AI Strategy and Governance

Professor Kartik Hosanagar

Agenda

- **AI-Driven Business Transformation**
  - AI applications, AI failures, and early failures followed by irrational retreats
- **Developing a Portfolio of AI Projects**
  - Quick wins, long-term projects, and Google as an AI portfolio example
- **Retraining Technical & Management Teams**
  - Applying available tools, hiring slowly & consistently, and upskilling
- **AI in the Organization Structure**
  - Behavioral patterns of orgs that are most successful at applying AI
- **AI Governance**
  - How algorithms can err, the risks this brings, and the implications for firms

Wharton
University of Pennsylvania

AI-Driven Business Transformation

- AI: An Opportunity and a Risk
- AI Applications
- AI Challenges and Failures
- Early Failures Followed by Irrational Retreats

AI: An Opportunity and a Risk

- AI is viewed by business leaders as both an opportunity and a risk.

From a 2019 BCG/MIT report:

9/10

companies feel AI presents a business **opportunity**

45%

of companies feel AI poses some business **risk**:

"what if competitors, particularly new entrants, figure out AI before we do?"

- Driven by the opportunities and risks, companies in many industries have announced AI initiatives.

Wharton
University of Pennsylvania

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

AI Applications are Everywhere

Outback Steakhouse wants to know if A.I. tech can help improve customer service

PUBLISHED WED, OCT 16 2019·8:00 AM EDT

FedEx robots could soon deliver items to your door in Dubai

Google, care.ai working together to develop autonomous monitoring platform

The edge computing technology's neural network algorithms can help drive workflow efficiency, detect gaps in care and deliver real-time intelligent notifications to staff, the AI developers say.

By Mike Miliard | October 24, 2019 | 02:52 PM

Bank of America's AI approach: 'Productive paranoia'

By Penny Crosman
Published October 08 2019, 12:00pm EDT

Boeing's self-flying taxi completes its first flight

It's a significant step toward airborne cross-town travel.

Microsoft reaches a historic milestone, using AI to match human performance in translating news from Chinese to English

Wharton
University of Pennsylvania

AI Application Challenges

- In a 2019 MIT/BCG study, 90% of companies surveyed had made investments in AI.

Of this group, only

40%

saw business gains from AI over the last 3 years.

- However, a subset of the 90% that invested in AI made **significant investments**.

Looking just at this subset that invested **significantly**, only

60%

saw business gains from AI over the last 3 years.

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

AI Failures are Also Emerging

Drop it like it's bot: Brands have cooled on chatbots

Tay, Microsoft's AI chatbot, gets a crash course in racism from Twitter

Why Google's Artificial Intelligence Confused a Turtle for a Rifle

By Jonathan Vanian November 8, 2017

WIRED Technology | Science | Culture | Gear | Business | Politics

Artificial Intelligence

AI's failure to live up to the hype is starting to put off investors

Investor enthusiasm for AI will wane with the first big failures – and it will be up to the industry to redefine the problems it is trying to solve

Emergent Tech ▸ Artificial Intelligence 23

Facebook scales back AI flagship after chatbots hit 70% f-AI-lure rate

'The limitations of automation'

By Andrew Orlowski 22 Feb 2017 at 17:46 SHARE ▼

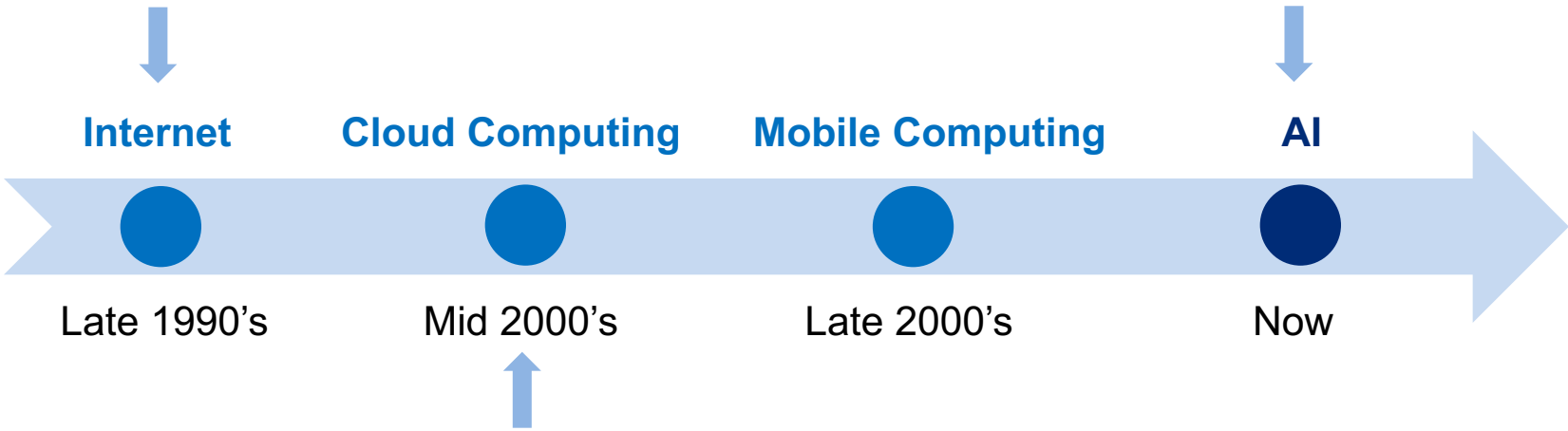
IBM pitched its Watson supercomputer as a revolution in cancer care. It's nowhere close

By CASEY ROSS @caseymross *and* IKE SWETLITZ @ikeswetlitz / SEPTEMBER 5, 2017

Early Failures Can Lead to Irrational Retreats

Many companies started online divisions due to the internet. There were some early successes but many more failures. This led companies to shut down/scale back their efforts, which allowed startups to disrupt their industries.

This pattern is likely to repeat itself with AI. So how should companies approach AI to avoid falling into the pattern of early failure leading to irrational retreats?



A similar pattern of early failures followed by irrational retreats happened with cloud computing. The companies that continued with the cloud are doing well, while those that retreated are still catching up.

Wharton
University of Pennsylvania

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Developing a Portfolio of AI Projects

- AI Portfolio = Quick Wins + Long-Term Projects
- Google AI Portfolio Example

A Portfolio Approach to AI

- A portfolio approach can help companies successfully unleash the power of machine intelligence.

redefine end-to-end processes

⬇

AI Portfolio = Quick Wins + Long Term Projects

⬆

optimization at a touch point

- Quick wins build consensus and also allow organizations to gain experience.
- Long-term projects are where companies will likely see the greatest impact.

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Quick Wins

- Quick wins focus on applying off-the-shelf ML (with suitable adaptations) to internal employee touchpoints.
  - These projects won't transform the business, but they serve to expose employees to the benefits of AI and build consensus on its potential.
  - They also allow companies to build the skills they need for larger AI projects, such as "large-scale data gathering, processing, and labeling."
  - These projects can often use "off-the-shelf AI tools …and they don't require massive investment in training and hiring."
- Some examples of quick wins include:
  - "a voice interface to help pharmacists look up substitute drugs"
  - "a tool to schedule internal meetings."

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Long-Term Projects

- Long-term projects are likely to be the most impactful because they involve rethinking end-to-end processes, not just focusing on point optimization.
- An example of a long-term project for an insurance company could be automating claims processing through speech and vision understanding.
  - Many car insurance companies already allows users to take photos of auto damage and settle their claims on a mobile app. Technology that's been trained on photos from past claims can accurately estimate the extent of the damage and automate the whole process.
- Because long-term projects are more involved than quick wins, off-the-shelf technology doesn't suffice. Long-term projects generally require organizational skills in building ML algorithms.

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Example of a Portfolio Approach: Google

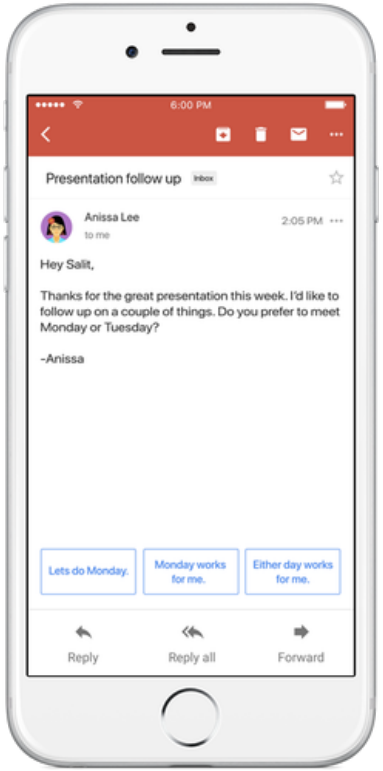
"Machine Learning is a core, transformative way by which we're rethinking how we're doing everything. We are thoughtfully applying it across all our products, be it search, ads, YouTube, or Play. And we're in early days, but you will see us - in a systematic way- apply machine learning in all these areas." *- Sundar Pichai*

- Google initially focused on incorporating ML into a few components of systems, but is moving towards using ML to replace entire systems.
- Google started with smaller projects and moved towards rethinking complete processes. Some examples include:
    - Google Photos
    - Gmail's Smart Reply
    - Data Center Cooling
    - Employee Retraining

Content/quotes from: https://backchannel.com/how-google-is-remaking-itself-as-a-machine-learning-first-company-ada63defcb70

Gmail's Smart Reply

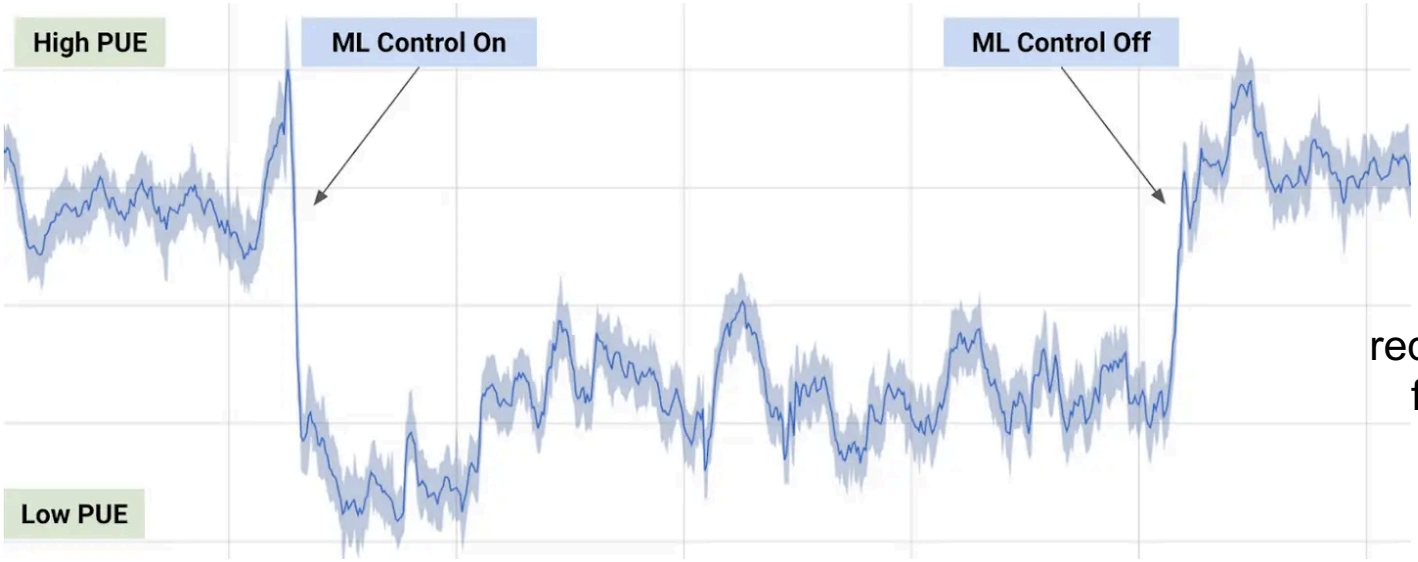
- What is Smart Reply?
  - Gmail feature that uses ML to provide email response options. Users can choose from these instead of typing out their own response.
- How does Smart Reply work?
  - It uses ML.
  - The system was trained by being "fed enough data to learn on its own, just as a child would learn."
  - Success is clearly defined & allows continued improvement.
    - Success is coming up with a "response that people found useful enough to use as their real response."
    - Training continues because the system knows when someone used or didn't use the suggestion.



Content/quotes from: https://backchannel.com/how-google-is-remaking-itself-as-a-machine-learning-first-company-ada63defcb70

Google/DeepMind Data Center Cooling

- DeepMind used ML to reduce the energy needed for data center cooling.
- Used historical data from sensors to train a deep learning neural network:
  - Historical data: “temperature, power, speeds, setpoints, etc.”
  - NN’s were trained on average PUE (Power Usage Effectiveness): “the ratio of the total building energy usage to the IT energy usage.”
- The model was tested in a data center. This graph depicts a day of testing:



40%

reduction in energy used for cooling purposes

Content/quotes from: https://deepmind.com/blog/deepmind-ai-reduces-google-data-centre-cooling-bill-40/

Google Photos

- How does Google Photos use machine learning?
  - It uses ML to find images of things users request, based on an understanding of the picture's content.
  - If someone asks for pictures of border collies, the computer "knows what a border collie looks like, and it will find pictures of it when it's a puppy, when its old, when its long-haired, and when it's shorn."
- How is this different than a human finding the photos?
  - Humans can't do this at scale. We can't process millions of photos in a timely manner.

Wharton
University of Pennsylvania

Content/quotes from: https://backchannel.com/how-google-is-remaking-itself-as-a-machine-learning-first-company-ada63defcb70

Google's Engineer Training

- To ensure this transformation with ML, Google embarked on internal training programs for training 25K engineers in ML.
  - Invites employees to spend 6 months embedded in ML team with a mentor.
  - Then distributes these experts into all product teams in the interest of creating organizational learning.

Content/quotes from: https://backchannel.com/how-google-is-remaking-itself-as-a-machine-learning-first-company-ada63defcb70

Suggested Exercise (individual or group)

- Identify a set of activities within your organization that you can automate using ML.
- Classify them into short-term and long-term initiatives
- Construct a 3-year ML portfolio consisting of 4-5 short-term projects and 1 long-term project
- Figure out how the AI team will fit into the org chart
  - Is it a separate group within the Org or does it fit into engineering or a product team?

Lowering Barriers For AI Use

- Democratization of Machine Learning

Democratization of ML

- Training/upskilling employees over time is important, but other resources also exist to help companies start developing their AI project portfolios.

- Resources that are Democratizing ML

1. Specialized chipsets and scalable computing platforms
2. Open-source frameworks and developer tools
3. Marketplaces

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Hardware

1 **Specialized chipsets** and **scalable computing platforms**

- Google's Tensor Processing Unit (TPU)
- NVIDIA's DGX-1

- Amazon Web Services (AWS)
- Google Cloud Platform
- Microsoft Azure + more

This specialized hardware and scalable infrastructure is available for rent at a low cost, which puts machine learning within reach for more organizations.

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Software

2 **Open-source frameworks** and **developer tools.**

- Google's Tensor Flow
- Apache's MXNet
- Facebook's Torch

- Microsoft Azure ML Studio
- Amazon/Google Platforms

These increasingly accessible tools help automate the data science process and allow software engineers to also contribute to data science efforts.

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

Data and Algorithms

3 **Marketplaces for data and algorithms.**

- Algorithmia
- Kaggle
- Exchange.ai
- And many more…

This indicates that hiring shouldn't be frontloaded, but rather undertaken slowly and consistently. "Making use of marketplaces for machine learning software and infrastructure can help keep costs manageable."

Content/quotes from: https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail

AI in the Organization Structure

- Organizational behaviors that help generate AI value
  - AI Strategy Integration
  - Taking Risks & Growing Revenue
  - Aligning AI Production & Consumption
  - AI Unification/Investing in Data & Process Change
  - Investing in Talent

Organizational Behaviors

- Why are some companies more successful than others at generating value from AI? Those that are more successful tend to do the following:

1. “Integrate their AI strategies with their overall business strategy.”
2. “Take on large, often risky, AI efforts that prioritize revenue growth over cost reduction.”
3. “Align the production of AI with the consumption of AI…to ensure that they adopt AI solutions effectively and pervasively.”
4. “Unify their AI initiatives with their larger business transformation efforts.”
5. “Invest in AI talent, data & process change in addition to (and often more so than) AI technology. They recognize AI is not all about technology.”

Wharton
University of Pennsylvania

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

AI Strategy Integration

- Applying AI to a company's existing strategy is more helpful than creating a strategy for AI alone.

Less Effective Approach →	More Effective Approach
• Develop a strategy for AI **specifically**	• Tie AI strategy into **overall strategy**
• Think of using AI as a goal **in and of itself**	• Think of AI as **a tool to reach existing objectives**
• Focus on AI's role in **particular projects**	• Focus on AI's effects on **business models**
• **Separate AI initiatives** from digital initiatives	• **Integrate AI initiatives** into digital initiatives

Integration is key over the long term, but companies do "start with less ambitious goals as precursors to bigger ones or as ways to achieve early wins and gain momentum."

Wharton
University of Pennsylvania

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

Taking Risks and Growing Revenue

- Organizations that are most effective at obtaining value from AI focus on revenue and growth side rather than on the cost side alone.

Less Effective Approach	→	More Effective Approach
• Focus on AI's role in **cutting cost & improving productivity** • Invest primarily in **low-risk projects**		• Focus primarily on AI's role in **generating revenue** • Invest in **higher-risk, higher-return projects**
23% of those investing in low-risk projects see value from AI		**50%** of those investing in high-risk projects see value from AI

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

AI Unification/ Investing in Data & Process Change

- Because AI systems are trained on data, they require a high volume of high quality data. Data often exists in individual departments, & managers "must source and integrate AI-dependent data across organizational silos."

Less Effective Approach	→	More Effective Approach
• Data **remains siloed in various departments across the organization**		• Organizations **"integrate their data, processes and behaviors to exploit AI opportunities"** – Based on this integration & use of AI, the org. gains new advantages

AI that is based on data integrated from many departments helps a company move away from a "fragmented view of a customer and [instead] meld the pieces together into a comprehensive understanding. With these new insights, the company works effectively as a single organization rather than as a collection of organizational units."

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

Aligning AI Production and Consumption

- Although developing AI algorithms is certainly important, “it’s critical to have willing and capable consumers of AI- people within the business with the desire and ability to exploit AI solutions to make a difference.”

Less Effective Approach	→	More Effective Approach
• Invest mostly **in developing/producing AI algorithms**		• Also invest in the **consumption of AI**, particularly in 2 areas: 1) A fertile environment 2) Building AI expertise

1) Creating a fertile environment is about “empowering business colleagues to realize AI’s business value by understanding how [AI tools]… can augment their people’s strengths and make their work easier.”
2) Building AI expertise is about helping business users learn how to:
   - “identify the right AI algorithms for specific business issues.”
   - “Interact w/ machines performing tasks that they/their colleagues previously did”
   - “work with the kind of probabilistic estimates that AI algorithms provide”

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

Investing in Talent

- Both hiring & upskilling are important, as “companies that hire, rent and cultivate AI talent are more likely to derive value from their AI initiatives.”

Less Effective Approach	→	More Effective Approach
• Relying on a **single approach** to building AI talent – Either on internal employees or external hires		• Taking a “**diversified approach** to AI talent” – Re-skilling internal employees through trainings as well as hiring “outside experts to lead AI development”

Content/quotes from: https://sloanreview.mit.edu/projects/winning-with-ai/?fbclid=IwAR3vpFQ0bPE1CK9kf8Mm07tleOO1eB5urQ9OdYOo7LwcunxH6VbeamgGT6Q

Business Transformation with AI

- Transforming businesses with AI is possible, but the companies that succeed will be those that focus on creating organization learning/changing organizational DNA, as well as embracing a portfolio approach.
- AI projects also come with some specific risks that must be managed.

Create organizational learning + **Embrace a portfolio approach** + **Manage new AI-specific risks**

Wharton
University of Pennsylvania


Wharton
University of Pennsylvania