galvanize

DSCI6006: Data Science for Business

INSTRUCTOR

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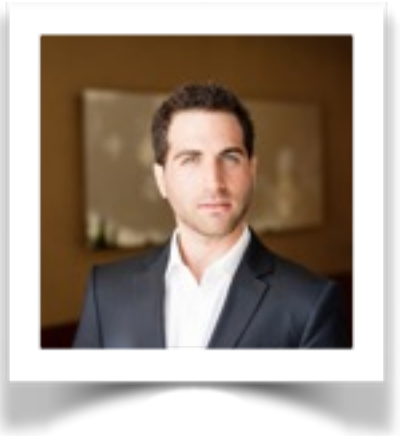

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LEARNING OBJECTIVES

- Identify opportunities to apply **data science** to **achieve business ROI**
- Start developing a **business-oriented** data science mindset
- Be able to identify key actions that will allow you to **transform** business problems into data questions
- Identity businesses' strengths and weaknesses in the data-driven era
    - Marketing
    - Operations
    - Finance
- Learn how to communicate in an effective & efficient way

METHODOLOGY

- Put you at work!
  - Overview of business context
  - Provide data and case background
  - Class activity: Discuss how you would leverage data to create ROI
  - Team Homework: Solve the case (use a model, optimize, get result)
  - Communication: Present your results and actionable recommendations

AGENDA

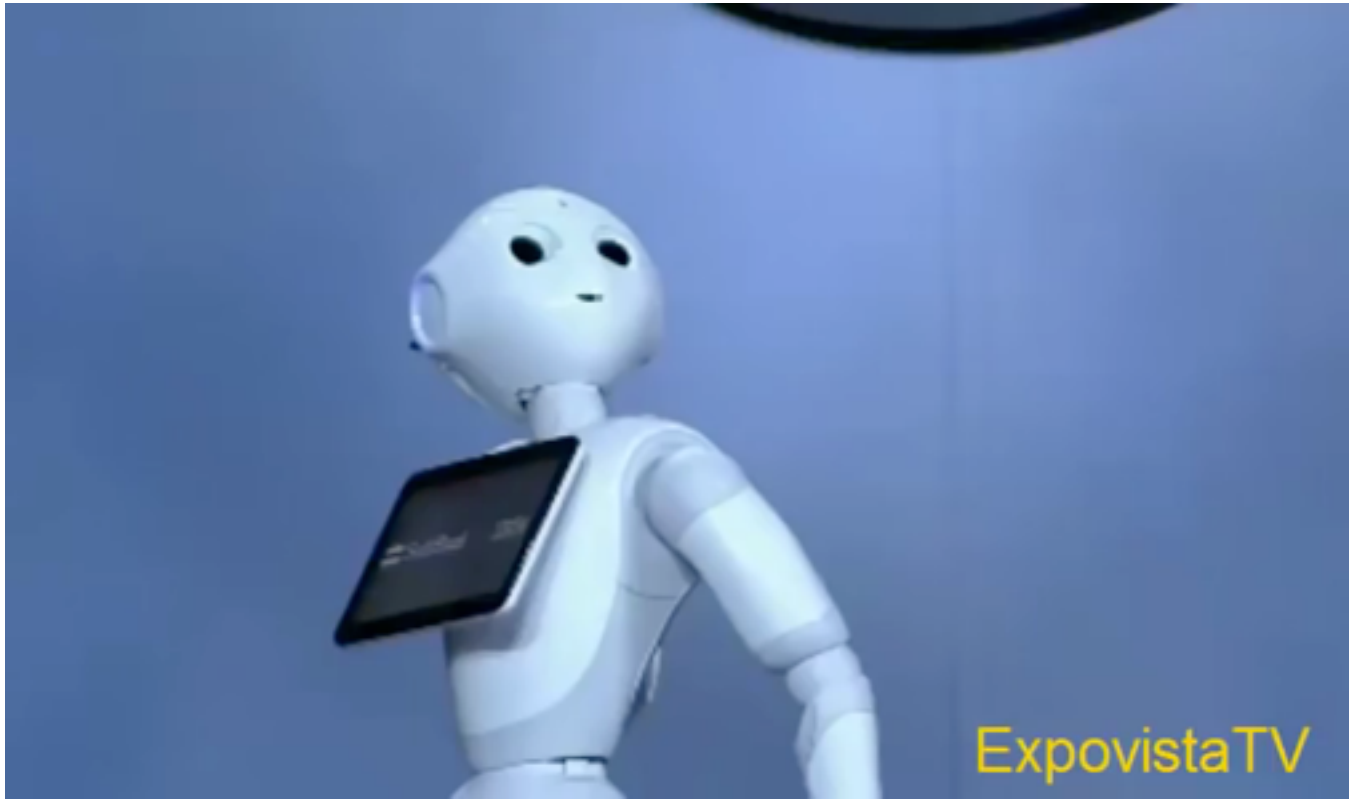
- Data Driven Organizations
- Data Science ROI
- Data Case & Discussion

INTRODUCTION

Our mission is to drive value
from data to better inform decisions
and enhance performances.

LEARNING

- What is learning in the context of data science?
- Why learning algorithms and not just code?



The Future Is Already Here

It's actually been here
for quite a while....

MACHINES ARE TAKING OVER OUR ORGANIZATIONS

Today, most innovative companies rely on data science & machine learning to drive business process and user experience to add value

The future of business innovation has an Artificial Intelligence components in it very core structure

SHORT HISTORY - A CHANGE IN BEHAVIOR

1949: Shannon's Computer Chess
(using algorithm to play Chess)

1997: Deep Blue (IBM) vs. Garry Kasparov
(chess championship, very specific algorithms)

2011: IBM Watson wins Jeopardy

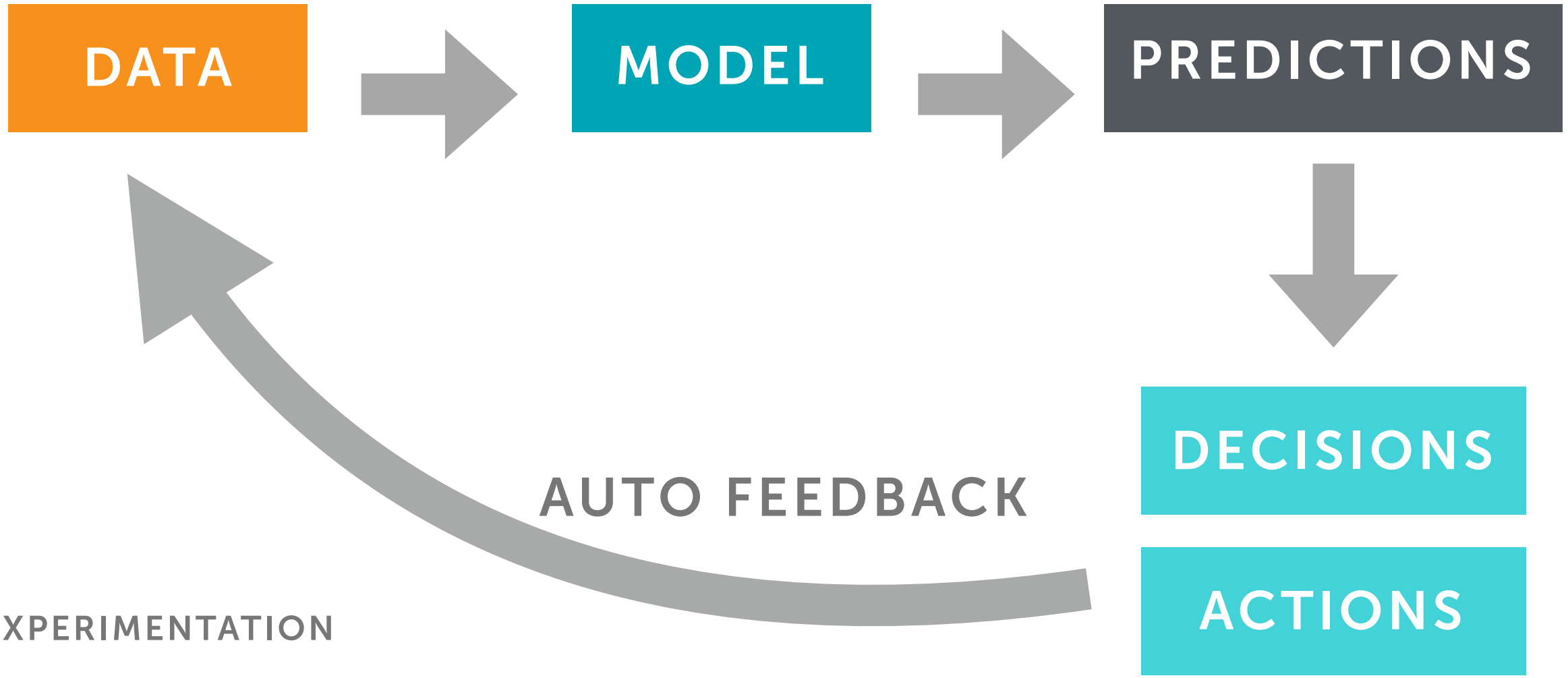
2016: AlphaGo (Google) vs. Lee Sedol
(learning algorithm wins Go)

HUMAN VS. MACHINE: NEWTON

Enough computing power means everything in the past, present, or future can run by a machine

It’s not quite scalable in business. Why?

HUMAN VS. MACHINE: MACHINE LEARNING



THE CONCEPT OF OODA LOOP

The concept of Learning & Agility:

John B., Military Strategist

Faster you run this **loop** (even when you make a mistake) — you will **win**

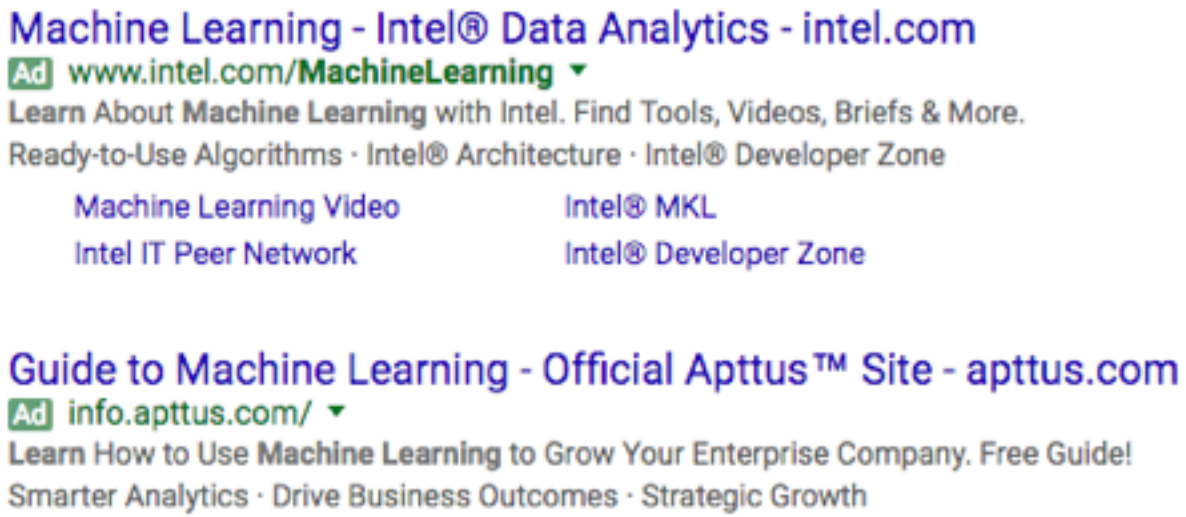
OODA LOOP IS HOW ML WORKS

- It is also very **similar** to how **businesses run**:
  - Learn from making decision & actions (0,1)
  - Iterative process

- For this to work, **businesses** have to **respond** to all of these predictions and actions

- Therefore you need to create a **data-driven agile organization**

GOOGLE PERFECTED OODA FOR ROI



- First Ad is NOT the one with the highest cost
- It's an optimization of the likelihood that a User will Click & User Preferences

  `User Clicked x User Preferences = {Maximizing revenue for Google}`
- This is changing businesses

MAGNITUDE OF CHANGE

- IN THE PAST 15 YEARS, 52% OF FORTUNE 500 COMPANIES HAVE DISAPPEARED.

75 YEARS

FORTUNE 500 LIFE EXPECTANCY IN 1955

15 YEARS

FORTUNE 500 LIFE EXPECTANCY IN 2015

TAKE A CLOSER LOOK

- "US faces ***shortage of 140,000 to 190,000 people with deep analytical skills***, as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make decisions." -MCKINSEY GLOBAL INSTITUTE

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THE 3 PILLARS OF DATA SCIENCE

These organizations have:

- Strong **data culture**
- Strong **teams**
- **Technology** infrastructure

DATA DRIVEN ORGANIZATIONS

DATA DRIVEN ORGANIZATIONS

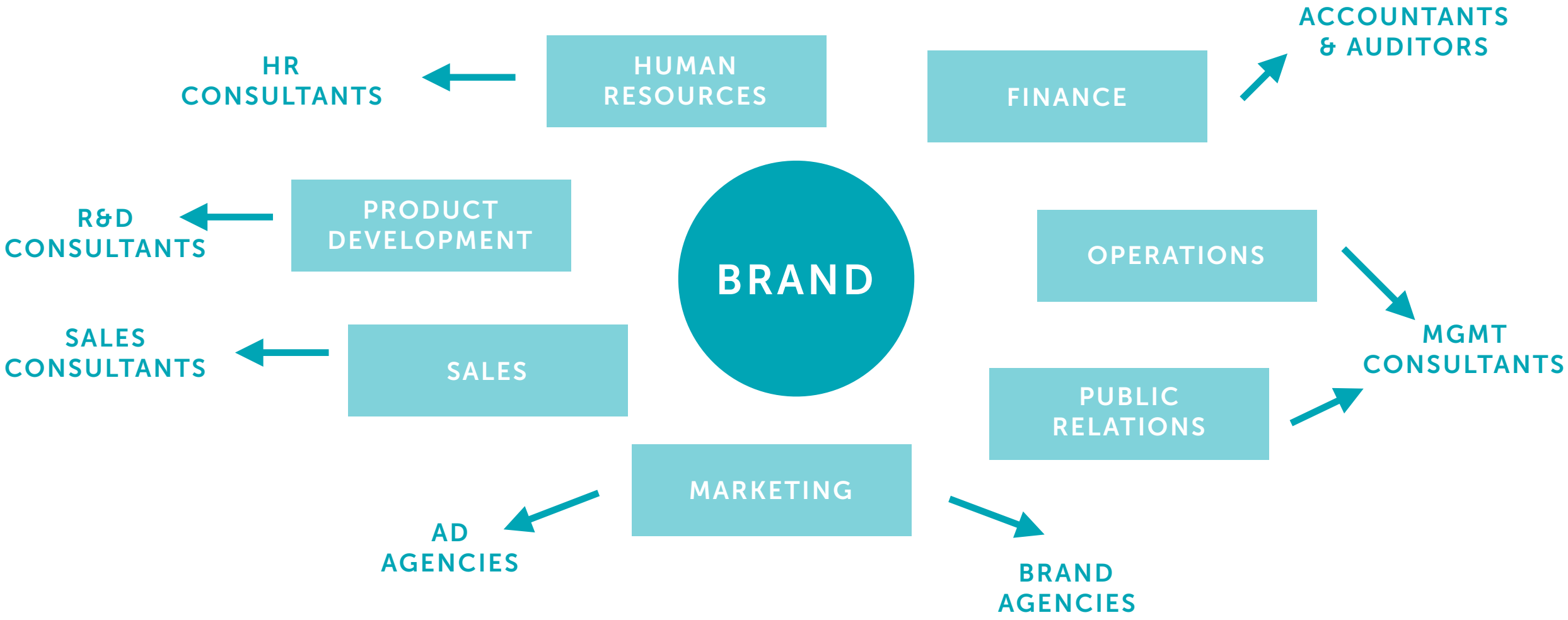
- Understand the conceptual thinking of a data driven organization
- Management under a data driven organization

DATA-DRIVEN ORGANIZATIONS

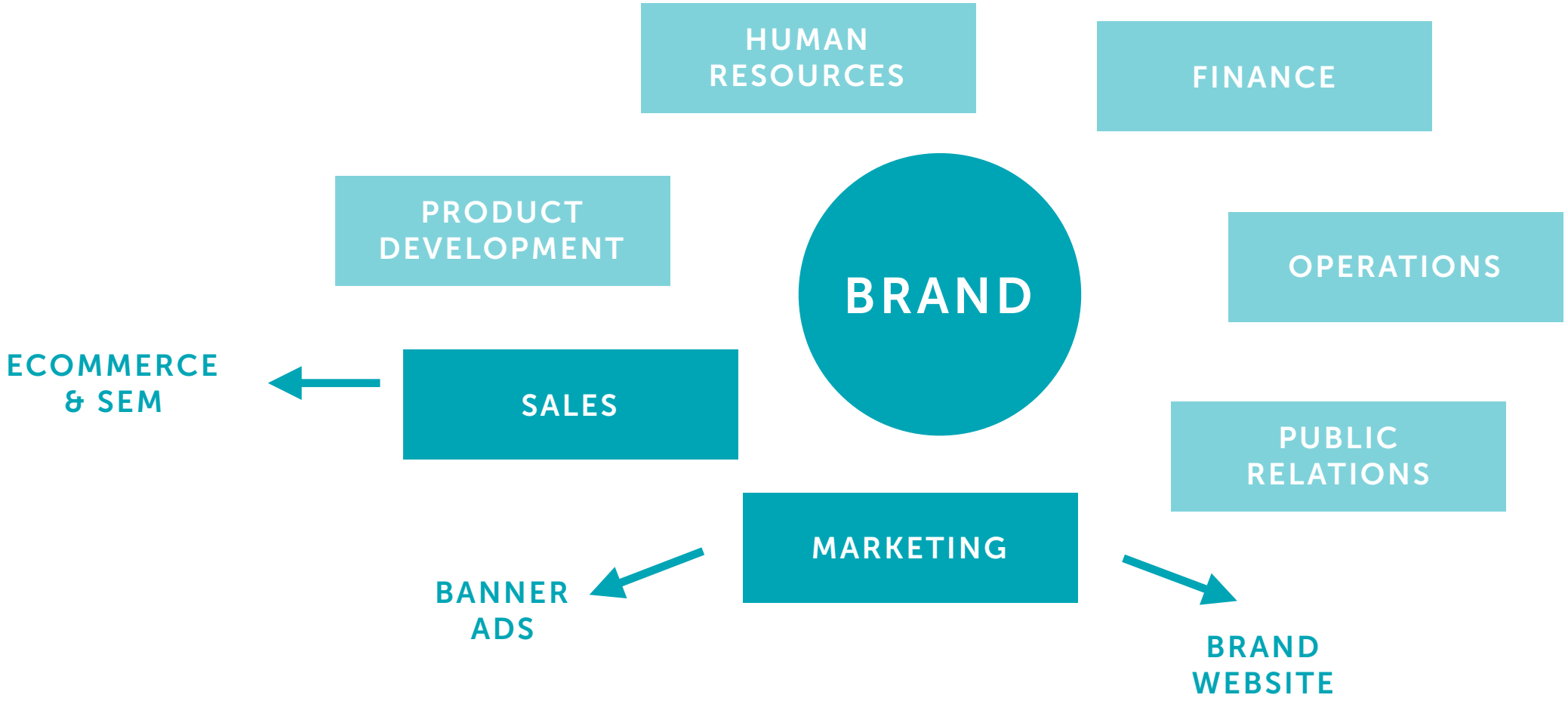
- Availability of data in Big Data era
- More problems, wider set of available options
    - Only computers can solve these problems
    - Human judgment leads to mistakes
- More available computational power, low cost
- Better informed-decisions improve business results

DATA DENIAL	DATA INDIFFERENT	DATA INFORMED	DATA DRIVEN
You distrust data and avoid using it	You don't care about data and have no need for it	You use it only when it supports your opinions or decisions	You use it to shape and inform all your decisions

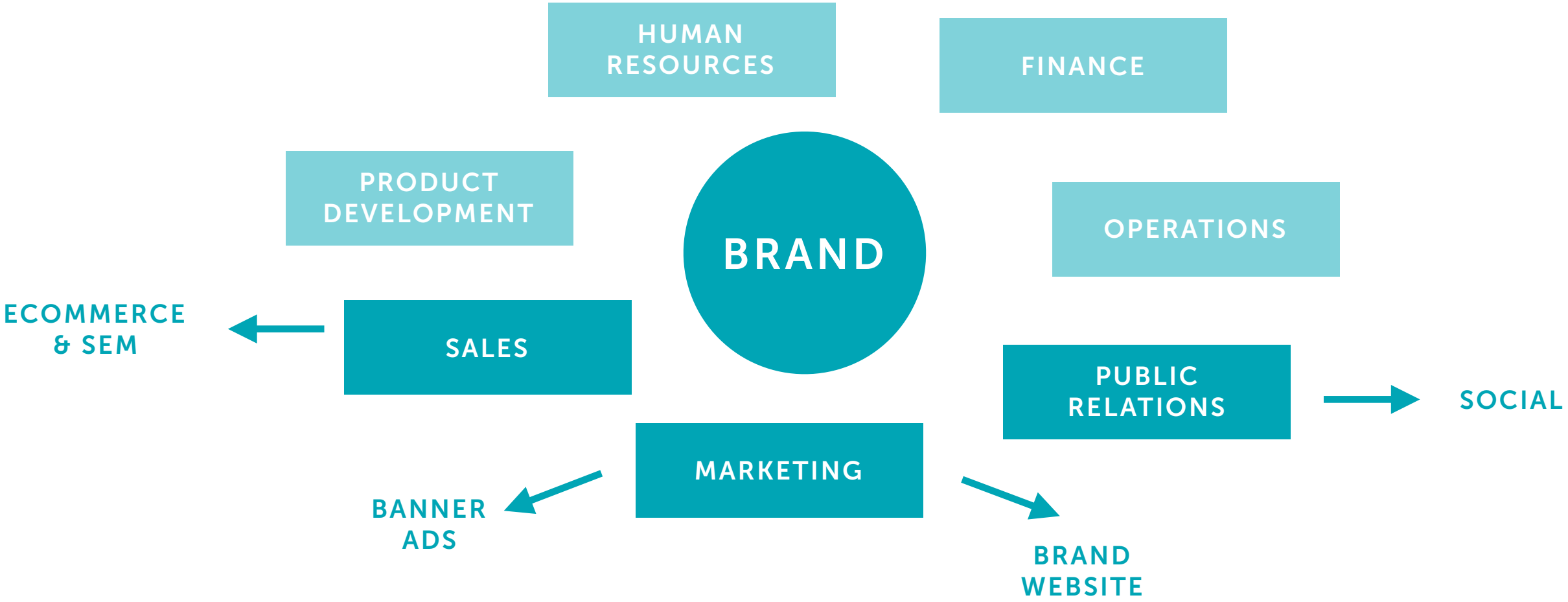
… 25 YEARS AGO: OPERATE IN SILOS



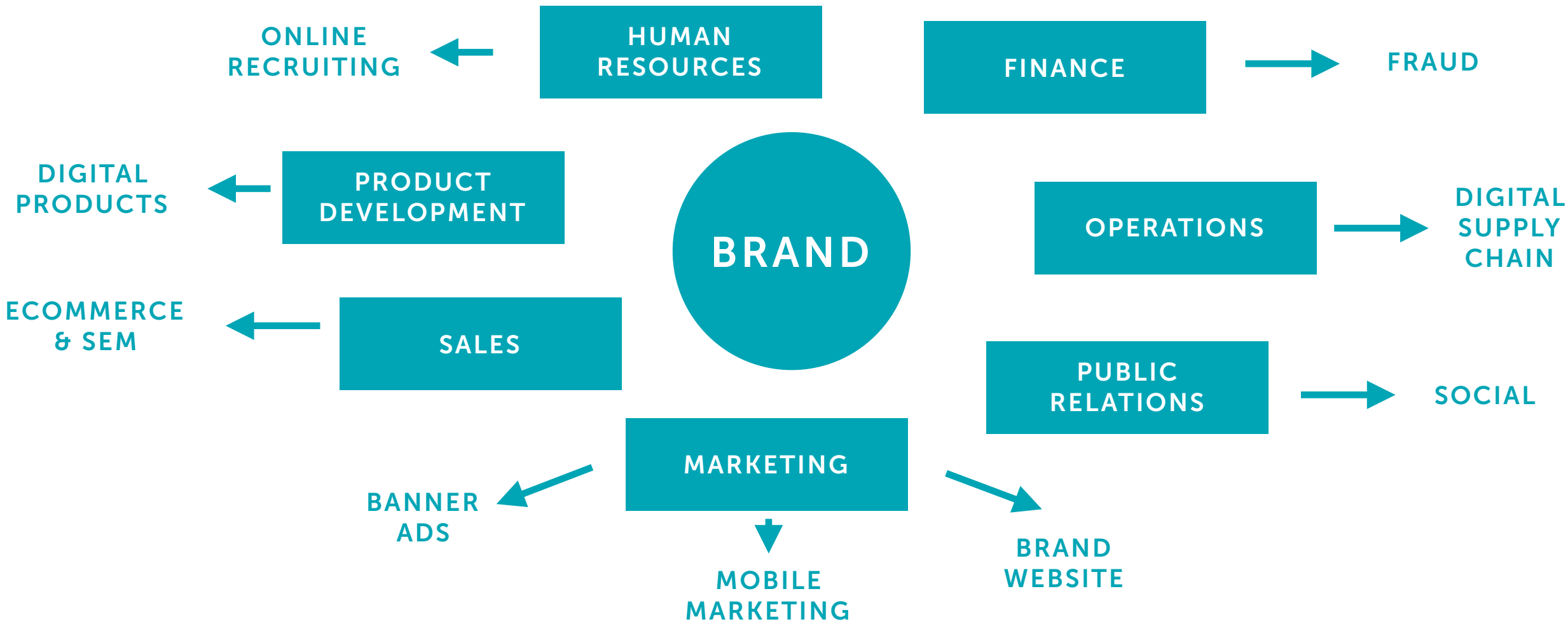
WEB 1.0 CAME ALONG



AND THEN WEB 2.0



NOW: DATA IS EVERYWHERE



FINDING THE BALANCE

Data shows us the world as it is, not how it could be…

Find the right **balance** and to get **insights** from the data but also stay tuned to your **intuition**

Why is it so hard to become
a data driven organization?

A MANAGEMENT PROBLEM

- **Fear -** of information, information overload
- **Nature -** don't feel comfortable with numbers
- **Ignorance -** people aren’t accustomed to solving problems with data
- **Control -** people just want to control everything they can
- **Lack of patience -** Results, now!

MANAGEMENT IN THE BIG DATA ERA

- **Leadership -** Companies **succeed** in the big data era not simply because they have more or better data, but because their leadership sets **clear goals**, **defines what success looks like**, and **asks the right questions**

- **Talent management -** As data become cheaper, data scientists become more valuable or expensive

- **Technology -** Tools are now available to handle the volume, velocity, and variety of big data. These technologies are generally cheap

MANAGEMENT IN THE BIG DATA ERA

- **Decision making -** An effective organization puts **information** and the relevant **decision** rights in the **same place**.

- **Company culture -** The first question a data-driven organization asks itself is not "What do we think?" but **"What do we know?"** This requires moving away from acting on hunches and instinct and breaking a the habit of pretending to be more data-driven than they actually are

The evidence is clear: **Data-driven decisions** tend to be **better decisions**.

Leaders will either **embrace** this fact or be **replaced** by others who do.

7 PRINCIPLES OF DATA-DRIVEN

Becoming a data-driven enterprise requires ***a plan and the right people***, ***technology*** and ***culture***.

These seven principles of data-driven transformation will help you successfully make the journey.

Jeff Hunter, Vice President Of The Na Insights & Data Practice At Capgemini, Says A Capgemini Survey Of 1,000 C-Level Executives And Senior Decision Makers Reveals Seven Principles Cios Should Follow To Help Their Organizations Successfully Transform Into Data-Driven Enterprises.

PRINCIPLE 1:

Start from your business objectives

Once clear - design a roadmap for leveraging data

PRINCIPLE 2:

Build infrastructure which can handle the flood of data and route it to cross-functional teams

Technology should support high volume and high velocity.

PRINCIPLE 3:

Create a data science and analytics culture

Data is treated as a strategic asset

PRINCIPLE 4:

Unleash data and insights-as-a-service

Bring data and decisions as close together as possible

PRINCIPLE 5:

Make data science value a crucial business KPI

Measure success to demonstrate ROI

PRINCIPLE 6:

Master the governance, security and privacy of your data assets

PRINCIPLE 7:

Empower your people with insights at the point of action

Build dynamic models to use data in real-time.

UNDERSTANDING DATA ROI

DATA ROI

- We are in a **new era** - world believes in the concept of smart cities, smart cars, and smart homes
- There are now many **real-world examples** of where big data and data science is making an impact and help companies generate revenue

BUSINESS OUTCOMES OF BIG DATA

- According to the most recent surveys by **Accenture**, **GE**, and **IBM**, there are ***strong conclusions*** that companies using big data
  - **92%** of executives are **satisfied** with the results
  - **89%** rate big data as **"very" or "extremely" important**.

- Similarly, Accenture researchers found that -
  - **89%** of respondents who have implemented at least one big data project see it as a way to **revolutionize business operations**
  - **85%** believed big data would **dramatically change** the way business is done

BUSINESS OUTCOMES OF BIG DATA

- In a collaborative (GE + Pivotal):
  - **84%** of those surveyed believe big data analytics will **"shift the competitive landscape for my industry"** within a year and 87% believe so in three years.
  - **89%** believe a lack of big data adoption will create a **risk of losing marketshare**, and 75% cite growth as the key value of analytics

- According to CIO.com and CEB - **CMOs** now spend more on **technology** and their biggest driver of their tech spending is big data

DATA ROI

Big Data implementations have now existed long enough to ***show results*** beyond the internet juggernauts and early adopters

From automotive and healthcare to logistics and retail, there are **strong results** with big data and data science across virtually every industry

MARKETING

Media: Huffington Post

How leveraged data

- Huffington's leadership believes in **running the business based on data**.
- This includes improving the **user experience in real-time** from social trends, **recommendations**, **moderation**, and **personalization**
- They **optimize** the site many ways, and their analytics platform powers the entire analytical process.

Business Benefits (ROI)

Huffington Post grew last year into the number one online news site in the United States.

Increase overall traffic & engagement

Airlines: Southwest

How leveraged data

- Southwest uses **speech analytics** to help improve the interactions between customers and personnel.
- Southwest uses big data to understand **online behaviors** and actions, improving offers for customers and leading to growth in loyalty year over year.

Business Benefits (ROI)

For companies focused on customer relationships, providing great service is top of mind via social channels and other interactions.

Increase in customers satisfaction and overall tickets sold.

Media: FT.com

How leveraged data

- FT.com uses data to understand and serve the customer better, create **targeted advertising**, and design new products based on information collected.
- Their CEO claimed that big data transformed their business. The company uses many data points to **analyze customer content preferences**, **increase relevance in their communications**, and **personalize the content**—all to keep visitors and traffic.
- The data also helps the company understand **time of day consumption** based on both PC and mobile channels.

Business Benefits (ROI)

Increase keep visitors and traffic

Telecommunications: Sprint

How leveraged data

- Sprint spoke about using big data analytics to **improve quality and customer experience** while reducing network error rates and customer **churn**.
- They handle 10s of billions of transactions per day for 53 million users, and their **big data analytics put real-time intelligence** into the network.

Business Benefits (ROI)

Driving a 90% increase in network capacity.

The project helped identify service issues and avoid needless, costly repair work.

Financial Services: AMEX

How leveraged data

- The American Express Company looked to shift traditional **business intelligence**-based hindsight reporting or trailing indicators of how business was doing to **predict loyalty**.
- Their sophisticated **predictive models** analyzed historical transactions with 115 variables to forecast potential **churn**.

Business Benefits (ROI)

In the Australian market, they now believe they can identify 24% of accounts that will close within four months.

Online Training and Gaming: Skillsoft

How leveraged data

- Skillsoft is using big data to l**earn and apply knowledge** across 19 million users and 60,000 learning assets.
- Content has been **individualized** based on **direct email response behavior** and **surveys**.
- The company's leadership see that the **analysis of big data** has generated substantial results and trusted **advanced machine learning** and **optimization algorithms** to deliver.

Business Benefits (ROI)

Since applying big data approaches, there has been a 128% improvement in user engagement and recommendations have proven to be much more relevant and actionable.

Churn Modeling

Goal: Identity groups of users/ customers that are at risk of unsubscribing or leaving

Usage: Understanding the characteristics of churners allows a company to identify uncovered problems, make product adjustments, and avoid customer churn

Business Benefits (ROI)

Customers retention

Consumer Lifetime Value (LTV)

Goal: Predict the characteristics of high LTV customers, this supports customer segmentation, identifies upsell opportunities and supports other marketing initiatives

Usage: Prioritization and sorting mechanism of customers

Business Benefits (ROI)

Customers acquisition and time management

Clustering / Classifications

Goal: Understand qualitatively different customer groups. Understanding the target helps you determine exactly what your products or services will be, and what kind of customer service tactics work best

Usage: Customer segmentation. Answers questions like: what makes people buy, stop buying etc,.

Business Benefits (ROI)

identify course of action to different groups of users/ customers + product offering optimization

A/B Testing

Goal: Quantitively understand user behavior and their preferences with respect a given advertisement or site feature they are shown

Usage: Optimize features on website to better attract users and increase their level of engagement (clicks, etc,.)

Business Benefits (ROI)

Drive traffic and leads towards a campaign or website

Influencers Model

Goal: Identify influences within a given network

Usage: Word of Mouth, marketing strategy, brand loyalty

Business Benefits (ROI)

Drive traffic and leads towards a campaign or website

FINANCE

FINANCIAL SERVICES: AIG

How leveraged data

- American International Group (AIG) uses big data and ***data visualization*** to help fight ***fraud***.
- The system takes ***structured and unstructured data*** from claims databases and handwritten adjuster notes to ***identify potential fraud***.
- Besides listing ***priority claims*** to investigate, charts and visualizations, like heat maps, inform teams of other ***insights*** and also help them make improvements to machine learning algorithms.

Business Benefits (ROI)

Avoid losing money due to fraudulent behavior

OPERATIONS

AIRLINES: DELTA

How leveraged data

- Delta has used big data to help with one of the most uncomfortable travel situations that exists—lost baggage.
- With over 130 million bags checked per year, the company held a lot of ***tracking data*** about bags and became the first major airline to allow customers to track their bags from ***mobile*** devices.

Business Benefits (ROI)

To date, the app has been downloaded over 11 million times and gives customers much greater peace of mind while traveling while also differentiating Delta as a customer-centric company.

LOGISTICS: UPS

How leveraged data

- On a daily basis, UPS makes 16.9 package and document deliveries every day and over 4 billion items shipped per year through almost 100,000 vehicles.
- With this volume, there are numerous ways UPS uses big data, and one of the applications is for ***fleet optimization***.
    - On-truck telematics and advanced algorithms help with ***routes***, ***engine idle time***, and ***predictive maintenance***.

Business Benefits (ROI)

Since starting the program, the company has saved over 39 million gallons of fuel and avoided driving 364 million miles. The next steps include completion of the roll-out and applying the operational efficiency to their airplanes.

PRODUCT

AUTOMOTIVE: TESLA

How leveraged data

- Tesla is the poster child for instrumenting vehicles with ***sensors*** and sending all the data back to the mother ship for ***analysis***, using an big data technology (Apache Hadoop® cluster) to ***collect the data***.
- For example, the company is ***notified*** if the car is not functioning properly and consumers can be ***advised to get a service***.

Business Benefits (ROI)

The data is used to improve the company's R&D, car performance, car maintenance, and customer satisfaction.

These capabilities have helped Tesla create market share in a difficult environment where charging stations are not widely deployed.

DATA CASE

AGENDA

- Case study + discussions

Case Discussion Questions:

- Please read the first section of the case - "***Initial Digital Wins***"

- What do you think an improvement of 40.6% translates into?
- What did the campaign staff learn about the value of website visitors?
- What did the campaign staff learn about how their experience could be inaccurate?
- How did the staff use experimentation to drive results?

CASE

Case Discussion Questions:

- Please read the second section of the case - "***Who Will Vote for Obama?***"

- What's the purpose of the model?
- What are the direct and indirect benefits of using a model like this?

Case Discussion Questions:

- Please read the third section of the case - "***Direct Mail Experimentation***"

- How did Obama's team learn from the online channels and apply these results and behaviors to the offline channels?

CASE

Case Discussion Questions:

- Please read the fourth section of the case - "***The Software Platform Backing The Win***"

- How could creating an API access can enable a diverse, distributed set of data resources (as if they were centralized)?