Demystifying Deep Tech

Netflix Leading with Data:
The Emergence of Data-Driven Video

Competitive Advantage

- Blockbuster

How Do We Know if Assets Yield Sustainable Advantage?

- Rareness
  - Is the asset in **limited supply** or **difficult to acquire**?
- Value
  - Does the asset yield **value** to the firm/customers?
- Imperfectly Imitable
  - Is the asset **impossible to imitate**?
- Non-Substitutable
  - Is the asset **without** comparable **substitutes**?

Netflix & DVD-by-Mail – Act I

- Netflix settled on a DVD-by-mail service model
  - It charges a flat-rate monthly subscription
  - Customers don’t pay mailing expenses and late fees
- Videos arrive in Mylar envelopes containing:
  - Prepaid postage
  - Return address

- After watching the video, consumers:
  - Slip the DVD back into the envelope
  - Drop the disc in the mail

Netflix & DVD-by-Mail

- Users make their video choices in their “request queue” at Netflix.com

- Consumers use the Web site to:
  - Rate videos
  - Specify movie preferences
  - Get video recommendations
  - Check out DVD details
  - Share their viewing habits and review

Case Questions

- What are the core competencies of Netflix's current business model (primarily DVD-by-mail with an online component)? Assess the value of Netflix's business as described in the case.

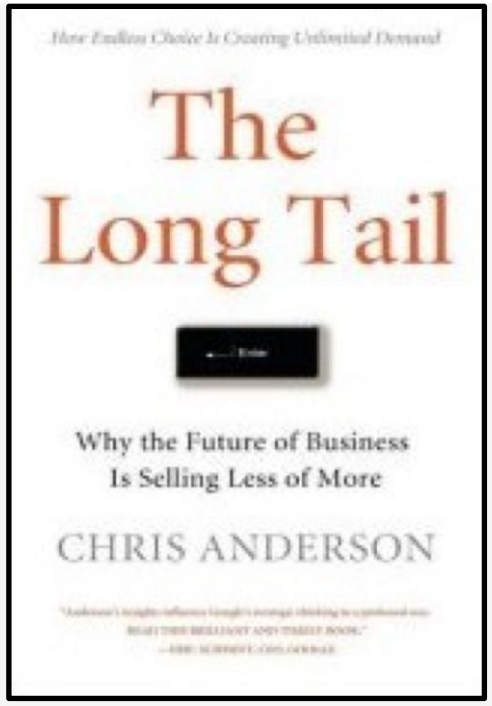
Q2

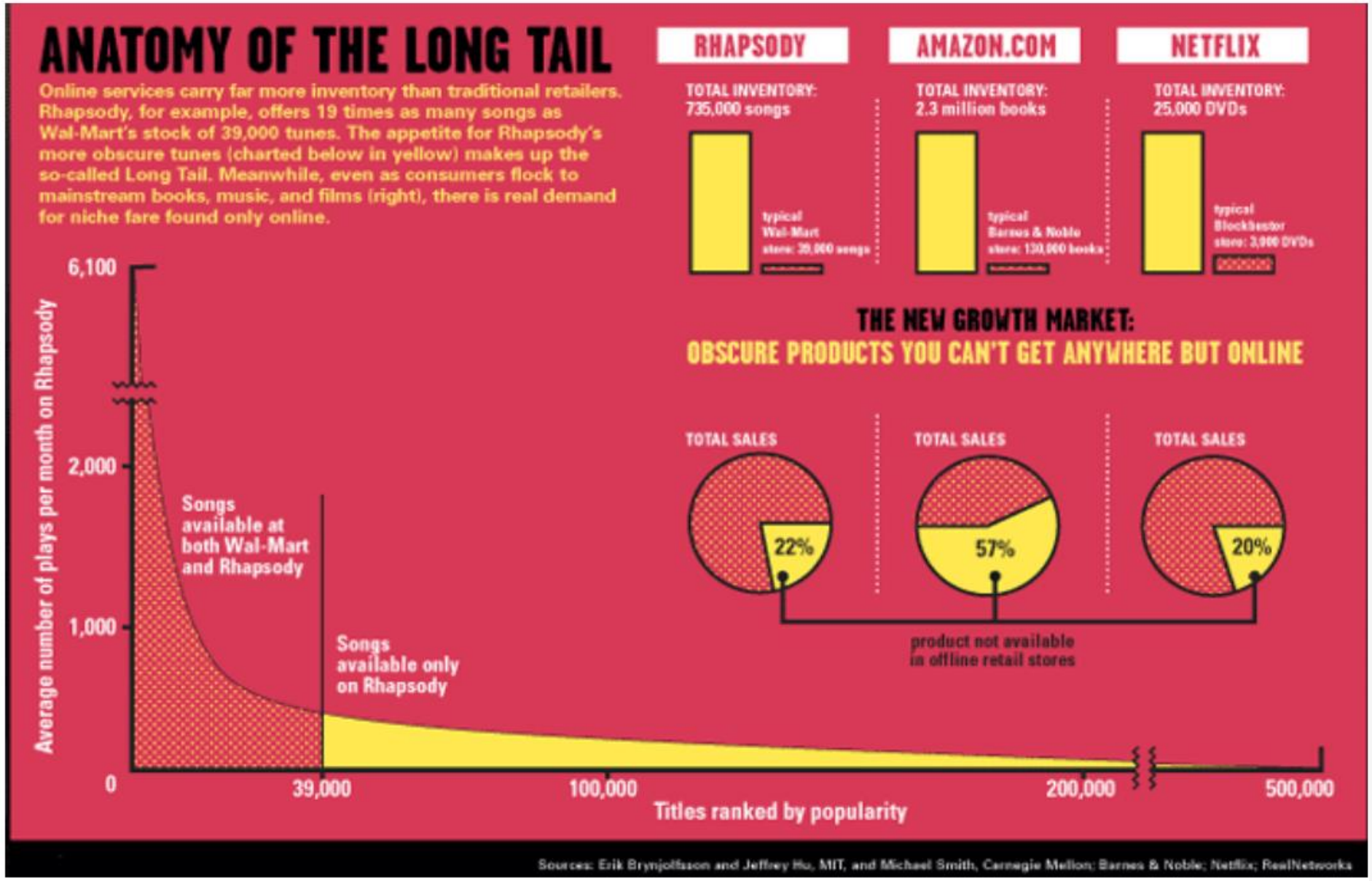
Why Netflix Won

Netflix's core capabilities

Flexibility	Selection / Logistics	Convenience	Customer Insights
• Subscription model – no late fees! • Customers could rent and watch movies on their own schedules	• No physical stores allowed deep selection in a wide variety of genres • Focus on logistics allowed Netflix to not only have a broad selection across genres and deep selection among popular movies, but also to efficiently get films to customers	• Mail delivery obviated the need to drive to bricks-and-mortar stores • Queuing system on Web site allowed customers to have a constant flow of movies	• Cinematch collaborative filtering algorithms aided the discovery process – better customer experience • Recommendation system and analytics allowed deeper understanding of customer trends, which let Netflix adapt better and more quickly

The Long Tail





Long Tail:
businesses that can profitably offer a great volume of less popular products

Source: Wired

Netflix Recommendation System - Cinematch

- How does it work?
- Recommender Systems
  - Collaborative Filtering
  - Content Filtering
  - Cold Start Problem
  - Hybrid Solutions

This Ain't About Blockbusters

Which Netflix selection returned more $$ to 20th Century Fox?

Collaborative Filtering:
technology that monitors trends among customers and uses this to personalize a given customer's experience.

Churn:
the rate at which customers leave a product or service.

Top 100			
1.		Add	Crash
2.		Add	The Curious Case of Benjamin Button
3.		Add	The Departed
4.		Add	The Bucket List
5.		Add	No Country for Old Men
6.		Add	The Pursuit of Happyness
7.	+1	Add	Iron Man
8.	-1	Add	Casino Royale
9.		Add	Blood Diamond
10.		Add	Little Miss Sunshine
11.		Add	The Notebook
12.		Add	Gran Torino
13.		Add	The Proposal
14.		Add	Babel
15.		Add	3:10 to Yuma
16.		Add	Inside Man
17.		Add	The Dark Knight
18.	+1	Add	Slumdog Millionaire
19.	-1	Add	The Devil Wears Prada
20.		Add	The Holiday
21.		Add	Hotel Rwanda

Recommender Systems

- Last.fm, Netflix
  - Collaborative Filtering / User based filtering
  - Requires adequate user behavior data
    - More data-more accuracy
    - Cold Start Problem
  - How do companies collect data
- Pandora
  - Content based filtering /Personality based filtering
  - Pandora uses attributes (referred to as genes) defined by its propriety “Music Genome Project” to profile songs and artists
    - For instance, gender of lead vocalist, prevalent use of groove, level of distortion on the electric guitar, type of background vocals, etc
    - Rock and pop songs have 150 genes, rap songs have 350, and jazz songs have approximately 400. Other genres of music, such as world and classical music, have 300–450 genes
    - Each song is analyzed by a musician in a process that takes 20 to 30 minutes per song

Case Questions

- In its competition with Netflix, where did Blockbuster go wrong? How was the use of customer data a key differentiator? How might Blockbuster have better positioned itself against Netflix?

Why Blockbuster Lost

- **Slow & Inadequate Response**
  - "No Late Fees" program was misleading
  - "Total Access" program was not well integrated – customers had to maintain separate accounts for the Web-based system and the store
  - Debuted in 2006!

- **Structural Issues**
  - Stores were franchise-based and Web site was maintained by corporate
  - Capex requirements for starting a separate Web-based logistics system to deliver DVDs by mail

- **Lack of Information Systems**
  - Lack of knowledge about its customers' preferences and behaviors
  - Lack of an appropriate CRM system

Questions

- Was this disruption due to business model or technology?
- So what should we do in the face of digital disruption?
- Are there companies that are managing disruptions well?

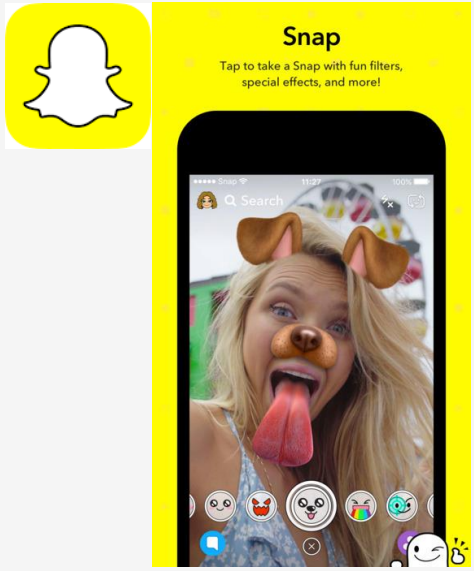
FB & The 'gram v. Snap + Tik Tok

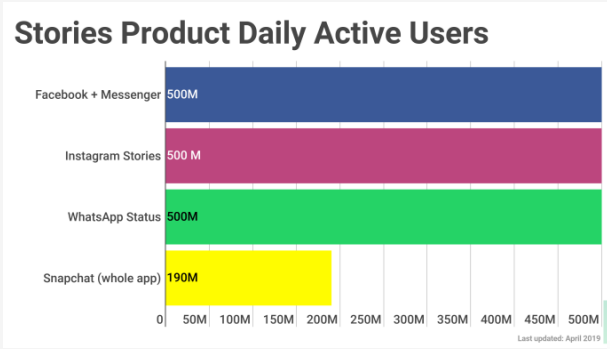
PERSONAL TECHNOLOGY: NICOLE NGUYEN

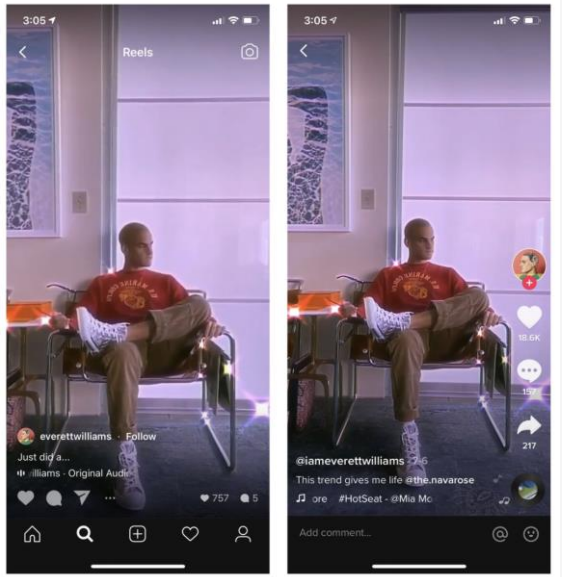
TikTok Isn't the First—or Last—App Instagram Copies

Facebook Inc.'s hottest property has cloned numerous features from trendy, fast-growing social-media apps—none more intensely than Snapchat. With the launch of Instagram Reels, it's TikTok's turn.

	Introduced by Snapchat	Appeared in Instagram	Time to mimic feature
Ephemeral Messaging	2012	2016	4 years
Stories	Oct. 2013	Aug. 2016	2 yrs. 10 months
Location Filters	July 2014	March 2016	1 yr. 3 months
Augmented Reality Stickers	April 2016	April 2017	1 year
Create-Your-Own Stickers	Dec. 2016	April 2017	4 months

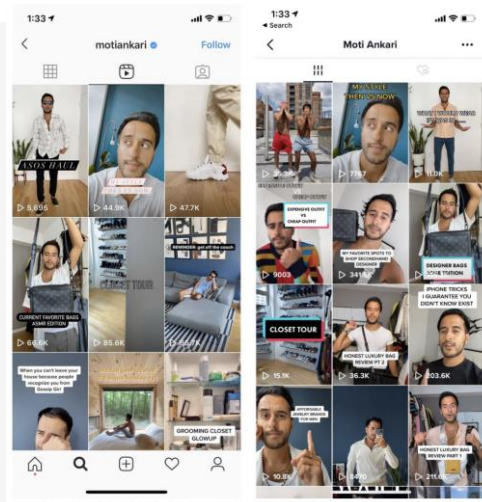






Last week, Instagram launched Reels, a short-form video hub that looks an awful lot like TikTok. TikTok's video view is on the right, and Reels' is on the left.

PHOTO: EVERETT WILLIAMS



Instagram copied TikTok down to the details: On the right, an account page on TikTok, and on the left, an account page showing Reels on Instagram. Note the same play icon and view count display on each.

PHOTO: MOTI ANKARI

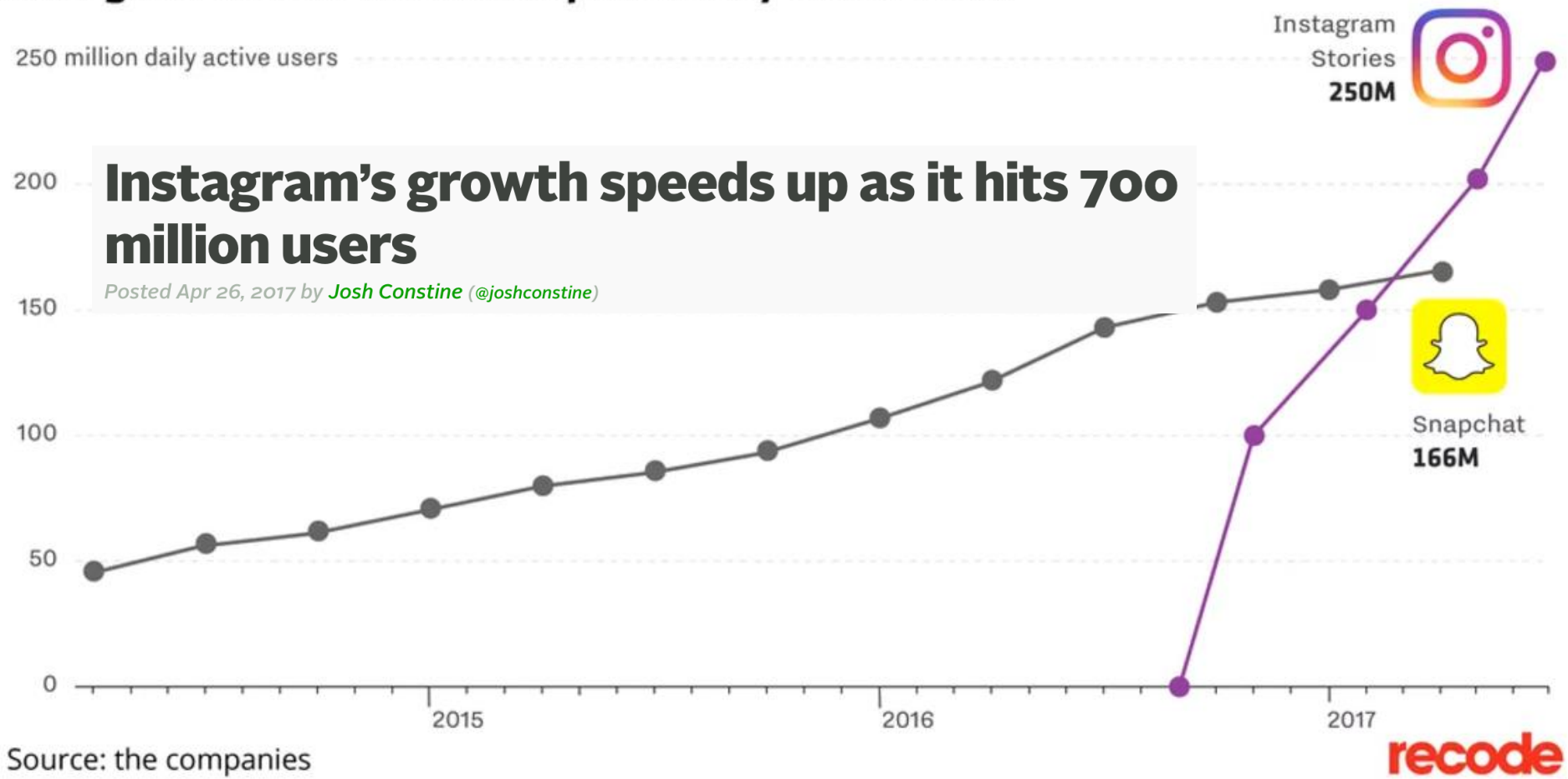
Data: TechCrunch - https://techcrunch.com/2017/04/13/instagram-stories-bigger-than-snapchat/

Forbes

MAY 3, 2017 @ 11:10 AM 7,918

Oh, Snap: Instagram Stories Is Killing The Competition

Instagram Stories versus Snapchat daily active users



https://www.recode.net/2017/6/20/15836248/instagram-stories-250-million-users-snapchat

Powerful Resources for Competitive Advantage

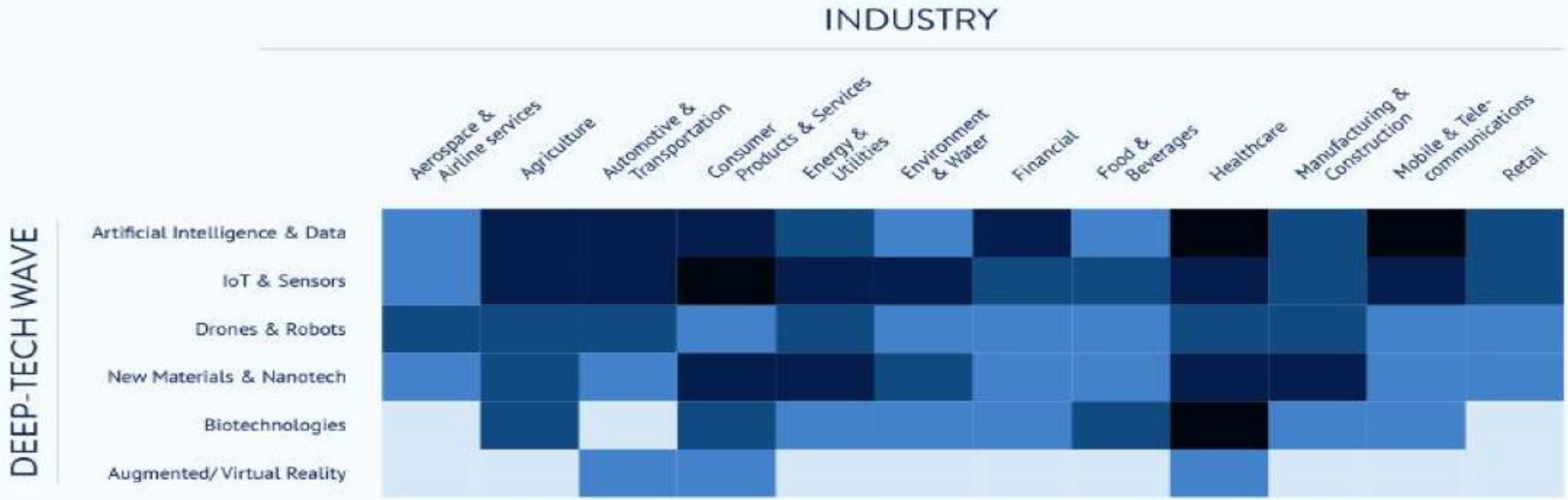
- Imitation-resistant Value Chain Organization
- Brand
- Scale
- Data – Differentiation & Switching Costs
- Network Effects
- Distribution Channels
- Patents?
    - useful, novel, non-obvious

Deep Tech

- Deep-tech innovations are defined as disruptive solutions built around unique, protected or hard-to-reproduce technological or scientific advances.

- Big Data
- Blockchain
- Social Networks
- AR/VR
- IoT
- AI
- ML

- 3D printing
- Digital Twin
- Space Tech
- Nanotech
- Biotech
- Robotics
- Autonomous Vehicles



The color of each cell represents the startup innovation intensity based on each deep-tech wave on a particular industry.

None (<1%)

Low **(1%-3%)**

Medium **(3%-5%)**

Strong **(5%-10%)**

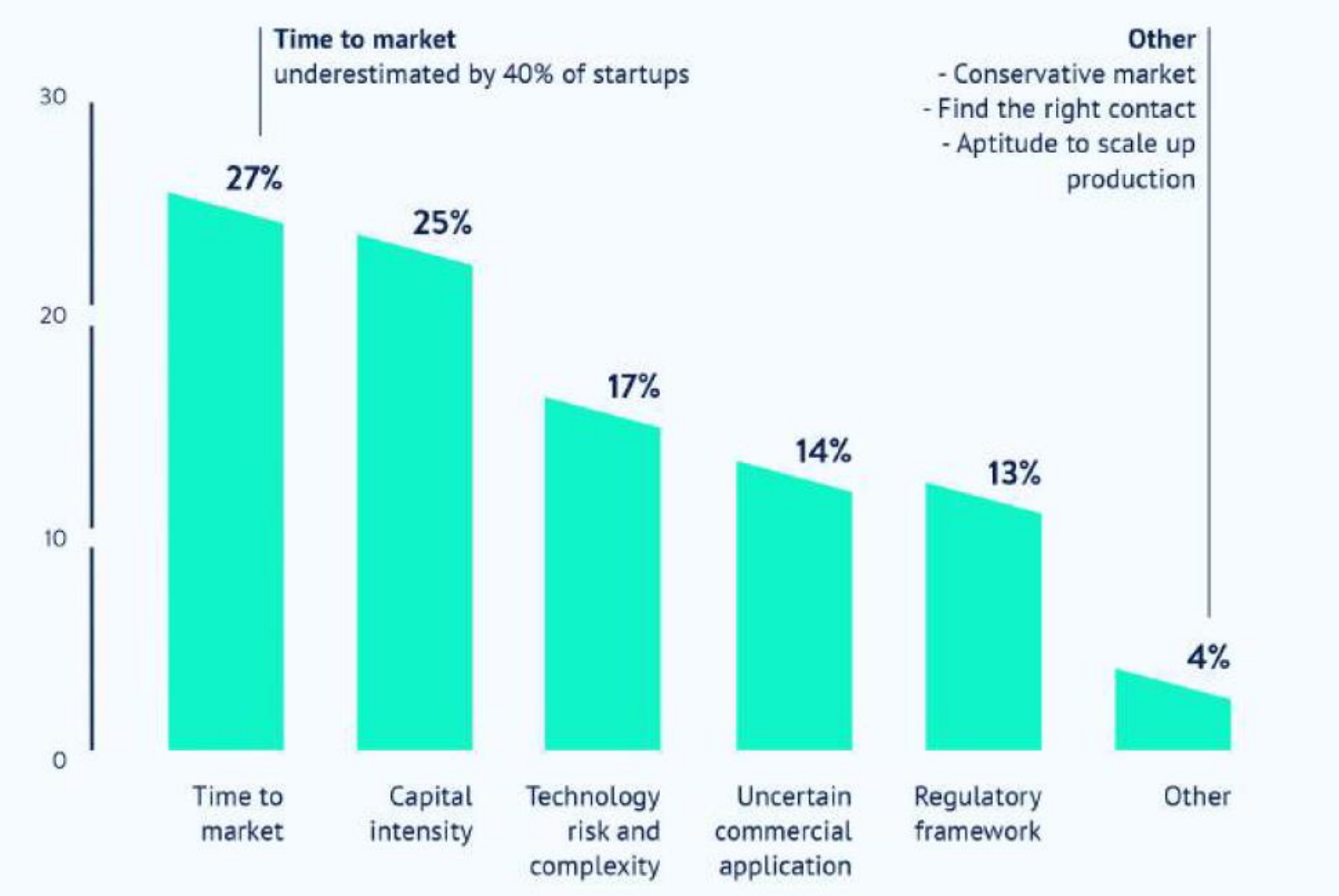
Very strong **(10%-20%)**

For example, New Materials & Nanotech leads to important innovation in Energy & Utilities: between 5% and 10% of all deep-tech startups applying to the Hello Tomorrow Challenge are developing solutions for Energy & Utilities based on New Materials & Nanotech.

Note: The sum of the various percentage figures exceeds 100% because one startup can use several technologies or target several industries.

Source: Applications filled out by the 3,500 startups from the Hello Tomorrow Challenge 2016.

Deep Tech - Challenges



Deep Tech – Critical Resources

- Resources:
  - Funding (80%)
  - Market access (61%)
  - Technical expertise (39%)
  - Business expertise (26%)

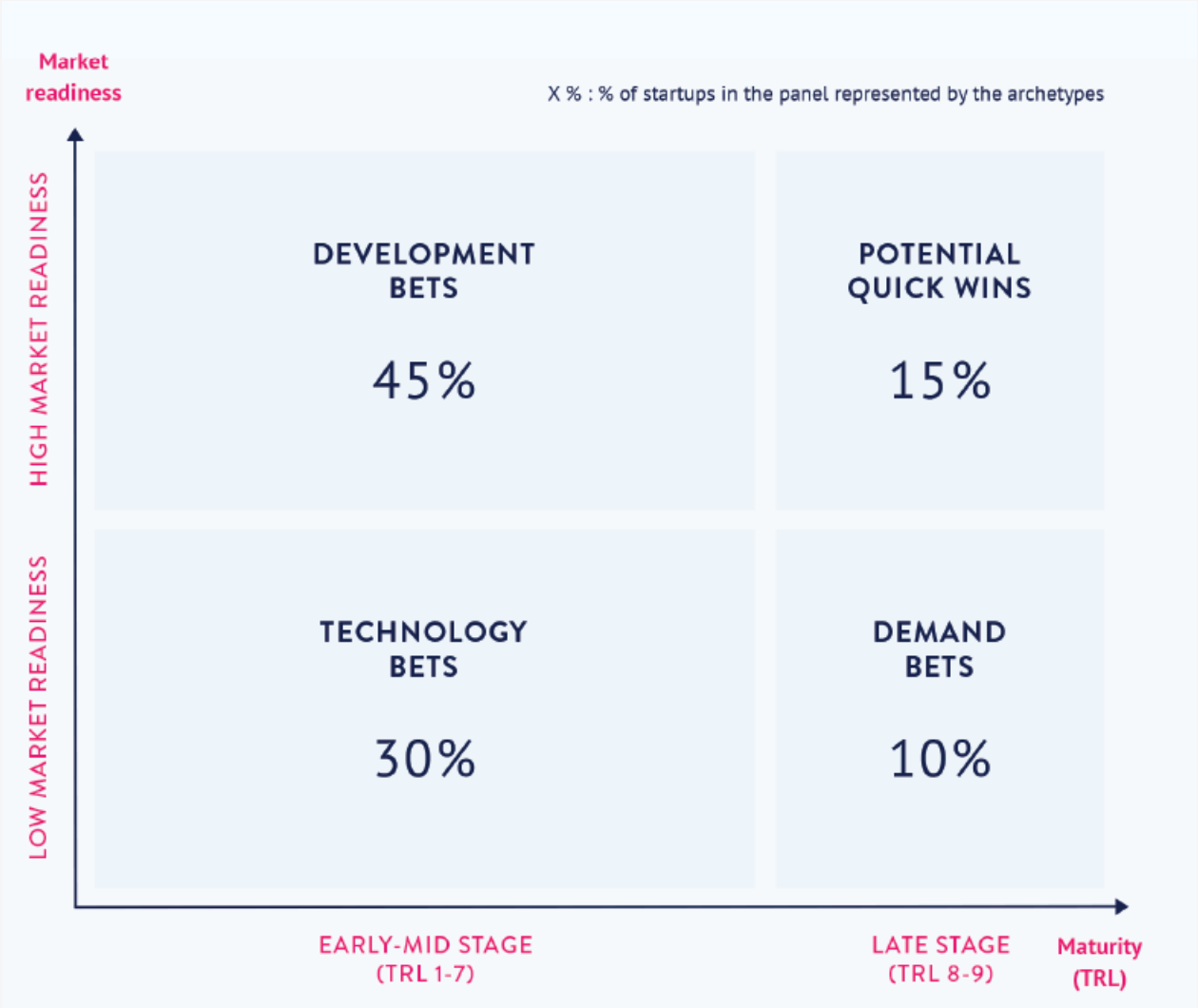
Deep Tech - Phases

	EARLY STAGE		MID STAGE		LATE STAGE	
Phase *(TRL)*	**Exploration** *(1-2)*	**Experimental Proof of Concept** *(3-4)*	**Functional Prototype** *(5)*	**Minimum Viable product** *(6-7)*	**Industrialization** *(8-9)*	**Commercialization**

Deep Tech – Critical Resources

technical expertise
technological uncertainty

long development time
technological uncertainty



funding
market access
talent

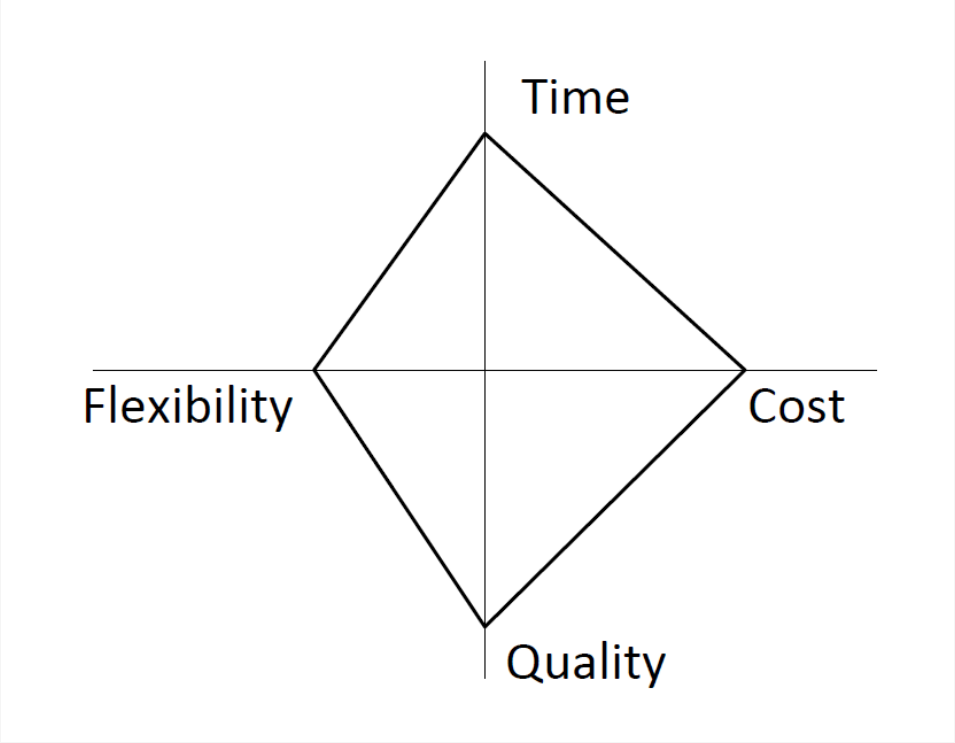
Market creation
Market resistance
Distribution networks & Infra

Digital Businesses – Pillars

- People
- Processes & Innovation
- Technology
- Data & Analytics

- Optimization & Improvement

The Devil's Quadrangle – Managing Processes



"improving a process along one dimension may very well weaken its performance along another"

Big data

Type of Data

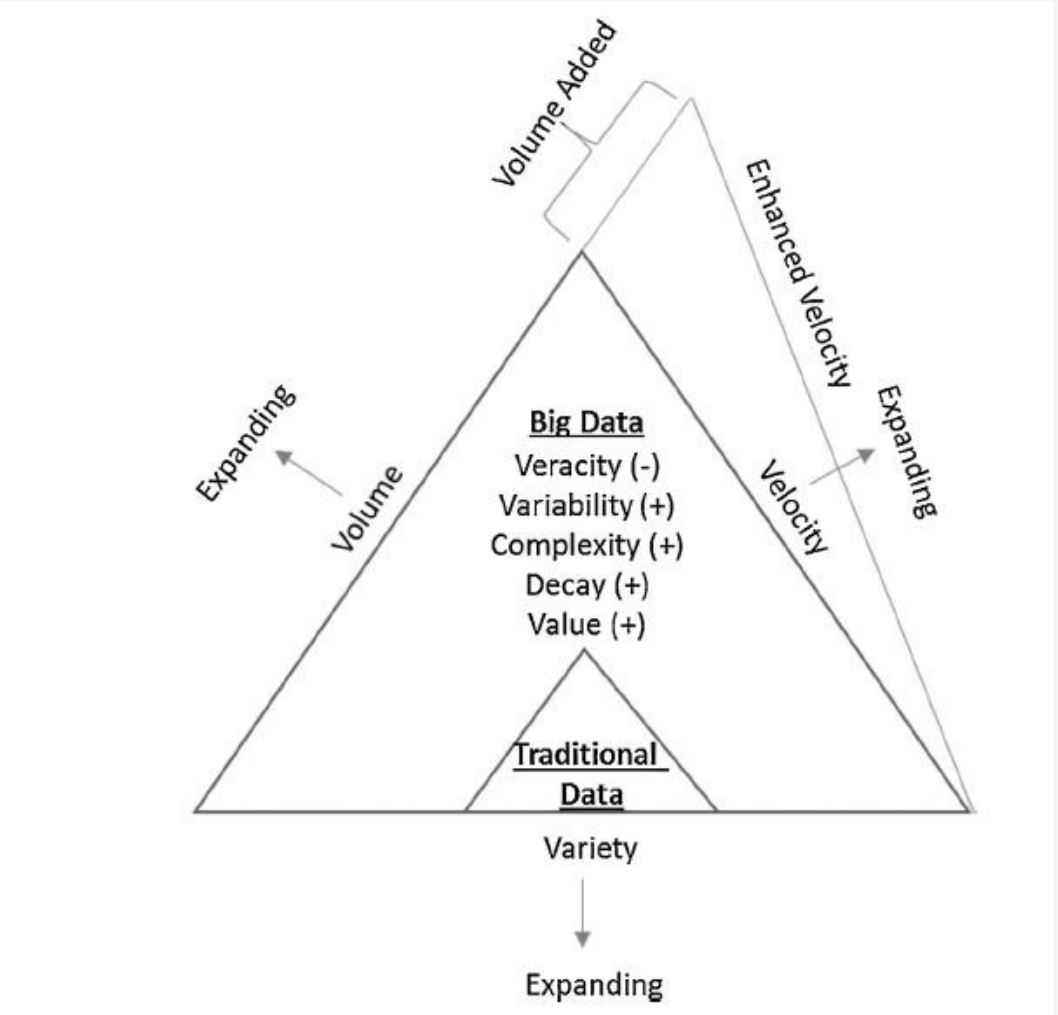
- **Structured**
  - Tables
- **Semi-Structured**
  - XML, JSON
  - Clickstream data, Ecommerce, APIs
- **Unstructured**
  - Audio, Video, Images, Text, Sensory Data
  - IoT Devices, Social Media

Data

- Storage
  - SQL, NoSQL
- Processing
  - Hadoop

Dimensions of big data

- Volume
- Velocity
- Variety
- Veracity
- Variability
- Complexity
- Value
- Decay



Evolution of big data and data analytics

- 1950s to mid-1990s
- Big Data 1.0
- Big Data 2.0
- Big Data 3.0

Big Data 1.0

- Web usage mining
- Web structure mining
- Web content mining

Big Data 2.0

- Social Media
  - Sentiment Analysis
    - Entity, sentence, document level
    - Lexicon-based, Machine Learning
  - Social Network Analysis
    - network structure, connections, nodes,
    - network density, network centrality, network flows

Big Data 3.0

- IoT Applications
  - Streaming Analytics
  - Edge Computing

Big data analysis of merchant reviews

- Relationships between consumers review activities and the viewers usefulness votes.
- Five factors related to consumers review activities
  - the review score of the reviewer
  - the number of social network friends of the reviewer
  - the cumulative number of reviews made by the reviewer
  - the number of words in the reviewer's comment
  - the existence of images or photos in the reviewer's comment.

Impact of Big Data

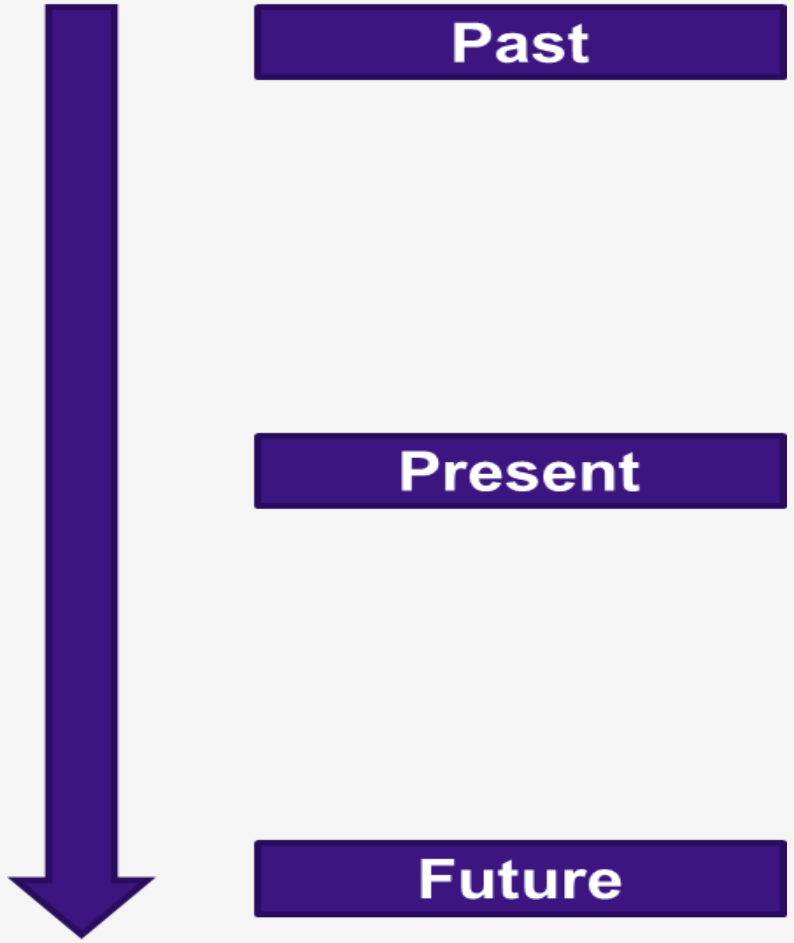
- Personalization marketing
- Better Pricing
- Cost Reduction
- Improved Customer Service

Challenges in big data

- Data Quality
- Data Security
- Privacy
- Investment Justification
- Data Management
- Shortage of Experts

Type of Data Analytics

- **What happened?**
  - Descriptive Analytics (Data aggregation, Summary)
  - What were our total sales this month?
- **Why did it happen?**
  - Diagnostic Analytics (Data discovery, Drill-down)
  - Why have sales gone down?
- **What will happen?**
  - Predictive Analytics (Regression, Neural Network)
  - Forecasting & What If Analysis
- **What do I want to happen?**
  - Prescriptive Analytics (Optimization, Recommendation)
  - Planning & Targets



AI and ML

What Is Artificial Intelligence? (1 of 3)

- Grand vision
  - Computer hardware and software systems that are as “smart” as humans
- Realistic vision
  - Systems that take data inputs, process them, and produce outputs (like all software programs) and that can perform many complex tasks that would be difficult or impossible for humans to perform.

What Is Artificial Intelligence? (2 of 3)

- Examples:
  - Recognize millions of faces in seconds
  - Interpret millions of CT scans in minutes
  - Analyze millions of financial records
  - Detect patterns in very large Big Data databases
  - Improve their performance over time (“learn”)
  - Navigate a car in certain limited conditions
  - Respond to questions from humans (natural language); speech activated assistants like Siri, Alexa, and Cortana

What Is Artificial Intelligence? (3 of 3)

- Major Types of AI
  - Expert systems
  - Machine learning
  - Neural networks and deep learning networks
  - Genetic algorithms
  - Natural language Processing
  - Computer vision
  - Robotics

Machine Learning

- Machine learning is a form of AI that enables a system to learn from data rather than through explicit programming.
  - Recognizing patterns
  - Supervised vs. unsupervised learning
- Contemporary examples
  - Google searches
  - Recommender systems on Amazon, Netflix

Supervised vs. Unsupervised learning

Supervised Learning	**Unsupervised Learning**
Input data is labelled	Input data is unlabeled
Uses training dataset	Uses just input dataset
Used for prediction	Used for analysis
E.g., classification, regression	Clustering, density estimation and dimensionality reduction