Technology Transition

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A crucial issue for research effectiveness

TT 1

Two Levels of Transition

- **Pre-competetive development:**

  Research ⟹ Development

  Cost ≈ 7 x Research

  – **Exploitation of open research results**
    » **performed by developers or by moving researches**
  – **Isolated from systems**

a fuzzy line

- **Proprietary development**

  Development ⟹ Marketing

  Cost ≈ 4 x Development

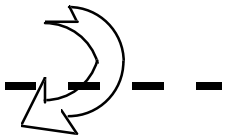
  – **Based on assessment of importance, performance, ...**
    » **performed by practitioners: engineers, marketing**
  – **System emphasis**

- **Hard to deconvolute in computing: consider both**

TT 2

Problem: Asynchrony

- **Research has finite scope and time resources**
  - **linked to researcher and student interest**
  - **limited by funding horizons**
  - **requires specialization, intensity**
  - **hindered by bureaucratic direction**



- **Development is market driven**
  - **starts after understanding of problem and solutions**
  - **requires more funding (7x), more commitment**
  - **needs rapid startup, planned end-points**
  - **often requires integration into extant systems (4x)**

We cannot expect that end/begin points match

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Approaches used for TT

- **Link researchers to industry** **[TRP, ATP, ESPRIT]**
  - **co-funding requirements only serves development**
    - » **destroys research timeline**
  - **academic access & sabbaticals for implementors**
    - » **good for re-invigoration, leads rarely to products**
  - **industrial access & sabbaticals for faculty**
    - » **can work well if there is a real need and receptor**
- **Put research on the shelf** **[Vic Reis ex DDRE -> DoE]**
  - **developer/engineer needs more than paper: demos**
    - » **code rot: systems change, old programs won't run**
    - » **semantic fog: in dynamic fields, meanings evolve**
    - » **Needs people: postdoc opportunity**

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Candidate TT Sites

- **Industry**
  - **End consumer of technology**
  - **Customer awareness**
- **Industrial and Academic Research labs**
  - **Bridge research and technology**
  - **Oriented towards government funded work**
- **Government Research labs**
  - **Independent from narrow commercial interests**
  - **Can be used to implement national policies**
- **Consultants**
  - **Independent, small scale**

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Example: ISX Corp
Westlake Village CA

✚ **Small Business**

Transition agent for ARPA I3 program, base at about 1 man/year

Available for added tasks, at added cost:

- ✚ **business modeling**
- ✚ **metrics mining**
- ✚ **demonstrations**
- ✚ **rapid prototyping**
- ✚ **consulting**

● **Motivation: entree into a new field**

- ✚ **Much initial energy**
- ▼ **Divergent long-range goals?**

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Example: SRI International
Menlo Park CA

Commercial Contract Research Lab

- ✚ **Near academic atmosphere**
  - ✚ **Able to hire very qualified people**
  - ▼ **Individuals with academic goals: papers, . . .**
- ● **Pressure to gain contracts**
  - ✚ **Able to respond rapidly to industrial demands**
  - ▼ **Many funding agencies use academic reviewers**
  - ▼ **Industrial are consulting type: intense, costly**
- ▼ **Little support for proprietary transfer**
  - ▼ **Few institutional resources for TT maintenance**
  - ▼ **No ownership rights gained on contracts**

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Example: NIST

Goverment Research Laboratory

- ✚ **Many long-term data programs**
  - ▼ **Experience in reference data distribution**
- ✚ **Technology transition matches charter**
  - ✚ **Little experience in software program distribution**
- ▼ **Charging mechanisms difficult**
  - ▼ **Awkward rules: CRADA results free to government (*can be large fraction of customer base*)**
- ▼ **Passive attitude**
  - ▼ **Opportunities missed because `*outside of scope*'**
  - ▼ **Risk-adverse (*bureaucrats can only lose*)**

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Example: Consultants

▼Traditional
- ▼ used only at early stages or for specific issues
- ▼ tend to focus on one recipe since renewal is costly
- ▼ often called in too late,
  perhaps to absolve management when projects fail

✚ Potential
- ✚ ongoing value-added services on the Internet
- ✚ can handle small-scale industrial needs
- ▼ reimbursement hard to initiate, improving
- ✚ early samples: product review and advice

▼Obsolescence
- ✚ meta consultants to assess, rank consultants?

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Problems with these TT sites

- Industry
  - – TT on shelf is not a product, get secondary attention
  - – Internal conflicts, resource demands
  - – External competitive conflicts
- Research labs
  - – Staff motivation for TT is poor
  - – Researchers are promoted / attractive by publications
  - – Contract focus and cycles disturb research progress
- Government Research labs
  - – Ponderous approach to fairness
  - – Risk avoidance and Commercial naiveté
- Consultants
  - – No base funding, customer contract driven

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Current Tendency

Force Industry and Universities to Collaborate

- **Major distraction for both due to asynchrony**
- **Policy questions re development boundary**

leads to inefficient personnel allocation.

- **Universities add research-motivated people to perform development for industry**
- **Industry assigns people that are not useful for customer-oriented work to deal with TT**

Funding cannot be taken from education / products

- **Government bureaucrats decide on relevance of research and development directions**

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Pre-Conditions

TT has to be the Intellectual Objective

- **TT organization must**
  - **benefit from the TT activity**
  - **not be viewed as a competitor to technology recipients**
- **Personnel promotion policy keyed to TT success**
  - **difficult to achieve in traditional academic setting**
  - **must prejudge success to be responsive**
- **Management recognition of the TT Unit**
  - **stable base funding**
  - **resources adequate for demonstration to recipients**
  - **payout from stock investment returns**

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Proposal: Focus on TT

Establish / Transform organizations to focus on TT

- **closest: Fraunhofer laboratories**

- **Benefits**
  - **Understand and deal realistically with asyncrony**
  - **Bridge boundary of pre-competetive and proprietary work**
  - **Career paths for TT specialists**

- **Problems**

  Lack of understanding by all 3 participants
  - **government agencies think/hope that researchers can do TT at small incremental cost**
  - **industry funders think that reseachers can supply systems**
  - **universities think they can do everything, given enough funds**

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Conclusion

Technology Transition should NOT be

- **an added responsibility of researchers**
- **an unreimbursed activity**
- **motivated by threats**

Not bound to a particular Institutional category but to a Willingness to make Tech Transfer a Significant Objective

Technology Transition requires

- **a strategy**
- **committed people**
- **institutions that focus on support of TT**

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