Artificial Intelligence is:

| The Future | Science Fiction | Part of our everyday lives |

All these options are true, it just depends on what type of AI you are referring to.

AI currently has some, but not all, facets of human intelligence

- **Complete AI** is still in the realm of science fiction or the distant future: machines equipped with all categories of human senses and the ability to exactly duplicate – or exceed - human ability to think and reason.

- **Targeted AI** is here and expanding daily: technologies that are able to perform specific tasks as well as, or better, than humans can.

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Why are we hearing so much about artificial intelligence at this point in time?

Multiple technologies have evolved to provide the capabilities to support AI functionality

Building Blocks of AI

Big Data
The more information an artificially intelligent computer can digest the smarter it gets. Technology evolution has reached a point where we can no longer effectively handle the volume of data and communications w/out advances in AI.

Processing Power
Analyzing vast amounts of data requires advanced processing power; wide availability of graphics processing units (GPUs) make parallel processing cheaper, faster and more powerful.. Cluster computing, enables the networking of many smaller – low cost computers into a single- powerful processing tool.
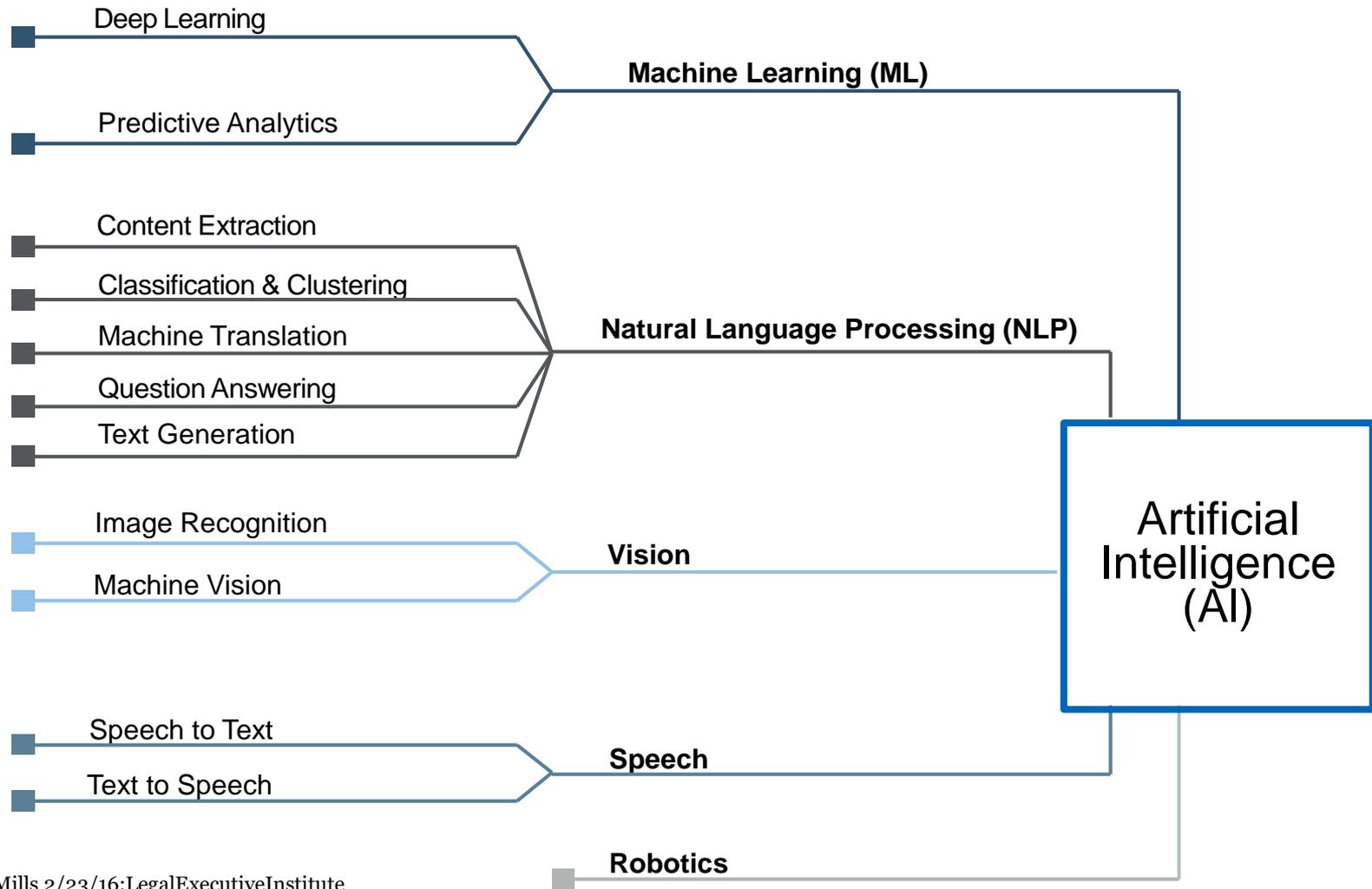
Algorithms & Analytics
Sophisticated software algorithms and analytics are used for calculation, data processing and automated reasoning. Before the "rise of the machines" we have the rise of the data scientist.

Cloud
Cloud computing solves two hurdles for AI: (1) storing massive volumes of data (2) making that storage affordable. Major cloud service providers are incorporating AI capabilities into their platforms.

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AI – an umbrella concept consisting of numerous subfields

Deep Learning

Predictive Analytics

Machine Learning (ML)

Content Extraction

Classification & Clustering

Machine Translation

Question Answering

Text Generation

Natural Language Processing (NLP)

Image Recognition

Machine Vision

Vision

Speech to Text

Text to Speech

Speech

Robotics

Artificial Intelligence (AI)

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One of the most prevalent AI subfields is **Machine Learning**

Defining AI subfields: Machine Learning

Machine Learning (ML)

- **ML Definition**: ML is the use of a set of rules (algorithms) to parse data, learn from it, and then make a determination or prediction about something in the world. Instead of hand-coding software routines with a specific set of instructions to accomplish a particular task, the machine is "trained" to learn how to perform the task.

- **Deep Learning**: the evolution for Machine Learning Deep Learning (DL) is a more advanced approach to Machine Learning. Both are inspired by the human brain's ability to learn, however DL is ML on steroids, more data, more processing power, faster and more nuanced learnings, and faster results

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Comparison: Machine Learning and Deep Learning for computer vision and image detection

- **Machine Learning:** requires the input of **hand-coded classifiers** (like edge detection filters so a program can identify where an object starts and stops; shape detection to determine if a shape has eight sides; or a classifier to recognize the letters "S-T-O-P").

- **Deep Learning:** each processing unit assigns a weighting to its input – how correct or incorrect it is relative to the task being performed. Final output is determined by the total of those weightings.

- Attributes of a stop sign image are chopped up and "examined" — its octagonal shape, fire-engine red color, distinctive letters, traffic-sign size, and motion or lack thereof.

- The task: to conclude whether this is a stop sign or not, by creating a "probability vector," which can be considered a highly informed assumption, based on the weighting.

- The system might be 86% confident the image is a stop sign, 7% confident it's a speed limit sign, and 5% it's a kite stuck in a tree ,and so on — and the advanced programs then determine an answer.

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Deep Learning advances Machine Learning by minimizing or eliminating the need for manual data input

Natural Language Processing and Speech Recognition

Defining AI subfields: Natural Language Processing

Natural Language Processing (NLP)

Definition: NLP is a set of technologies that enables machines to interact with humans in a written and spoken language (rather than code) to deliver information and insights as if speaking to another person.

Core components include:
- syntax analysis for parsing sentences and identifying parts of speech
- entity recognition for identifying persons, products, events, media, locations
- sentiment analysis for determining sentiment expressed in text.

Current approaches to NLP are often based on Machine Learning.
Voice assistants and customer service are some of the best known applications of NLP, including:
- Siri
- Customer services (analyzing customer calls)
- IoT (smart home voice assistance (echo, google home)
- Event extractions – hedge funds use to monitor what's happening to companies they are tracking
- Improving health care– reading nurses notes (Walks w/ wheels)
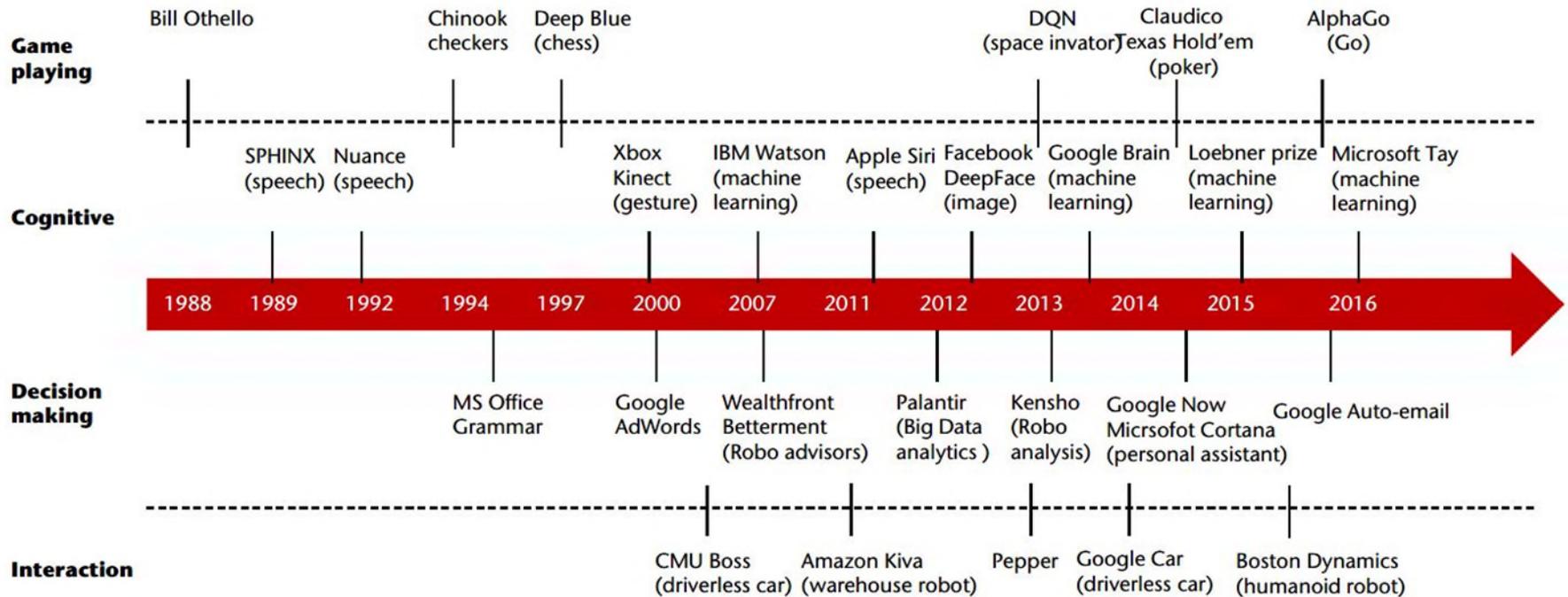
Source: Samsung Insights 4/17

AI in Business

Major tech companies are in a race to the top in pursuit of AI achievements; frequently leveraging multiple types of AI technologies in their products and services.

> *"We will move from mobile first to an AI first world"*
>
> Sundar Pichai, Google CEO

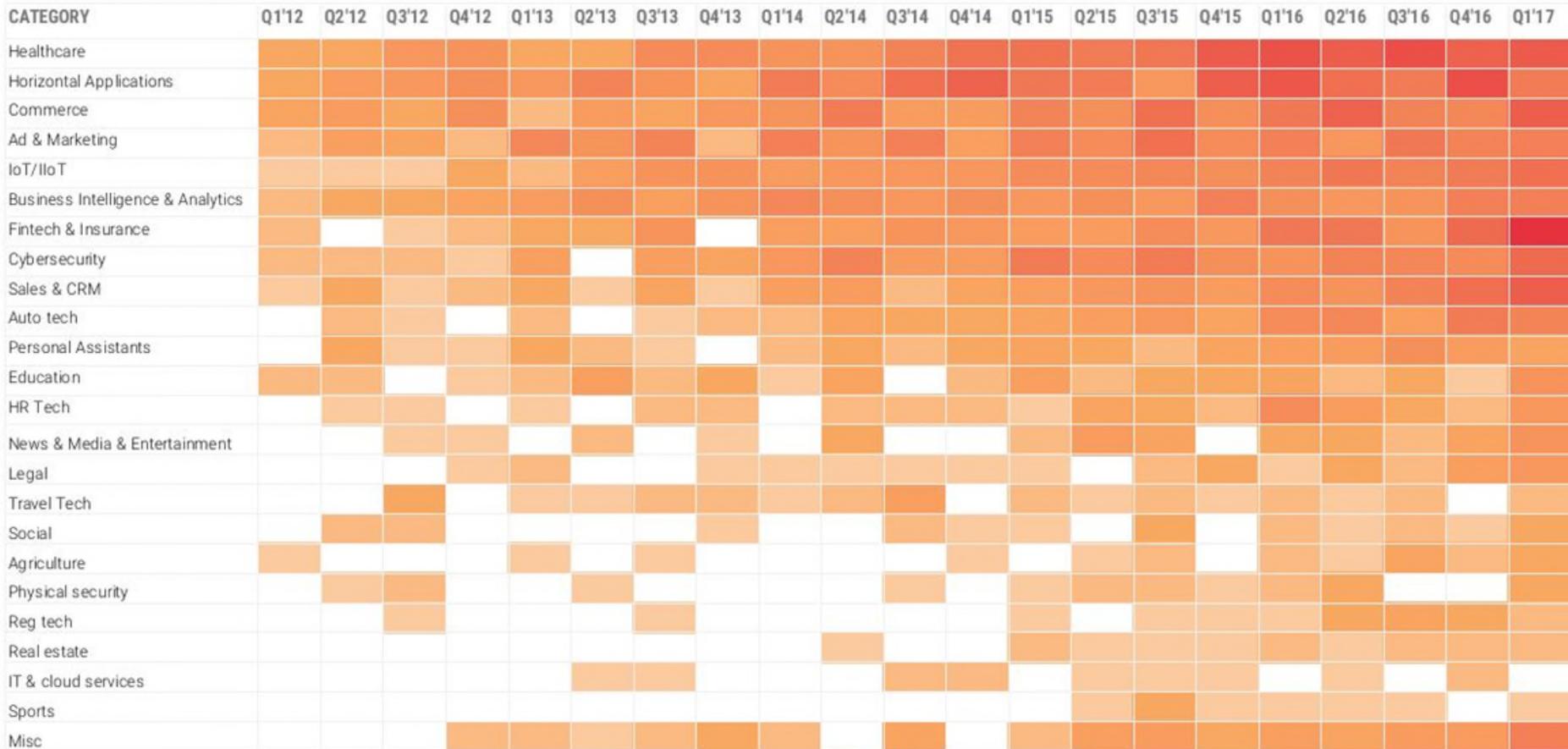# Major milestones in the history of artificial intelligence

Source: Jefferies

What Industries are investing most in AI?

AI HEATMAP: DEALS DISTRIBUTION BY CATEGORY
Q1'12-Q1'17 (as of 3/23/17)

AI is in the early stages of business deployment

- **Rapid advancements; unclear ROI**: more time needed to reveal genuinely beneficial applications.

- **Market research firm Gartner categorizes mainstream adoption of machine learning 2-5+ years away**, but will be "the most disruptive class of technologies over the next ten years."

- **Limited deployment: supervised learning software requires huge amounts of data**: Despite AI's breadth of impact, the types of it being deployed are still extremely limited.

- Almost all of AI's recent progress is through one type, in which some input data (A) is used to quickly generate some simple response (B).

What Machine Learning Can Do
A simple way to think about supervised learning.

| INPUT A	RESPONSE B	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Loan application	Will they repay the loan? (0 or 1)	Loan approvals
Ad plus user information	Will user click on ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	French sentence	Language translation
Sensors from hard disk, plane engine, etc.	Is it about to fail?	Preventive maintenance
Car camera and other sensors	Position of other cars	Self-driving cars

SOURCE ANDREW NG © HBR.ORG

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AI market adoption

- **Market size estimated at $8 billion in 2016 and will exceed $47 billion by 2020**: IDC predicts the market for artificial intelligence will have a growth rate of 55% between 2016-2010. **AI investment will be led by banking, retail, healthcare and discrete manufacturing**.

- **Vendor landscape:** led by tech giants IBM, AMZN, FB, GOOG, APPL, MSFT; key players in AI vary by application. ~2,600 startups by Bloomberg's count; expect industry consolidation as the market becomes more established.

Adoption Curve for AI Technologies

TechRadar™: Artificial Intelligence Technologies, Q1 '17

TechRadar™: Artificial Intelligence Technologies, Q1 2017
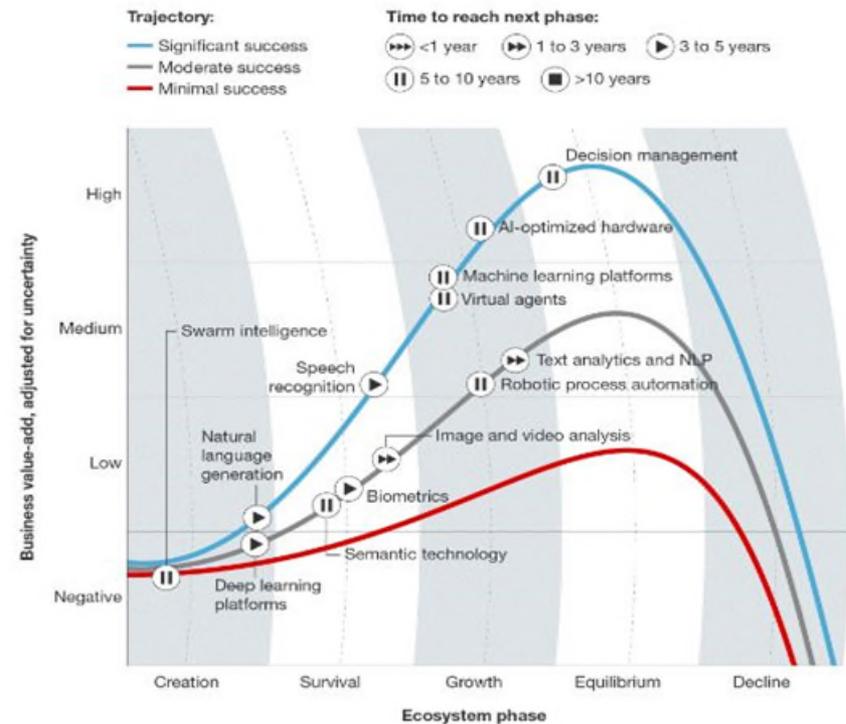
Sources: WSJ 1/11/17; MIT 3/28/16; Investors Biz Dly 3/10/16; Forbes 1/23/17

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Approaching Data Governance Differently

- Objective-- Is there a better approach than
    - Lots of meetings
    - Large committees
    - Stakeholders from across the organization
    - Lots of talk – little operational guidance

Promoting Effective Governance

- Questions/Thoughts:

  - Should you establish a data governance committee?

  - How many members should the committee have?

  - How often should it meet?

  - What processes should the committee establish or change?

  - Consider whether widespread stakeholder representation will lead to meaningful outcomes.

Additional Considerations

- Do the large, multi-stakeholder data governance committees effectively advance the data governance objectives of the enterprise?

- What elements of the committee are valuable?

- What are the main obstacles that prevent governance committees from being effective and/or efficient?

- What are some solutions to those obstacles?

Consider Using a Small Group of SMEs to Create a Decision Making Framework

- **Small cross functional team to create a strawman governance framework**

  - **IT, Security, Clinical, Finance, Legal, and HR**

  - **Perform a data mapping**

  - **Identify what can be done?**

    - **Legal**

    - **Regulatory**

    - **Religious**

    - **Contractual**

  - **Apply the framework to common use and business Cases**

  - **Roll out the model to additional waves of stakeholders for improvement and adaptation**

The SME team

- Small – committed

- Cross functional to capture diversity of issues and ideas- but not so big that noting can get done

- Identify, discuss, **AND RESOLVE** issues for purposes of a framework recommendation

Data Map

- **Perform a data mapping of what information is collected and transmitted, how, for what purposes, and who has access (this can be done at a high level initially, with drill-down as the process is understood and its value proven)**

- Necessary step to create intelligent guidance for the organization

- Secondary benefit for your security compliance program

Legal Framework

- Developing a legal analytic framework that answers the question of "what are we legally permitted to do?"

- Using the legal framework to guide the business analysis of how the business and patients can derive value from the data.

- Legal considerations are complex but can be managed when the committee understands the data at issue and the most common purposes for disclosure.

- Discussion of current data regulation landscape.

Use Cases and Data Guardrails

- Create use cases to predevelop common scenarios for approval and denial based on legal guidelines and business goals so there is not an ad hoc approach for every request.

- Recommend flow charts to visually depict common use cases. Categorize by what makes most sense to your organization (e.g., recipient, purpose, who has approval authority).

- Address controls that need to be in place.

Goals of Strawman Model

- Groups are better at declaring what they don't like than creating what they do like

- The strawman allows for focused input from a broader stakeholder group

- The internal discussion becomes about making the strawman work in your organization

- The roll out of the framework guardrails allows others to be trained to make intelligent data use and access decisions aligned with business goals

- Education

- Accountability

- Prevent missed business opportunities