The Technology Innovation Program - Understanding "Critical National Needs" in New Technologies

Topic: The Key Questions and the University Role

William B. Bonvillian

Director, MIT Washington Office

April 24, 2008 - NAS STEP BOARD

FOUR IDEAS:

1. Think about your niche
2. Ask: Who are the other players?
3. What is the political support model?
4. What is the university role

1) Think about your niche

1. Think about your niche

- It's not just "critical national need" in the new statute, it's also "accelerate innovation" and "high risk-high reward"
- So: must tie needs to breakthrough innovation advances.
- Have to check all three boxes
- On the scale of a $14 trillion economy & $60b in federal basic research, TIP is a tiny program
- Get out of the doldrums of the "Aquifer of Death" and into the challenge of the "Valley of Death" - the storm-tossed "Darwinian Sea"

1. Your niche, con't

- Your program will only make a difference, only change the world, if you -
  - Support technologies that will create a new functionality in the economy
    - Computing creating a new functionality in the economy, fuel economy doesn't, it's incremental not radical
  - You want to get into the LaLa Land of the virtuous cycle of innovation -
    - Breakthrough technologies that change functionality then you can pile on applications that translate into productivity gains that grow real wealth and wellbeing in the economy
  - THAT'S INNOVATION

1. Your niche, con't

- SO BET BIG -
- And there are organizational tests for applicants:
  - Don't fund hobbies - fund innovation
  - True innovation operates at two levels, the institutional level and the personal, face-to-face level:
    - (A) institutional level - innovators live on islands but they must be connected to the mainland to be able to implement their innovations
      - Think Xerox Parc and its weak connection to the Xerox mainland
    - (B) personal level - need great teams of innovators (see below)
  - Don't just fund ideas, fund the groups that have the connectedness

1. Your niche, con't

- You will get the pick of the innovator crop -
  - You have a much bigger program than SBIR, your gov't competitor - $3m grant vs. ~$300K
  - And -- you don't have that awful gap between Phases I and II
  - where innovators eat peanut butter sandwiches for a year waiting for their Phase II award
- Innovators will want your money

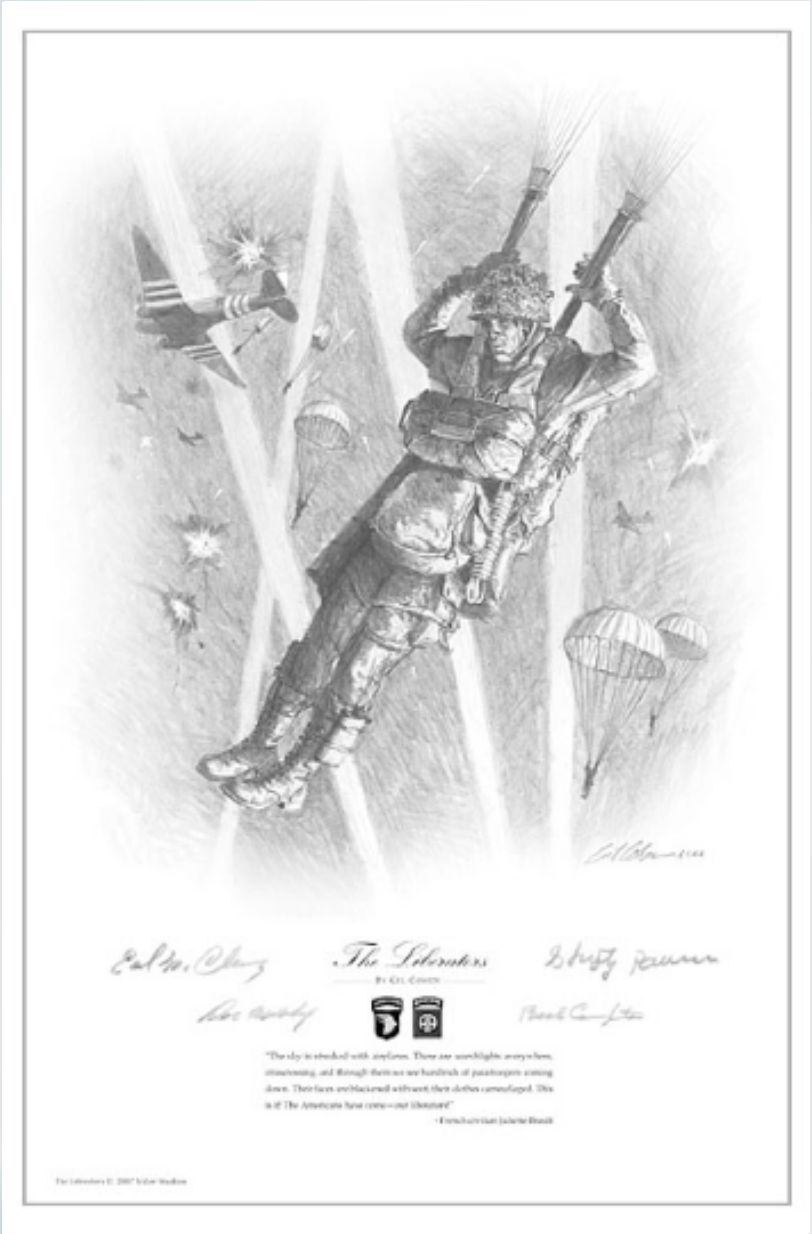
1. Your niche, con't

- SUMMARY:
  - Not just critical national needs, it's breakthrough research serving those needs

  - Look at awards that create new functionality in the economy, start the virtuous cycle of innovation
  - Bet on big advances, not hobbies
  - Look at the institutional connectedness of the sector - are awardees going to implement?
  - Are you starting "great groups" of innovators?
  - Put together a checklist to help create a vital niche role for TIP

2. Ask: Who are the other players?

- Think about whether to parachute into occupied territory…



2. Ask: Who are the other players?

- Think about areas where you can have an effect
- Don't parachute into Occupied Territory
- A few Examples:
  - **Example - Occupied Territory: NIH**
    - NIH spends close to $30b/year on drug discovery - will TIP make a difference on drug discovery?
    - But, for ex., bioengineering - the convergence of physical science technologies into life science - is underfunded
    - Few other players - NBIB would be supportive, could collaborate -- $3m grant dwarf's RO-1 awards for PI's

2. Who are the other players, con't

- **Example - Unoccupied Territory: FDA**
  - A biopharma spends +/- $800m to get a blockbuster drug approved through FDA clinical trials - the approval is a major bottleneck
  - FDA needs applied process technologies to speed trials, cut costs improve safety - see: FDA's "Innovation Stagnation" Report
  - otherwise we can only launch major market "blockbuster" drugs - we can't do small population, vaccines, 3rd world disease remedies - unless we can make trials more accurate and more
  - We won't be able to implement personalized medicine without breakthroughs in areas like "virtual human systems"
  - Few other players; FDA would likely welcome entry, be a collaborator

2. Who are the other players, con't

- **Example - Unoccupied Territory: Manufacturing**
  - US increasingly unable compete with low cost, low wage, high technology economies in manufacturing
  - Will only be able to compete if it sharply improves mfg. efficiency and productivity
  - Gains in mfg. process and mfg. technology a necessity - for ex., next gen robotic assembly?
  - Another example: the largest barrier to entry of new energy technologies is mfg. cost - driving down energy technology mfg. process and mfg. technology costs will be key to energy alternatives and renewables

2. Who are the other players?, con't

- SUMMARY:
  - Think about <u>who the other players</u> are in an area-are you redundant?
  - <u>Don't parachute into occupied territory</u>
  - Think about areas **<u>where you will be welcomed with a victory parade</u>**
  - Where you will get <u>agency collaborators and mission supporters</u>

3. What is the political support model?

3. What is the political support model?

- The Legislative Rule:
  - You can't just create good program substance
  - You have to have good program substance AND a workable political support model that will sustain the program over time
  - AND - the political support model has to support not contradict strong program substance and quality
  - Compare the 3 1980's competitiveness programs:
    - ATP: substance +/pol. support -
    - MEP: substance +/ pol. support +
    - SBIR: substance +/pol support + - but pol. support problem for program substance

3. Political support model, con't

- Ask: what constituencies that are willing to weigh in politically can build support for and sustain the program?
- ATP shift to TIP - from zero constituency support to possibilities:
  - State govt's can be collaborators
  - Universities can be R&D participants
  - Will these be significant enough roles to make them sustaining supporters?
  - Others? agencies (and their constituencies) the research helps?
    - relationship has be be ongoing and sustainable, not one-time only

3. Political support model, con't

- There is not a secure support base in this group yet
  - A danger of univ's is that they earmark - there is now $1.3b of univ. earmarking, the only growing R&D field
- Is there a way of organizing research sectors where TIP research has made a difference?
  - Going back to earlier ex's, if research sustained and ongoing, a sector (mfg., bioengineering, applied medical process R&D) may be willing to organize support
    - Like the way MEP has a nat'l association of state agencies

3. Political support model, con't

Summary:

- Need Political Support Model that maintains program quality
- potential of univ. and state gov't participation could provide support
- If TIP provides ongoing, sustained sector support, that could be a support base

4. What is the University role?

Fire Engine atop MIT Dome - the 2006 “hack”

4. What is the university role?

- Universities often do radical technology advance from basic research, as opposed to incremental advance based on tacit knowledge - the information an industry has about its product line or sector
- That's an opportunity if TIP wants to use its limited funding to create new functionality, to support transformative technologies through high risk, breakthrough model
- The "hybrid model" - combining univ research and small co's - has proven a helpful in getting across the "valley of Death" - takes advantage of both skillsets

4. University role, con't

- Rule: ideas are cheap, it's all in the execution
- What to look for in university partners:
- Tech transfer experience?
  - Experienced tech transfer offices interested in the long term relationship not short term licensing revenues
- Company creation experience - has the univ. spun out successful startup co's?
- Faculty with industry, esp. start-up, experience
- Schools with a "Patent or Perish" attitude toward faculty not only "Publish or Perish"

4. The university role, con't

- An essential point:
- The univ./company hybrid have to be very close - hybrid has to be a "great group" to innovate (see: Warren Bennis)
- Look hard at the group - look for:
  - Flat, non-hierarchical, two levels
  - Interdisciplinary, right mix of talents
  - Great leadership
  - Remarkable talent
  - Work together - idea-sharing, deep collaboration
  - Optimistic nor realistic
  - Wear blinders, only see their project
  - On a protected island, with a bridge to the mainland to stand up their project
  - On a Mission from God - possess missionary zeal

4. The university role, con't

- Summary:
- Univ.'s can aid with radical advance for new functionality
- Hybrid-model
- Look for tech transfer & startup experience
- Look for great groups

photo of ARPANET (IMP) Team (L to R): Truett Thatch, Bill Bartell, Dave Walden, Jim Geisman, Robert Kahn, Frank Heart, Ben Barker, Marty Thrope, Will Crowther, Severo Ornstein. Not pictured: Bernie Cosell.

Wrap-up:

- So: Four thoughts:

1. Think about your niche
2. Ask: Who are the other players? - don't land in occupied territory
3. What is the political support model?
4. What is the university role?