![Kellogg's logo]

Translating Data Models into Action
INFORMS Presentation
May 10th 2018

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Global Analytics

Agenda

- The Kellogg Company
- CPG Recent History
- The Analytics Journey at Kellogg's
- Supply Chain of the Future
- Translating Data Insights into Action
- Forecasting Redesign
- Questions & Open Discussion

The Kellogg Company

Our Vision:

To enrich and delight the world through foods and brands that matter.
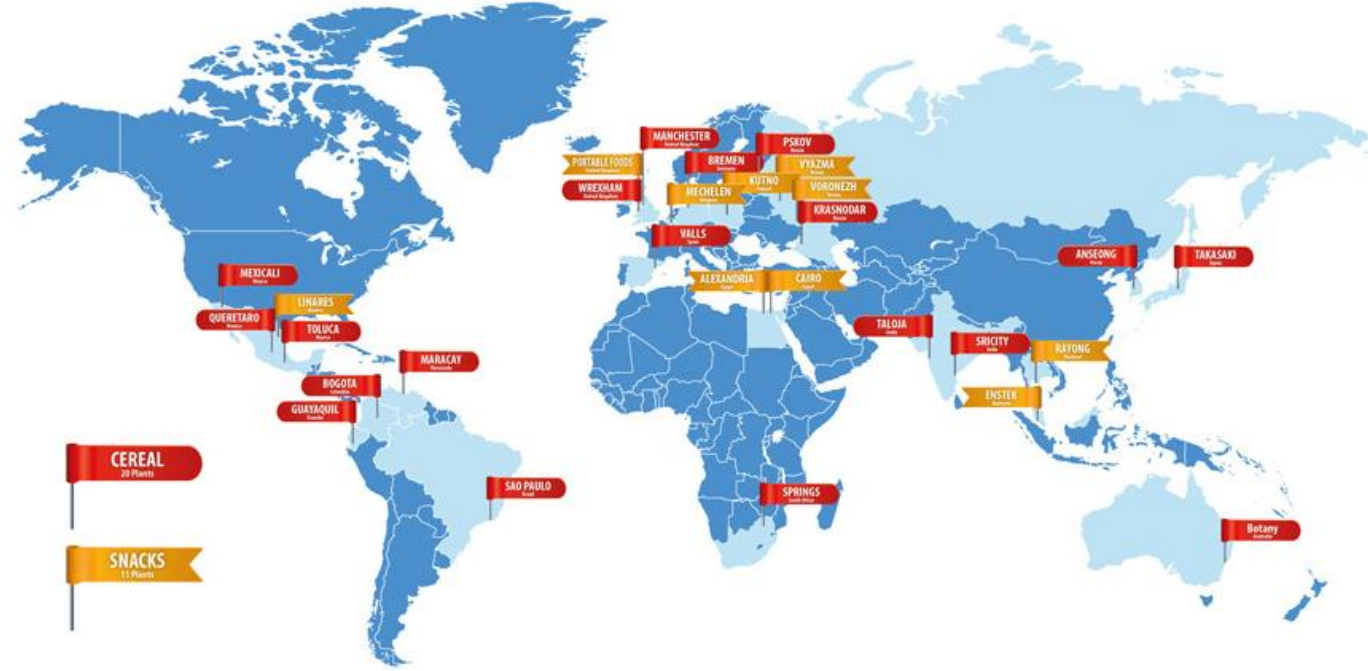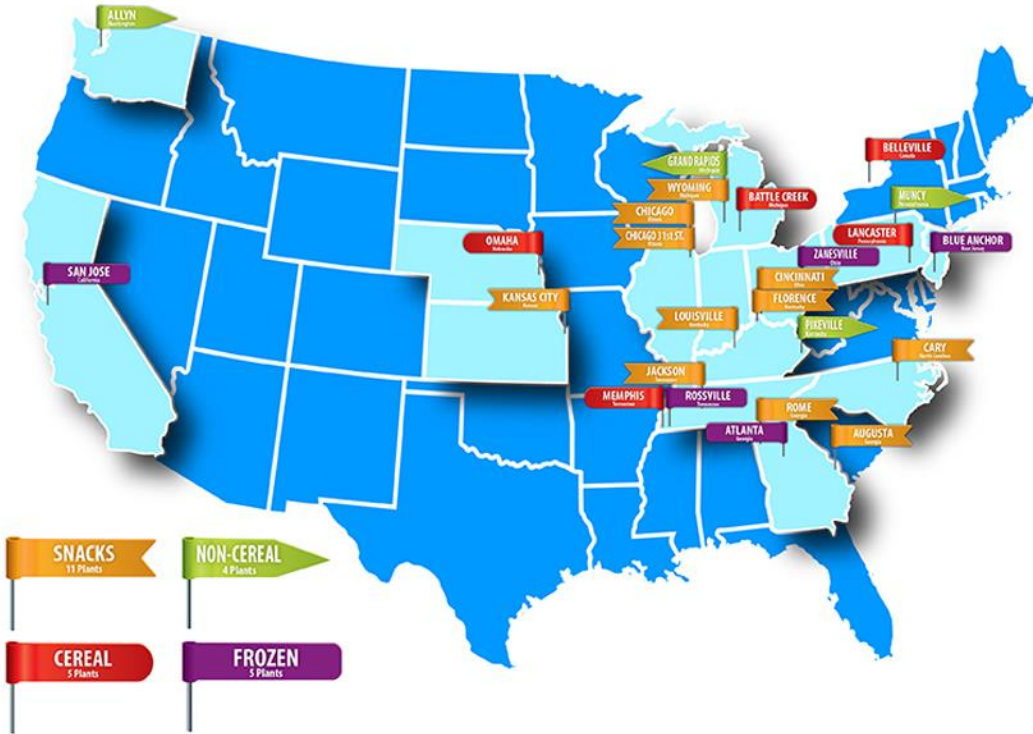
Our Purpose:

Nourishing families so they can flourish and thrive.

The Kellogg Company

25 domestic US plants, plus CoMan and CoPackers

Mfg in 18 countries and distribution in over 170 countries

The Kellogg Company

Sustainability

- Strong focus on reducing the environmental impact of our business practices

SUSTAINABILITY

Energy — By 2020, expand low carbon energy use in plants by **50%** and reduce energy, GHG in plants by an additional **15%***

By 2050 reduce GHG from our operations by **65%** and work with direct suppliers to help reduce their GHG by **50%**

$28M
2005-2015 in Energy and Water Cost Savings in our manufacturing sites

Packaging — Continue adding value to foods and the planet via increased resource-efficient packaging

1,000,000
pounds of packaging avoided in just one of dozens packaging reduction initiatives in 2016

Water — By 2020, implement reuse projects in at least **25%** of plants, reduce usage by additional **15%*** and continue watershed quality support

7.1M
Gallons of water reduced in just one plant per year through conservation initiatives

Waste — By 2020, reduce total waste in plants by **15%***

68%
Reduction in total waste from 2005 - 2016

35+
35 Kellogg's Origins™ Projects in 5 continents to support best practices in sustainable agriculture

294,000
farmers supported directly and indirectly Through programs from 2014-2017

15,200
Smallholder farmers supported through Kellogg programs from 2014-2016

10,000
Women farmers and workers supported through Kellogg programs from 2014-2017

Ingredients / Materials
Responsibly source priority 10 ingredients by 2020

Validate social compliance with suppliers

Sustainable Agriculture
Support 500,000 farmers, focusing on Climate Smart Agriculture, to improve livelihoods

Smallholder Farmers
Help improve livelihoods for 15,000 smallholder farmers in regions from which we source

Women Farmers / Workers
Identify women in the value chain & develop programs to help improve their livelihoods, families and communities
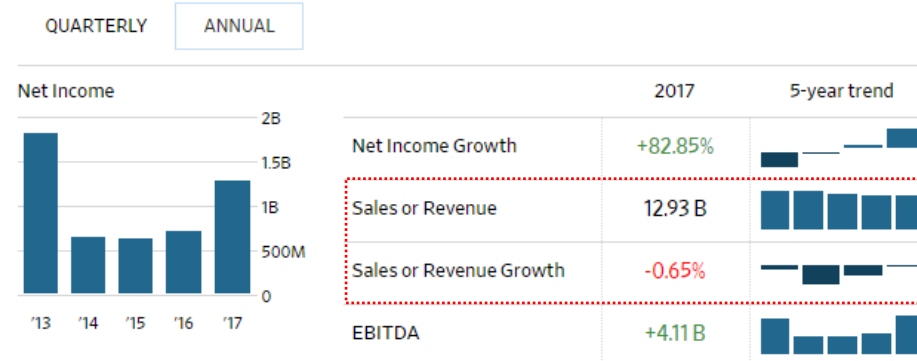
The Kellogg Company

Quick Facts:

- HQ in Battle Creek, Michigan

- Founded in 1906

- 2017 revenue of 13 Billion dollars
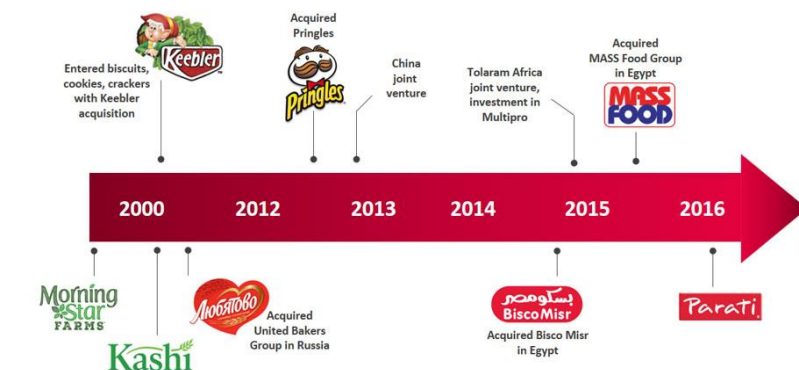
- #216 on Fortune 500 list (2017)

Kellogg Co.
K (U.S.: NYSE)

QUOTES & COMPANIES
VIEW ALL COMPANIES

REAL TIME 10:44 AM EDT 04/23/18
$60.38 USD
0.11 0.18% ▲

Volume
345,951

65 Day Avg Vol
2,897,054

1 Day Range
59.99 - 60.69

52 Week Range
58.76 - 74.28
(10/30/17 - 06/14/17)

1D 5D 1M 3M YTD 1Y 3Y $ %

ADVANCED CHARTING   COMPARE ▾

Open 60.38   Prior Close 60.27 (04/20/18)
1 Day   K 0.18% ▲   DJIA -0.16% ▼   S&P 500 0.05% ▲   Consumer Goods 0.34% ▲

Graphics & Data courtesy of Wall Street Journal.com

Income Statement Kellogg Co. →

QUARTERLY | ANNUAL

Net Income

	2017	5-year trend
Net Income Growth	+82.85%	
Sales or Revenue	12.93 B	
Sales or Revenue Growth	-0.65%	
EBITDA	+4.11 B	

RECENT ACQUISITIONS

Entered biscuits, cookies, crackers with Keebler acquisition
Acquired Pringles
China joint venture
Tolaram Africa joint venture, investment in Multipro
Acquired MASS Food Group in Egypt

2000   2012   2013   2014   2015   2016

Acquired United Bakers Group in Russia
Acquired Bisco Misr in Egypt

Consumer Packaged Goods - Food (CPG) Recent History

General Mills

Sales or Revenue	15.62 B	
Sales or Revenue Growth	-5.70%	

Mondelez

Sales or Revenue	25.90 B	
Sales or Revenue Growth	-0.10%	

Kraft Heinz

Sales or Revenue	26.23 B	
Sales or Revenue Growth	-0.94%	

Pepsico

Sales or Revenue	63.53 B	
Sales or Revenue Growth	+1.15%	

Five Challenges for the CPG Sector in 2018

Tough hurdles amidst a steady shift in consumer preferences

Perspectives

2018 Consumer Products Industry Outlook

Newer approaches and bolder moves in consumer goods

As consumers prosper from stable US and global economies, the consumer products industry will reinterpret traditional levers to fuel growth in a hyper-competitive market.

7 Mega-Trends, Challenges and Opportunities Disrupting the CPG Industry

by Jesper Grode and Carlos Dufour | June 21 2017

Megadeals in Consumer Packaged Goods

The Capable Deal Maker

How supersized deals are helping the sector respond to challenges.

Consumer Packaged Goods - Food (CPG) Recent History

Challenges

- eCommerce Disruption of Retail Landscape

- Lower barrier to entry for startups

- Changing consumer preferences – fresh – avoiding center aisles

- Private equity take overs -focus on cost cutting and efficiencies

- Increasing transportation costs

Opportunities

- New distribution methods

- Incentive to innovate and acquire

- Accelerating trend identification

- Revenue growth management analytics

- Supply chain analytics

The Analytics Journey at Kellogg

Think Big
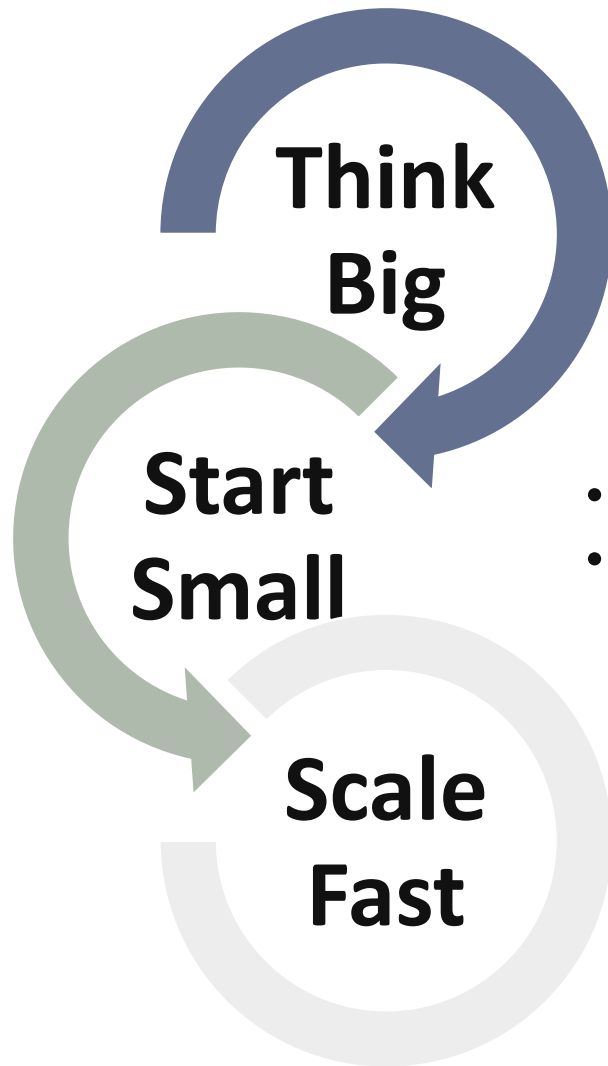
- Start with End State in mind
- Cross-functional
- Common platform for efficiency and speed

Start Small

- Quick wins
- Leverage pilots to prove out business cases, new approaches, and technologies

Scale Fast

- Once we have proven the business case, we will then scale quickly to other businesses and geographies

KEYSTONE: Our Analytics Ecosystem
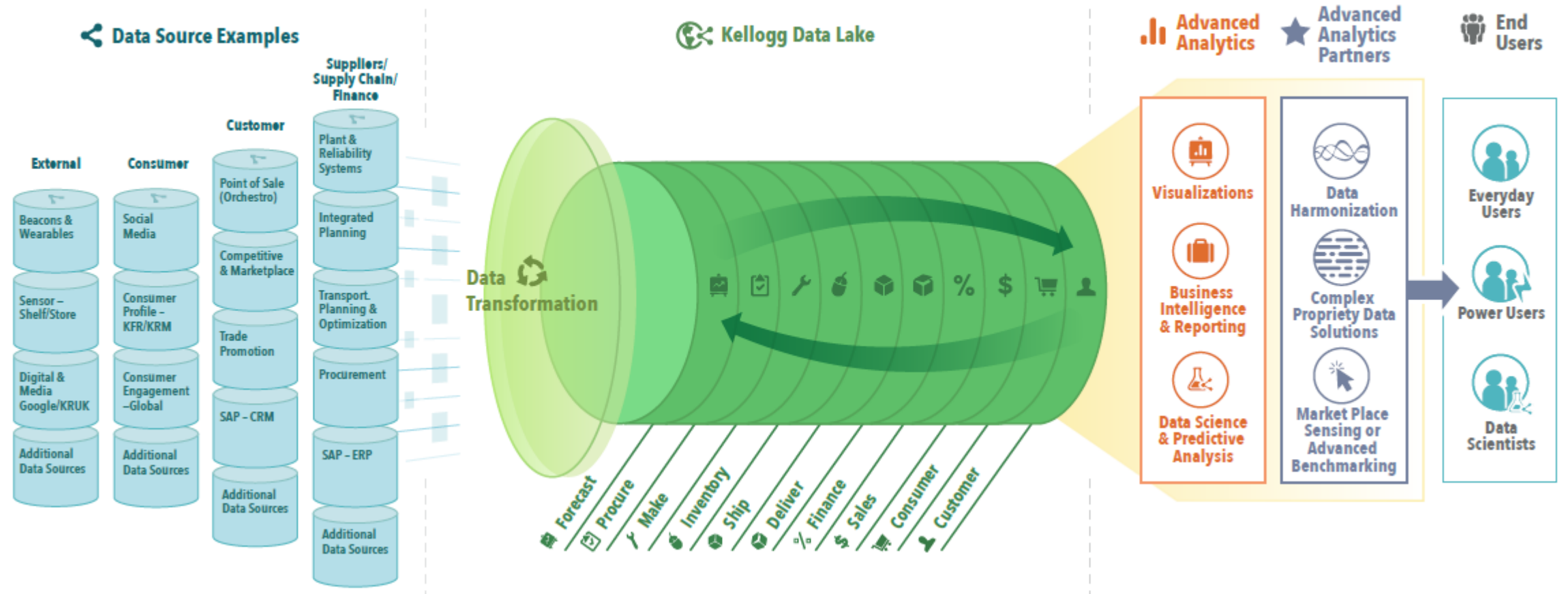
The Analytics Journey at Kellogg

Data Science	SWAT team approach to big opportunities; aligned to functional areas; end to end deployments (data, model, tool development).
Data Visualization COE	Proof of concept team that partners with the business to train business users on best practices of data visualization and to foster data democratization.
Reporting & Modeling	Sustainment of created models; ad-hoc reporting requests from existing data sources or models; support of data changes – entry level – data scientists in the making.
Analytics "Factory"	External resources that translate data science projects into long term 'operationalized' solutions. Typically IT resources that translate SAS, "R", Python to more supported IT tools.
Data Services	Organizational responsible for connecting 'Keystone' to data sources and harmonizing the data. Database admins and SQL experts.
Platform Architecture	Individuals responsible for the connections among the various components of the analytics ecosystem and product management of each component.
Data Governance	Team responsible for source system data management and harmonization.

The Analytics Journey at Kellogg

FROM

TO

FROM	TO
Large amounts of data in silos	Integrated data w/ improved insights
Poor data quality	Data governance
Reporting the past - reactive	Real-time and predictive insights
Internal focus: reporting on ourselves	External focus: customer/consumer
Inconsistent metrics	Consistent exception based measures
Redundant activity: significant time on data collection and reporting	Consolidated data collection and reporting activities

Translating Data Insights into Actions

1. Process engineering for "**action-based analytics**"

2. "**Immersive technology**" for interaction & collaboration
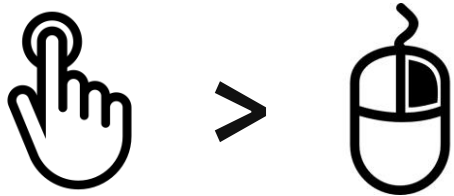
3. "**Storytelling**" with the full analytics ecosystem

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Translating Data Insights into Actions

Process Engineering: Action Based Analytics

2 MODEL
ETL, Data Modeling, Statistical Modeling, Machine Learning

3 VISUALIZE – "Dazzle"
Expose your insights for decision making

4 CONSUME
Engage users to interact and learn from the data

6 ACTION
Decide – Implement Act – Real World Activity

1 DATA
Collect, Cleanse, Collate, Consume

Data   Data   Data   Data

5 ENRICH
Provide a mechanism for users to provide context, decisions, and feedback on the data

Translating Data Insights into Actions

Process Engineering: Action Based Analytics

Translating Data Insights into Actions

Process Engineering: Action Based Analytics

Translating Data Insights into Actions

K-Max: Immersive Technology

DEATH BY POWERPOINT

DATA IMMERSION

- A typical monthly staff meeting
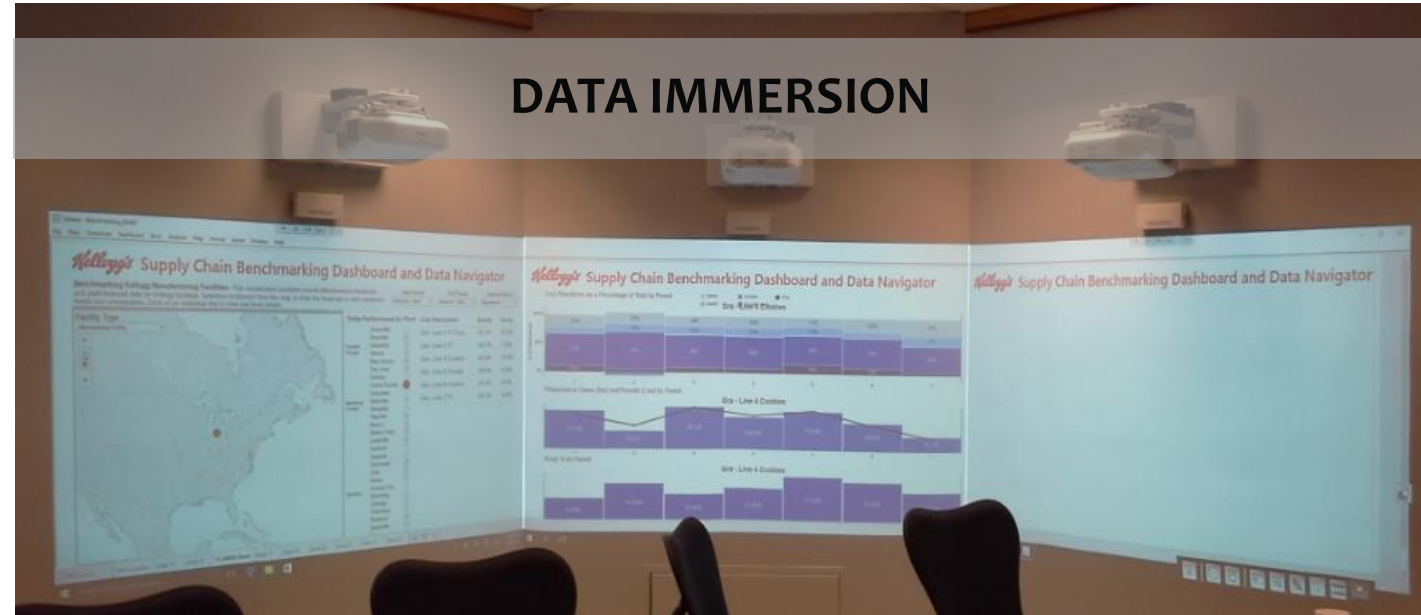
- Interactive, immersive, and agile

Translating Data Insights into Actions

K-Max: Immersive Technology – Go "Big" or Go Home

Small Form Factors	Big Form Factors
• *Tablets* • *Phones* • *Smart Watches*	• *Touchscreen Monitors* • *Multi-Screen Projectors* • *Large Format Displays*

ADVANTAGES
- Mobile
- Forces simplicity
- Individualized

DRAWBACKS
- Small Screen Size
- Loss of 'Context'
- Constrains Design

ADVANTAGES
- Large Canvas Size
- Clear Context in Viz
- Collaborative
- 'Immersive'

DRAWBACKS
- Can lead to 'chart junk'
- Requires Dedicated Tech.
- Reqs Dedicated Dashboards

Translating Data Insights into Actions
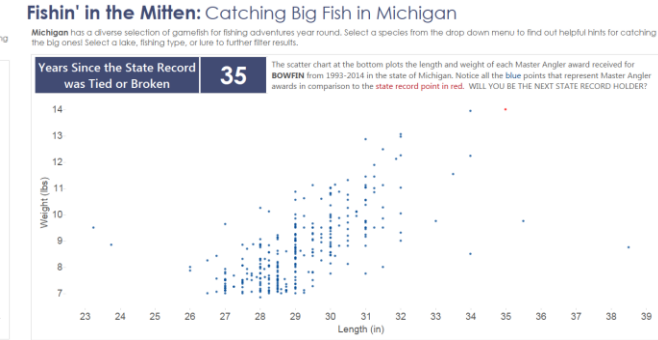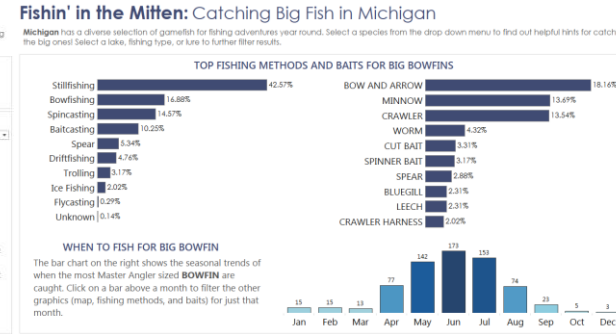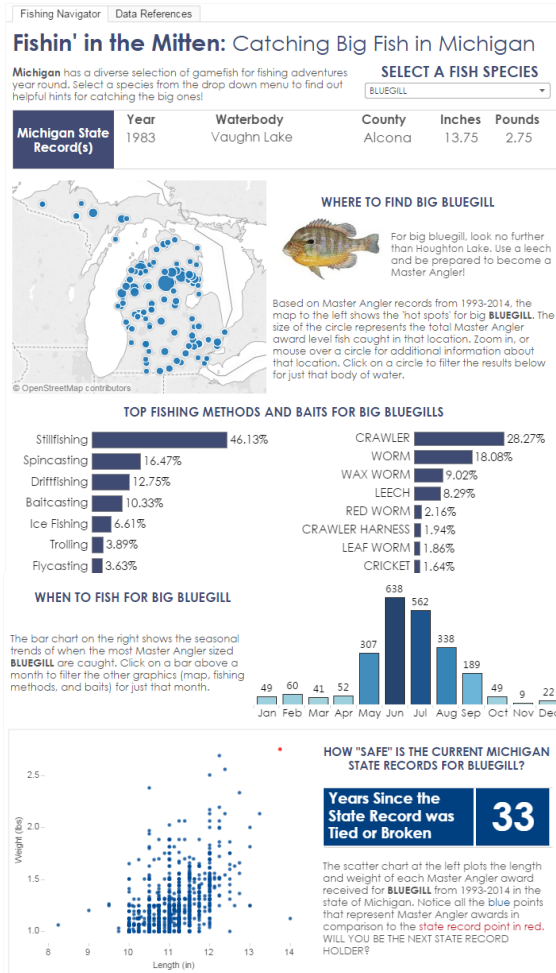
- Multi-Screen Visualization

- (All Visible at the Same Time - Context)

- Removing 'scrolling', 'jumping', or 'hyperlinking'

- Context of visualization apparent

- Holistic view

- Guided 'flow' – filling in sections based on selections

- Extended canvas for storytelling

- "Long-form" Viz Style

- (Requires Scrolling)

Translating Data Insights into Actions

K-Max: Immersive Technology

- **Business Value**
  - Elicits interaction, collaboration
  - Moves away from static PowerPoints to interactive discussions
  - Provides a comprehensive view (E2E) performance in one view
  - Engages individuals to ask questions and 'see' interactions of data
  - Provides a multi-purpose environment:
    - *Creative problem solving*
    - *White boarding*
    - *Wireless projection of screen content*
    - *Interactive data visualizations*

Forecasting Redesign at Kellogg

Demand Planners spent a lot of time improving the stat model output.

The efforts were not guided by a clear and updated segmentation for prioritizing effort.

Previous Forecast Method

Time & Effort for Demand Planners

Stat Model Output MAPE

Consensus Forecast MAPE
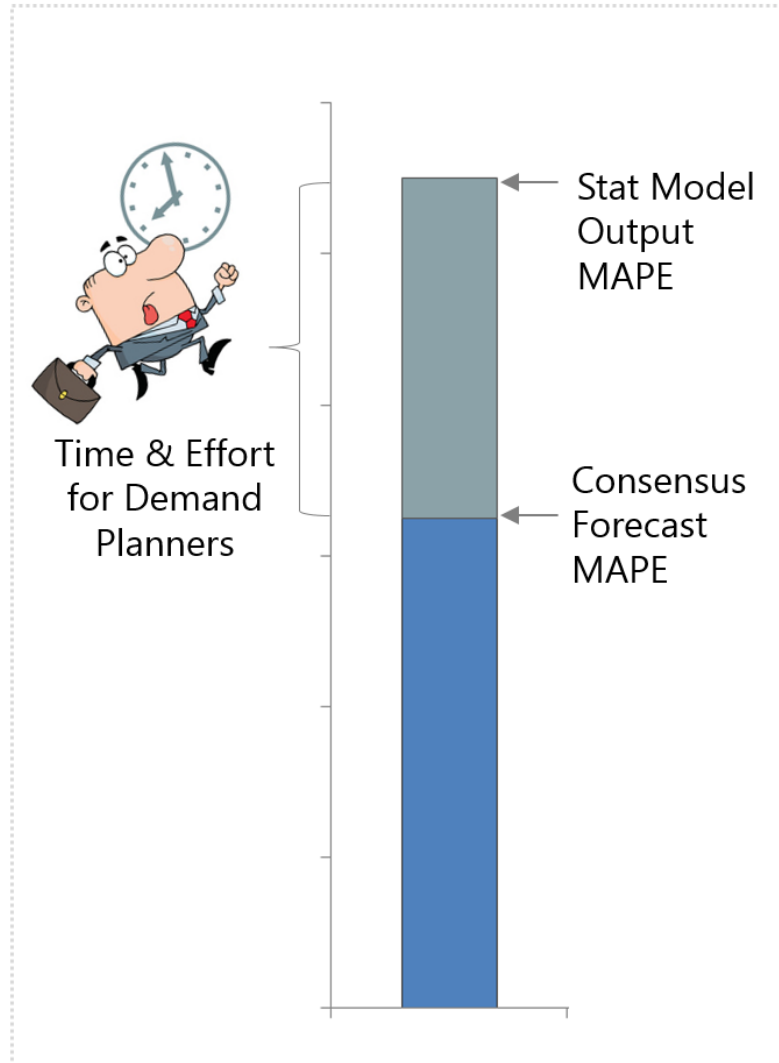
Current Forecast Method

1. Less work to improve Stat Model

Time & Effort for Demand Planners

2. Improved Consensus MAPE

Stat Model Output MAPE

Consensus Forecast MAPE
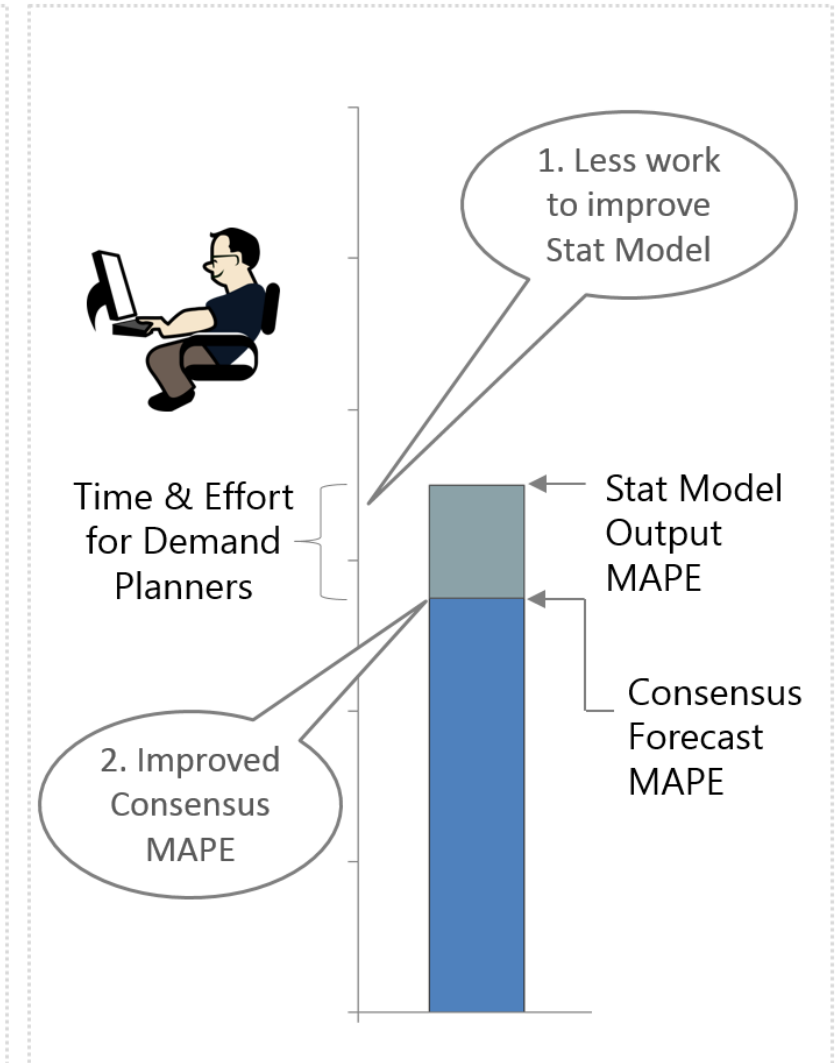
Forecasting Redesign at Kellogg

Objective – reduce work required to obtain the consensus forecast – move to total forecast – implement forecast value add

- **Method:** Alternative ways to forecast consumption (first tier in Multi-tiered causal analysis)

  - Broader set of forecasting models to apply to forecast consumption

  - Better use of feature, display, etc.

  - Achieved through repetitive 'design of experiments' to evaluate multiple settings for forecast server parameters

- **Method:** an analytical segmentation hierarchy rather than a business hierarchy

Design of Experiments for Forecast Server Settings

Thank you for your time and attention.

Q & A