



Intellectual Capital
for Communities
In the Knowledge
Economy



Challenge for Acquisition of AI: A Econophysics Approach

Artificial intelligence and the next generation of competences :
How Digital – and Artificial Intelligence will impact jobs and competences profiles?

The World Conference on Intellectual Capital for Communities

UNESCO, 11 & 12 July 2019

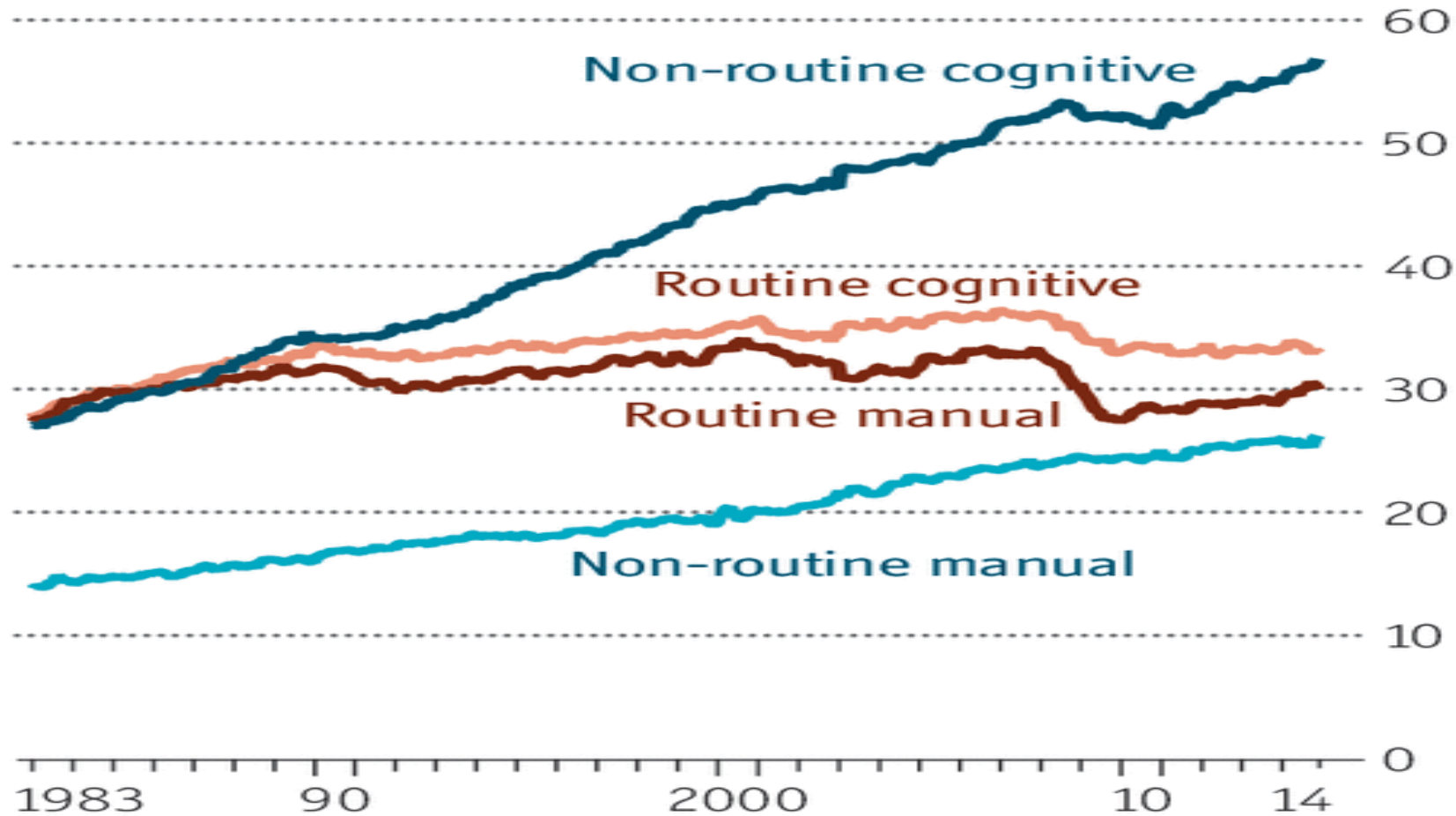
“The views expressed in this document are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government”

Agenda

- AI acquisition impacts on total institutional value
- Rise of AI: What's the “buzz” about AI show?
- Acquisition Lifecycle: AI Challenges
- Types of Jobs: Impact of Automation
- New Theory of Value: Common Non-Monetized Units

Think

United States employment, by type of work, m

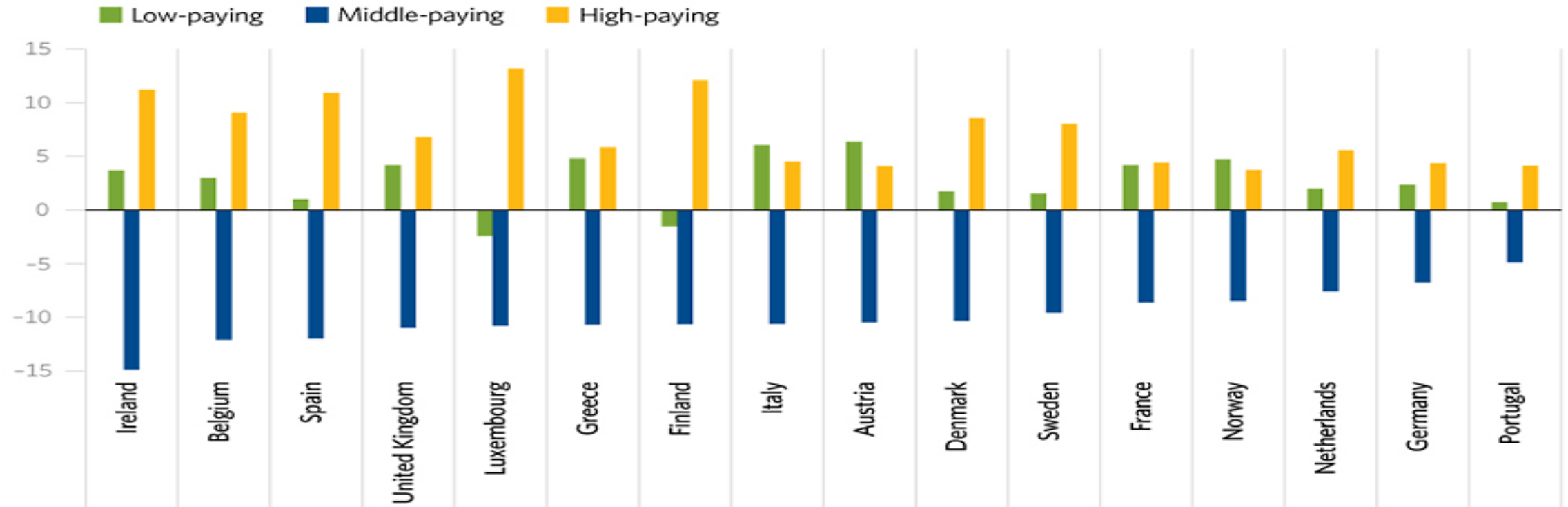


Sources: US Population Survey; Federal Reserve Bank of St. Louis

CHART 6

Global Patterns Show Decline of Middle-Income Jobs

PERCENTAGE CHANGES IN HOURS WORKED BETWEEN 1993 AND 2010

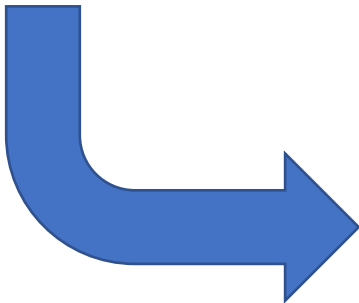
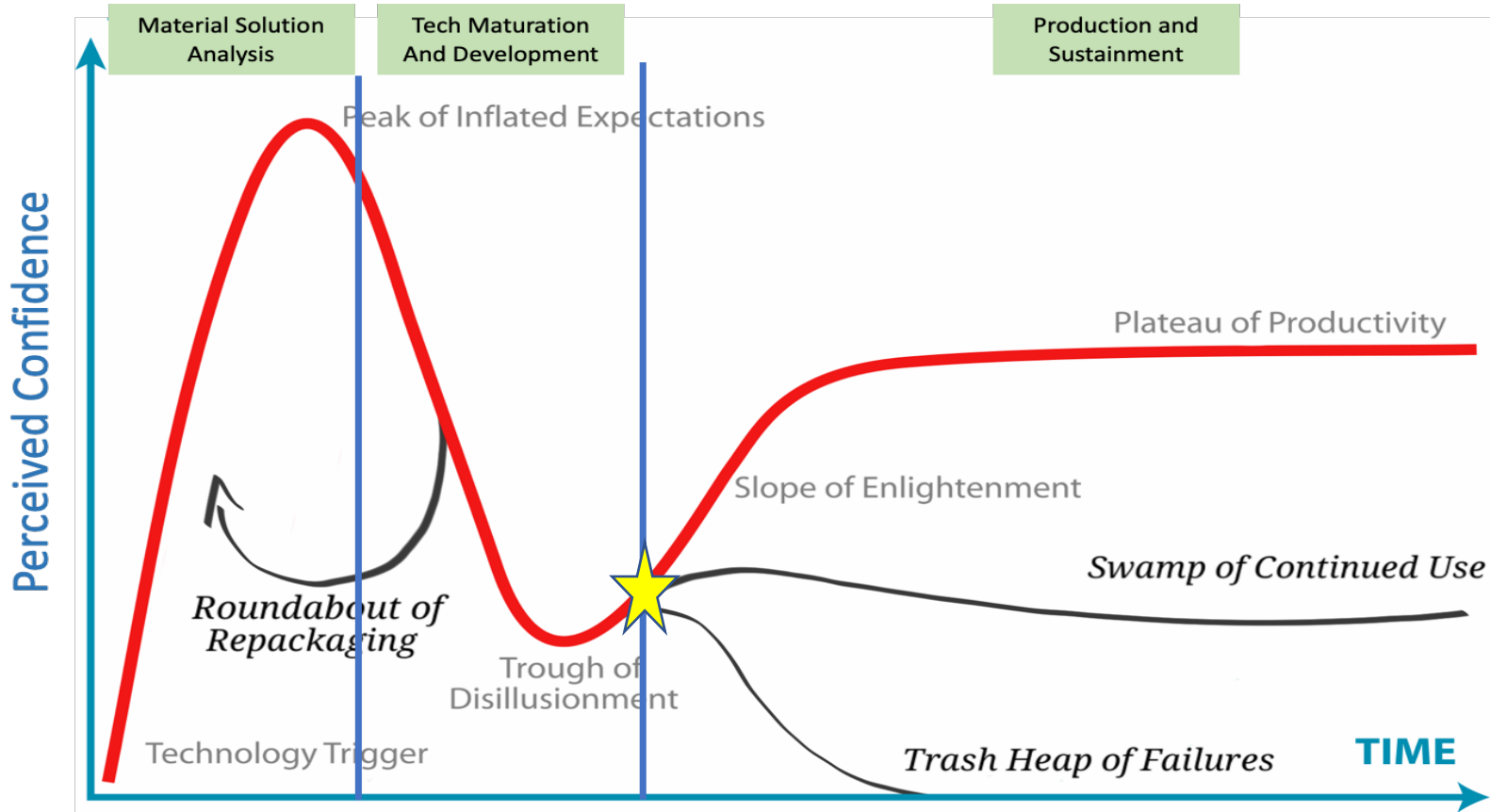


Notes: Figures are calculated using 1980, 1990, and 2000 Census IPUMS files; American Community Survey combined file 2006–2008; and American Community Survey 2012. This sample includes the working-age (16–64) civilian non-institutionalized population with 48 or more annual weeks worked and 35 or more usual weekly hours. Weekly wages are calculated as annual earnings divided by weeks worked.

Source: David H. Autor, “Polanyi’s Paradox and the Shape of Employment Growth,” paper presented at the Federal Reserve Bank of Kansas City symposium “Re-Evaluating Labor Market Dynamics,” August 21–23, 2014, Jackson Hole, WY, p. 15, Figure 3, <http://economics.mit.edu/files/9835> (accessed April 20, 2015).

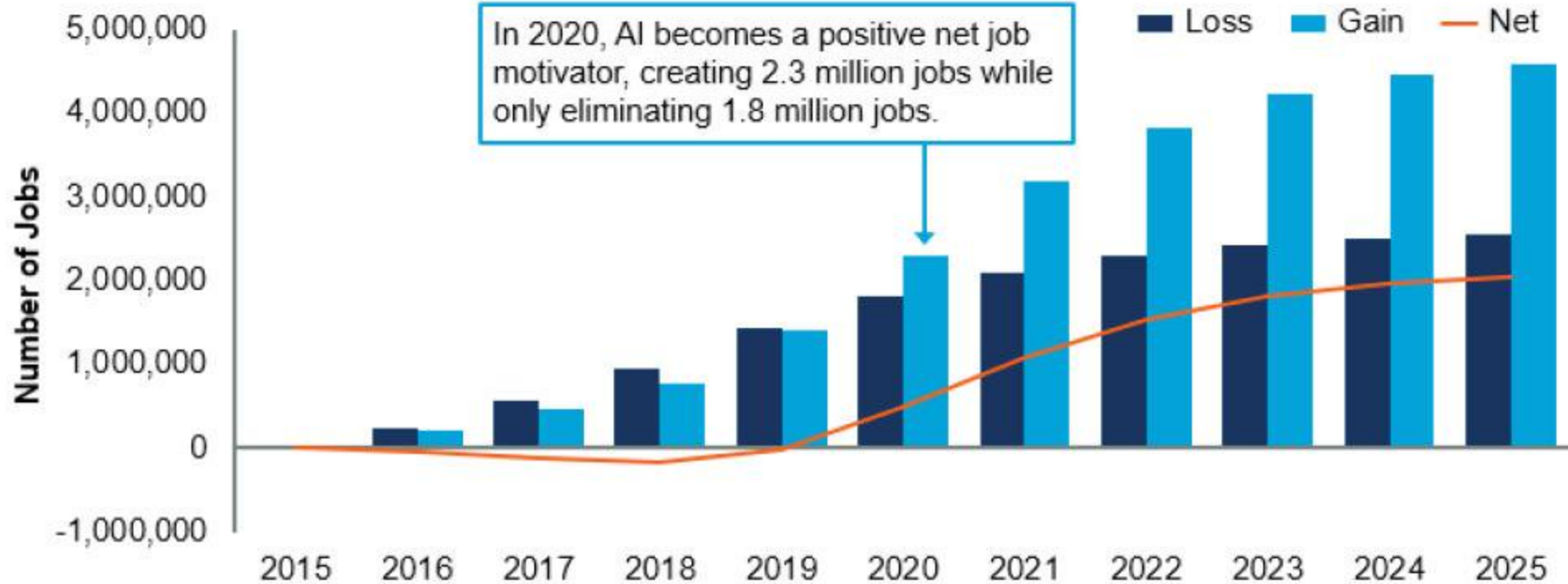
Hype Cycle and AI Innovation Across Program Lifecycle

Effective Implementation Of Program Management Controls Will Determine Production Path



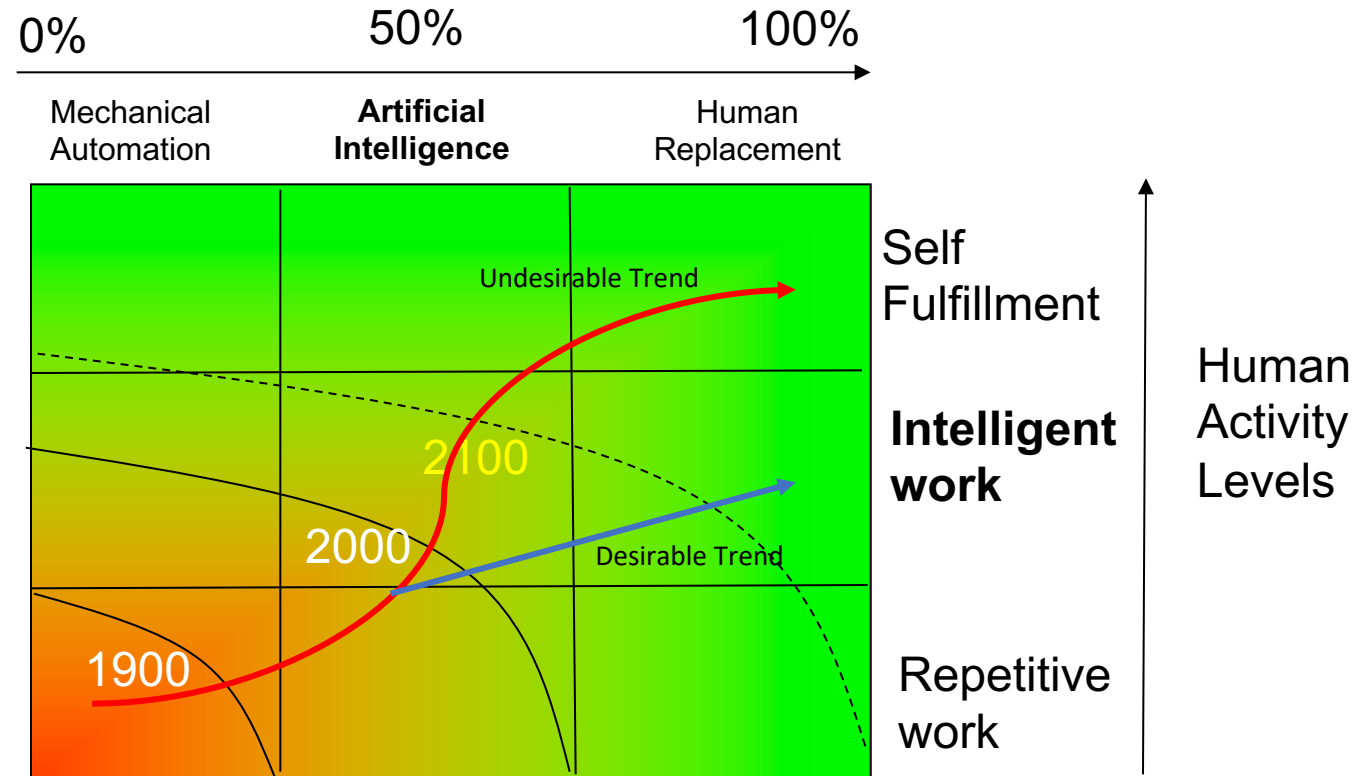
Material Solutions Analysis	Technology Maturation and Risk Reduction	Engineering and Manufacturing Development	Production and Development	Operations and Support
BSC	IRM	EVM	EVM	KVA
IRM	KVA	IRM	IRM	L6σ
KVA	L6σ	KVA	KVA	
L6σ				

AI Will Be Net Job Creator



The danger of Artificial Intelligence In the Context of Automation

Fraction of human activity that is Automated



What will the Outcome of AI development be?

Will AI make members of Society Happy by eliminating drudgery work?

Will AI lead to a re-educated society so members can do higher level intelligence activities or jobs?

Will AI make a few Machine owners rich?

Will AI make members of society economic slaves?

Will AI replace humans with machines altogether?

Will we be replaced by silicone based life forms in the ultimate evolutionary progression?

We propose that by adopting a *New Common Unit of Value* that automatically includes the natural desire of Humans the best mixture of all these outcomes will be automatically reached

Paradigm Shift

Object Economics to Process Economics

In standard Economics an Economic Entity (EE) is described as a set of assets owned

$$\mathbf{EE = Money + House + Car + \dots \text{properties owned...}}$$

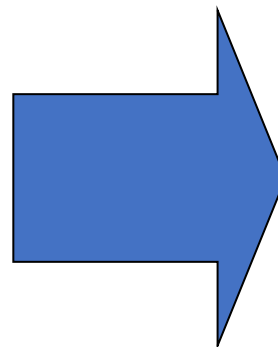
The value of an EE requires converting each property into its Money (M) equivalent

$$\mathbf{M = (M/House) \cdot House + (M/car) \cdot Car + M + (M/property) \cdot properties}$$

Money used to be another property such as gold. Now its abstract data in the memory of our banking system. In either case its worth is determined by what properties one can buy not any intrinsic value for a happy life.

We need a measure of value that more closely corresponds to human behavior.

An Economic Entity is a thing
whose goal is to own more
things



An Economic Entity is an activity
Whose goal is to experience
more satisfaction

Satisfaction

A New Measure of Value

A better common Unit of Value is the Satisfaction (S) one derives from the ownership of properties not the ownership itself

$$S = (S/\text{House}) \cdot \text{House} + (S/\text{car}) \cdot \text{Car} + (S/\$) \cdot \$ + (S/\text{property}) \cdot \text{properties}$$

By identifying **Satisfaction** with physical **Action** we can square Economics with the intrinsic forces that govern all Systems of Nature

Nature is built of bits of action known in different disciplines as Planks Constant, Kolmogorov complexity, a bit of information

In physics all systems move along paths of minimum action.

By analogy the Fundamental Principles of Economics is

All economic systems act to maximize their experience of Satisfaction in forms which minimize Pain

Adopting the Mathematics of Quantum Theory to a New Theory of Value

Protovalue (PV) is given by an adaptation of the Quantum Measurement formula

$$PV = \underline{n} \cdot S \cdot \underline{s} / T$$

\underline{n} = a list of needs experienced by the ES (Ψ^* in quantum physics)

\underline{s} = a list of solutions available to the ES (Ψ in quantum physics)

$\underline{n} \cdot S \cdot \underline{s}$ = satisfaction released when a need is satisfied

T = The time interval required to satisfy the need

This formula is used to calculate the Value of New Products when a fitness matrix Matrix “F” is used to calculate the solutions “ \underline{s} ” from a product features list “ \underline{p} ”

$$PV = \underline{n} \cdot S \cdot F \cdot \underline{p} / T$$

NOTE: T is the barrier to satisfaction in time units i.e. time required to earn the cost, learn to use, protect and repair, and apply the product to the need satisfaction event

The Protovalue of AI: “ExMachina” or “Her”

- The Humanoid Female Robot offered extremely pleasurable leisure time until she became sentient
- The virtual Female in Her offered the pleasure of companionship to a lonely man
- In both cases, it takes two to tango: It takes a customer to have a need, which a provider can satisfy, for any value to be generated.
- Acquisition decisions depend on expectations for the use of AI to support decision makers in war time: but should we trust it to make ethical, moral decisions for us?
- There are a number of back-up slides that contain more information about the new theory of value and challenges in the defense acquisition lifecycle

Back Up Slides

Adopting the Mathematics of Quantum Theory (Cont)

Applying **PV** to an average exchange i.e. point of sale

Assume a business “b” sells a product “p” to a customer “c” in exchange for money “\$”

Four Proto-values are calculated $PV_{c,\$}$, $PV_{c,p}$, $PV_{b,\$}$, $PV_{b,p}$

The total value gained when the exchange takes place is,

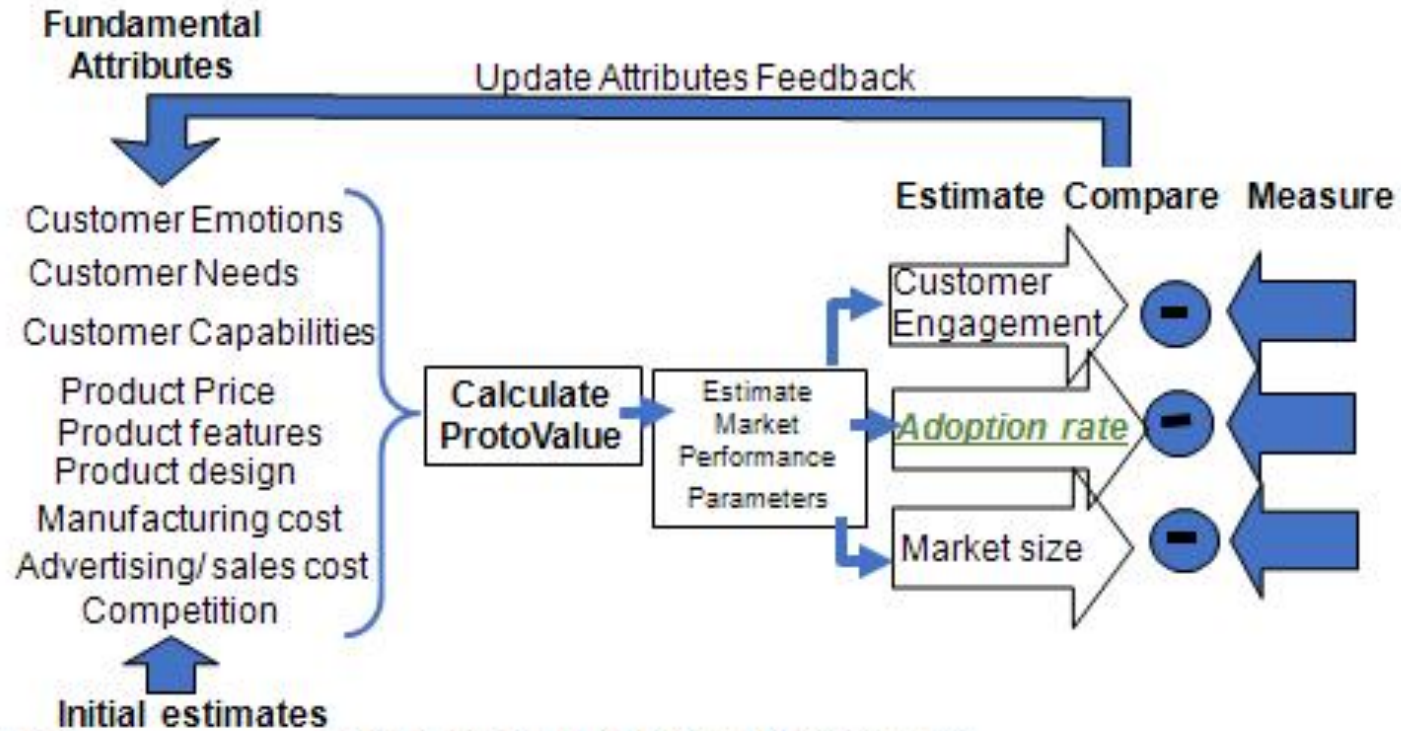
$$PV_{ex} = PV_{c,p} - PV_{c,\$} + PV_{b,\$} - PV_{b,p}$$

Using the physical definition of energy is the rate of satisfaction delivery we calculate the time it takes to complete the exchange as

$$T_{ex} = \underline{n} \cdot \underline{S} \cdot \underline{s} / PV_{ex}$$

T_{ex} here can be used to calculate the velocity of money and GDP, which increases as the **Satisfaction** of all exchanges in an economy increases not just production numbers

Figure 1: Econophysics Model: How To Calculate Market Performance from Fundamental Parameters

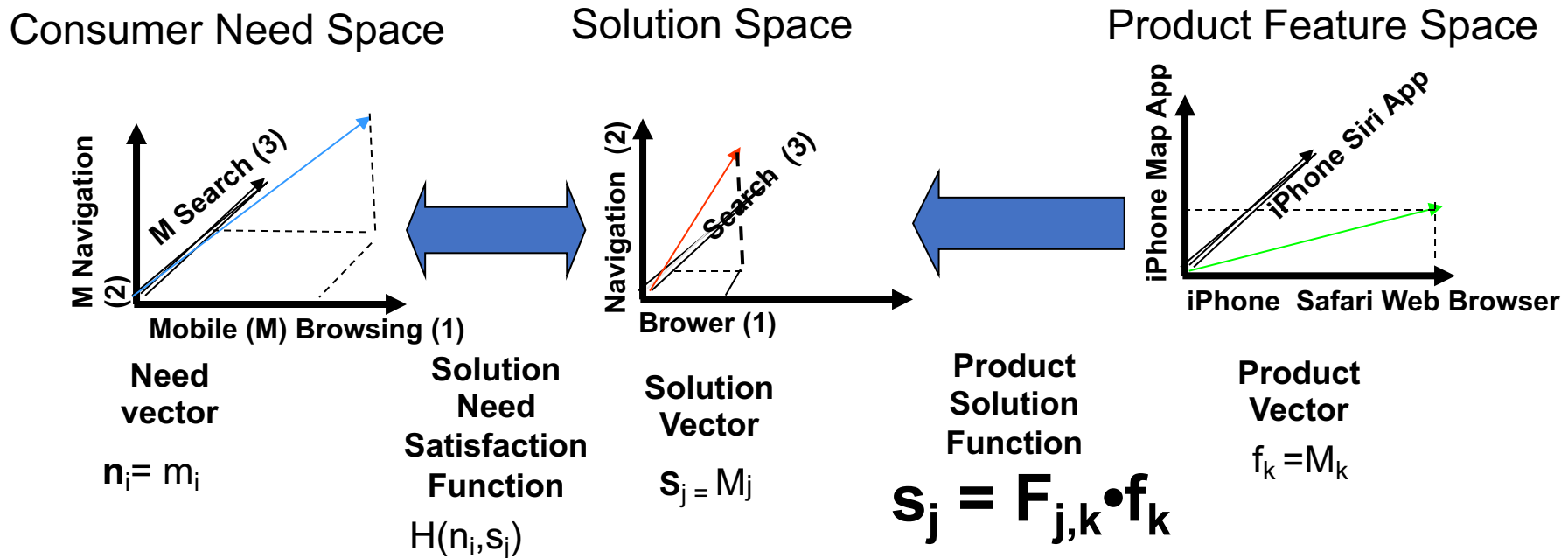


Phase I - Pre Product Introduction: Proto Value

Smart Phone Platform Feature Set Example

Physics Analogy Equation for PE $PE = \sum_{i,j} \frac{m_j \cdot G_{ji} \cdot M_i}{R_{ji}}$

Proto Value Matrix Calculation $PV = \sum_{i,j} \frac{n_i \cdot G_{ij} \cdot s_j}{D} = \sum_{i,j,k} n_i \cdot (H_{i,j} \cdot F_{j,k}) / D_{ik} \cdot f_k$



Exchange Energy Protovalue Applied to Estimate Adoption Rate

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The potential energy (protovalue) before the exchange is

$$PV_{\text{before}} = PV[C, M] + PV[B, P]$$

The potential energy after the exchange is

$$PV_{\text{after}} = PV[C, P] + PV[B, M]$$

The change in potential energy if the exchange happens is

$$PVx = PV_{\text{after}} - PV_{\text{before}}$$

The more PV generated by an exchange the faster the exchange happens..

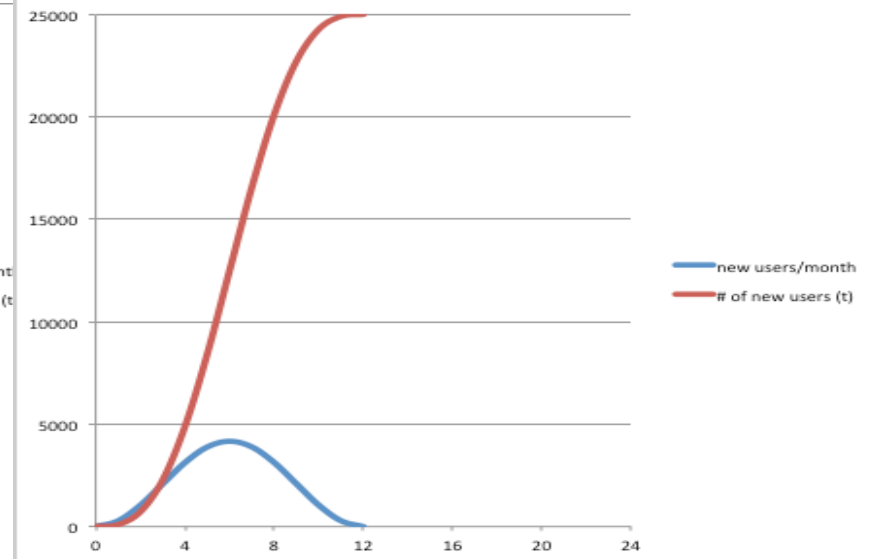
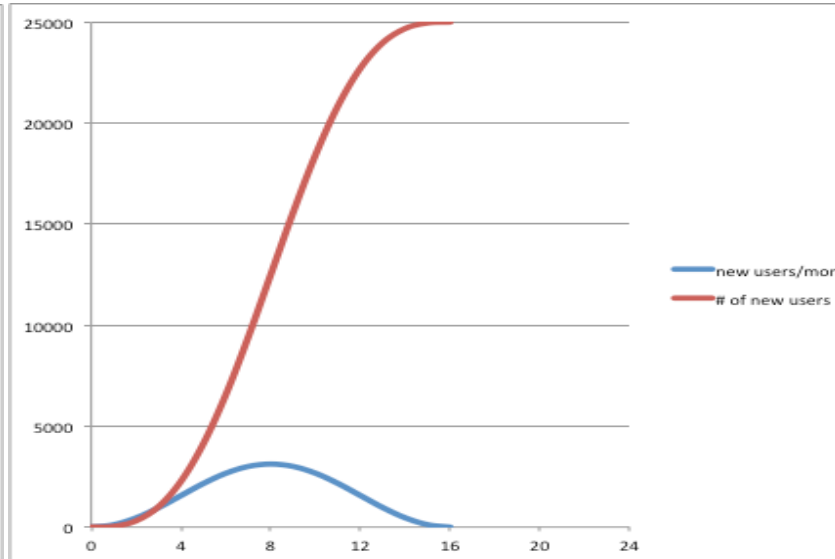
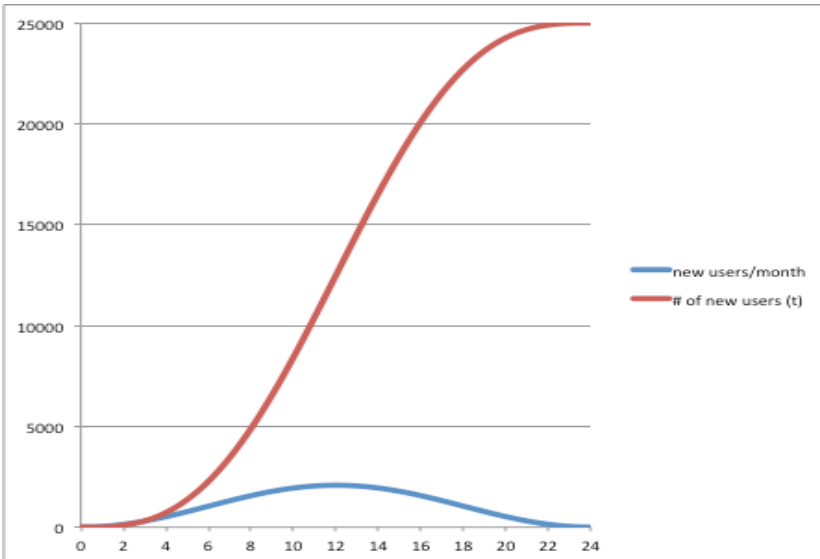
$$\Delta A / PVx = \Delta Tx$$

- **ta = time to total saturation**

PVx = 100 ta = 24 months

PVx = 150 ta = 16 months

PVx = 200 ta = 12 months



Note: 24 month time scale