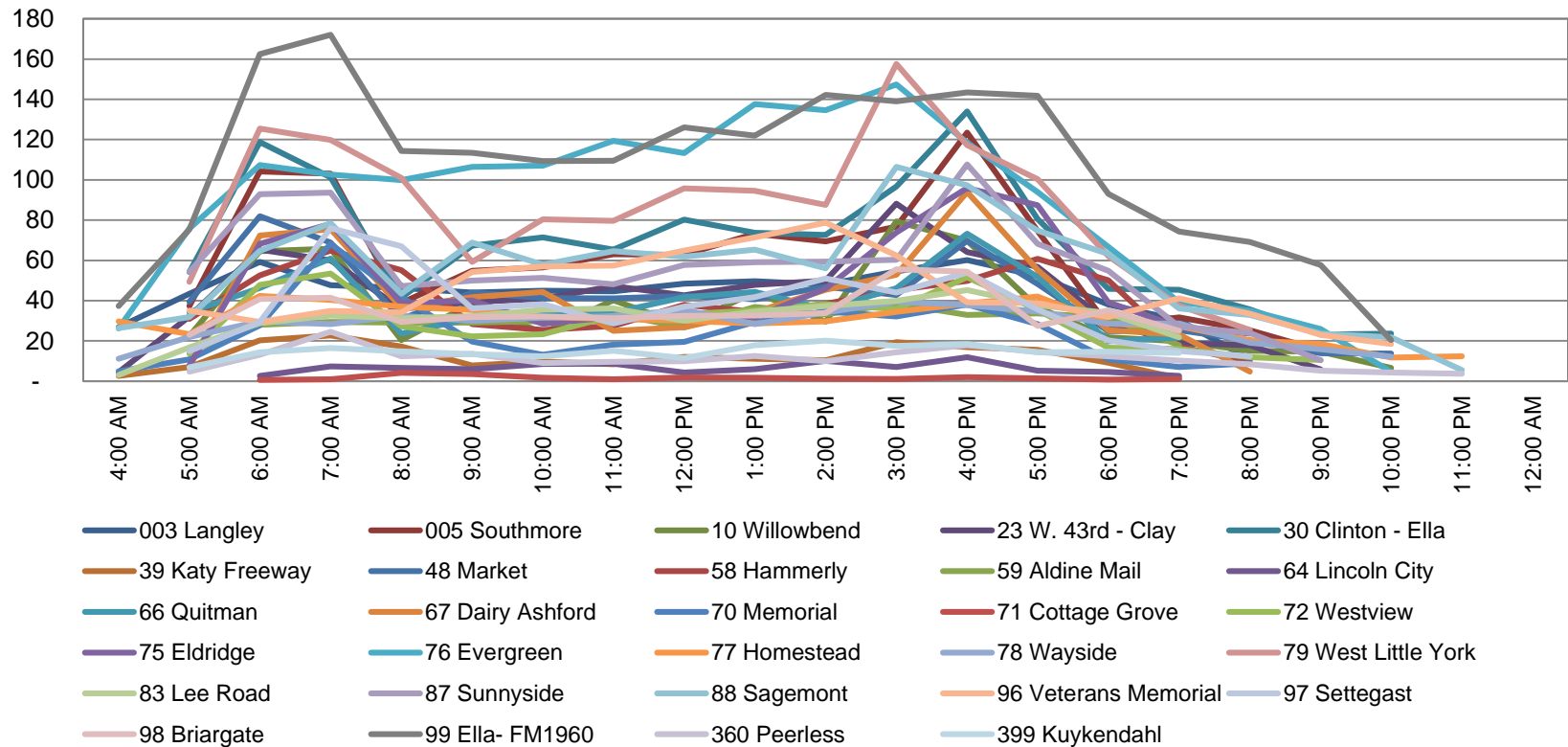
# WHEN DATA AND IDEOLOGY COLLIDE

Gasoline Prices vs. Boardings (Weekday) - Local Bus System



# WHEN DATA AND IDEOLOGY COLLIDE

**Average Weekday Boardings by Hour Time Period**  
**Green (Coverage) Routes – By Route**  
**February 2016**



# KNOWN RIDERSHIP GENERATORS

## Passenger Shelters

Adding shelters with existing high ridership = 20% increase / stop



## Schedules

InfoPanel Program (pre-dated next-bus-texting) with schedules in shelters on select routes = 310K increase in 18 months



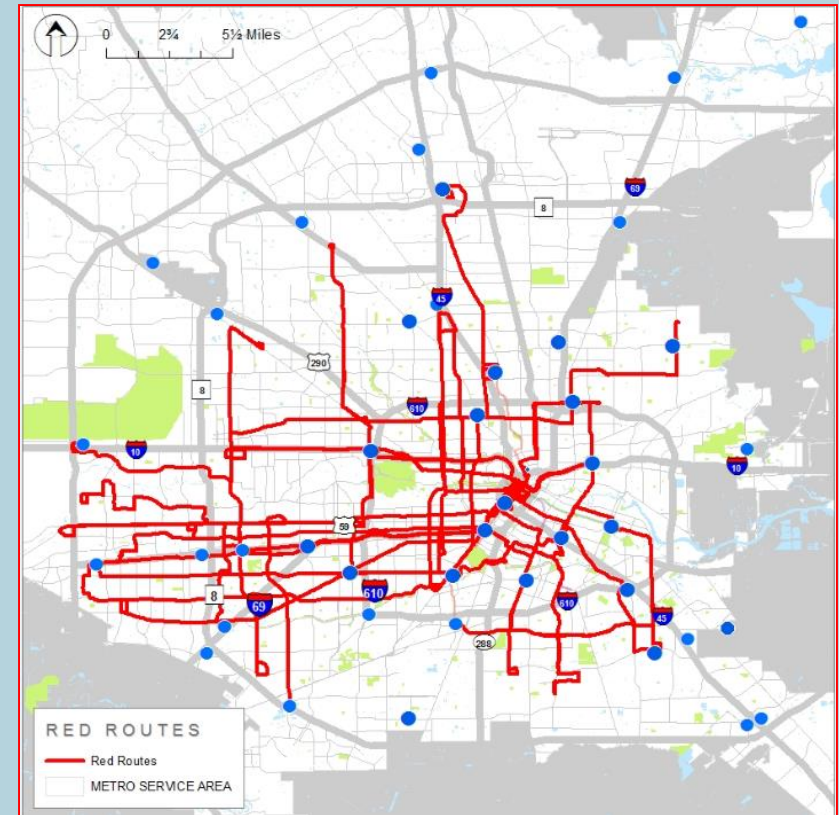
## Maps

Post-Hurricane Katrina issuance led to growth on entire system



# KNOWN RIDERSHIP GENERATOR

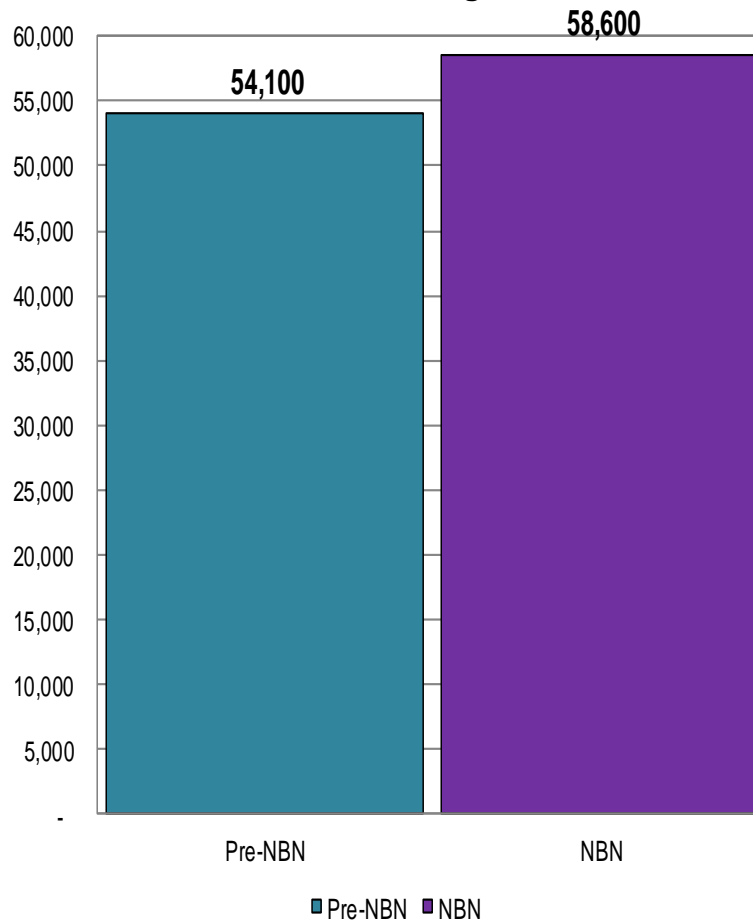
- Increased frequency on routes with high ridership levels
- Increased frequency 7-days per week
- Elimination of branches



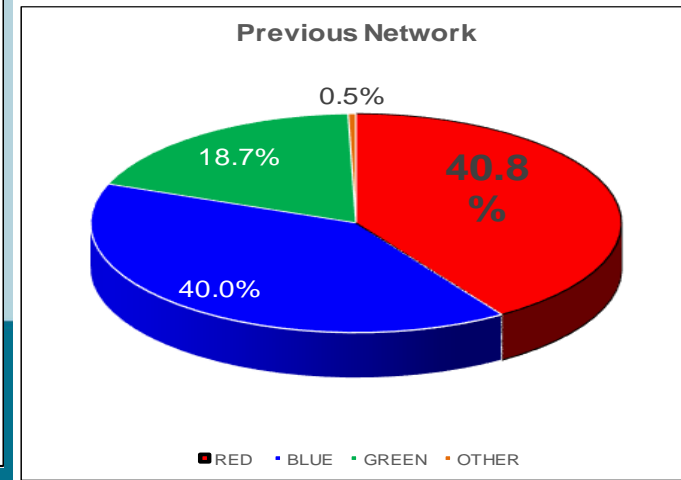
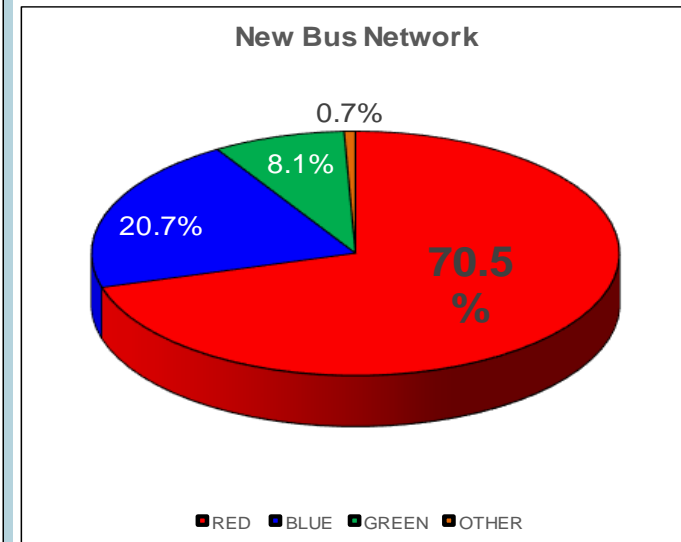
# NEW BUS NETWORK

- Average Sunday: **+33%**
- Average Saturday: **+18%**
- On-Time Performance: **+ 7%**
- Total Network: **+8%**  
**BUT**
- Average Weekday, Other Texas Properties: **-8%**

**Pre-NBN and NBN Monthly Local Network Boardings (in 000s)**



**Average Weekday Allocation**



# EFFECTIVE USE OF DATA

- **D**etermine what's most critical
- **A**nalyze what you have
- **T**ry presenting in different ways for different audiences
- **A**adjust as needed



# For future information

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