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Establishing and Utilizing GIES: The Role of Business Innovation in Solving Global Policy Issues

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Outline

- Innovation in the business sector
- University-industry-government collaboration as an innovation system
- Comparing national innovation systems
- Essential considerations for a successful university-industry-government “innovation ecosystem”

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Innovation in industry: motivated primarily by competitiveness

- Innovation yields high value-added products and services
  - Existing products, services: profit margins fall, work moves to lower-cost economies (offshore)
  - New products / services = intrinsically higher value-added
  - Companies develop pipelines for new product creation and market introduction = sustained competitiveness
- The ability to innovate = increased labor productivity
  - Worker participation in manufacturing line improvement

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Limits of industry sector-internal business innovation

- Most business innovation is late stage
  - Budgets: 10% to Research, 90% to Development
- Most industry innovation is incremental
  - Addition of one or two new features to an existing base
  - Companies typically try to stay just ahead of competitors (reduce market risk)
- Constrained by current market and competitiveness needs
  - Company may delay introduction of new technology until has gained all possible revenue from old approach
  - (In the short term) coping with global problems may yield extra cost, not extra revenue

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Some types of innovation in business

New Product for existing market	Nintendo “Wii” (new feature added to existing product category)
New Market for existing product	Use Wii to improve athletic training programs
New Combination of technologies	Apple i-Phone
New Business Process	Airline outsources employee medical services, aircraft maintenance
New Business Model	Flat rate for cellular phone service
Completely New …	Personal computer ?

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Business innovation is (of course) part of national innovation system

- Traditional contributions by industry sector
  - Understand market behavior (people's perceived needs)
  - Transform basic research into product development
  - Implement new ideas in real world
- Traditional contributions from government
  - Fund basic and some applied research
  - Issue regulations to protect society (safety, fairness)
  - Promotion of social awareness, problem identification
- Traditional contributions by university
  - Engine of non-commercial research, including basic R&D
  - Preparation of next generation labor force (with knowledge, skills of emerging importance)

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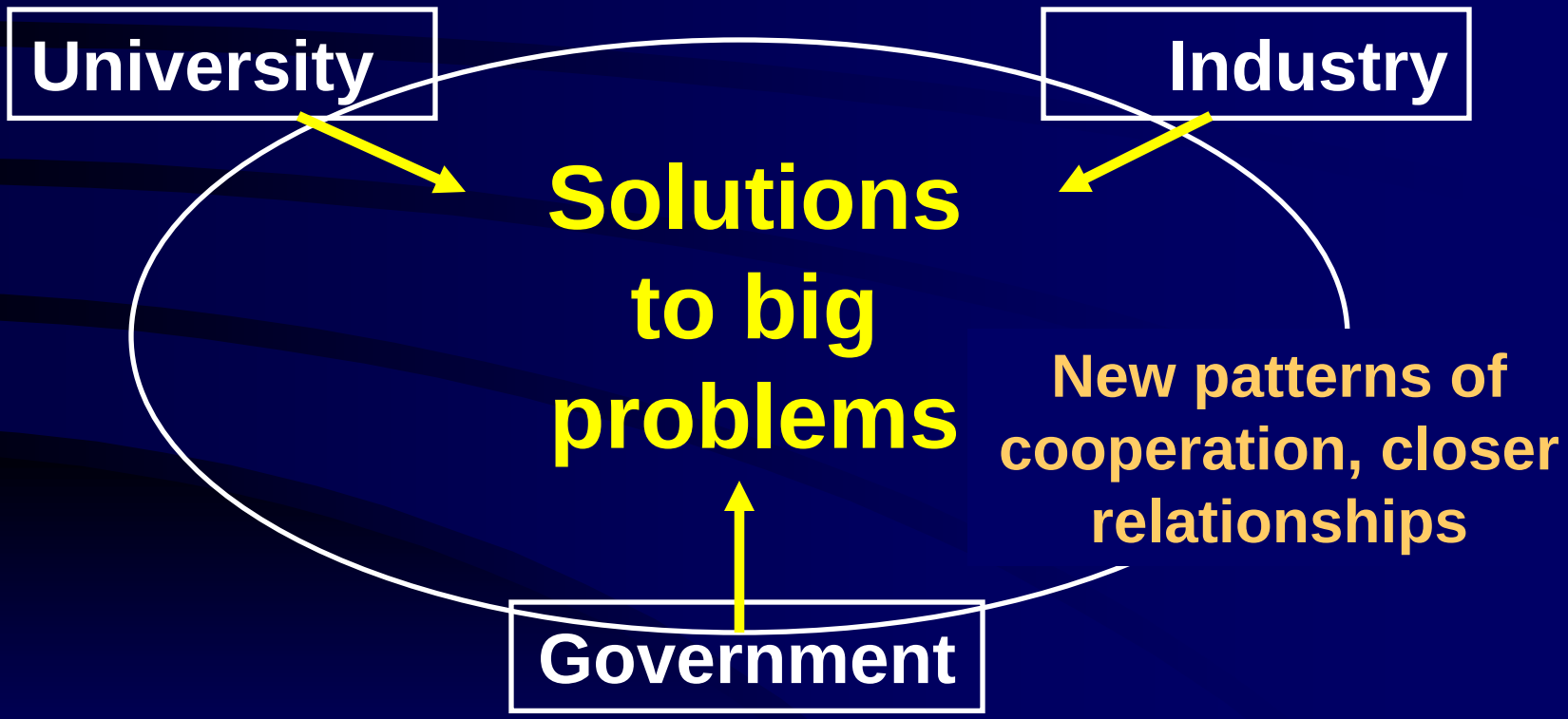
Big problems require the “ba” of collaboration, as well



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Understanding the “ba” of university-industry-government interaction

Comparison of the innovation systems in three countries

Elements of an innovation system

- **Institutions**
  - At national level: universities and other noncommercial research institutes, industry, government
- **Mechanisms of interaction**
  - Funding
  - Transfer of knowledge
    - Flow of people
    - Rights licensing, new company creation, …
- **Underlying policies**
  - Overall direction, strategic concerns
- **Environment of the system (infrastructure)**

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Comparing national innovation systems - 1

- How government money flows to R&D in university, industry, and government labs
  - Does the flow promote cooperative relationships?
- Employment patterns of R&D workforce
  - E.g., high mobility (change companies often), or not
- Patterns of cross-sector knowledge transfer (mechanisms and policies)
  - Rights ownership and licensing
  - Ownership of start-up companies and their assets

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Comparing national innovation systems - 2

- **Infrastructure issues**
  - Degree of macro-economic development; speed of growth
    - Advanced economies typically rely on innovation for competitiveness more than do developing economies
  - Sector-internal characteristics
    - E.g., Is there much M&A inside the industry sector?
  - Other national policy objectives
    - E.g. to spread out capital more than just to a few big companies or business groups)
  - Legal framework for IP and enforcement

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Comparing the U.S. and Japan systems - 1

	U.S.	Japan
Government funding for R&D	Competition-based	Still mostly allocated
	Multiple agencies fund research in each sector	Separate R&D systems: companies < METI etc., universities < MEXT
	Direct subsidy of industry R&D politically difficult	R&D policy: for industry / economic development (not much for defense)
	Matching funds: industry - university partnerships	Matching funds within industry for government projects

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Comparing the U.S. and Japan systems - 2

	U.S.	Japan
Employment patterns	High mobility: industry “buys” Ph.D. graduates	Lifetime employment: hire young & assign to research in company lab
Patterns of transfer from university	Highly developed licensing and also “spillover” relationships	New laws and patterns since 1998; still “bugs” in working out implementation
	Many examples of successful new company spin-out	No superstar examples of successful university spin-out companies (yet)

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Comparing the U.S. and Japanese systems - 3

	U.S.	Japan
Infrastructure	Companies strong at M&A to acquire knowledge, tech	Highly developed company-internal knowledge transfer
	Need innovation for high value-added business (to sustain high cost of living)	
	Legal system well-established in general, consistent enforcement	

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The result: comparing university-industry cooperation in U.S. and Japan

U.S.

- Most common pattern: university-based research with real-time industry participation
- Motivations for research cooperation:
  - Two-way, long-term knowledge exchange
  - Recruiting
- Industry expects to pay to participate
  - But not pay full cost

Japan

- Most common:
  - Research outsourcing
  - Rare: company visitor in university research group
- Motivations:
  - Company's specific commercial objectives
- Close, lasting personal relationships between professors & graduates
  - May marginalize revenue to university

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China - 1

Infrastructure: transitional economy	Some funding for S&T development still comes from World Bank, UNESCO
	Lack of large domestic companies with resources or needs to fund research in universities (but university research funding is coming from foreign firms)
	Industry cooperation with university focuses on recruiting, long-term relationships for later use
	Reorganization of university sector, still many Soviet-style research institutes

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Total R&D spending in China - 2003 (from all sources of funds)

- Total R&D spending = RMB 154 billion
  - Increase of 20% over 2002
- Universities = 10.5% of total
- Government research institutes = 25.9%
  - But research institute share of R&D spending had been 42.8% in 1996
- Company R&D = 62.4% of total spending
  - Had been 43.3% in 1996

China Nat'l Bureau of Statistics, cited by Chen and Kenney 2005

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Background: High-Tech Business in China

- Tend to compete more on cost than on advanced technologies
  - R&D mostly for product development, localization, some re-engineering (e.g. to cut manufacturing cost)
- Hiring from U.S. (including returnees): for management roles, not for company research
- Foreign R&D labs in China: active programs with Chinese universities, hire recent graduates
- Little direct interaction between Chinese companies and U.S. universities

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China innovation system: Distinctive features - 2

Government R&D funding patterns	Apparently not concerned with promoting university-industry cooperation -- rare requirement for matching funds
Employment	High mobility, but industry is probably still much less important market for Ph.D.s than in U.S.
Patterns of transfer	Robust spin-out of start-up companies, which the university may own !!
	No famous start-up companies from universities (yet), but Lenovo came from CAS Institute of Computing Technology

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Highlighting some differences

	U.S.	China	Japan
Government funding	Promotes univ-industry symbiosis	Separate systems for funding university and industry	
Industry wants < top universities	Real time partnerships	Research outsourcing	
National labs	Special purpose	Historically dominant	Leverage industry R&D
University start-ups	Robust		Still weak
Innovation goal	Sustained competitiveness, but specifics vary according to the national economy		

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Some conclusions

- The same approach to university-industry-government collaboration will not apply everywhere
- Each sector must be allowed to fulfill its primary roles -- to satisfy its primary motivations
  - Industry: ultimately, return value to owners
  - University: progress of knowledge
  - Government: national security, macroeconomic conditions, social welfare
- So, how to establish multi-sector cooperation at the GIES level?

An interesting case at the local level: Joint Venture Silicon Valley

- Mission: bring together people from business, government, education, community to act on issues affecting economic vitality, quality of life
- Identifies problems
  - Funds research into regional needs, progress
- Finds the team to solve the problem: spins out initiatives
  - E.g. Smart Valley, CommerceNet, S. V. Global Trading Center…
  - Assists initiatives in obtaining start-up funding
- Promotes awareness
  - Publishes yearly "Index of Silicon Valley," other programs
- Gets out of the way

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Summary

- **Business innovation**
  - Motivated and constrained by business concerns
  - Essential in GIES: real-world development and implementation of new solutions to big problems
- **National innovation systems differ**
  - Sensitivity to stage of economic development, sectoral motivations, policy concerns
  - Further affected by history (evolution of system)
- **Lessons for GIES**
  - Balance of power in collaborative partnerships
  - Know when and how to get out of the way: transfer knowledge

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