ATP's Legacy: Current & Future Research to Examine Collaboration

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Why study collaboration? Why important?

The changing nature of innovation demands new knowledge and learning networks that facilitate communications and collaboration at the frontiers of many disciplines and that can cross organizational boundaries between academia, industry, and government.

Council on Competitiveness

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Collaboration in ATP Projects

- 86% of all ATP projects involve collaboration
- Joint ventures had an average of 4.4 members, which range from 2 members to 25 members.
- Average number of subcontractors:
  - 2.4 for single-company projects
  - 3.4 for joint venture companies

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Motivations for Forming Collaborations (% who responded yes)

- Pool resources with other firms in order to reduce the cost of R&D or achieve a greater scale of effort (72%)
- Benefit from complementary R&D expertise and capabilities of different firms (83%)
- Gain knowledge and learn from other firms (66%)
- Address a technical problem that is common to the industry (72%)
- Access commercialization capabilities of other firms (42%)

Source: Survey of ATP Joint Ventures

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Majority would not have formed Collaboration without ATP

Estimated loss to the economy had collaboration not formed:

- Revenues: $1.86B
- Profits: $404M
- Cost Savings: $115M
- Licensing: $36M
- Additional R&D: $1.3B

- Patent applications 133
- Patents granted 89

Source: Survey of ATP Joint Ventures

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Collaboration & Trust

- ATP involvement is important in helping to foster trust and cooperation among joint venture partners (ATP Joint Venture Survey).
- Build trust face-to-face and then can communicate by phone or email after that & meet infrequently (HBR, January 26, 2006, page 15)
- ATP: kickoffs, annual meetings, and closeouts are key to project management

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Joint Ventures tend to have more….

- Publications (44% vs. 32%)
- Filed patents (59% versus 37%)
- Early revenue (57% versus 29%)

…when compared to single-company projects.

Source: Campbell et al, 2003, University Participation in the ATP, and the Effect on R&D Project Outputs

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University Collaborations are Important

University participation in ATP projects:

- 70% of joint venture project
- 50% of single company projects

University participation is 'critical' in almost half of these projects.

Source: BRS data & Survey of ATP Applicants 2002

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University Role in ATP Projects

Projects involving universities:

- Usually took on more ambitious research.
- Experienced more difficulty and delay but were more likely to end in success.
- Were more likely to:
  - Publish (41% vs. 29%)
  - Have early revenue (40% versus 35%)

Source: Hall, Link, Scott, *Universities as Research Partners*, 2002, and Campbell et al, 2003, University Participation in the ATP, and the Effect on R&D Project Outputs

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Universities Play a Vital Role in ATP Research Projects

"Universities represent a vital source of new technical ideas for firms of all sizes. The ferment of industrial relationships pervades even the most elite academic institutions."

Source: Branscomb et al. Managing Technical Risk, 2000

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An ATP award encourages collaborations even after an ATP project closes

Joint Venture participants:

- One out of two companies continued existing relationships.
- One out of four companies formed new relationships.

Source: Awards and BRS data.

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An ATP Award Changes Long Term Behavior of Many Firms

Behavioral Additionality (looking forward at Closeout)

- 50% pursue projects with higher risk
- 46% pursue projects with longer time horizons
- 55% pursue collaboration with other companies
- 48% pursue collaboration with universities and other non-profits

Source: BRS surveys

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wTe Team Collaboration: David Spencer & wTe Team

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Manufacturing / Materials Processing

High Speed Identification and Sorting of Non-ferrous Metal Scrap
wTe Corporation, Bedford, Mass.

November 2000 to October 2003
Total project budget: $2,621k
ATP Cost Share: $1,997k

Project

Develop a system that accurately analyzes, sorts, and recycles scrap metal at high speeds using optical sorting.

Potential Impacts

- Improve the separation accuracy of high-quality non-ferrous concentrates from the nation's automobile shredders;
- Allow the recovery of non-ferrous materials from municipal refuse streams; and
- Create annual economic benefits of $2B when adapted broadly.

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Metal Waste / Metallurgy

Optoelectronic Sensing of Liquid Metal Composition
wTe Corporation, Bedford, MA

January 2005 to December 2007
Total project budget: $2,408K
ATP Cost Share: $1,998K
Award No.: 4H3052

Project

The goal is to develop a new, automated, in situ, real time, elemental analysis system for molten metal alloys. The proposed technology will operate at high speeds in a variety of molten metal alloy systems.

Potential Impacts

- The system will increase the efficiency of smelting, foundry, and casting operations;
- Will significantly improve the quality of the alloys produced and reduce the amount of required energy for these operations; and
- Enable the US metal industry to better compete with foreign producers.

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wTe is an Example of a Great Team

- David Spencer, charismatic leader, metallurgist and businessman
- Science Advisory Board that includes academic and business metallurgists.
- University involvement (WPI directly involved & MIT ties)
- Subcontractors work as partners
- Clear goals—eye on the prize.
- Compelling need for the technology.
- Freedom within structure.
- Camaraderie: Work hard, play hard.
- Follow the rules.

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Factors Affecting Collaborative Success: *Reach for the stars.*

Alliance design factors

- *Number of alliance partners* Knowledge or resource contribution of additional partners need to be balanced against the increased transaction and coordination costs.
- *Presence of competitors* Collaborations with competitors require management attention to communication and trust issues.
- *Project scope and goals* More ambitious projects have more successful outcomes on multiple measures of performance.

Source: Dyer et al, forthcoming 2006, The Determinants of Success in R&D Alliances

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Factors Affecting Collaborative Success: *Trust but verify (Reagan)*

Alliance management factors:

- *Frequency of communication* among participants is associated with more successful outcomes on multiple measures of performance.
- *Contractual provisions and governance procedures* to protect intellectual property and resolve disagreements are important to R&D alliance success.

Source: Dyer et al, forthcoming 2006, The Determinants of Success in R&D Alliances

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A Study of Sustainable Collaboration Confirms Findings

- Abnormal Situation Management Consortium (ASMC): An ATP project that occurred between 1994 and 1998.
- Several years later the ASMC still exists.
- Irene Petrick & team from Penn State University studied the ASMC team to examine the longevity of the team.
- Team found longevity provides both benefits and constraints.

Source: Petrick, et al, A Study of Sustainable Collaboration: The Abnormal Situation Management Corporation, forthcoming, 2006

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A Study of Sustainable Collaboration Confirms Findings of Other Studies

Contributors to consortium success:

- Flexibility in approach and fluidity in <u>membership</u>.
- Importance of <u>intangible benefits.</u>
- <u>Charismatic leader</u>.
- <u>Organizational champion.</u>
- <u>Governance</u> and decision-making practices.

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ATP's Legacy: Create a Data Enclave

Purpose: To allow access by researchers (both academic and other agencies) to important data sets that are not currently available due to confidentiality of the data.

- Small agencies lack economies of scale
  - Access not provided in timely manner
  - Limited response to new statistical and operational developments
  - Limited ability to disseminate
- This reduces government's return on investment for data collection (GPRA; PART)
- Reduces innovative development of new products based on existing data e.g.
  - Science metrics
  - Linkages across existing datasets

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The Mechanics of a Data Enclave

- ❑ Data archiving, indexing, and curation
- ❑ Provision of research access
- ❑ Statistical protection (statistical)
- ❑ Researcher training (Educational)
- ❑ Dissemination to researcher community (Operational)
- ❑ Agency-specific data protection requirements (Legal)
- ❑ Consortium interaction

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ATP's Legacy

- Ensuring that ATP reports and evaluation outputs can continue to be retrieved through the National Technical Information System and the National Archives Retrieval Administration
- Sharing evaluation infrastructure with States
  - Texas
  - California
  - Maine

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