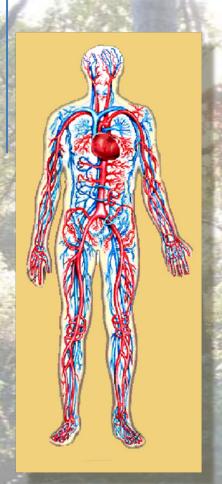
Total Environmental Assessment

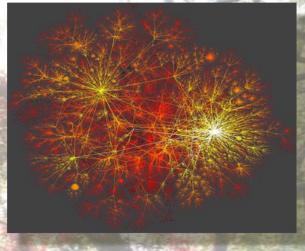
- Natural Systems only work as wholes
 - Technology & Economic impacts are incurred together.
 - Technology Footprint + Economic delivery system footprint
- Macro & Micro Rebound Effects
 - Business Development Start-up, Maturation, Break-down
 - Economic Feedbacks, Dependencies, Opportunity costs
 - Environment Resource Discovery, Development, Depletion
- Analytical Methods
 - •Whole system measure set boundaries and find parts
 - Combining measures with different units
- The Philosophical Problem what we can't categorize
 - •Nature doesn't work with weighted categories, but builds networks of complementary parts that act as a whole.



Accounting systems / Natural systems

Every system counts on all its parts & is built by them









•Every part counts on ALL its systems, the lathe on the operator & the business, the business on the town and community it's finance, culture and networks of supporting industries

Accounting systems / Natural systems

•H.T. Odum Model

Listing Inputs to an equation

Numerical Variables

Defined Relations

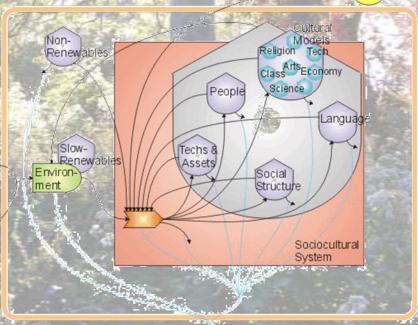


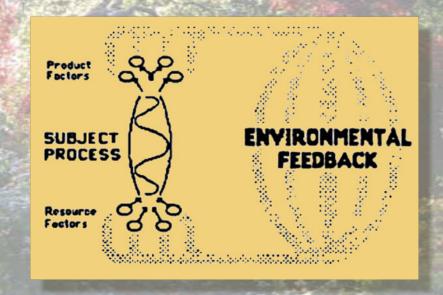
Whole System Diagram

Pointing to Individual Wholes

Collect-Transform-Distribute

Physical Processes





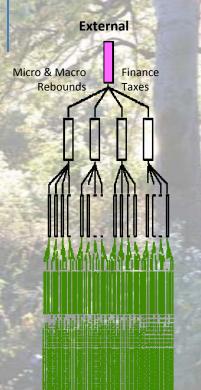
Tide

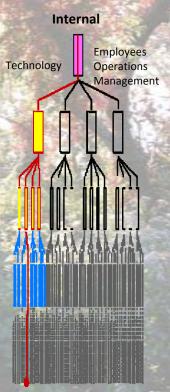
Uplift

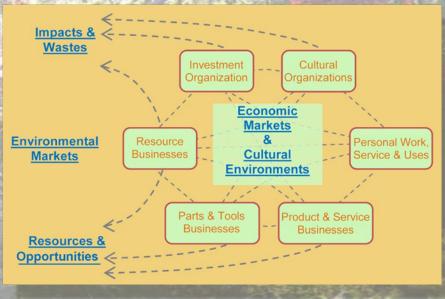
Accounting systems / Natural systems

- Technology Footprint
- Economic Footprint
- Micro-Economic Rebound Effects
- Macro-Economic Rebound Effects

- Business Service Network
- Labor Resources
- •Cultural Resources
- •Financial Resources







What they have in common also sets the boundary of their impacts, their value in S as a share of the system's total

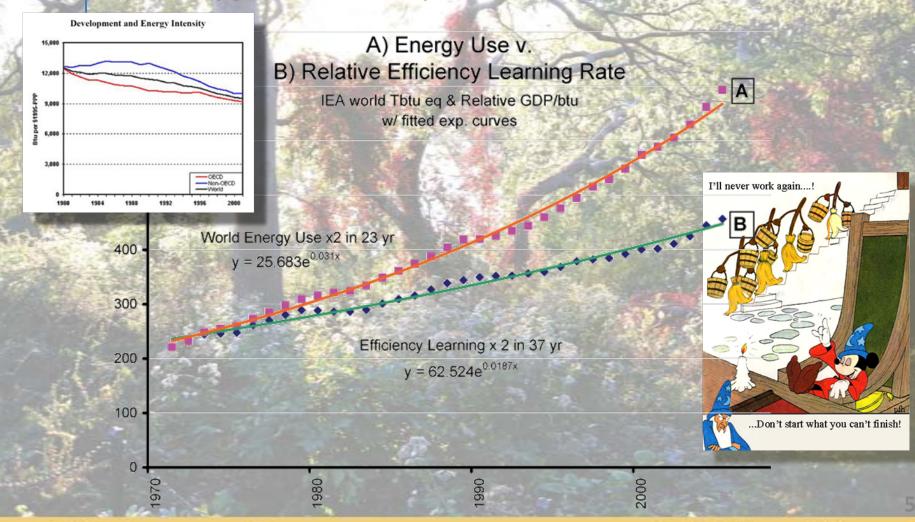




Measure from the world as a whole

Why efficiency improvement inevitably grows economic impacts

•Why "average" growing impact is a good estimate to start with



Whole system accounting

Direct impacts — how the product uses its environment both for deterministic & opportunistic causes

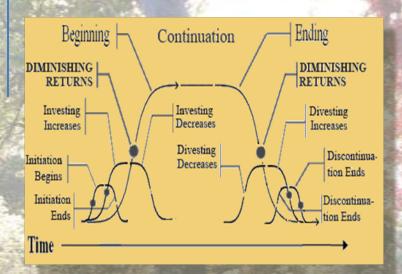
- •Add estimated average Economic Footprint = ~6000btu/\$ (2008\$)
- + Technological footprint within two degrees of separation (two steps of spending on 1000 things = 1 million degrees of distribution)
- + Unique impacts, = Unique compensations = "first pass total"
- •Combining "apples & oranges", measures with dissimilar units



Whole system accounting

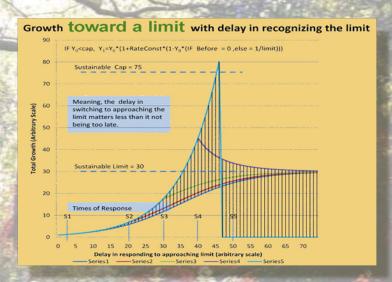
Time Impacts – how the business changes its environment

•Business development stages beginning & ending



- Costs of beginning & ending
 - Development impacts share
 - •Impacts of how profits used (+/-)
 - Dismantling & Restoration share
- •Resource impacts
 - Sustainable development (+)
 - Depletion opportunity cost (-)

 Resource development maturation or exhaustion

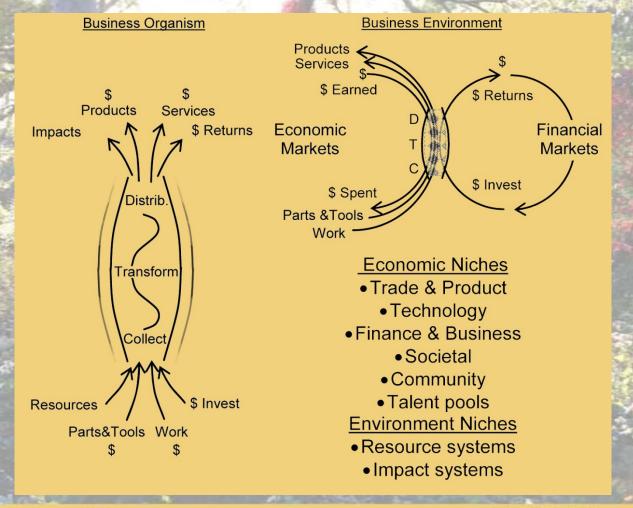


- Virtuous rebound effects
 - Sustainable circles, prompt response
 - Self-limitation & education
 - Maturation & diversity
- Vicious rebound effects
 - Unsustainable dependencies
 - Slow response to limits

Individual System Accounting Model

- •Individual Whole System
- A product's share of whole

- Economic Niches & Finance
- Environmental Niches







EA

Outline list of categories

Technology system Economic delivery system

Impacts from

Raw Matl. & Supply Oper. Matl. & supply Serv. Matl. & supply

\$ Products

business consumer



\$ Services

business consumer

\$ Returns

venture capital self-investment public stock bonds transaction financing mortgages employee plans

Collect, Transform, Distribute

Environ **Feedbacks**

1st greater access & lower cost then depletion & diminishing returns footprint overlap dependencies diversity loss change

Resources

\$ raw materials free space ecosystem opportunity

Business Feedbacks

growth & maturation increased competition industry change technology change remaking plans dependencies diversity loss change

\$ Plant & Supply

plant equipment office furniture computers climate control components material supplies utilities

Cost & Opportunity Over Time Trans

Divergence?

Community **Feedbacks**

public investment support then burden social change increasing entitlements regulation needs dependencies diversity loss change

\$ Labor & Services

warrantees insurance management accountants product design marketing & sales staff & labor maintenance transport

Starting events

1st idea, venture \$



Ending events

depletion limit investor break

\$ Financing

venture capital self-investment public stock bonds transaction financing mortgages employee plans





The Philosophical Problem

- •Nature doesn't create impact systems using weighted categories, but as wholes built around complementary parts.
- Nature uses "life", storms of connections that act as a whole, building on complementary opposites somewhat beyond categorization.
- Technology & Econ impacts incurred with the same choices.
- •That nature doesn't connect parts the way we think is why we need to watch systems behave as a whole.



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