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“Mechanisms and Success Factors in Technology Acquisitions Processes”

A Pragmatic View to Acquisition of Innovative Technology

Rainer Hasenauer
Marketing Management Institute
Research Group High Tech Marketing
Wirtschaftsuniversität Wien
http://www.wu.ac.at/mm/team/hasenauer
www.hitechcentrum.eu
www.hitec.at
A Pragmatic View to Acquisition of Innovative Technology

1. Initial environment and preconditions
2. The Search for Opportunities
3. Candidate Set and Compliance to the Acquirer
4. Selection Criteria
5. Absorptive Capacity
6. Success Factors / Rejection Factors
7. Lessons Learnt
1. Starting Point and preconditions

- This key note focuses on acquisition of innovative technology and success factors of related decisions for SME.
- Absorptive capacity is key!
- We rely on the coherence of Technology Readiness Level (TRL) and Market Readiness Level (MRL) as an approach of early risk detection and successful market entry.
- We will show empirical results of 26 different technology products for 2012 to 2015.
Technology Acquisition Process ¹)

1. **Identification** of attractive technologies and potential partners
2. **Assessment** of opportunities, **selection** of best match and **consideration** of contract terms
3. **Negotiation** of acquisition terms
4. **Transfer** of the technology to the acquirer

Localization

1. **Acquisition context**
2. **Acquisition evaluation**
3. **Acquisition options**

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¹ Letizia Mortara, Simon Ford: “Technology Acquisition: A guided approach to technology acquisition and protection decisions”, Institute of Manufacturing, Univ. of Cambridge 2012, p5

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5/25/2016
2. The Search Strategy for Opportunities

• **Search motivation:**
  To overcome the limits of the actual technology in use. To proactively improve competitive position.

• **Search Task / Search Question**
  Search goal, search constraints (time, resources),
  **Example:** 3D printer with 40µ accuracy

• **Information sources** for search navigation
  www, Fairs, Conferences, Experts, formal mutual Information exchange, Customers, Suppliers

• **Search quality:** related to information source quality

• **Search economy:** search benefit vs. search risk
3. Candidate Set and Compliance to the Acquirer’s objectives

Successful search is transformation of nescience (non-knowledge) into proved knowledge.

Acquirer’s activities:

- Set up and involve Buying Center (BC) in acquisition process
- Identify long list of technology candidates $T(X,Y,Z)$
- Check compliance to Marketability Criteria $[MC;T]$ [6]
- Evaluate technology acceptance (PU / PEoU)$^1$ [6]
- Check coherence between TRL and MRL $^2$ [3]
- Evaluate risk of assimilation gap
- Evaluate willingness to pay by capital budgeting

1) PU: Perceived Usefulness, PEoU: Perceived Ease of Use
2) TRL: Technology Readiness Level; MRL: Market Readiness Level
Criteria of High-Tech Innovation Marketability and Technology Acceptance / Rejection

(MC 1.) Innovativeness
(MC 2.) Testability
(MC 3.) Controllability
(MC 4.) Compatibility
(MC 5.) Implementability
(MC 6.) Assimilability

Technology Acceptance:
- Perceived Usefulness
- Perceived Ease of Use

Technology Rejection

Willingness to Pay (WtP)

Cross-functionality is a proven economic success factor in high-tech innovation and implies communication between multiple knowledge disciplines.

The buying and selling center are represented by a multidisciplinary buying (acquirer) respectively selling team (supplier).

1) Assimilation Gap is significant => Rejection of Innovation
4. Empirical findings

26 Examples of innovative Technologies before Market Entry

Example of classifying 26 innovative technology projects by coherence between Technology Readiness & Market Readiness and risk evaluation

# Technology Push/Market Entry Projects (2013-2014)

<table>
<thead>
<tr>
<th>ID</th>
<th>Innovation</th>
<th>Entry</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Gesture controlled mmi</td>
<td>2014</td>
<td>scanner</td>
</tr>
<tr>
<td>B</td>
<td>Technical simulation</td>
<td>2014</td>
<td>software</td>
</tr>
<tr>
<td>C</td>
<td>Atmospheric nitrogen deposition collector</td>
<td>2014</td>
<td>sensor</td>
</tr>
<tr>
<td>D</td>
<td>Aerosol jet-printing</td>
<td>2014</td>
<td>3d printing</td>
</tr>
<tr>
<td>E</td>
<td>Selective Laser Melting</td>
<td>2014</td>
<td>3d printing</td>
</tr>
<tr>
<td>F</td>
<td>Sensors for mobile robots</td>
<td>2014</td>
<td>sensor</td>
</tr>
<tr>
<td>G</td>
<td>Health CCPM</td>
<td>2013</td>
<td>robotics</td>
</tr>
<tr>
<td>H</td>
<td>Safety Robot</td>
<td>2013</td>
<td>robotics</td>
</tr>
<tr>
<td>I</td>
<td>Atmospheric plasma for wood surface energy</td>
<td>2013</td>
<td>material science</td>
</tr>
<tr>
<td>J</td>
<td>Phase change material</td>
<td>2013</td>
<td>building construction</td>
</tr>
<tr>
<td>K</td>
<td>Flame retardant rubber</td>
<td>2013</td>
<td>material science</td>
</tr>
<tr>
<td>L</td>
<td>Magic lens augmented reality</td>
<td>2013</td>
<td>software</td>
</tr>
<tr>
<td>M</td>
<td>Bone diagnostics</td>
<td>2013</td>
<td>medical diagnosis</td>
</tr>
</tbody>
</table>
# Technology Push/Market Entry Projects

*(2011-2012)*

<table>
<thead>
<tr>
<th>ID</th>
<th>Innovation</th>
<th>Entry</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Continuous Non-Invasive Blood-Pressure Measurement</td>
<td>2012</td>
<td>medical diagnosis</td>
</tr>
<tr>
<td>O</td>
<td>‘Watch dog’ for semiconductor</td>
<td>2012</td>
<td>software</td>
</tr>
<tr>
<td>P</td>
<td>Containment</td>
<td>2012</td>
<td>building construction</td>
</tr>
<tr>
<td>R</td>
<td>Lab on chip diagnostics</td>
<td>2012</td>
<td>software</td>
</tr>
<tr>
<td>S</td>
<td>Vibrational acoustic analysis</td>
<td>2012</td>
<td>medical diagnosis</td>
</tr>
<tr>
<td>T</td>
<td>Smart bottling plant</td>
<td>2011</td>
<td>machine construction</td>
</tr>
<tr>
<td>U</td>
<td>Bright red systems</td>
<td>2011</td>
<td>scanner</td>
</tr>
<tr>
<td>V</td>
<td>mmi pressure and temperature sensors</td>
<td>2011</td>
<td>sensor</td>
</tr>
<tr>
<td>W</td>
<td>Bionic surface</td>
<td>2011</td>
<td>material science</td>
</tr>
<tr>
<td>X</td>
<td>Cellular materials</td>
<td>2011</td>
<td>material science</td>
</tr>
<tr>
<td>Y</td>
<td>V-REDOX</td>
<td>2011</td>
<td>energy storage</td>
</tr>
<tr>
<td>Z</td>
<td>Diamond-like carbon</td>
<td>2011</td>
<td>material science</td>
</tr>
</tbody>
</table>
# Readiness of 26 Technology Push Projects

<table>
<thead>
<tr>
<th>Market Readiness</th>
<th>Demand Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building the adapted answer to the expressed need in the market</td>
<td>9</td>
</tr>
<tr>
<td>Identification of the Experts possessing the competencies</td>
<td>8</td>
</tr>
<tr>
<td>Definition of the necessary and sufficient competencies and resources</td>
<td>7</td>
</tr>
<tr>
<td>Translation of the expected functionalities into needed capabilities to build the response</td>
<td>6</td>
</tr>
<tr>
<td>Identification of system capabilities</td>
<td>5</td>
</tr>
<tr>
<td>Quantification of expected functionalities</td>
<td>4</td>
</tr>
<tr>
<td>Identification of the expected functionalities for new product/service</td>
<td>3</td>
</tr>
<tr>
<td>Identification of specific needs</td>
<td>2</td>
</tr>
<tr>
<td>Occurrence of feeling “something is missing”</td>
<td>1</td>
</tr>
</tbody>
</table>

## Technology Level

- **Fundamental research**
- **Applied Research**
- **Research to prove feasibility**
- **Laboratory Demonstration**
- **Technology Development**
- **Whole system Field demonstration**
- **Industrial Prototype**
- **Product Industrialisation**
- **Market / Sales Certification**

## Technology Risk

- **Red-not ready for market**
- **Yellow – Transition:**
- **Green—Ready for market**

Off diagonal = risk
Technology management = stay on diagonal!
Stay on the Diagonal!
This is valid also for the acquirer!

- Concurrent, step-by-step market and technology development places the right product into the right market window at the right time.
5. Absorptive capacity

- **Absorptive capacity**, the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. It’s a function of the firms prior knowledge. (Cohen / Levinthal [7])
- The closer a country to the technological frontier the more growth depends on having **highly educated** workforce. (Nelson/Phelps 1966)
- The further back from the frontier the more count good **primary** and **secondary education**. ([4] Aghion/Howitt 2006).
- Main channels of advanced technology diffusion are **Trade Openness** and FDI. ([5] Yergali Dosmagambet, 2008, p17).
- **Education speeds the technology diffusion** and accelerates the catch up speed to the technological frontier, **hence narrowing the gap**.
Absorptive capacity$^2$)

Knowledge accumulation

Time

Pre catching up phase

catching up phase

Technological frontier

frontier sharing phase

Pre frontier sharing phase

### Behavioral patterns of catching up the technological frontier

<table>
<thead>
<tr>
<th>Income status</th>
<th>Domestic source</th>
<th>Foreign source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich income highly educated</td>
<td>Domestic Technology base</td>
<td>Import capital goods</td>
</tr>
<tr>
<td>Medium income Good educated</td>
<td>Benefit from foreign imports of embedded technology</td>
<td>Used foreign patents and embodied technology in imported capital goods</td>
</tr>
<tr>
<td>Poor income</td>
<td>Benefit from foreign patents</td>
<td>Use foreign patents</td>
</tr>
</tbody>
</table>

**FDI and collaborative ventures** are highly efficient measures to speed catching up the technological frontier.
6. Success Factors: direct success (1)

- **Economic ratios:**
  - lower costs, higher productivity (Output/Input), higher profitability (RoS, RoI)

- **Technical ratios:**
  - higher availability, less breakdown time, increased stability of quality (MTBF higher, MTTR lower, % availability higher; \( \sigma \) (Qual) lower)

- **Competitive ratios:**
  - increased relative market share, higher innovation half life

- **Social ratios:**
  - Improved labor conditions,
  - increased job variety

- **Environmental ratios:**
  - decreased footprint due to new technology
6. Success Factors: indirect success (2)

- Increased **technological competence** of workers by knowledge transfer

- **Complementary effects** of new technology to joint business processes and activities (lower set up time, shorter cycle time)

- **Motivational impulse** to apply newly gained knowledge to similar applications by internal R&D

- Increased **technological autonomy** by acquiring maintenance and repair knowledge

- **Develop business** by offering supportive technology service for the local market.
6. Success Factors: Negotiation (3)

• Put emphasis on contract design with supplier:
  – training of own staff + exams at suppliers site,
  – Factory acceptance test with own staff
  – Site acceptance test with own staff
  – Detailed documentation
  – Service level agreements and training
  – Joint application centered R&D agreement
  – Agreement on Reference Installation for local market
7. Lessons Learnt

- Acquirer’s decision supported by Buying Center has to take into account the requirements of user, quality manager, purchasing manager, legal, risk and financial aspects.
- Technology supplier must bridge the gap between existing and required knowledge / skills to implement the acquired technology.
- Acquirer’s absorptive capacity is key!
- Service / maintenance focused partnership is key.
- FDI, foreign trade liberalization and localized know how transfer services for sustainable partnership.
THANK YOU!

Q & A?

MAIL1: rainer.hasenauer@wu.ac.at
MAIL2: rh@hitec.at
SKYPE: rainer.hasenauer
References


