Overview and analysis of the Japanese and US innovation systems

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Overview and Analysis of the Japanese and US Innovation Systems

by Sergio Jofre

SUCCES WP1 Meeting
Stockholm June 18 2008
The report was elaborated on the base of a literature review and personal experiences from Japan (Department of Environmental Engineering, Osaka University).

Today’s presentation includes

a) Introduction
b) Comparison of Japanese and US innovation systems from the point of view of the *Triple Helix* concept based on the Academy-Government-Industry interaction in Japan and the US
c) Main Findings
d) Conclusions for SUCCESS WP1
e) Suggestions for finalizing our contribution
There is no single definition of innovation systems when we observe the process at national level.

However, we can understand a National Innovation System (NIS or National System of Innovation) as the flow of technology and information among people, enterprises and institutions which is key to the innovative process on the national level.

According to innovation system theory, innovation and technology development are results of a complex set of relationships among actors in the system, which includes enterprises, universities and government research institutes.
Introduction - 2

Therefore,
In order to observe the complexity and dynamism of innovation systems a relatively new model has been developed:

The “Triple Helix” model of innovation that captures multiple reciprocal relationships at different points in the process of knowledge capitalization.

Generation of knowledge infrastructure in terms of overlapping institutional spheres. Each sphere takes the role of the other and hybrid and tri-lateral networks emerge at the Interfaces (most countries moving towards the adoption of this model)
Evolutionary Triple Helix model

The overlay of communications and expectations at the network level guides the reconstruction of institutional arrangements over time (system evolution)
Comparison of Japanese and US innovation systems

Current innovation systems in Japan and the US are in a state of transition. The main drivers of this transition are the need to efficiently respond to increased globalization and competitiveness of markets, and the challenge of sustainable development.

Japan:
Former innovation system based on “technology substitution for energy”
Need for increasing growth with limited resources and energy
Innovation lead by government and industry
“In-house” R&D of large companies/tacit knowledge embedded in work and sales forces
Focus on production efficiency (e.g. the lean production concept) and manufacturing power

US:
Former innovation system based on “IT substitution for manufacturing technology”
Increasing growth thought developing new functionalities
Innovation lead by a liberalized arrangement of different innovation agents
Strong incidence of foreign human resources, mobility and competitiveness
Focus on new functionality and network synergy (e.g. The silicon Valley)
Findings 1 - Triple Helix in Japan and the US

**Government**

<table>
<thead>
<tr>
<th>JAPAN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trends:</strong></td>
<td><strong>Trends:</strong></td>
</tr>
<tr>
<td>• Undergoing restructuration (less divisions more autonomy and power)</td>
<td>• Dictating and keeping “rules of the game”</td>
</tr>
<tr>
<td>• Design of S&amp;T and R&amp;D policies and strategies (including all national sectors)</td>
<td>• Regulation and Deregulation</td>
</tr>
<tr>
<td>• Encouraging industry-academy collaboration</td>
<td>• Facilitating Innovation Environment</td>
</tr>
<tr>
<td>• Aiming social consensus</td>
<td>• Setting up national priorities</td>
</tr>
<tr>
<td>• Aiming less “interference”</td>
<td>• Aiming more “presence”</td>
</tr>
<tr>
<td>• Increasing funding of R&amp;D</td>
<td>• Aiming more funding to R&amp;D</td>
</tr>
</tbody>
</table>

**Role:**

<table>
<thead>
<tr>
<th>JAPAN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (aiming lower)</td>
<td>Moderate (aiming Higher)</td>
</tr>
</tbody>
</table>
Findings 2 - Triple Helix in Japan and the US University (academia)

<table>
<thead>
<tr>
<th>JAPAN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trends:</strong></td>
<td><strong>Trends:</strong></td>
</tr>
<tr>
<td>• Undergoing restructuration (from public to corporate)</td>
<td>• Liberalized and autonomous</td>
</tr>
<tr>
<td>• Aiming more liberalization and autonomy</td>
<td>• Highly selective and competitive</td>
</tr>
<tr>
<td>• Selective and competitive</td>
<td>• High business incubation competence</td>
</tr>
<tr>
<td>• Lower incubation business competence (aiming higher)</td>
<td>• High incidence of foreign skills (decreasing enrolment &amp; recruitment)</td>
</tr>
<tr>
<td>• Lower incidence of foreign skills (aiming higher)</td>
<td>• High rate of external collaboration</td>
</tr>
<tr>
<td>• Lower rate of external collaboration (aiming higher)</td>
<td>• Variety of funding sources</td>
</tr>
<tr>
<td>• Aiming to increase funding variety</td>
<td>• &quot;In-house&quot; IPR mechanisms</td>
</tr>
<tr>
<td>• &quot;in-house&quot; IPR mechanisms</td>
<td>• Decreasing scientific production (aiming higher)</td>
</tr>
<tr>
<td>• Increasing scientific production</td>
<td><strong>Role:</strong></td>
</tr>
<tr>
<td><strong>Role:</strong></td>
<td><strong>Role:</strong></td>
</tr>
<tr>
<td>Historically low to Moderate (aiming higher)</td>
<td>High (aiming to sustain)</td>
</tr>
</tbody>
</table>
### Findings 3 - Triple Helix in Japan and the US Industry

<table>
<thead>
<tr>
<th>Japan</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trends:</strong></td>
<td><strong>Trends:</strong></td>
</tr>
<tr>
<td>• High incidence in Government S&amp;T Policies and Strategies (sustaining)</td>
<td>• Independent &amp; Proactive (sustain/increase)</td>
</tr>
<tr>
<td>• Strong “in-house” R&amp;D and High embedded tacit knowledge (sustaining)</td>
<td>• Diversify R&amp;D and lower tacit knowledge (decreasing aiming recovery)</td>
</tr>
<tr>
<td>• Low mobility and low foreign skills dependency (increasing)</td>
<td>• High mobility and foreign skill dependency (decreasing foreign recruitment/aiming recovery)</td>
</tr>
<tr>
<td>• Long-term and large size networks (sustain or increase)</td>
<td>• Short-term collaboration networks (aiming longer)</td>
</tr>
<tr>
<td>• Outsourcing Basic Research (increasing)</td>
<td>• Collaborating in Basic research (sustain)</td>
</tr>
<tr>
<td>• Use of “Open Science” and IPR mechanisms (increasing)</td>
<td>• IPR mechanisms (sustain)</td>
</tr>
<tr>
<td>• Passive search for external collaboration (aiming higher)</td>
<td>• Active search for external collaboration (sustaining)</td>
</tr>
<tr>
<td>• Low Venture Capital (aiming higher)</td>
<td>• Venture capital (including Angels)</td>
</tr>
</tbody>
</table>

**Role:**

Historically very High

**Role:**

High
Conclusions for SUCCESS WP1

Japan and the US are undergoing major changes at different organizational levels in order to align their national systems of innovation with globalization and sustainability.

Fundamental changes in both NIS has been inspired on each other history of failure and success. Therefore, there is common path of learning,

NIS in Japan and US are merging (towards the innovation ecosystem)

Results of interaction between academy-government-industry (and hybrid institutions and networks) are incidentals, there is no single formula for success, therefore:

“models of collaboration are less relevant that the benefit implicit in the simple action of collaborating”

“Collaboration at any rate and time increases the possibility to induce synergy, while flexibility and learning capability increases the chance of adaptation”
Suggestions for finalizing contributions to WP1

Regarding our contribution:

• Extending the scope of the analysis to the EU case (Triple Helix)
• Including in the analysis a chapter for “energy policy” in Japan, US and EU

Regarding WP1 in general:

• Many of today’s contributions to WP1 relates to innovation system studies – but with slightly different approaches (national innovation systems, technology specific innovation systems, regional innovation systems)
• Therefore, we would like to propose a final review and edition of complementary contributions based on the innovation system approach:
  • **Bruggink**, Benchmarking EU governance of energy innovation systems
  • **Markhorst**, Literature review of knowledge transfer, sustainable universities and regional models of innovation
  • **Jofre**, Overview and analysis of Japanese and US innovation systems
  • *partly Ottani & Bou*, *Innovation networks – concepts and empirical review*
Many thanks for your attention.

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Q&A
**Linear Model of Innovation**

Basic Research → Applied Research → Development → Commercialization

**Non-Linear Model of Innovation**

- **Basic Research**
  - Quest for basic understanding
  - New knowledge
  - Fundamental ideas

  Feedback:
  - Basic Research needed for discovery
  - Search for new ideas & solution to solve longer term issues

- **Potential use**
  - Application of Knowledge to a specific subject
  - Prototyping

- **New unanticipated applications**

- **Development of products**
  - Goods & Services

  Feedback:
  - Market signals / Technical challenge
  - Desired product modification or new characteristics
  - Cost / Design trade-off

Danmarks Tekniske Universitet
Tri-lateral Collaboration Models

**Static model**

- Nation state encompasses academia and industry and
directs the relations between them
- Strong form: Soviet
- Soft form: Latin America & Norway

**“Laissez-faire” (“let do”) model**

- Institutional spheres with strong
  borders dividing them and highly
circumscribed relations among the spheres
- Examples: Sweden & US
Innovation Ecosystem

"Interaction Fields"

Inputs
- Knowledge Creation
- Basic and Long-term Researches

Pool of Concept
- Human Networks (CEO, CTO, CMO, CFO)
- Networks of Technologies
- Networks of Funds
- Regional Clusters
- Industry-Academia Collaborations
- IP / Standard
- Regulation / Deregulation

Outputs
- New Products / Services
- New Markets
- New Social Service

Funding
- Human Resources / Education
- Public Acceptance

Profit Growth and Welfare