Session 8. Framework for rebalancing in digital age

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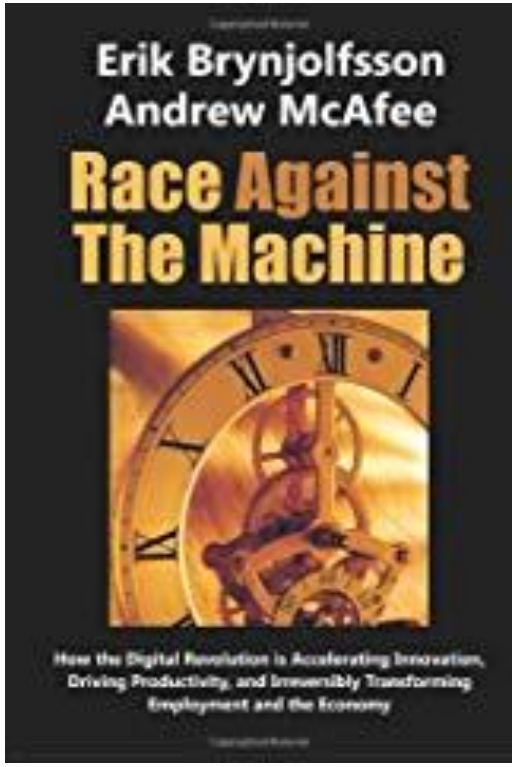
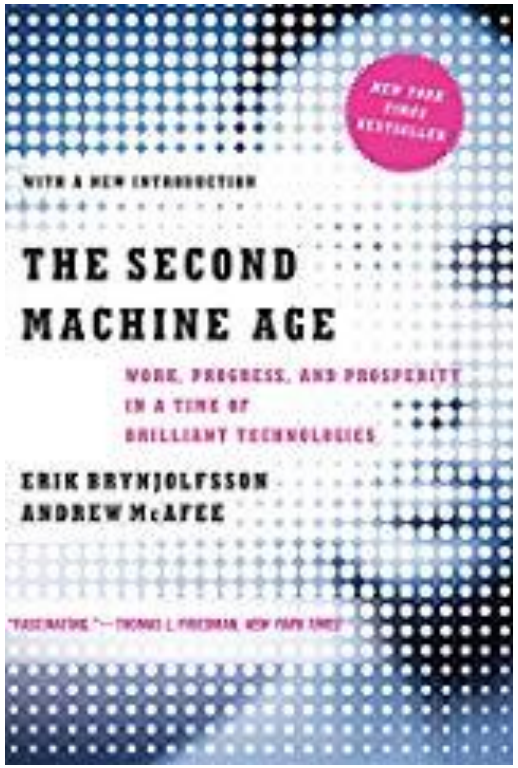
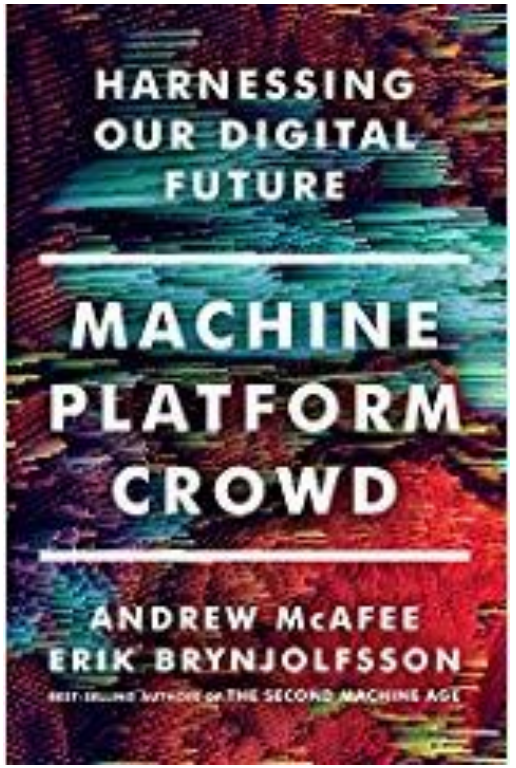
MIT-PROPOSED FRAMEWORK







MIT Professors E. Brynjolfsson, PhD and A. McAfee

THREE PAIR REBALANCING, BUT NOT A REPLACEMENT

- Complexity of many problems grows faster than computer power, because they are combinatorial
  - the number of possibilities that the computer must examine multiplies with each step (think of games like chess or go)
- Kinds of combinatorial problems in the economy
  - dynamic allocation of resources
    - business process design
      - knowing all sequences of words a chatbot might use to get a sale

COUNTERPARTS

- Human mind / Machine intelligence
  - Accountants with spreadsheets; Engineers with computer-aided design software; Assembly line workers next to robots
- Products / Platforms
  - Product: ride across town. Platform: Uber; Product: accommodations. Platform: Airbnb; Product: news stories. Platform: Facebook
- Internal knowledge and capabilities / Crowd
  - GE Appliances' core designs, manufactures, and markets refrigerators and ovens. NASA's core builds spaceships. Microsoft's core develops personal computer operating systems and applications

THE REBALANCING IN DIFFERENT AREAS OF A BUSINESS

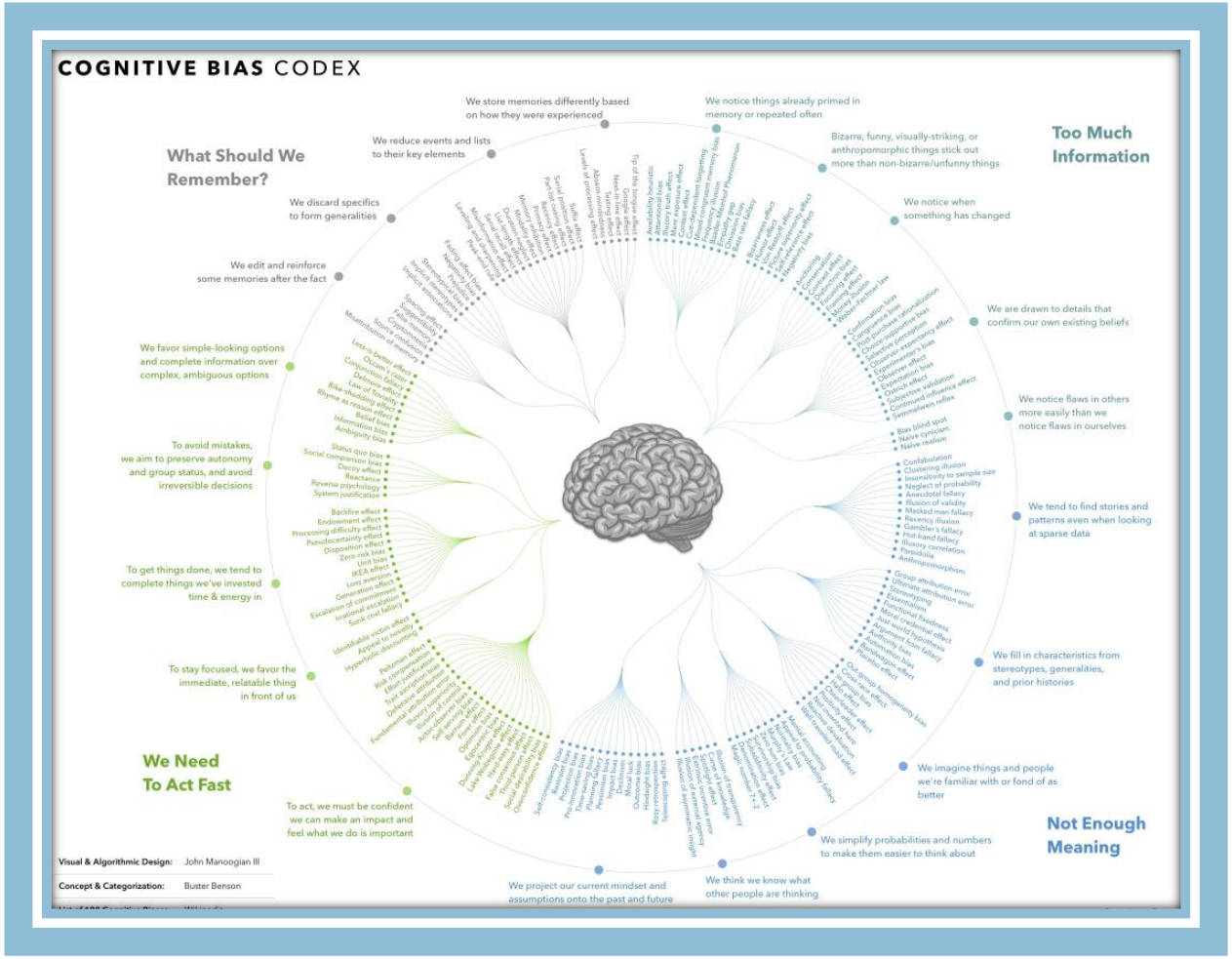
Business processes	• Between assigning work to minds vs. machines
Business models and offerings	• Between offering a product vs. building a digital platform
Organizational design	• Between relying on centralized core of knowledge vs. accessing a decentralized knowledge

TRADITIONAL DECISION MAKING

- Reliance on **intuition and instincts** of people with higher seniority to make decisions (HiPPOs - highest-paid person's opinions)
  - Standard partnership between mind and machine:
    - machines do math and record-keeping
    - people exercise **judgment** to make decisions
- Makes sense when data are scarce, expensive to obtain, not available in digital form
- Problem with traditional decision making: **cognitive bias**

COGNITIVE BIAS

- Discard specifics to form generalities
- Edit memories after the fact
- Favor simple-looking options
- Drawn to details that confirm own believes
- Think we know what other people are thinking



HOW HUMANS REASON AND EXERCISE JUDGMENT
(*Daniel Kahneman, Nobel Prize winner*)

System 1 thinking

- fast, automatic
- requires little conscious effort
- associated with intuition
- powerful but has many built-in biases
- **managers are often lauded for their quick thinking**

System 2 thinking

- slow
- deliberative
- takes a lot of effort for humans to use
- machines can do it quickly
- **deliberative data-driven decisions outperform System 1 decisions**

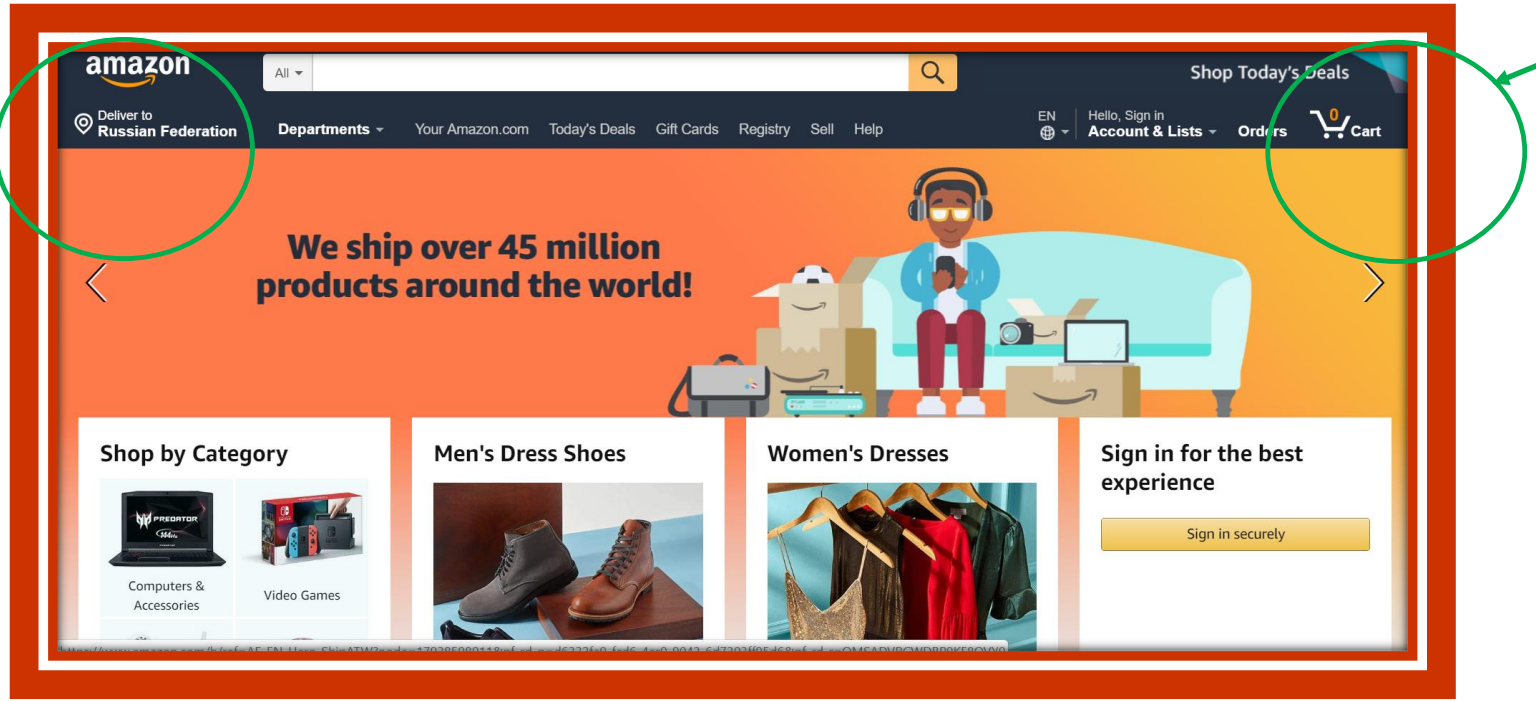
DATA-DRIVEN DECISION MAKING

- Reliance on the information and insights extracted from data analysis and experiments
- Digitized data available for decision making:
  - documents, news, music, photos, video, maps, requests for information (RFIs), responses to RFIs, data from all kinds of sensors, including mobile phones, etc.
- Combination of big data with instant access and growth of computing power:
  - objective data analysis
  - controlled experiments to make better decisions
- Data-driven decision making leads to improved decision making
  - research shows that the companies that are doing more digital, data-driven decision-making are on average significantly more productive, have higher performance, and more likely to be successful

DATA-DRIVEN DECISION MAKING: CASE 1 - AMAZON

Group A

Group B



DATA-DRIVEN DECISION MAKING: CASE 2 – HIRING AT GOOGLE

System I thinking approach

- Assumption: people are good at picking people
- Reliance on the expertise of HR consultants
- Main tool: unstructured job interviews
- Problem: *confirmation bias*
  - people make a snap judgment influenced by our existing beliefs
  - people then shift from assessing a candidate to *hunting for evidence that confirms their initial impression*

Data-driven approach

- Data-driven self-assessment of system performance
  - gathered data on Google's own hiring process and subsequent performance of new hires
- Main tool: structured job interviews
- Interviewers collected consistent data about the candidate
  - used that data to make consistent hiring decisions

BENEFITS OF DATA-DRIVEN DECISION MAKING

- Data-driven decision making is correlated with higher productivity
- Between 2005 and 2010, the use of data-driven decision making among at US manufacturing plants increased from 11% to 30% of plants
- Plants that adopted data-driven decision making had 4 key advantages,
  - high levels of information technology, educated workers, greater size, better awareness
- The more companies characterize themselves as data-driven, the better they performed on financial and operational results
  - firms in the top third of their industry in the use of data-driven decision making, on average, 6% more profitable than their competitors

ECONOMICS OF DATA-DRIVEN DECISION MAKING

- Why does data-driven decision making affect productivity?

- Economics of information: information is valuable only if it leads to
  1) a **change in a decision** and
  2) a **change in an outcome**

- Data used to **reinforce an existing decision** doesn't have economic value

HOW TO REBALANCE FOR AUTOMATED DECISION MAKING

- Towards 100% machine-based decisions?
- Rebalancing with common sense
  - human mind is great in spotting exceptional situations that aren't covered by the data
  - "the broken leg rule": people have a broader view of the world than stripped-down algorithms do
  - Persuading HiPPOs
    - tell a compelling story: use vivid anecdotes to interest the executive
    - document the research: present objective data for the course of action
    - provide a framework: give the executive a new way to think about the issue



GENERAL PURPOSE TECHNOLOGIES

- R. Solow (*Nobel Prize in economics*): growth comes from inventions of new, better technologies, NOT from working harder, putting in more hours, or even by investing more capital
- Three characteristics general purpose technologies (GPTs):
  - pervasive, improve over time and enable follow-on innovations.
- GPTs have the potential to remake economies and spur growth
- GTPs only have this impact when *complementary changes in practices* are made to take advantage of the unique properties of GPTs
  - example: the power source of a factory and the design of a factory should be complements
    - best available power source - steam engines; compact building with all factory tasks clustered close to the central steam engine - the best complementary design
    - best available power source - electric motors; low, sprawling building laid out by the order of the workflow of manufacturing steps - the best complementary design

THANK YOU

FOR REFERENCES CONTACT
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