CPET 575 Management Of Technology

Part Three
Enactment of Technology Strategy – Developing A Firm’s Innovative Capabilities

References:

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Enactment of Technology Strategy – Developing A Firm’s Innovative Capabilities

- Overview
- Innovation Challenges in Established Firms
- Strategic Management of Corporate Research
- Managing Corporate Entrepreneurship
- Conclusion
Overview

- Technology strategy is enacted through the performance of a sequence of key tasks:
  - Technology Sourcing (on a continuous basis)
    - Many Firms: License agreement, R&D with other firms, Consortia, Strategic alliance, Joint ventures, and Acquisitions
    - High-Tech Firms: Internally R&D
  - Corporate Innovation Challenges
    - New product and new business development
- Marketing and Sales?
- Technical Support & Field Services

Innovation Challenges in Established Firms

- New Product and New Business Development
- Exploiting Innovation Opportunities in the Induced Process
- Exploiting Innovation Opportunities in the Autonomous Process
- A Balancing Act
Innovation Challenges in Established Firms

The Evolutionary Process Model of Strategy Making, Exhibit 1
- **Induced strategic process**
  - Incremental and architectural innovations
  - New product development
- **Autonomous strategic process**
- **Induced Strategic Action**
  - Corporate strategy
    - Reflects top management’s belief about the basis of the firm’s past and current success
    - Beliefs => Firm’s views => Distinctive (core) competences and Product-market domains for successful competition
  - External environments
Innovation Challenges in Established Firms

- The Evolutionary Process Model of Strategy Making, Exhibit 1
  - Induced strategic process
  - Autonomous strategic process
- Induced Strategic Action
- Structural Context
  - Serves to select strategic initiatives (corporate strategy, organizational learning)
  - Encompasses:
    - Administrative mechanism (resource allocation rules)
    - Cultural mechanism (rules of expected behavior)

Innovation Challenges in Established Firms

- Innovations Associated with Induced Process
  - Incremental or Architectural Innovations
  - From firm’s R&D investment
  - Overlooks the fundamental growth problem
- Management of Technology
  - Short & Medium terms
    - Managing incremental and architectural innovation
  - Longer term
    - Managing disruptive innovations
Innovation Challenges in Established Firms

- Innovations Associated with Autonomous Process
  - Radical Innovations
  - Emerge somewhat unexpectedly or serendipitously from the firm’s R&D investment
  - Initially not large
  - Important for a firm’s long-term survival and development
  - Exploit growth opportunities in marginally related (or even unrelated) areas of business

- A Balancing Act
  - Innovation challenges associated with the Autonomous Process
  - Innovation challenges associated with the Induced Process

Strategic Management of Corporate Research

- The Functions of Corporate Research
  - Support of Existing Business (Induced Process)
  - New Strategic Direction (Autonomous Process)
  - Effectively Using the Output of Corporate Research

- Making Key Interfaces
  - Corporate Research – Divisional R&D Interface (Induced Process)
  - Corporate Research – Business Research Interface (Autonomous Process)

- Linking Corporate Research to Corporate Development Strategy
  - Assessing Technological Opportunities
  - The Role of Different Levels of Corporate Research Management
  - Allocating Resources to Corporate Research
EXHIBIT 2 The Functions of Corporate Research

The research charter must be specified. The research charter represents the shared understanding of the mission that research is expected to fulfill.

<table>
<thead>
<tr>
<th>New strategic directions</th>
<th>Support of existing business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving and strengthening understanding of</td>
<td>Identifying product and process improvement</td>
</tr>
<tr>
<td>technologies in use</td>
<td></td>
</tr>
<tr>
<td>Discoveries and developing new technologies</td>
<td></td>
</tr>
<tr>
<td>Intelligence</td>
<td></td>
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<tr>
<td>Human resources</td>
<td></td>
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<tr>
<td>Technology transfer</td>
<td></td>
</tr>
<tr>
<td>Identifying acquisition candidates with</td>
<td>Recruiting for all divisions, from corporate</td>
</tr>
<tr>
<td>needed technological expertise</td>
<td>research to operations</td>
</tr>
<tr>
<td>Diversifying to new applications</td>
<td></td>
</tr>
<tr>
<td>and markets</td>
<td></td>
</tr>
<tr>
<td>Diversifying to entirely new business</td>
<td></td>
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<tr>
<td>Opening windows on new science and technology</td>
<td></td>
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<tr>
<td>Recruiting new kinds of skills</td>
<td></td>
</tr>
</tbody>
</table>


EXHIBIT 3 Linkages Among R&D Units

<table>
<thead>
<tr>
<th>Geographical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
</tr>
<tr>
<td>Personal</td>
</tr>
<tr>
<td>Closed</td>
</tr>
</tbody>
</table>

Administrative

Closed

Tight coupling

Open

No coupling
Strategic Management of Corporate Research: Managing Key Interfaces

EXHIBIT 4 Systematic Differences Between Business and R&D People

<table>
<thead>
<tr>
<th>R&amp;D People</th>
<th>Business research people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work environment</td>
<td></td>
</tr>
<tr>
<td>1. Structure</td>
<td>Well defined; existence of research tradition clearly described</td>
</tr>
<tr>
<td>2. Methods</td>
<td>Science and codified</td>
</tr>
<tr>
<td>3. Database</td>
<td>Systematic and objective</td>
</tr>
<tr>
<td>4. Work and time pressures</td>
<td>Mostly internal; how long does it take?</td>
</tr>
<tr>
<td>Professional Orientations</td>
<td></td>
</tr>
<tr>
<td>5. Operating assumptions</td>
<td>Serendipity</td>
</tr>
<tr>
<td>6. Goals</td>
<td>“New” ideas can it be improved?</td>
</tr>
<tr>
<td>7. Performance criteria</td>
<td>Quality of investigation</td>
</tr>
<tr>
<td>Quality of personnel</td>
<td></td>
</tr>
<tr>
<td>8. Educational background</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>9. Experience</td>
<td>Deep and focused</td>
</tr>
<tr>
<td>Personal interests</td>
<td></td>
</tr>
<tr>
<td>10. Career objectives</td>
<td>Become venture manager?</td>
</tr>
</tbody>
</table>

Source: Burgelman and Sajios, Inside Corporate Innovation (New York Free Press, 1988)

Linking Corporate Research to Corporate Development Strategy

- Assessing Technological Opportunities: Five Dimensions of Uncertainty
  1. Usefulness of innovation cannot be immediately appreciated (Laser invention at Bell Lab)
  2. The impact of innovation often depends on improvements in complementary inventions (Laser in telecomm and Fiberoptics)
  3. Major innovations often constitute entirely new technological systems; but it is difficult to conceptualize such systems (telephone => primarily a business instrument)
Linking Corporate Research to Corporate Development Strategy

- Assessing Technological Opportunities: Five Dimensions of Uncertainty

4. Major innovations often originated from an attempt to solve very specific problems and leads to unanticipated uses (steam engine => pumping water out of flooded mines)

5. The ultimate impact of innovations depends on the ability to effectively link them to specific categories of human needs (David Sarnoff, who linked the wireless comm to extended human needs)

Linking Corporate Research to Corporate Development Strategy

- Assessing Technological Opportunities: Initial Screening Questions

  • Are the first-class researchers available to pursue them?
  • Is major investment likely to yield major advances?
  • How many years will take before we see successful results?
  • How many failures and successes have others had in this areas?
Linking Corporate Research to Corporate Development Strategy

- Assessing Technological Opportunities: Next Level Screening Questions
  - Can the **expert technology** be obtained from vendors or through acquisition?
  - What **costs** would be incurred to displacing an existing research program to implement the new proposal?
  - Is there enough hope that a **successful results** can be **transferred downstream**?
  - Will the **necessary capital** be available?

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Linking Corporate Research to Corporate Development Strategy

- The Role of Different Levels of Corporate Research Management
  - Technicians, Technologist, Engineers
  - Bench scientist
  - Group leaders
  - R&D managers
  - Director of corporate R&D
Managing Corporate Entrepreneurship

- The Managerial Challenges Posed by Autonomous Strategic Action
- The Use of New Venture Divisions
- A Framework for Assessing Internal Entrepreneurial Initiatives
- Design Alternatives for Corporate Entrepreneurship
- Choosing Design Alternatives
- Implementing Design Alternatives

Managing Corporate Entrepreneurship

- The Managerial Challenges Posed by Autonomous Strategic Action
  - Technology-based internal entrepreneurship activity – emerges spontaneously
  - Examples
    - 1966, Mechanical-based Calculators => Electronic Calculator, unfavorable market research forecast, William Hewlett personally championed the project
    - 1970’s, SAP company
    - 1980, Sam H. Eletr, a manager in Hewlett-Packards lab, tried to persuade HP’s new product people to get into biotechnology; Sam Elter quit HP to start his own business (Venture $5.2 Million) to make Gene machines, which make DNA, the basic material of the generic code
Managing Corporate Entrepreneurship

- The Use of New Venture Divisions
  - NVD – Operating Division Interface Problems
  - NVD – Corporate Management Interface Problems
- Exhibit 5 Interface Problems Involving the NVD

<table>
<thead>
<tr>
<th>Strategic interference</th>
<th>NVD-Operating divisions interface</th>
<th>NVD-corporate management interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Administrative/ Cultural frictions</strong></td>
<td>* Domain protection issues</td>
<td>* Lack of diversification strategy</td>
</tr>
<tr>
<td></td>
<td>* Synergy consideration</td>
<td>* Limits to rate of strategic change that can be absorbed</td>
</tr>
<tr>
<td></td>
<td>* Rigidities resulting from management system</td>
<td>* Effects on corporate image</td>
</tr>
<tr>
<td></td>
<td>* Personal transfer issues</td>
<td>* Circumvention of corporate rules and regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Inadequate measurement and reward systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Resistance to institutionalization</td>
</tr>
</tbody>
</table>

Managing Corporate Entrepreneurship

- A Framework for Assessing Internal Entrepreneurial Initiatives
  - Assessing Strategic Importance
  - Assessing Operational Relatedness
- Exhibit 6 Toward an Assessment Framework

EXHIBIT 6 Toward an Assessment Framework

Key dimensions and their implications

- Strategic importance
- Degree of control
- Administrative linkages (authority)
- Operational relatedness
- Efficiency considerations
- Operational linkages (networking)
- Organizational design alternatives

Managing Corporate Entrepreneurship

Assessing Strategic Importance

Critical Issues to be Addressed:

- How does this initiative maintain the firm’s capability to move in areas where major current or potential competitors might move?
- How does this help the firm determine where to go?
- How does it help the firm create new defensible niches?
- How does it help mobilize the organization?
- To what extent could it put the firm at risk?
- When should the firm get out of it if it does not seem to work?
- What is missing in the analysis?

Managing Corporate Entrepreneurship

Assessing Operational Relatedness

Critical Issues and Questions to be Addressed:

- What key capabilities are required to make this project successful?
- Where, how, and when will the firm get them if it doesn’t have them yet, and at what cost?
- Who else might be able to do this, perhaps better?
- How will these new capabilities affect the capabilities currently employed in the firm’s mainstream business?
- What other areas may possibly require successful innovative efforts if the firm move toward with this project?
- What is missing in the analysis?
Managing Corporate Entrepreneurship

Design Alternatives for Corporate Entrepreneurship

- Determine Administrative Linkages
  - Strategic importance: Very important, Uncertain, Not important
  - Strong: Exert control over?
  - Spin-off?
- Determining Operational Linkages
  - Maximized synergies, maximized cost of transactions?
  - Operational relatedness
    - Unrelated
    - Partly related
    - Strongly related

Choosing Design Alternatives

Exhibit 7 – 9 Design Alternatives

1. Direct Integration
2. New Product Department
3. Special Business Units
4. Micro New Venture Department
5. New Venture Division (NVD)
6. Independent Business Units
7. Nurturing plus Contracting
8. Contracting
9. Complete Spin-Off
Managing Corporate Entrepreneurship

EXHIBIT 7 Organization Designs for Corporate Entrepreneurship

<table>
<thead>
<tr>
<th>Strongly related</th>
<th>Partially related</th>
<th>Unrelated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct integration</td>
<td>New product development</td>
<td>Special business units</td>
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<tr>
<td>Micro new venture department</td>
<td>New venture division</td>
<td>Independent business units</td>
</tr>
<tr>
<td>Nurturing and contracting</td>
<td>Contracting</td>
<td>Complete Spin-off</td>
</tr>
</tbody>
</table>

Very important | Uncertain | Not important

Operational relatedness

Strategic importance

Three Major Issues and Potential Problems

1. Corporate management and the internal entrepreneur should view the assessment framework as a tool for clarity—at a particular moment—their community of interests and independencies and to structure a non-zero sum game.

2. Corporate management must establish measurement and reward systems capable of accommodating the incentive requirements of different designs.

3. As the development process unfolds, new information may modify the perceived strategic importance and operational relatedness, which may require a renegotiation of the organization design. The organization design framework must thus be used dynamically, with ventures potentially moving from one type of arrangement to another.
Implementing Design Alternatives

- Three Major Issues and Potential Problems
  - Stability of relationship
  - Appropriate benefits from the entrepreneurial endeavors
  - Provide the entrepreneur with opportunity to be more successful
  - Policies
  - Protect proprietary corporate capabilities and skills, intellectual property, etc

Conclusion