Jim VanderMey

Chief Innovation Officer and
Co-Founder of OST

The Hype

The “What If We Could Do This?” Project Is Our Sweet Spot

Founded in 1997, OST is an Enterprise healthcare services company with over 100 healthcare engagements and a strategic partner to dozens of healthcare systems. We have performed primary research on clinician workflow support, how data supports shared decision making in healthcare, wearable development, ML for patient and consumer acquisition, and more.

Thinking ahead. Seeing beyond. Building together.

OST

OST CAPABILITIES

DEVELOPMENT OST builds IoT devices and platforms that are deployed with tens of thousands of devices in healthcare and mobile. We have designed and developed patient portals and optimized buying experiences.

DESIGN strategy, service and product design

ANALYTICS integrated with Cerner and Epic, strong experience in supporting physicians and pop health through visual analytics

ADVANCED PARTNER with AWS, and MS Partner in IoT and Healthcare

MANAGED SERVICES PROVIDER supporting hospitals in running the infrastructures that support clinical workflows every day

The Hype is real…

How are you responding?

- External pressure to innovate and generate demand
- Internal pressure of optimizing and mitigating risk
- Knowing you may be asked, “What is our roadmap for (insert sexy technology here) integration?”

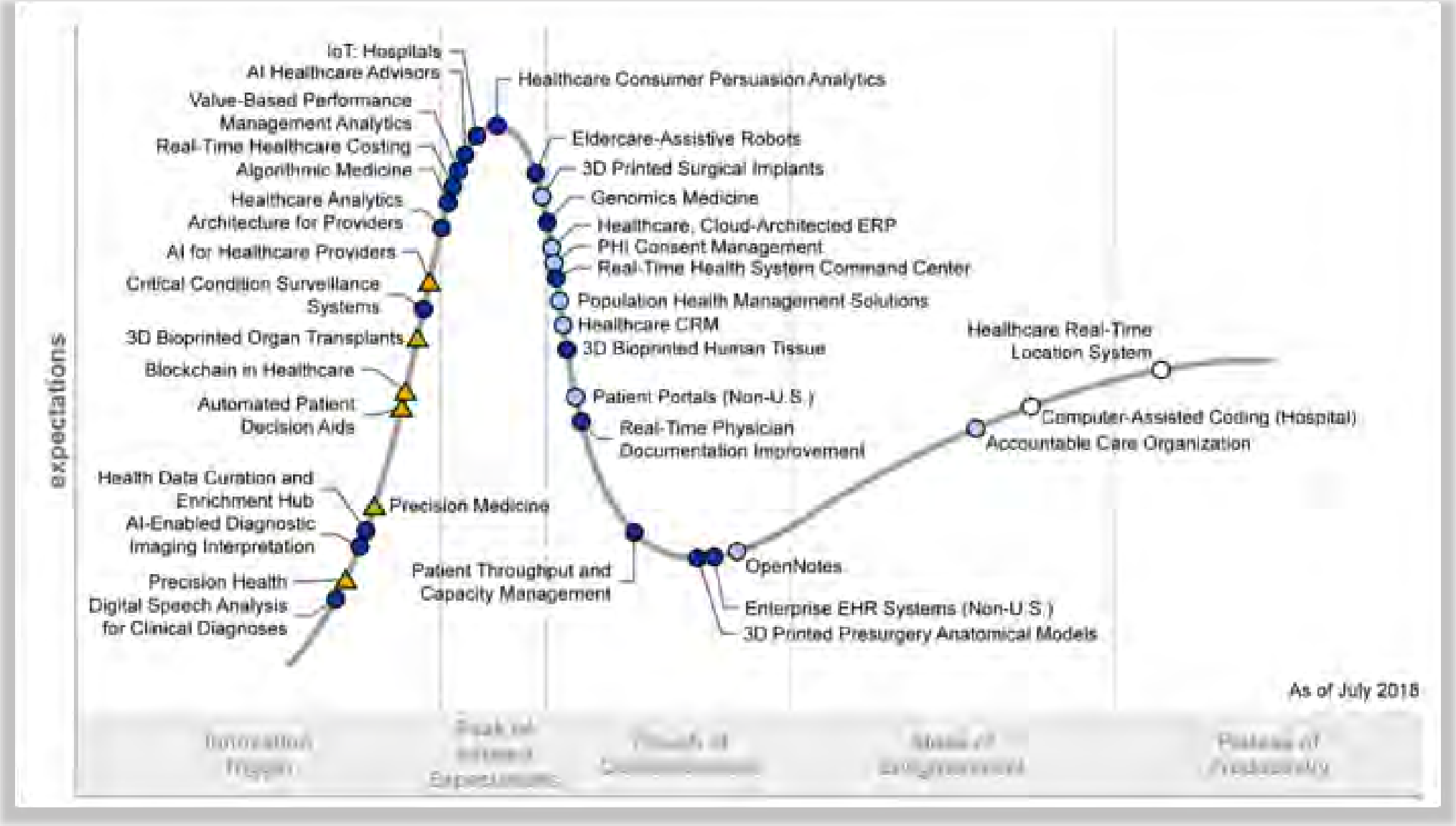
What is your plan?

First, let's define "hype"

Hype is when the level of media coverage is out of proportion to the reality of the event or its significance

Hype thrives on FOMO (The Fear Of Missing Out)

The All-Too Familiar Hype Cycle



Four Themes : Adoption vs Acquisition

Apps, AI, IoT, and Analytics

1

What experience are you creating for the user?

2

Does the platform you're building allow you to ingest the data and analyze it at scale?

3

Is the content, output, or recommendations integrated into the existing workflows in order to engender trust and support strong clinician engagement?

CDS for example

4

Collecting data generated by the patient or the device is not enough. Knowing how it is being used can identify the behavior impact or technical impediments.

Knowing a technology is only half the battle

*"This matrix reminds CIO's that their recent priorities — EHR's, enterprise data warehouses and patient portals — have become foundational/commodity (**not transformational, as we would have hoped**, but surely not passé)." - Gartner*

Technology is not transformational.
People and leaders are.

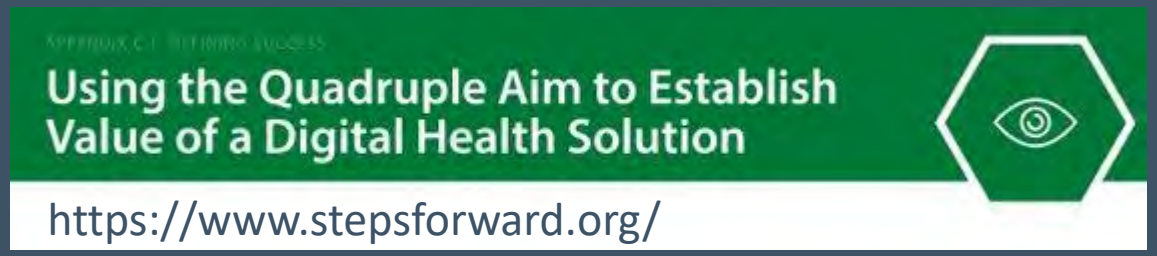
Virtuous Circle of Systems Leadership in Digital Industrial Transformation

Jeff Immelt, Robert Siegel, Stanford Graduate School of Business
Robert Siegel, Stanford Graduate School of Business

Technologies *can* live up to the hype

To be legit, technology must scale, delivering substantial value to one or more of the Quadruple Aims of healthcare

- *Lowering cost • Improving quality and outcomes*
- *Improving clinician experience • Improving patient experience*



Examples of hyped technologies

Apps and custom apps

The cloud

IoT

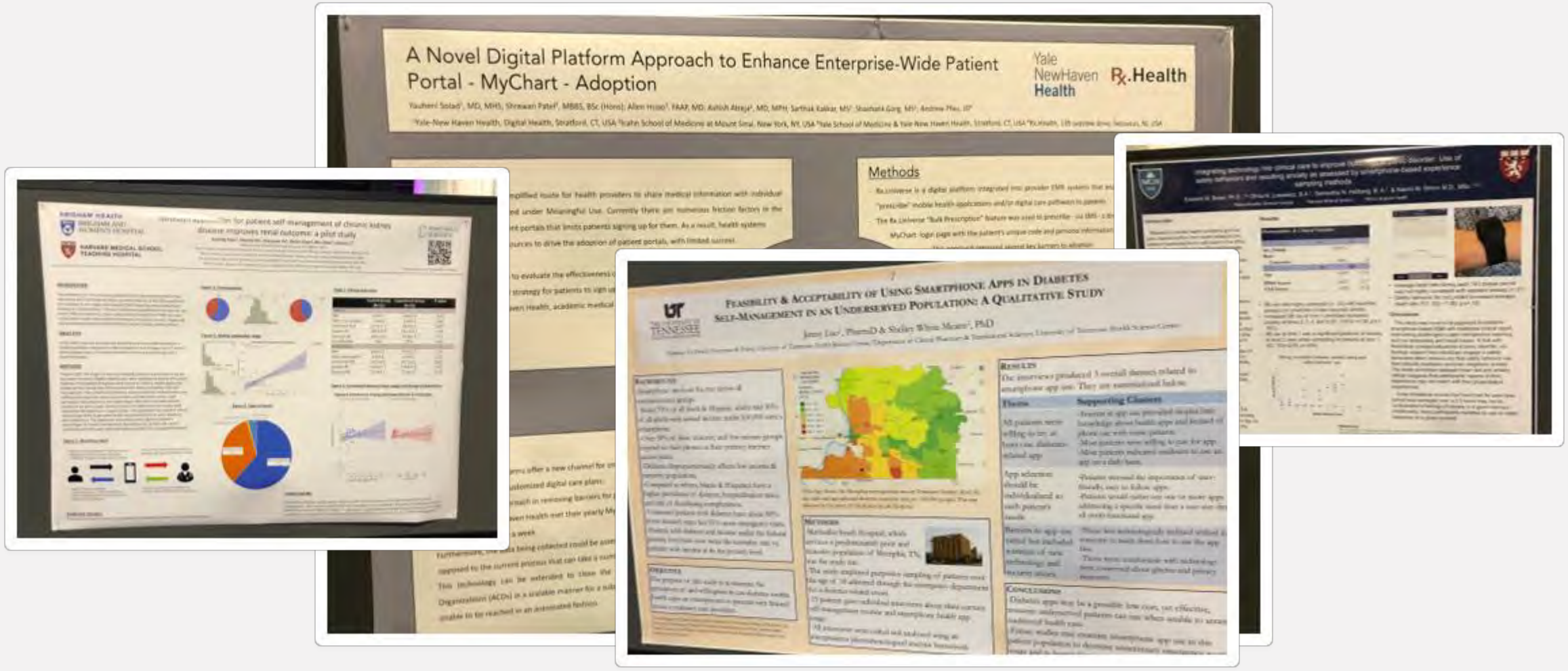
AI/Machine Learning

Blockchain

Do they deliver measurable value in care?

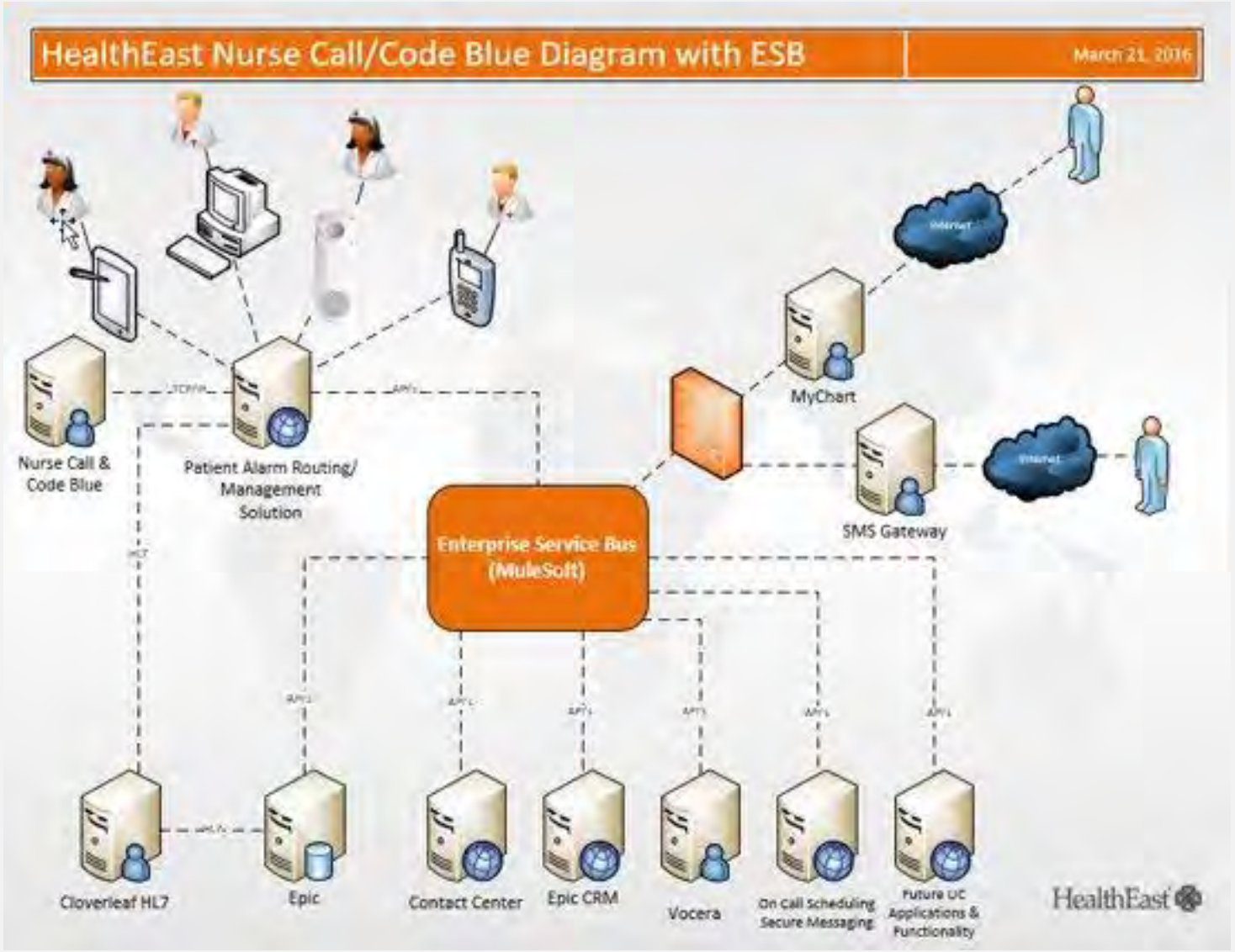
Apps and Custom Apps

Apps are an avenue for research and behavior change



FUTURE STATE FOR:

UC, EPIC INTEGRATION, & NURSE CALL/CODE BLUE/MIDDLEWARE



MedNow™ App Overview

MedNow ™
Successful, but just one direction

57,000 downloads
137,920 DTC visits
104,555 Avoided UC/ED visits
$20,345,791 DTC cost savings

Access via on-demand care
Reduce cost via early treatment of low-acuity conditions

Challenges with apps and custom apps

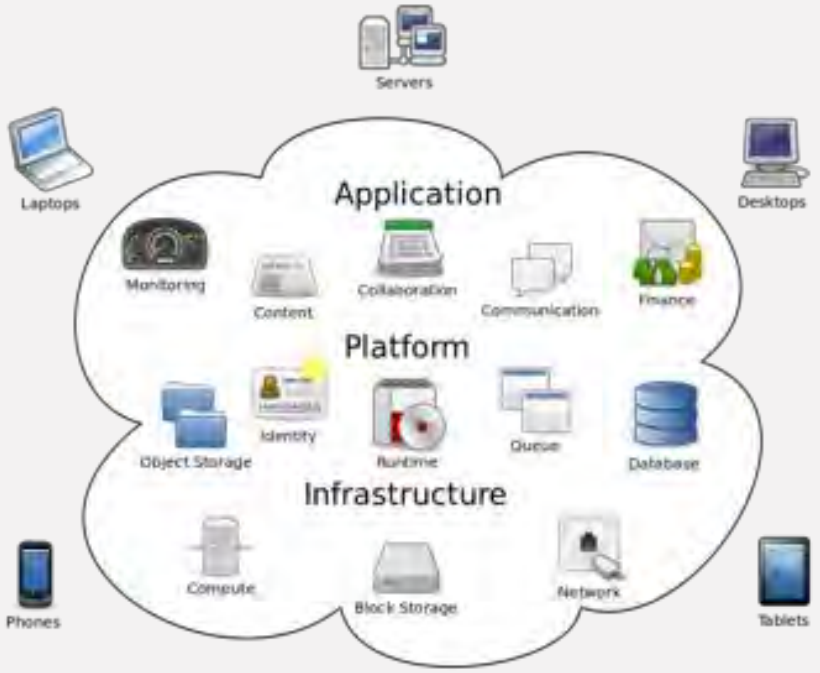
- The app economy is much faster than healthcare economy.
  Are you keeping up?
- Does the app support your brand?
- How will you facilitate data exchanged between the app and your enterprise systems?
- How will you support apps as providers begin prescribing apps
  and wearables and devices as part of discharge planning and care management?
- Build out org capacity to not just build apps but deliver experiences.
- You can heavily invest in an app, only to find that investment made meaningless by market events (MedNow, Vidyo, and MyChart Mobile)

The Cloud

The Cloud

5 core values of Cloud Computing

- On-demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service



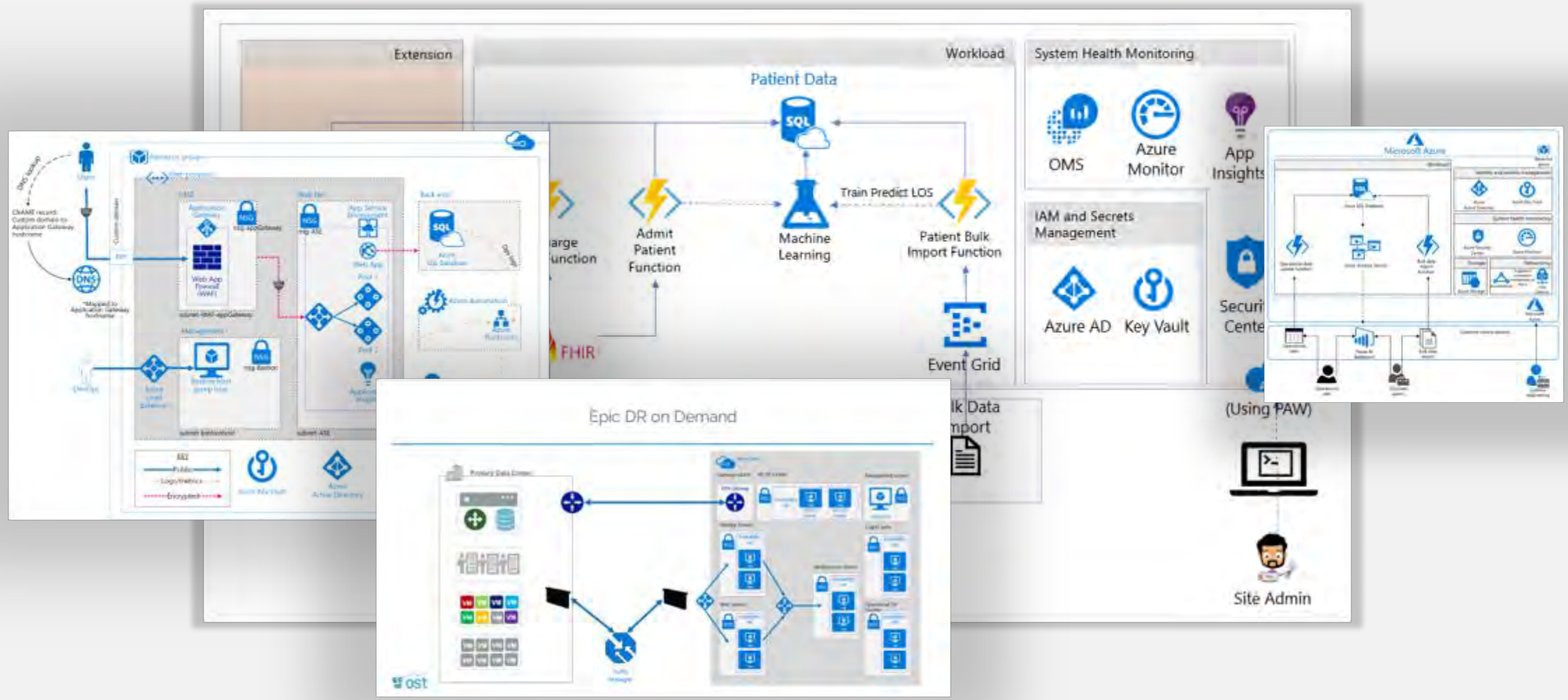
Our DC should start looking more like the cloud, and the Cloud is implemented with the best attributes of the DC. We need to build for velocity and reliability. The inability to introduce change without reliability puts the organization at risk due to a lack of agility and the risk of stranded capital.

Cloud and the imperative for Hybrid IT

using an example from 1895

Hybrid IT is a cross-functional approach, aligning business and technology, by modernizing the enterprise with platforms, products, and services optimized for the results your business values most

Modern Hybrid Healthcare IT Infrastructure



Challenges with the Cloud

- What is your security model of and Identity and Access Governance (IAG)?
- Have you extended your network and core connectivity to support the Cloud?
- Change mindset from installing servers to providing services
- Have you started to play and learn so that you can be responsive to the next opportunity to leverage the cloud?
- Start thinking about workloads that have advantages being deployed in the Cloud, and when you have a chance to build, do it Cloud-native

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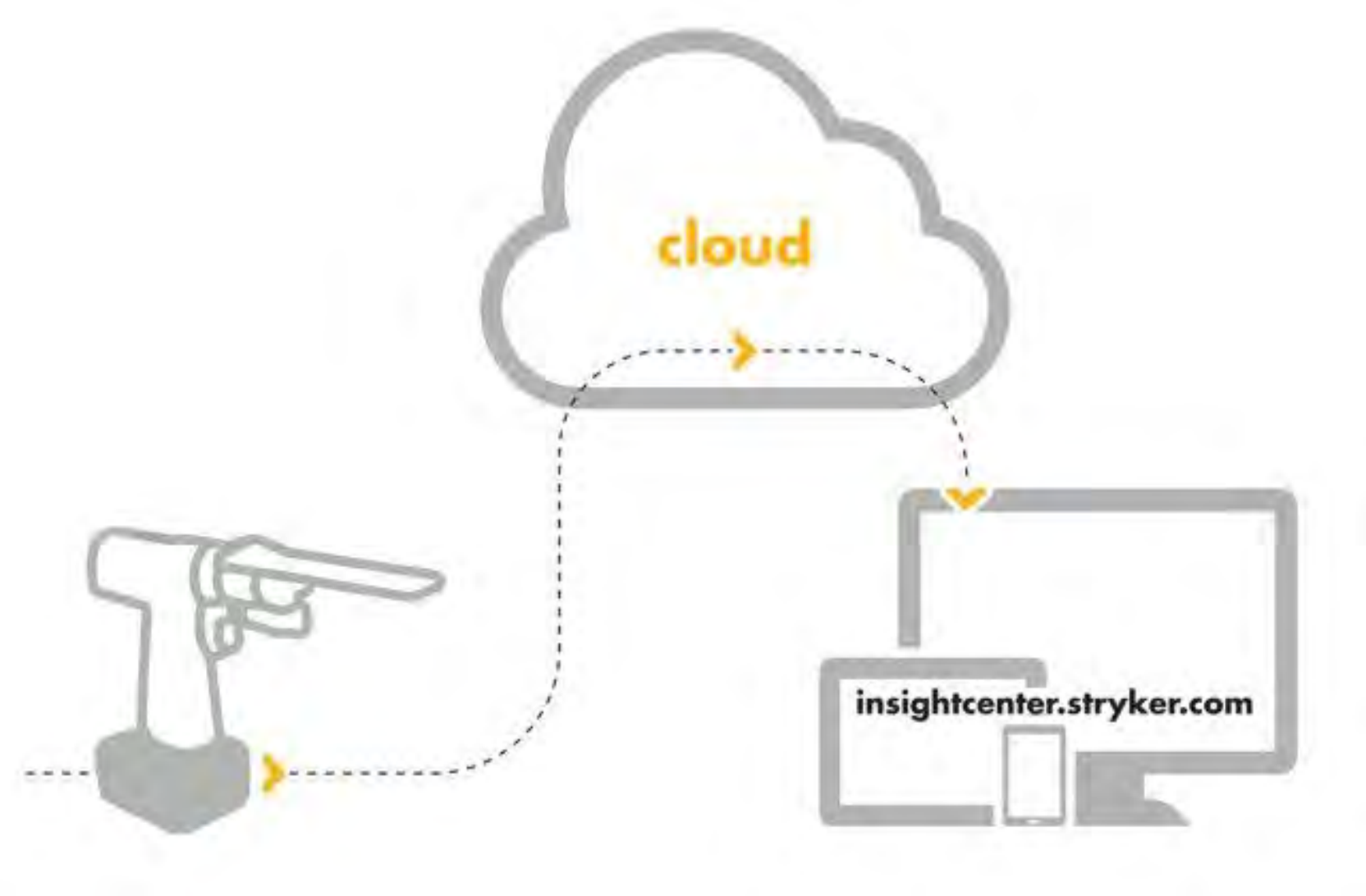
IoT

IoT

The **Internet of things** (**IoT**) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect, collect and exchange data

Harnessing Predictive Models for Surgical Tool Optimization (inside the walls)



Wearable companies moving up the healthcare value chain (outside the walls)

Fitbit follows a medical services company pattern

As it learns more about the market, creates new path to market and services that reach people across the value chain

https://healthsolutions.fitbit.com/

IoT at scale

Fitbit as a medical services company pattern (when the IoT device company learns more about the market, creates new path to market and services that reach the patient across the value chain)

- Uber Eats – identify what people search for, but cannot find, then create micro-restaurants to serve that need
- When your partner becomes your competitor because they have the data and are vigorously analyzing it for market opportunity
- Embedded intelligence within the devices
- Security and the maturity model (OTA)
- How will you capture and use data at scale (clue, it won't be in your EDW)
- Stryker, MedTronic

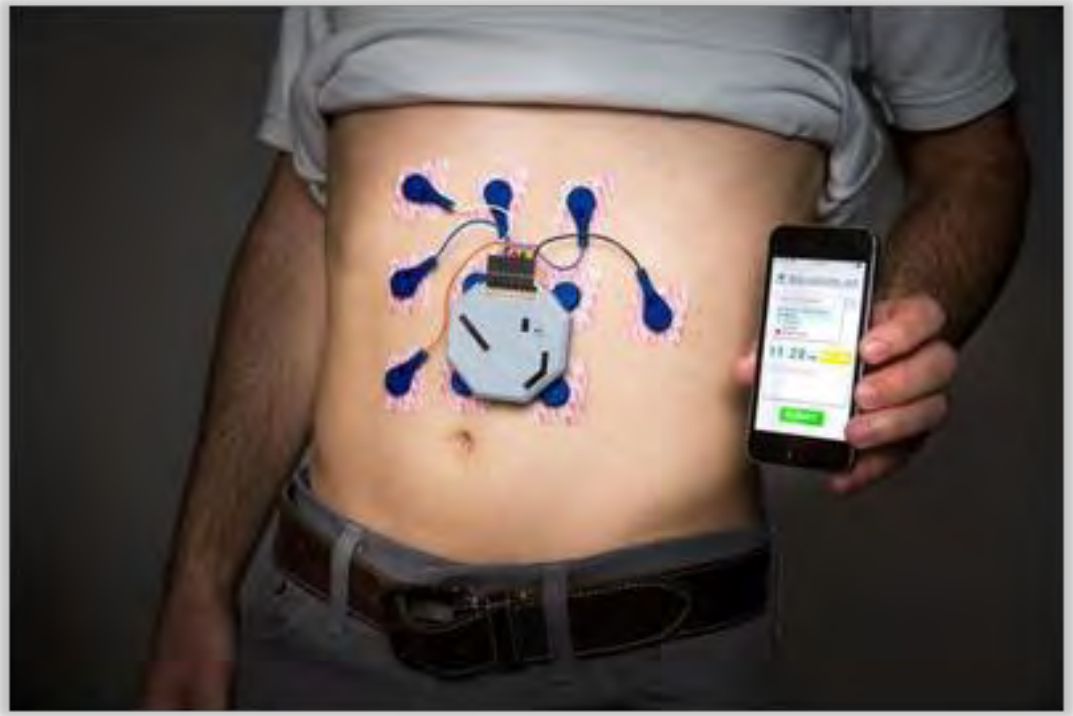
What Does An Aquarium Thermometer & A Commercial Freezer Have In Common?

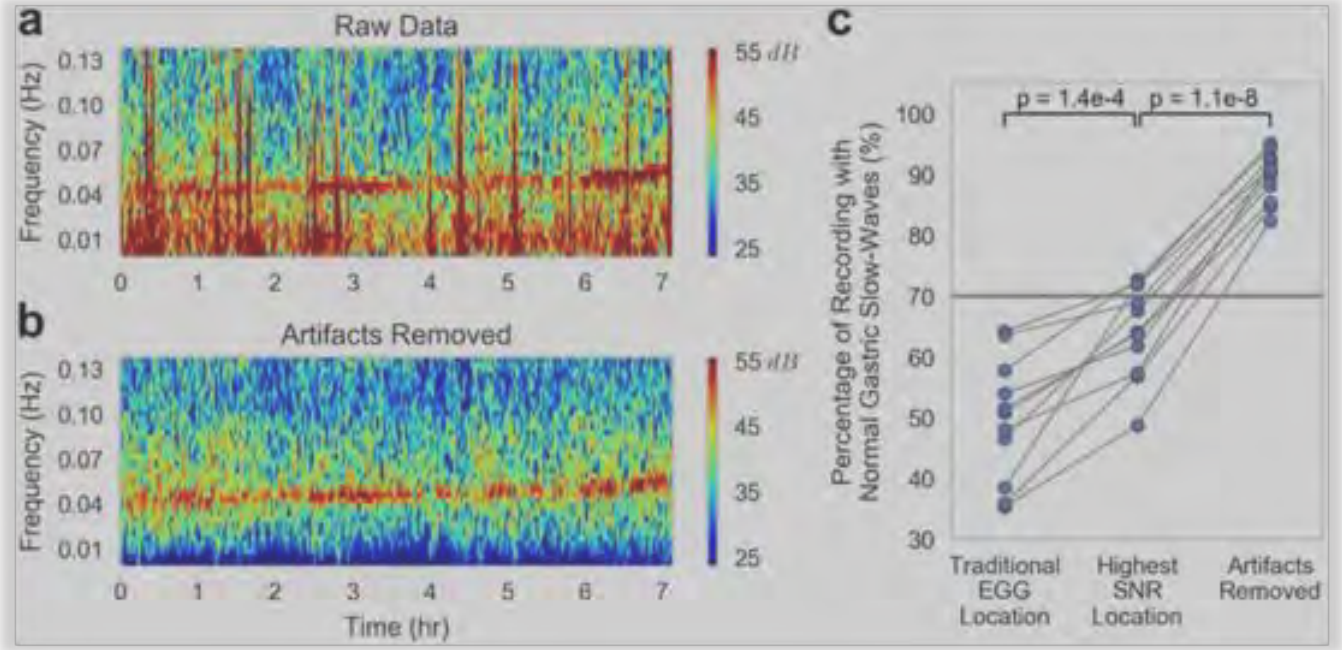
Answer: They were both attack vectors for hackers

In 2017, the aquarium allowed for the data theft of a casino's high-roller list

The commercial freezer was connected to a mechanical contractor that was the data egress path for the Target data breach

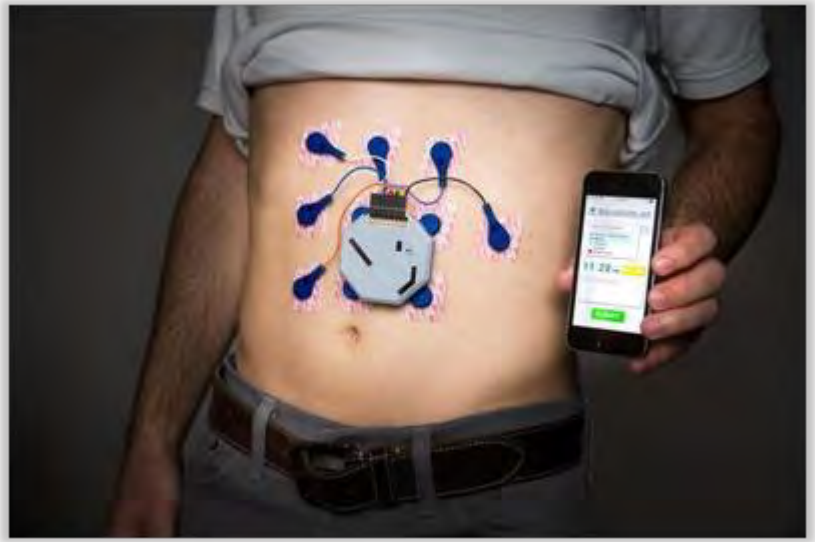
This is happening in San Diego: Personal EGG





https://www.nature.com/articles/s41598-018-23302-9

Lessons from the personal EGG (I couldn't talk about at AEHIT)



- They put physicians in the center (HIL) for the sake of clinical decision making, liability and billing.
- Data sets are clearly not going to represented in structured data within the EHR
- Processing the data is managed in the cloud as a SaaS model, data acquisition is a key part of the device and commercialization strategy
- Results come back as document images.

From OST direct engagement with Todd Coleman, UCSD GI Innovation Group

Challenges with IoT

How do you manage the product lifecycle or create the next version?

- What do you do with the data?
- Is it even the right data?
- How do you integrate IoT in enterprise systems?
- How do you make money? Not a cost center
- Embedded intelligence within the devices
  Security and the maturity model (OTA)
- How will you capture and use data at scale
  (clue, it won't be in your EDW)

The security of hundreds of devices scattered around your region

Dealing with IoT creating direct relationships between the consumer/patient and the device manufacturer

Contracting around security, ongoing monitoring, liability, compensation for the quality outcomes, and more

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AI/Machine Learning

Working AI Definition

- AI is a collection of trained models (neural network, machine learning, deep learning etc.) that actually takes **actions** on the predictions,
  not just providing insights or recommendations

- AI eliminates the need for human intervention. Must be **integrated** and the use case must be pragmatically **narrow** to achieve.

- AI gets smarter over time. Must have a built in **data loop** to update predictions and actions in real time.

AI/Machine Learning

AI and ML model [broad application/ migration/cross-organization applicability] limited by standardized data

- Imaging – standard, a model built at John Hopkins for ophthalmology cataract detection – translatable like Phillips and GE
- Sepsis detection or cardiac events – not so much
- Learning systems are custom to each data set and source at this time
- Saliency models turn out to have strong overlap with human experts
- **Replicatable methods, but non-replicatable models**

We are at the crossroads of learned wisdom and intuition and machine-generated models. We have to teach the systems. (The JCI Example)

But the people that teach the systems are not compensated for the machine-generated outcome: CPT codes and RVUs for Radiology, for example

Epic, UGM, Ochsner, and Cardiac Events

Predictive Analytics to Assist Clinicians

- 44% reduction in inpatient ICU admissions
- Struggles: Bringing this to other health systems with scale, and integration with real-time data sources that provide enough fidelity for decision making
- NOT an OST project, but working on bringing this to other Epic health systems

Challenges with AI/Machine Learning

- Medical best practices of transferring a mathematical algorithm to a new region (what biases went into the original algorithm – i.e. was it developed for a mostly Caucasian population? How does it apply to a mostly Hispanic region?
- Each healthcare institution defines and categorizes data differently
- How does the model learn in new context – i.e. a kangaroo, grocery bags and bricks (AI/ML do not create intuition or generalizable knowledge)
- Easy-to-do POC's
- At this time, AI will most likely be embedded into systems as a value-add rather than an initiated project

AI/Machine Learning: Clinical Validation

This illustrates the problem of how clinically validated, well researched practices will actually be adopted by clinicians. University of Michigan is trying to overcome this with the Learning Health System initiative, and Hopkins is trying to build validated AI models to be embedded by device manuafacturers.

- IoM – still >11 years for standard of care evolution
- Seth Martin MD, the Friedewald equation and LDL-C
  VLDL-C = Triglycerides/5 LDL-C = Total Cholesterol – (HDL-C + VLDL-C)
- ***"The best way for this to be adopted is from one physician leader to another"***
- Published in JAMA in 2013 https://jamanetwork.com/journals/jama/fullarticle/1779534
- Mobile app to do this rudimentary calculation
  https://www.hopkinsmedicine.org/apps/all-apps/ldl-cholesterol-calculator

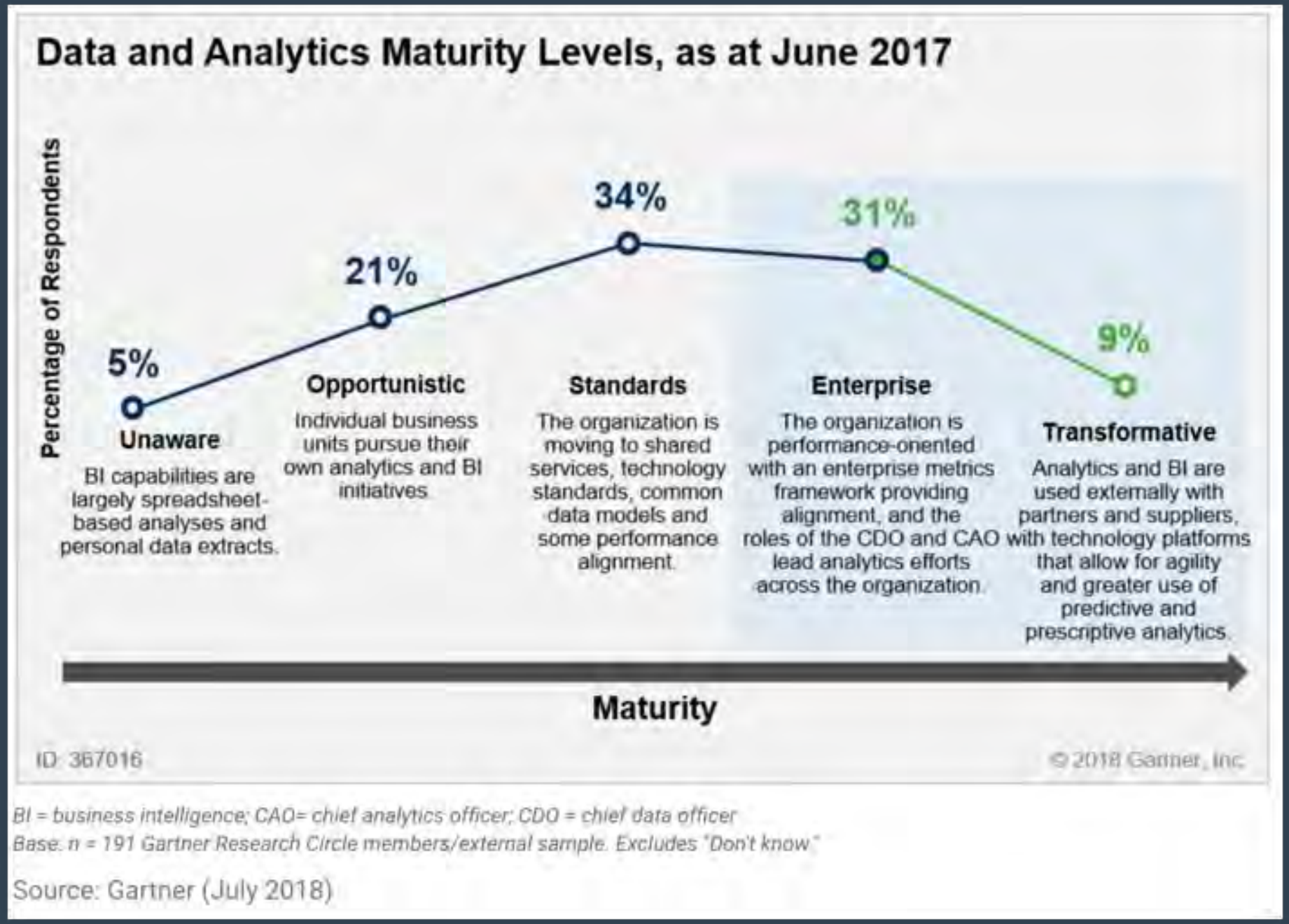
Aligning Discharge Plans based upon Social Determinants

Using Predictive Modeling and Big Data

- To in real-time identify the behavioral models that align to personas that have a specific way of absorbing complex healthcare information.
- Use the tools to create a MORE personal experience that aligns Design Thinking and Data to inform the discharge planning communication process.
- Engaged researcher, social networker, game player, overwhelmed and needs help, care giver.

WHY?

Move to the right with your data, or you won't succeed.



BI = business intelligence; CAO= chief analytics officer; CDO = chief data officer
Base: n = 191 Gartner Research Circle members/external sample. Excludes "Don't know."

Source: Gartner (July 2018)

Technologies have to scale

Scaling requires leadership at every stage

Transformation can only happen after tech escapes to the business

Knowing a technology is only half the battle

*"This matrix reminds CIO's that their recent priorities — EHR's, enterprise data warehouses and patient portals — have become foundational/commodity (**not transformational, as we would have hoped**, but surely not passé)." - Gartner*

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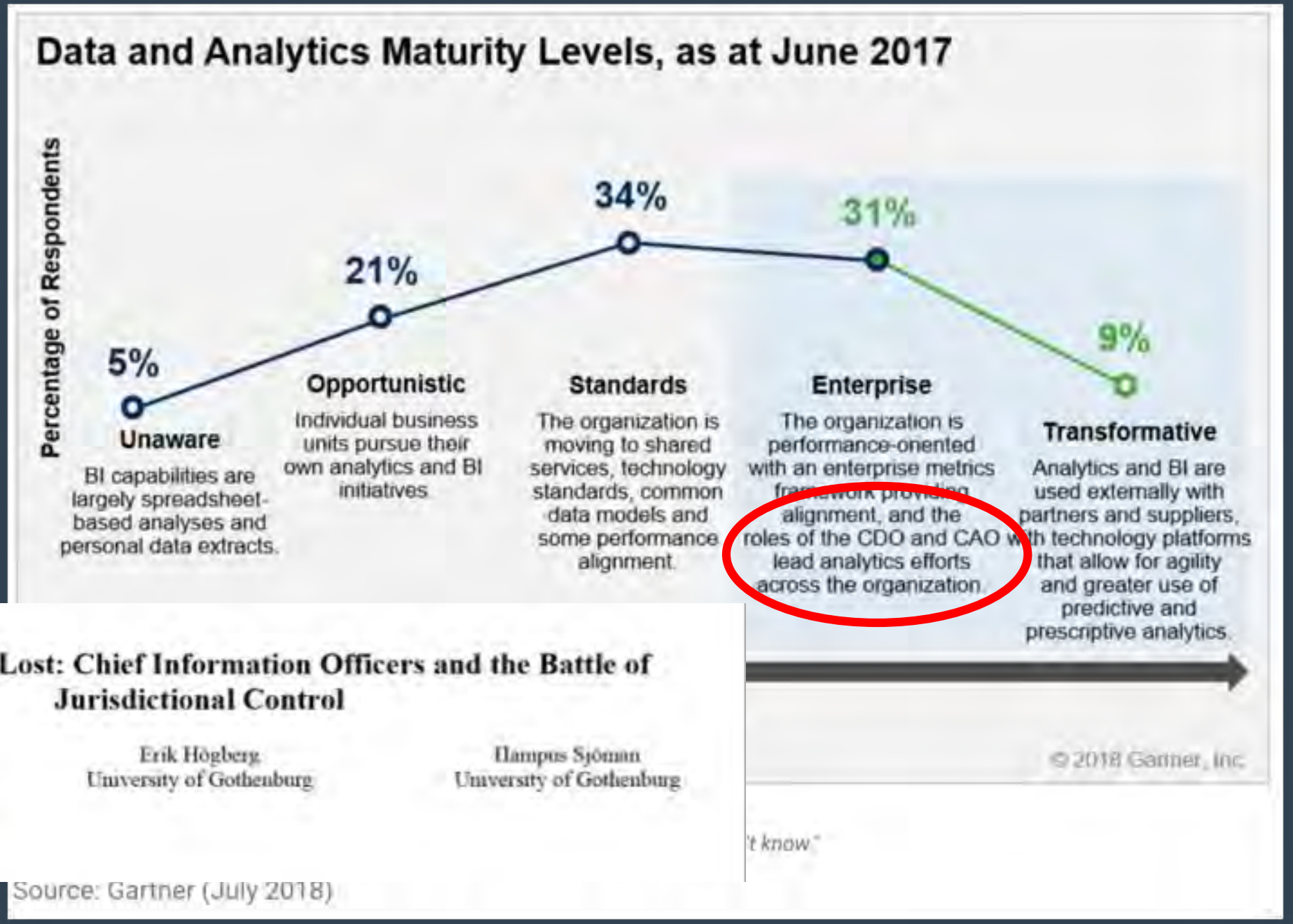

How the West was Lost: Chief Information Officers and the Battle of Jurisdictional Control

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Erik Högberg
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Hampus Sjömann
University of Gothenburg

t know."

Using data to create and confirm hypotheses

Leaders who use data: Dr. Chris Longhurst

IDEAS AND OPINIONS

Annals of Internal Medicine

Physician Burnout in the Electronic Health Record Era: Are We Ignoring the Real Cause?

N. Lance Downing, MD; David W. Bates, MD, MSc; and Christopher A. Longhurst, MD, MS

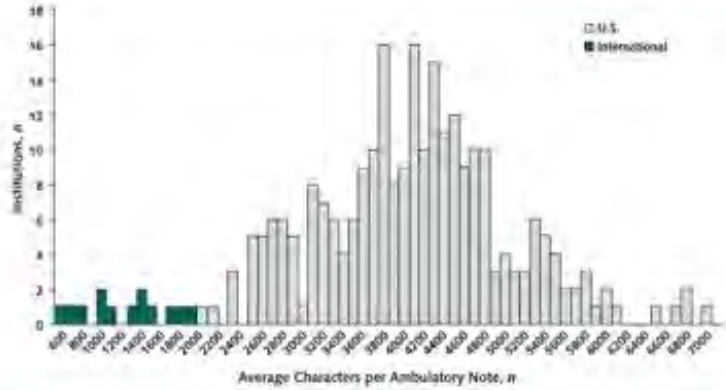
Physician burnout is reaching crisis proportions in the United States (1). Studies have noted a rising prevalence of emotional fatigue. One study suggested that more than half of physicians in some disciplines are burned out and that this proportion is increasing. The number of clinicians leaving the workforce represents a major concern to health care professionals and to the health of the nation. Many factors contribute, but the physician's interaction with electronic health records (EHRs) is especially important now that EHRs have been broadly adopted across the country.

Although EHRs have great potential to improve care, they may also have perverse effects. Some studies suggest that U.S. physicians now spend as much time on "desktop medicine" (interacting with the computer) as they do face to face with patients (2, 3). Providers must divide their attention between patients and the EHR, and many believe that this compromises patient–physician relationships (4). Although few physicians support reverting to paper, there is a growing sense within the medical community that the EHR is driving professional dissatisfaction and burnout.

Through our work supporting EHR optimization, we have helped to launch EHR software in health systems outside the United States. Among many others, the Royal Children's Hospital in Melbourne, Australia, and Jurong Health in Singapore have recently adopted the same vendor software (Epic Systems) that we support in our own health systems. We noted a significantly different interpretation of the EHR abroad: Physicians were more likely to justify billing to such payers as the Centers for Medicare & Medicaid Services, physicians must specify diagnoses from long and confusing arrays of choices relating to each test or procedure and document a clinically irrelevant number of elements for the history of present illness, review of systems, and physical examination. Documentation requirements in the United States are a relic of fee-for-service and will make even less sense as we move to new payment mechanisms.

The movement toward a value-based payment system alone will not ameliorate the effect of documentation on physician workflow. Since the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted, U.S. clinical notes have doubled in length (Epic Systems, Unpublished data). Meaningful use incentives have unintentionally created requirements for substantial, low-value documentation (8). Administrative tasks could grow even further as value-based payments increasingly demand documentation of comorbid conditions, quality process metrics and clinical outcomes. Although the Merit-based Incentive Payment System and other incentive programs are focused on moving the U.S. system from a fee-for-service toward a value-based model, they have their own documentation requirements, for which clinicians will likely bear a significant burden. Just as health systems scrambled to produce often meaningless administrative records to receive meaningful use incentives, value-based programs could similarly encumber clinicians. In fact, fee-for-service may not drive the bulk of

Figure. Average characters per ambulatory progress note in U.S. and international health systems.



Column height represents number of organizations. Dark columns represent 13 organizations outside the United States (140 000 notes from Canada, the United Kingdom, Australia, the Netherlands, Denmark, the United Arab Emirates, and Singapore). Light columns represent 254 organizations in the United States (10 million notes).

Jim VanderMey

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The Hype

AMA Digital Implementation Guide

- Don’t allow your initial implementation to die in the “Pilot Graveyard”
- Avoid redundant labor and centralize RPM administration
- Scale in small, manageable batches
- https://www.ama-assn.org/ama-digital-health-implementation-playbook

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- Historic Gartner Hype Cycle
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  https://arxiv.org/pdf/1810.05250.pdf
  https://www.researchgate.net/publication/26653862_Quality_The_Mayo_Clinic_Approach
- Recent Top Ten issues in healthcare from HCEG, a historic group from the payer/managed care perspective (spoke at this event last month)
  https://hceg.org/wp-content/uploads/2018_HCEG_Top_10_Infographic_FINAL.jpg
- The AWS well architected framework is an excellent reference for cloud best practices
  https://aws.amazon.com/architecture/well-architected/
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- The Dunning-Kruger Effect: A cognitive bias where people of low ability have the illusion of superiority and mistakenly self-assess their cognitive ability or domain knowledge greater than what it is. Helpful to apply to new projects where people that are experts in one domain are dismissive of the challenges faced in a new technology. https://en.wikipedia.org/wiki/Dunning%E2%80%93Kruger_effect https://www.healthcarefinancenews.com/news/atul-gawande-says-amazon-berkshire-jpmorgan-healthcare-venture-will-take-gradual-progress
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Where do you fall and where does the technology sit?