The International Society of Service Innovation Professionals

ISSIP/NSF Workshop:

Industry-Academe research partnerships
to enable the human-technology frontier
for next generation smarter service systems

By Invitation Only

Engineering Robots To Live In and Learn With: Towards Smarter/Wiser Service Systems

Jim Spohrer (IBM) San Jose, CA, Wednesday March 29, 2017

http://www.slideshare.net/spohrer/issip-nsf-smart-service-systems-20170329-v1

ISSIP
PROMOTING SERVICE INNOVATION FOR OUR INTERCONNECTED WORLD

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Dedication: Douglas C. Engelbart

Father of the mouse and augmentation theory

Table 1 shows a simplified framework for classifying improving human performance areas as they relate to an individual (see also Spohrer 2002, in this volume).

Table 1. Main improvement areas relative to an individual

Relative position	Improvement area
External (outside the body), environmental	• New products: materials, devices and systems, agriculture and food • New agents: societal changes, organizations, robots, chat-bots, animals • New mediators: stationary tools and artifacts • New places: real, virtual, mixed
External, collective	• Enhanced group interaction and creativity • Unifying science education and learning
External, personal	• New mediators: mobile/wearable tools and artifacts
Internal (inside the body), temporary	• New ingestible medicines, food
Internal, permanent	• New organs: new sensors and effectors, implantables • New skills: converging technologies, new uses of old sensors and effectors • New genes: new genetics, cells

4. Strategies for Transformation

Science and engineering as well as societal activities are expected to change, regardless of whether there are policies to guide or promote such changes. To influence and accelerate changes in the most beneficial directions, it is not enough to wait patiently while scientists and engineers do their traditional work. Rather, the full advantages of NBIC developments may be achieved by making special efforts to break down barriers between fields and to develop the new intellectual and

Figure 2. Vision of the world as a distributed, interconnected "brain" with various architectural levels that can empower individuals with access to collective knowledge while safeguarding privacy.

Spohrer JC, Engelbart DC (2004) Converging technologies for enhancing human performance: Science and business perspectives. Annals of the New York Academy of Sciences.1013(1):50-82.

Roco MC, Bainbridge WS (2002) Converging technologies for improving human performance: Nanotechnology, biotechnology, information technology, and cognitive science. WTEC.
https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/bioecon-%28%23%20023SUPP%29%20NSF-NBIC.pdf

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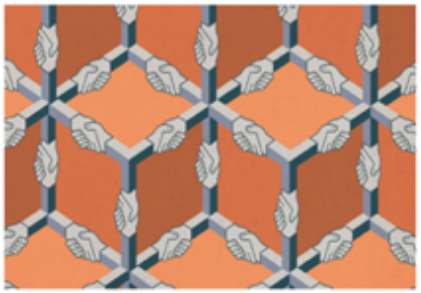
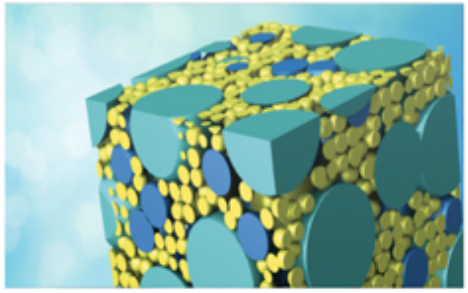
Artificial Intelligence/Augmented Intelligence

Augmented Reality

Open Technologies



Blockchain – Trust Economy



Material Science

Service System: Dynamic configuration of people, technology, information, and organization connected internally and externally by value propositions. [socio-economic-technical systems]

Smart Service Systems: People and organization are augmented with cognitive systems.

Spohrer J, Maglio PP, Bailey J, Gruhl D (2017) Steps toward a science of service systems. Computer. 40(1).

Spohrer J, Bassano C, Piciocchi P, Siddike MA (2017) What Makes a System Smart? Wise? In Advances in The Human Side of Service Engineering 2017 (pp. 23-34). Springer International Publishing.

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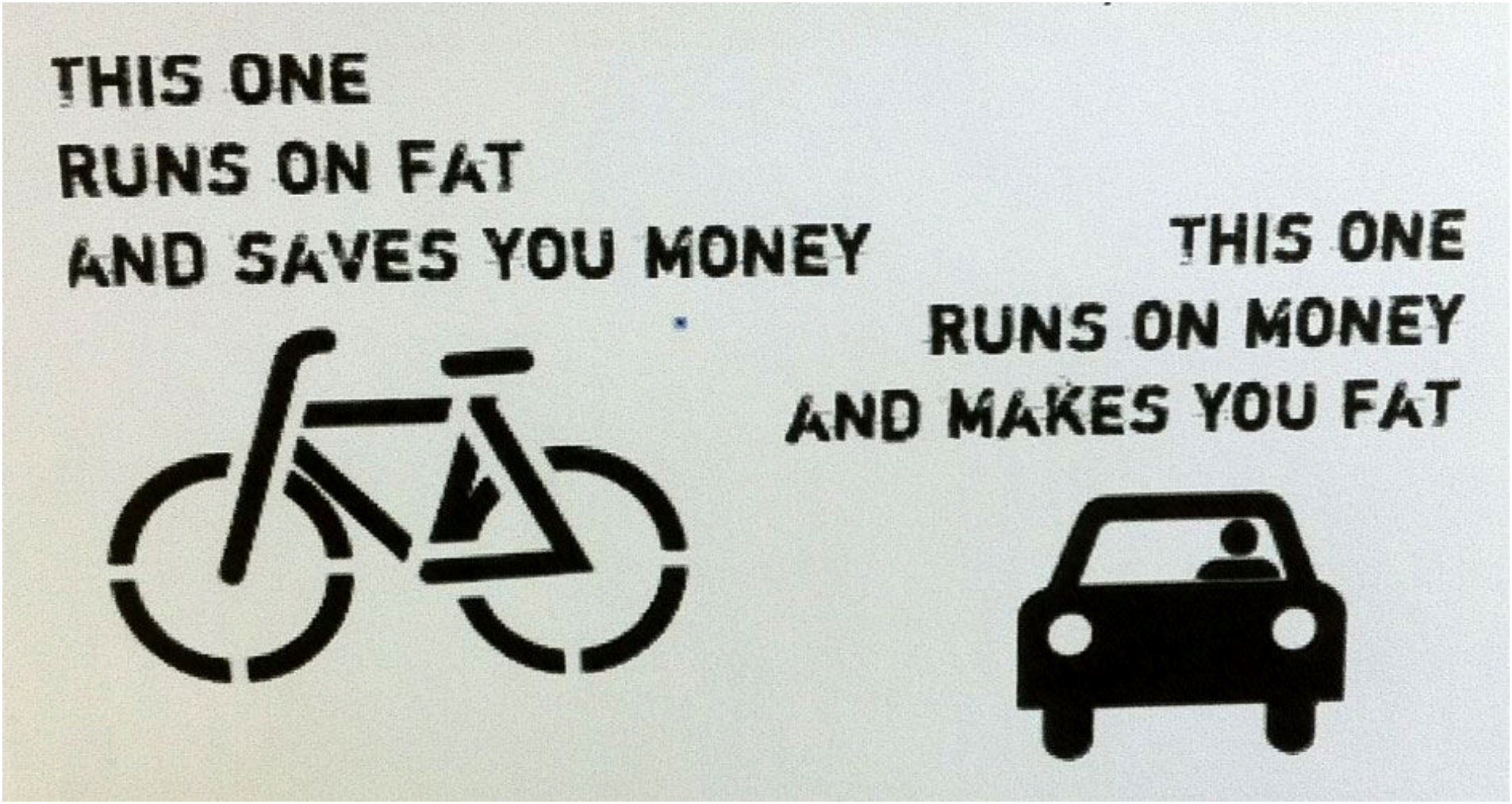
Engineering Tools to Augment



Harris S, Karkauer D (2016) Complexity& Stupidity. A Conversation with David Krakauer. Sam Harris Podcast

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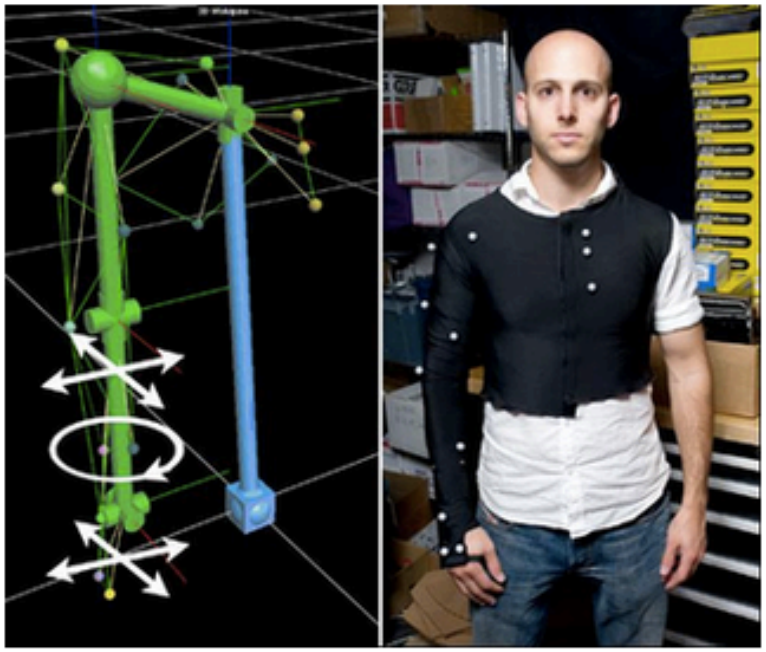
Robot Suit May Help You Achieve a Perfect Golf Swing

October 31, 2007 By Lisa Zyga feature



A robotic feedback suit: markers on the right arm indicate the joints that are regulated by the system. Credit: Lieberman and Breazeal. ©2007 IEEE.

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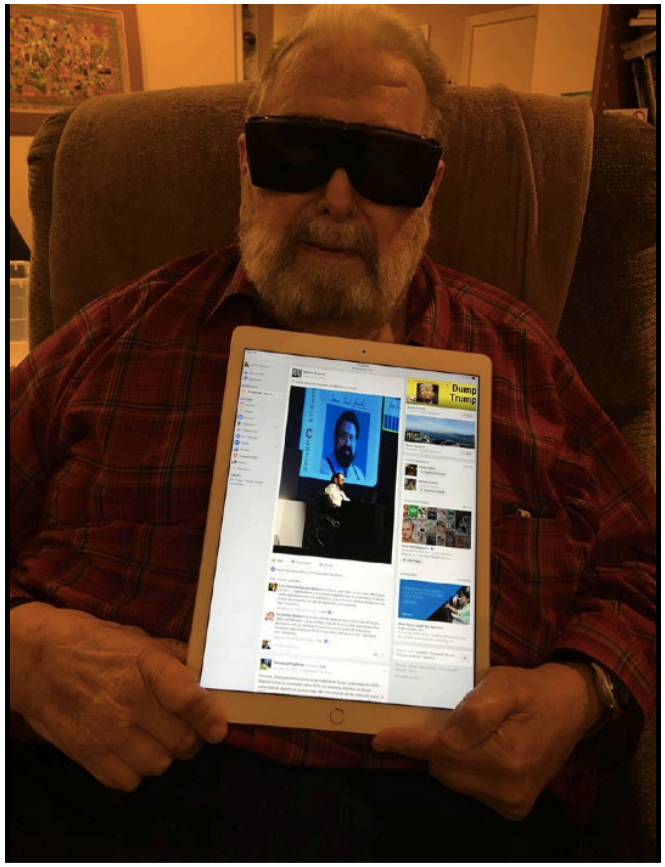
Engineering Robots We Will Live In and Learn With

- Exoskeletons Clothing
- Driveless Cars
- Furniture, Chairs, Beds
- Robotic Houses
- Healthy Neighborhoods
- Robotic Cities



Amigos do Jean Paul Jacob
https://www.facebook.com/groups/jeanpauljacob/

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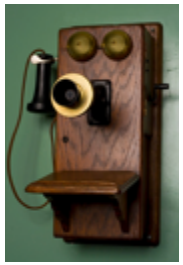
Can better service help us be wiser?



1955

1975

1995

2015

2035

2055

Cognitive Mediator (2035): Tool, Assistant, Collaborator, Coach, Mediator
Open Technologies will enable this and more…

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Almaden Institute

IBM

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Definitions: AI vs IA

AI is Artificial Intelligence, or
intelligence in machines (smart machines)

Cognition as a Service (CaaS):
AI building blocks for IA solutions

IA is Intelligence Augmentation, or
people thinking and working together with smart machines.

IA is what IBM calls “Cognitive Computing” and
the smart machines are called “Watson Solutions” or
more generally “Digital Cognitive Systems (Cogs)”

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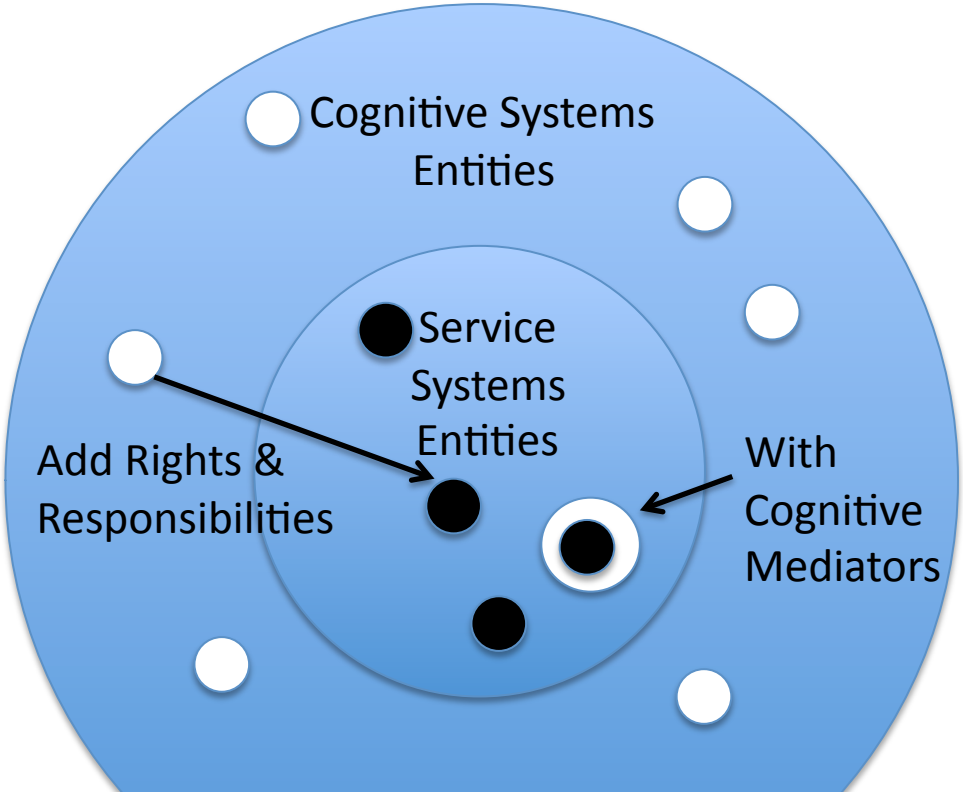
In Summary



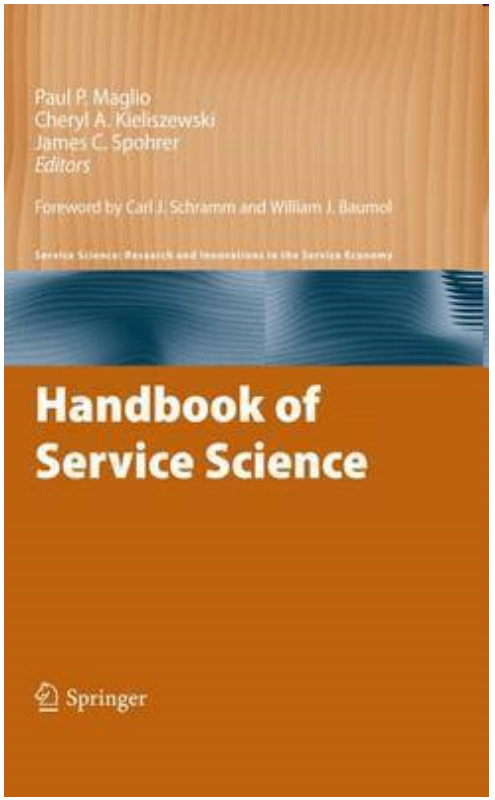
IBM Watson

Apple Siri

Microsoft Cortana

Google Now

Amazon Echo



"A service science perspective considers the evolving ecology of service system entities, their value co-creation and capability co-elevation interactions, and their capabilities, constraints, rights, and responsibilities."

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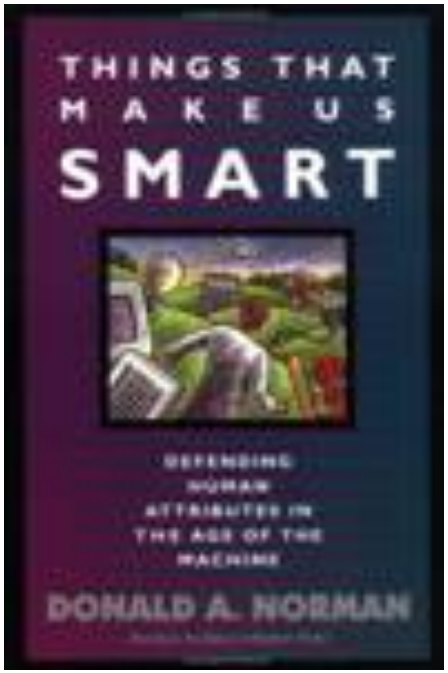
Some paths to becoming 64x smarter:

Improving learning and performance

- 2x from Learning sciences (methods)
  - Better models of concepts
  - Better models of learners
- 2x from Learning technology (tools)
  - Guided learning paths
  - Elimination of "thrashing"
- 2x from Quantity effect (overlaps)
  - More you know, faster you go
  - Advanced organizers
- 2x from Lifelong learning (time)
  - Longer lives and longer careers
  - Keeps "learning-mode" activated
- 2x from Early learning (time)
  - Start earlier: Challenged-based approach
  - STEM-2D in K-12 (SSME+DAPP Design of Smart Service Systems)
- 2x from Cognitive systems (performance support)
  - Technology & Infrastructure Interactions
  - Organizations & Others Interactions



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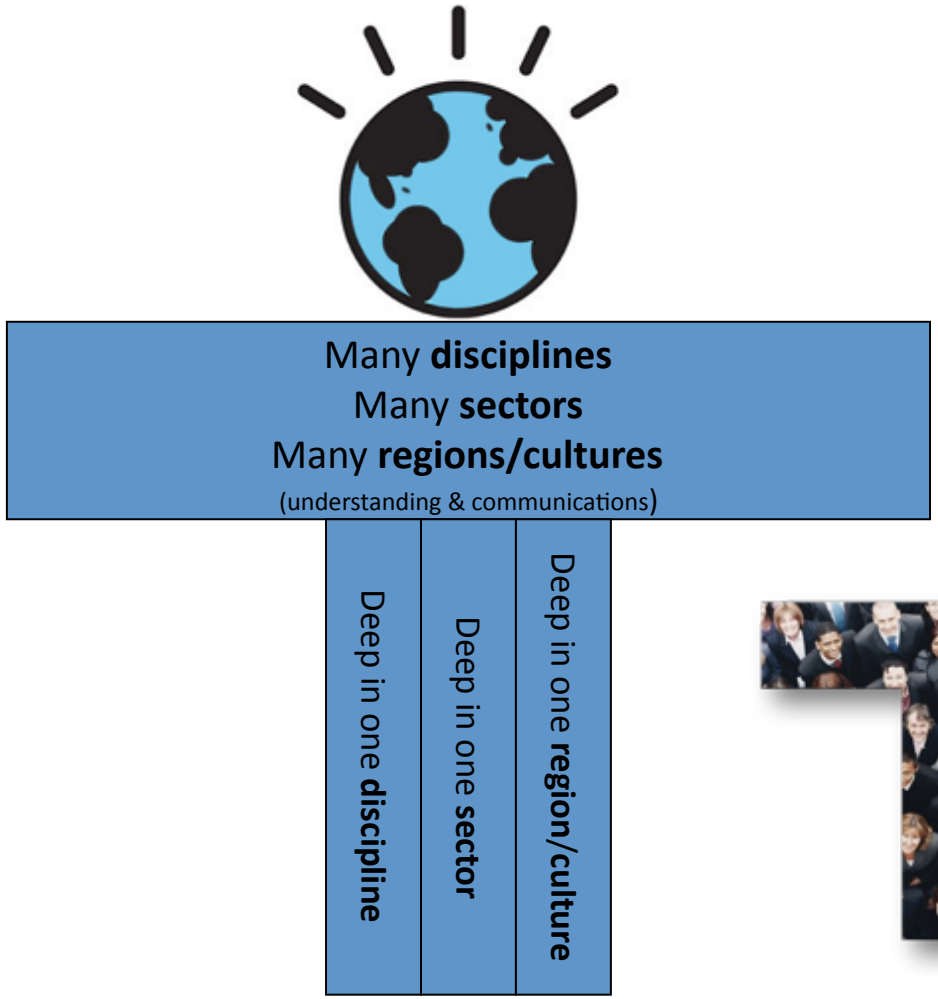
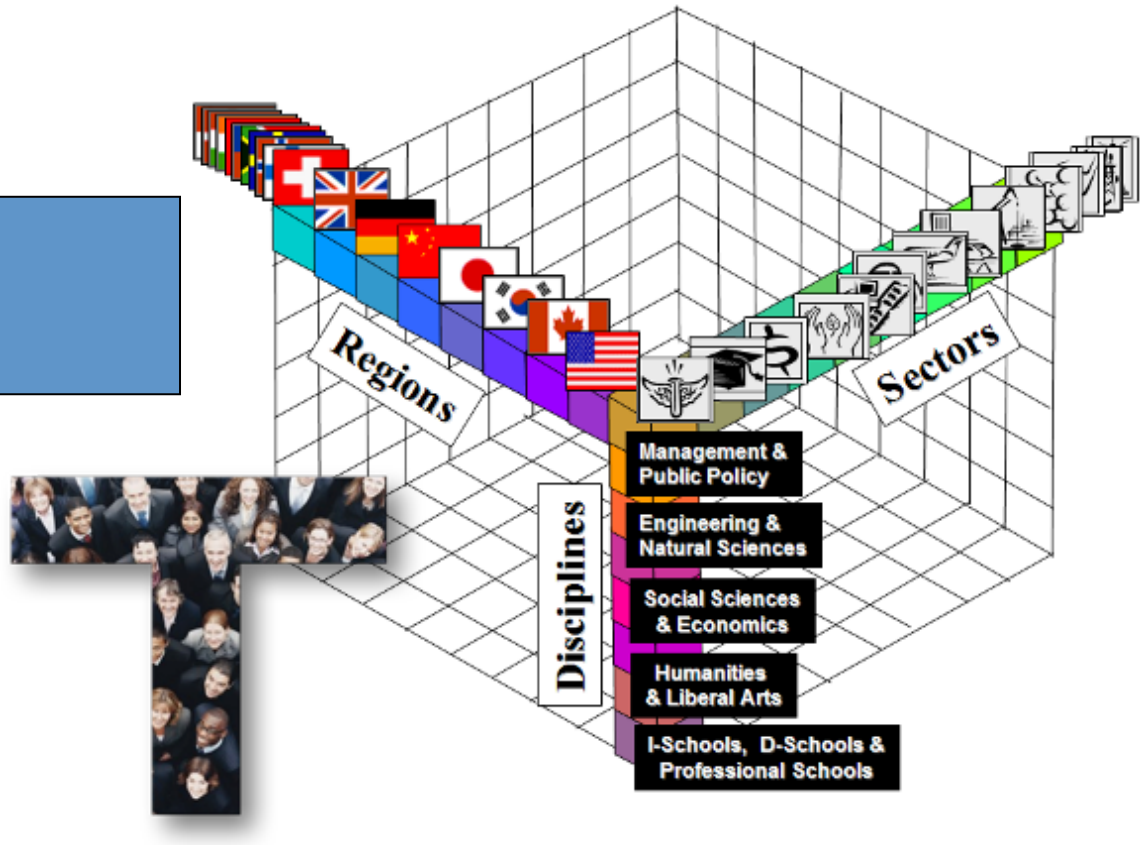
Next Generation:

Future-Ready T-Shaped Adaptive Innovators





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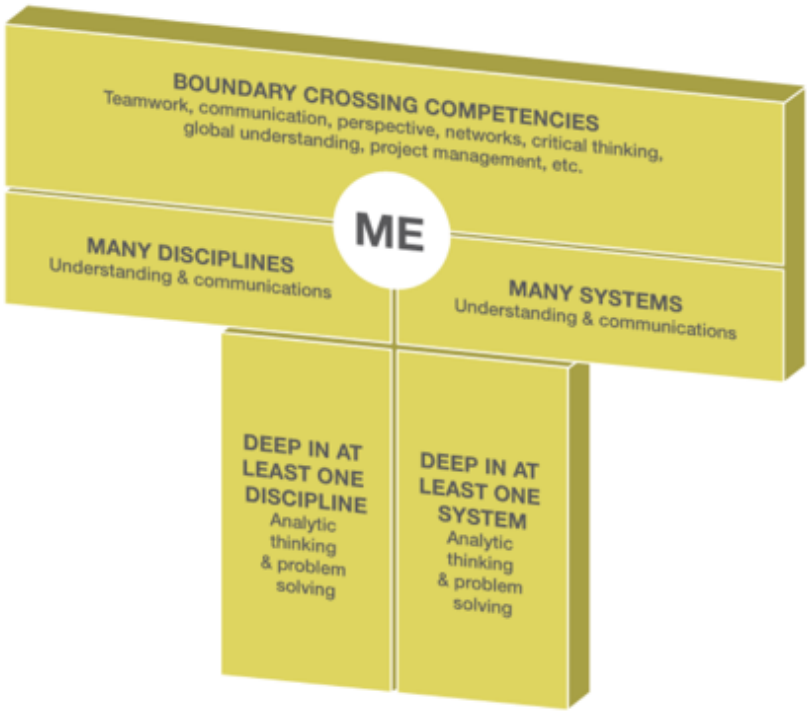
Future-Ready T-Shapes



The ME in the T: Can-Do Attitude

Summary of Dweck's *Mindset*

Fixed vs Growth

ability is static		ability is developed
avoids challenges		embraces challenges
gives up easily		persists in obstacles
sees effort as fruitless		sees effort as necessary
ignores useful criticism		learns from criticism
threatened by others		inspired by others' success

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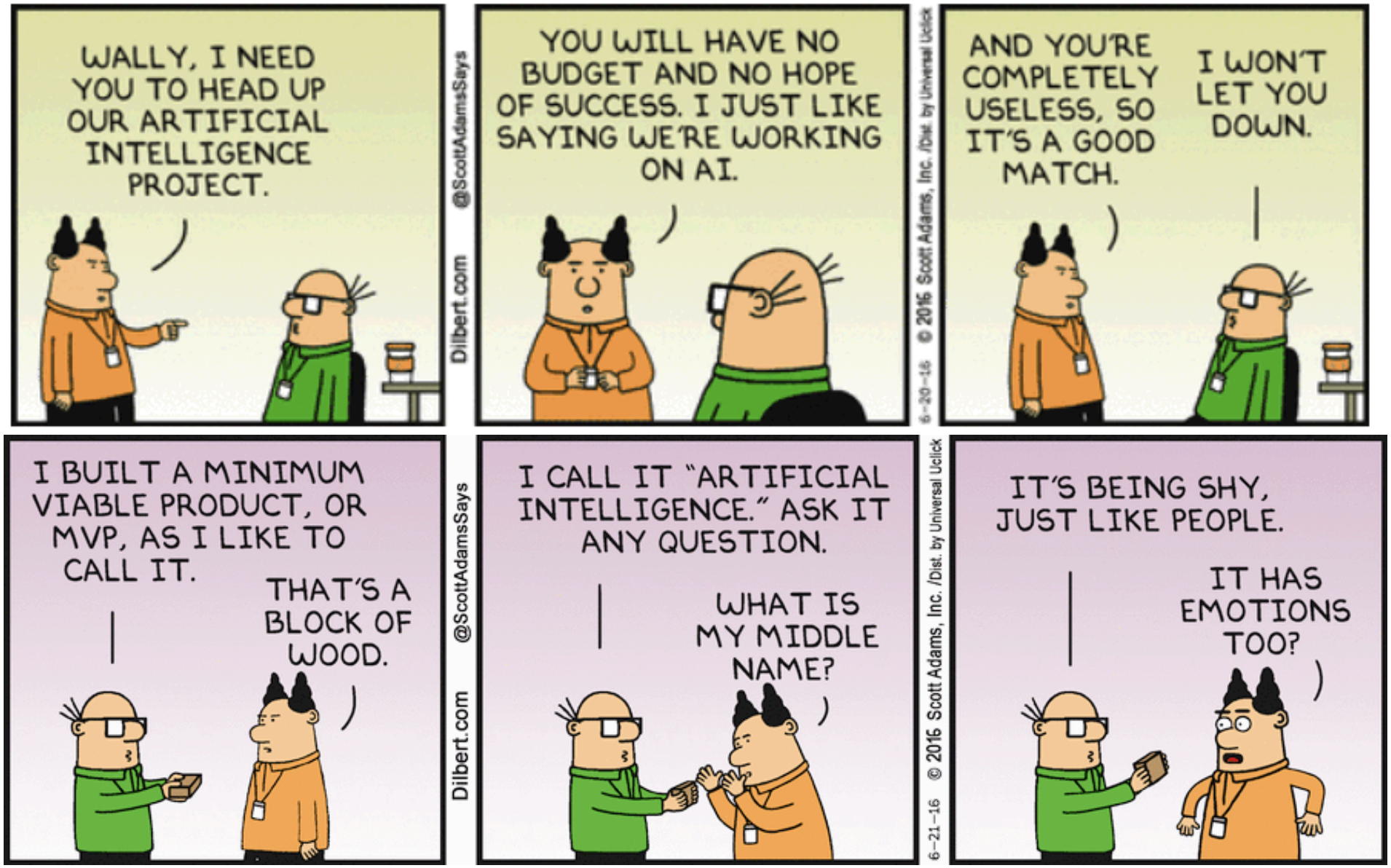
But this stuff is still really hard…