Theme II “Key Issues of IP and Technology Management: From Research to Commercialization”

Topic 7: Commercialization Procedures; Licensing, Spin-offs and Start-ups

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Tokyo Institute of Technology
Tokyo, Japan
Positioning of University in the Business Operation

University

Institute

Creation of Technology

Protection of Technology

Use of Technology

Profit by use of Technology

Investment for new Technology

R&D for new Product

Production Technology

Business Operation

Purchasing Parts, Materials

Field Service Technology

Cost Reduction Technology

Environment Technology

Quality Management

Sales & Profit

Market

Customers

Sales & Profit

Licensing, Business Start Up

Cost Reduction Technology

Facility, Parts Management
Difficulty for collaboration between university and industry

It is not easy to minimize the gap of culture, sense of value, behavior, etc. Not necessary to confront both parties, but take them toward the same direction. If both parties stick on protecting their own area, naturally a strong conflict will be happened.

Someone who knows the different culture of both parties, has to make a certain role to take them towards the same vision/Objectives.

Technology Management Office
Intellectual Property Coordinators
### Existence of different culture, mission between university and industry

<table>
<thead>
<tr>
<th></th>
<th>University</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission</td>
<td>Education &amp; Research</td>
<td>Commercialization</td>
</tr>
<tr>
<td>Culture</td>
<td>Bottom Up</td>
<td>Top Down</td>
</tr>
<tr>
<td>Sense of Value</td>
<td>Systematization of Knowledge</td>
<td>Creating Profit &amp; Growth</td>
</tr>
<tr>
<td>Time span</td>
<td>No limitation</td>
<td>Depend on Market</td>
</tr>
<tr>
<td>Subject for research</td>
<td>Basic Research</td>
<td>Industrial Research</td>
</tr>
</tbody>
</table>

- Not necessary to integrate different cultures
- Understand & Sharing different cultures

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Basic Research → Industrial Research → Profit

Anti-profit
Difference Between “Research” and “Development”

“Research” means “The Process to create valuable technical element”.

“Development” means “The Process to select valuable technical element and reduction to a product”.

Social Needs

Technical Elements

Concrete Product

Technical Elements
Balance between university and industry

- Lack of Research Infrastructure, including Fund
- High Performance of Basic Research vs. Low Performance of Basic Research
- High Level Universities vs. Low Level Universities

Level of Basic Research

- Joint R&D
- Licensing
- Sponsored Research based on industry’s needs (Small Applications)

Level of Research for commercialization
Importance on joint R&D from the start

Research Activities
- Joint Research
- Requested Research
- Technical Consulting

Sponsorship from Industry

Patent prosecution

Invention

Needs from Industry
- Matching Seeds and Needs

Marketing

Licensing

Start up Venturing

New Industry
- Economical Development

National Budget

Economical Development

Return

Invention

Importance on joint R&D from the start
# Commercialization Process from Research

## Problems

<table>
<thead>
<tr>
<th>Problems</th>
<th>Research has opposite vector from Development</th>
<th>Development is not reflected by Market</th>
<th>Business Operation has not yet established</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Research has opposite vector from Development</td>
<td>- Research towards Technical Seeds, and Development towards Specific Products</td>
<td>- Big Gap between Market Needs and Product Concept</td>
<td>- Lack of Competence against Competitors</td>
</tr>
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<td>- Development is not reflected by Market</td>
<td>- Lack of Strategy for Further Growth</td>
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</tr>
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</table>

## Actions

<table>
<thead>
<tr>
<th>Actions</th>
<th>Expand from Marketing to Sales</th>
<th>Leadership by Professional Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Introduce Marketing into Research and Development</td>
<td>- Use Venture Capitalist bridging Product Concept to Investors</td>
<td>- Make a Strategy for Growth competing with Competitors</td>
</tr>
<tr>
<td>- Clarify Target for Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Project Management based on Technical Seeds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Diagram

- **Research**
  - Create Basic Technical Seeds
  - New Findings and Systematization
  - Technical Elements

- **Development**
  - Expand from Research to Development
  - Product Specification by Marketing
  - Manufacturing Technology

- **Start Up**
  - Start up Company
  - Organization Set Up
  - Value Chain Establishment
  - Launching New Product
  - From Marketing to Sales

- **Commercialization**
  - Expand Business Operation
  - Sales Promotion
  - Increase Manufacturing Capacity

## Problems

- Research has opposite vector from Development
- Research towards Technical Seeds, and Development towards Specific Products
- Business Operation has not yet established
- Lack of Competence against Competitors
- Lack of Strategy for Further Growth

## Actions

- Introduce Marketing into Research and Development
- Clarify Target for Development
- Project Management based on Technical Seeds
- Expand from Marketing to Sales
- Use Venture Capitalist bridging Product Concept to Investors
- Leadership by Professional Management
- Make a Strategy for Growth competing with Competitors
Venturing from university in Japan

- By the end of 2007, totally 1,773 venture companies are under operation in Japan.
- Regarding its economical impacts, it is estimated that the total sales turnover is US$ 2.8 billion and the total number of employees is 23,000.
- Economical impacts including its extending effects is US$ 5.1 and 36,000 employees.

Accumulated Number of Venture companies from university

Core Venture: Venturing based on Technical Seeds generated by universities + Students’ venturing related with universities

Source: University’s venture companies investigation 2007
It is estimated that the reasons for subjects and problems are as follows.

- Technical seeds from university is still in the research level and not matured in the product level.
- Many cases with management members of researchers who have lack of management experiences.
### Comparison of Commercialization Process

Which type of process will make the best success?

<table>
<thead>
<tr>
<th></th>
<th>Research</th>
<th>Development</th>
<th>Start Up</th>
<th>Commercialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>University</td>
<td>-</td>
<td>-</td>
<td>Venture Company</td>
</tr>
<tr>
<td>B</td>
<td>University</td>
<td>Existing Company</td>
<td>-</td>
<td>Venture Company</td>
</tr>
<tr>
<td>C</td>
<td>University</td>
<td>Government</td>
<td>-</td>
<td>Venture Company</td>
</tr>
<tr>
<td>D</td>
<td>University</td>
<td>Government</td>
<td>Existing Company</td>
<td>Venture Company</td>
</tr>
<tr>
<td>E</td>
<td>University</td>
<td>Existing Company</td>
<td>-</td>
<td>Venture Company</td>
</tr>
</tbody>
</table>
Typical Process of Venture Spin-Off

- **Incubator**
  - Support
  - Spin-Off

- **Venture Capital**
  - Equity
  - Cash

- **Investor**
  - Returns
  - Fundraising

- **University**
  - Support
  - Joint R&D

- **Venture Company**
  - Growth independently

- **Government**
  - Support

- **Enterprise**
  - M&A
  - Alliance
  - Licensing Out

- **IPO:** Initial Public Offering
### Services by Incubation Center

#### Soft Supports by Business Incubators in US

<table>
<thead>
<tr>
<th>Services</th>
<th>Response %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support on Business Basic</td>
<td>95</td>
</tr>
<tr>
<td>Marketing Support</td>
<td>90</td>
</tr>
<tr>
<td>Accounting/Financing Support</td>
<td>76</td>
</tr>
<tr>
<td>Legal Support</td>
<td>53</td>
</tr>
<tr>
<td>IP Management</td>
<td>64</td>
</tr>
<tr>
<td>Investment Support</td>
<td>73</td>
</tr>
<tr>
<td>Create Management Team</td>
<td>55</td>
</tr>
<tr>
<td>Management Member</td>
<td>55</td>
</tr>
<tr>
<td>Support for Strategic Partners</td>
<td>81</td>
</tr>
<tr>
<td>Collaboration Program</td>
<td>63</td>
</tr>
<tr>
<td>Product Evaluation</td>
<td>50</td>
</tr>
<tr>
<td>Management Information System</td>
<td>26</td>
</tr>
<tr>
<td>Production Support</td>
<td>46</td>
</tr>
<tr>
<td>Product Design Support</td>
<td>31</td>
</tr>
<tr>
<td>Networking Support</td>
<td>89</td>
</tr>
<tr>
<td>Commercialization Support</td>
<td>79</td>
</tr>
<tr>
<td>Collaboration with University</td>
<td>89</td>
</tr>
<tr>
<td>Compliance Support</td>
<td>36</td>
</tr>
<tr>
<td>Overseas Trading Support</td>
<td>54</td>
</tr>
<tr>
<td>Support from Government</td>
<td>50</td>
</tr>
<tr>
<td>Business Training Support</td>
<td>43</td>
</tr>
</tbody>
</table>

#### Typical Services by Business Incubators in JAPN

- Information Services for Soft Support
- Support on Investment
- Consulting Services by Experts
- Support on R&D
- Support on Sales
- Support from Public Sector
- Others

#### Comparison of Services by Business Incubators JAPN/US

<table>
<thead>
<tr>
<th></th>
<th>JAPAN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance</td>
<td>Financial Support: 47%</td>
<td>Support for Loan Access: 77%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment by R&amp;D Team: 44%</td>
</tr>
<tr>
<td>Management</td>
<td>Consulting by Experts: 23%</td>
<td>Business Basic Support: 96%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accounting/Finance Management Support: 77%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legal Support: 47%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IP Management: 37%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outside Experts: 42%</td>
</tr>
<tr>
<td>Technical</td>
<td>R&amp;D Supports: 16%</td>
<td>Collaboration with university: 76%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology Transfer: 40%</td>
</tr>
<tr>
<td>Sales/Marketing</td>
<td>Sales Support: 11%</td>
<td>Marketing Support: 89%</td>
</tr>
<tr>
<td>Facility</td>
<td>Facility of Public Institute: 8%</td>
<td>Production Practices: 37%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Facility Services: 45%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer Lab: 40%</td>
</tr>
</tbody>
</table>
## Skills required for Incubation Managers

<table>
<thead>
<tr>
<th>Skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Business skills required to commercialize products/Services and achieve rapid growth, such as financing, marketing, management</td>
<td></td>
</tr>
<tr>
<td>Supporting skills to clarify the needs of tenants, and make a good matching between the tenant and management resource</td>
<td></td>
</tr>
<tr>
<td>Networking skills to find a supporters of incubation center</td>
<td></td>
</tr>
<tr>
<td>Communication skills to consult and advise to the entrepreneur</td>
<td></td>
</tr>
<tr>
<td>Business experience in the targeting industrial field</td>
<td></td>
</tr>
<tr>
<td>Strong leadership and motivation to support incubation activities</td>
<td></td>
</tr>
<tr>
<td>Human relationships with Management members of incubation center</td>
<td></td>
</tr>
<tr>
<td>Skills to create business plan and strategy as an incubation center</td>
<td></td>
</tr>
<tr>
<td>Management skills to provide the best services of incubation center</td>
<td></td>
</tr>
<tr>
<td>Communication skills to keep good relations with society</td>
<td></td>
</tr>
<tr>
<td>Marketing skills to find the expected tenants</td>
<td></td>
</tr>
<tr>
<td>Skills to promote communication with media to give benefits to entrepreneur</td>
<td></td>
</tr>
<tr>
<td>Skills to evaluate business progress of tenants</td>
<td></td>
</tr>
</tbody>
</table>
Skills Required for Management of Venturing Companies from University

- Technical Knowledge, R&D Skills: 15%
- Financial Support Acquisition Ability: 15%
- Product Planning Ability: 5%
- Sales, Marketing Ability: 10%
- Networking Ability: 10%
- Staff Management Ability: 2%
- Market Creation Ability: 5%
- Other Ability: 5%
- Business Model Planning Ability: 28%
Growth Process of Venturing Company

Financing
- Public Funds
- Private Fund
- Venture Capital
- Angel

Idea
- Technology
- Patent

Very Importance of Financing in early stage

Start up

Growth

Stagnation

IPO: Initial Public Offering
- M&A: management buy-out
- MBO: management buy-out

Private Equity Funds

Low/No Growth

Liquidation

Bank

Stock Market

Stock/Securities company

Accountant, Lawyer, Consultant

Start up

Early Growth

Rapid Growth

Exit
Growth Process of Venturing Company

Financing/Funding

- Start up
- Early Growth
- Rapid Growth
- Stable Growth

Sales

Time

Unreliable Risk

Risk

Easiness of Funding

Easiness of Funding

Big Debts
Let me introduce one of the results of our research

“Financing from Venture Capitalist is a Key success factor for venture company”
Hypothesis

**Hypothesis 1:**
Patents & patent applications are important for Japanese bioventures and can be used to attract VC financing.

**Hypothesis 2:**
The amount of & satisfaction with VC financing are significantly determined by the bioventures’ abilities to protect their technologies with patents and utilize them.
## Research methodology

**Success variables (22 variables):**
- Intellectual capital (7 variables)
- Alliance capital (5 variables)
- Human capital (5 variables)
- Product & market attractiveness (5 variables)

**Performance variables (2 variables):**
- Amount of VC
- Satisfaction with VC

Four-point 24 Likert scale web-based survey questionnaire
(1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree)

**Survey samples:**
17 Japanese and 10 foreign VC-backed bio-ventures.
The US (1), the UK (4), Switzerland (2), Sweden (1), Germany (1), and France (1).

**Interviewee:**
TOP-VC = an early-stage biotech VC investor in Tokyo
Results (1) – Mean Scores

Table 1: Mean scores of Japanese and foreign bioventures on variables that were important for their success in obtaining VC financing

(* Significant at 0.1, ** Significant at 0.05)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Japan</th>
<th>SD</th>
<th>Foreign</th>
<th>SD</th>
<th>t-sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intellectual Capital:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patents</td>
<td>3.65</td>
<td>.606</td>
<td>3.20</td>
<td>1.135</td>
<td>1.34</td>
</tr>
<tr>
<td>Patent applications</td>
<td>3.65</td>
<td>.702</td>
<td>3.90</td>
<td>.316</td>
<td>−1.07</td>
</tr>
<tr>
<td>Out-licensing strategy</td>
<td>3.06</td>
<td>1.029</td>
<td>3.50</td>
<td>.850</td>
<td>−1.14</td>
</tr>
<tr>
<td>Cross-licensing strategy</td>
<td>1.47</td>
<td>.514</td>
<td>2.00</td>
<td>.667</td>
<td>−2.32**</td>
</tr>
<tr>
<td>In-licensing strategy</td>
<td>2.18</td>
<td>1.015</td>
<td>2.10</td>
<td>.738</td>
<td>0.21</td>
</tr>
<tr>
<td>Patent sales</td>
<td>2.53</td>
<td>.943</td>
<td>3.10</td>
<td>.876</td>
<td>−1.56</td>
</tr>
<tr>
<td>Exclusive patent exploitation</td>
<td>3.29</td>
<td>.772</td>
<td>3.00</td>
<td>.816</td>
<td>0.94</td>
</tr>
</tbody>
</table>

- **Patents & patent applications** are important for Japanese bioventures and can be used to attract VC financing.

- **Out-licensing and exclusive patent exploitation** were also important for VC financing

<Hypothesis 1: Verified>
Results (2) - Multiple regression analyses

3 variables that were highly rated (mean ≥ 3) by both groups were used as independent variables.

Independent variables (IVs)  
- Patents
- Patent applications
- Out-licensing strategy
- Origin (0 = Japan; 1 = foreign)

Dependent variables (DVs)  
- Amount of VC
- Satisfaction with VC

The regression with DV; “amount of VC” failed to reach significant level (F=1.81, p = .163)
The regression with DV; “satisfaction with VC” is significant as follows:

<table>
<thead>
<tr>
<th>Dummy Origin</th>
<th>Satisfaction with VC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patents</td>
<td>.136</td>
</tr>
<tr>
<td>Patent applications</td>
<td>.210</td>
</tr>
<tr>
<td>Out-licensing strategy</td>
<td>-.337*</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.177</td>
</tr>
<tr>
<td>F</td>
<td>2.39*</td>
</tr>
</tbody>
</table>

Mean scores:  
Japan = 2.29  
Foreign = 3.00  
t-sig. = -2.25 **

* Significant at 0.1, ** Significant at 0.05

<Hypothesis 2: Rejected>
Results (3) - Factor analysis

4 VC financing success factors were developed to be used a guideline for new bio-ventures.

<table>
<thead>
<tr>
<th>Factor 1: Product &amp; Market Attractiveness</th>
<th>Eigen value (Total)</th>
<th>% Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive patent exploitation (0.85)</td>
<td>4.15</td>
<td>29.67</td>
</tr>
<tr>
<td>New untapped market (0.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Many products under development (0.63)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large and growing market (0.61)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Factor 2: Technical Capability          | 2.05                | 14.62      |
| Founder/CEO with managerial experience  |                     |            |
| Upstream alliance (0.72)                |                     |            |
| Patents (0.64)                          |                     |            |
| Large and growing market (0.53)         |                     |            |

| Factor 3: Management Capability         | 1.97                | 14.05      |
| Management with diverse skill set (0.82)|                     |            |
| In-licensing strategy (0.72)             |                     |            |
| Out-licensing strategy (0.56)            |                     |            |
| Large management team (0.53)             |                     |            |

| Factor 4: Entrepreneurial Capability    | 1.35                | 9.62       |
| Founder/CEO with VC experience (0.80)   |                     |            |
| Founder/CEO with entrepreneurial experience (0.61) |          |            |

Extraction Method: Principal Factor Analysis
Rotation Method: Varimax Rotation (Note: Component loading of 0.5 as a cut-off for significance)
Results (4) - Mean factor score analysis

Factor 1: Product & Market Attractiveness

Factor 2: Technical Capability

Factor 3: Managerial Capability

Factor 4: Entrepreneurial Capability
Research Results

1. **Patents & applications** were important for both the Japanese and foreign bio-ventures and were used to attract VC financing.

2. Out-licensing & exclusive patent exploitation strategies were also important for their competitiveness and for attracting VC financing.

3. However, patent protection & utilization had no significant impact on the amount of and satisfaction with VC.

4. Because the Japanese respondents are not satisfied with the VC funding, it is advised that they should start acquiring and developing their internal “entrepreneurial capability” and international alliances.
Topic 7; Summary

1. Positioning of University in the Business Operation
2. Difficulty for collaboration between university and industry
3. Balance between university and industry
4. Comparison of Commercialization Process
5. Subjects and Problems for Venturing from university in Japan
6. Skills required for Incubation Managers
7. Factors to get Financing from Venture Capitalist
Let’s Challenge Start-up for Commercialization together!

Thank you for listening!

Yoshitoshi Tanaka
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Tokyo, Japan