Trading Zones, Interactional Expertise and Service Science

Michael E. Gorman
(Psychologist)
Science, Technology & Society
University of Virginia

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are needed to see this picture.

Global problems like climate change, war, hunger and disease require collaboration across disciplines and cultures

Explored in workshop on trading zones & interactional expertise, May 21-24, 2006

http://bart.tcc.virginia.edu/Tradzoneworkshop/index.htm

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Problem of Incommensurability (Kuhn)

- Experts in an old paradigm may not be able to communicate with those in a new
  - John Polanyi's discovery of laser rejected by *Physics Review Letters*
- Participants from different disciplines and cultures disagree over what is a problem worth solving, the proper way to solve it and what constitutes data

Trading Zone as solution to incommensurablity

- Galison-- scientists and engineers develop an interlanguage (creole) to communicate when designing systems like radar, particle accelerators
- *Nanocajun*
- Lambert--Jet Propulsion Laboratory engineers refer to their negotiations over where to land a rover as trades

Expert agents can substitute for, or complement, a creole

- Baird--early in the development of MRI, surgeons interpreted an artifact as a lesion
- Solved by someone with background in both physics and surgery:
- Interactional expert

Three levels of shared expertise in multidisciplinary trading zones (adapted from Collins and Evans)

- None--participants speak different languages, or use the same terms in incommensurable ways
- Interactional--an expert in one discipline who has mastered enough of the language of another to facilitate trades with others--T-shaped
- Contributing--an expert who masters a new domain enough to make an original contribution

Three Kinds of Trading Zones
(with Matt Mehalik)

State 1: A (technological, ideological, or political) elite

- has the overall problem representation
- black boxes others into specific roles whose purpose those persons do not need to understand.
- Communication downward (orders) & upward (evidence of obedience)--*no trade*
- Examples: *Seeing Like a State* (Scott)

Elite dominates: no trade

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P=participant

Three Kinds of Trading Zones

State 2: *Relatively* equal trading zones

- Actors often trade with *boundary objects (cowrie shell)* or across *systems (Radar, Everglades)*
- Boundaries of zone can shift--who is allowed to trade? Who is left out?
- Zones can be nested within or networked with other zones

Equal trading zone around a boundary system

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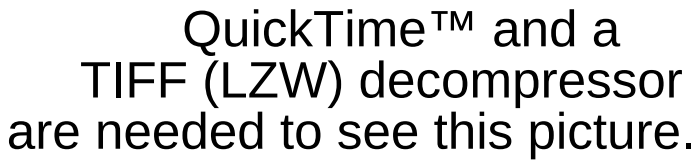
Three Kinds of Trading Zones

State 3: Shared mental model

- All participants need to share a common representation of the system and its goals.
- Dynamic representations, so sharing needs to be continuous.
  - Flowing to the work
  - Must avoid groupthink
- Joint contribution to development of a new expertise
  - ARPANET

Shared mental model



Service Science involves both interactional expertise and development of a creole

- New kinds of interactional expertise that combine science, engineering, social science, management and ethics--T-shaped
- Agreement on language that reflects core concepts multiple practitioners agree on
- Leads to trading zones among these areas that will help us understand the revenue side, and also the social side--creating a better world in terms of opportunities for all and global environmental sustainability

SSME at UVA

- Could play a role in the Engineering Business Minor, has a foothold in graduate business school (Matthias Hild)
  - Can SSME help transform these programs?
- Gorman wants to offer the first truly global SSME class for UVA's new Semester at Sea program--create students who can collaborate globally--take advantage of NIIs?
- Connect to Earth Systems Engineering Management

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Semester at Sea

- Involves over 600 students from multiple US Universities, about 20 of whom would take an SSME course
- Stops in Russia, China, Vietnam, India, Egypt, Turkey and Spain, where field trips associated with the class can be arranged
- Need advice from IBM experts and others at the conference on how to manage this

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Back-up slides

The impacts of socio-technical changes on complex systems like the global environment are not entirely predictable, therefore

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State 3: Adaptive management of a reflexive historical system

The Earth Systems Engineer has "to be in continued dialog with the creation that we are responsible for, and part of"—creating "new and more self-aware cognitive systems".

Brad Allenby

Michael E. Gorman

ESEM as one example of an SSME application area

- Companies, governments and civilizations do need to think about their long-term sustainability
- Which will require co-evolution of human, natural and technological systems--all currently intertwined (and perhaps someday indistinguishable)

Inventing nature

Avatar transforming her environment in Second Life

SSME has a role in transforming socio-technical systems

Indeed, it is a critical capability

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