A New Model for Academic Entrepreneurship: Successes and Lessons

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Greetings and Best Wishes from Stevens Institute of Technology
Outline

- Model of Traditional Research University
- Global Competition
- Defining Innovation
- The Academic Entrepreneurship Model of IP Commercialization
- Successes
- Lessons Learned
- Conclusion
Spheres rarely overlap making it difficult to establish a learning environment which sustains innovation.

Challenge: Bring the spheres together through a new model
US Patents and Revenue from Traditional Model

Number of Patents granted to US Universities per year*

New Plateau/Decline or backlog in Patent Office?

Licensing Revenue, 1992-2004: $283 Million \rightarrow $1,385 Million**

*Source: United States Patent and Trademark Office
**Source: Association of University Technology Managers
# Global Competition

## Patents granted per 100,000 residents Year 2006

<table>
<thead>
<tr>
<th>Country</th>
<th>Patents granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>99.51</td>
</tr>
<tr>
<td>Korea</td>
<td>182.81**</td>
</tr>
<tr>
<td>Taiwan</td>
<td>50.01</td>
</tr>
<tr>
<td>USA</td>
<td>30.07</td>
</tr>
<tr>
<td>Singapore</td>
<td>9.19</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.22</td>
</tr>
</tbody>
</table>

* Source: JPO, KIPO, USPTO, TIPO, MyIPO and IPOS

**Change in Patent Application Processing

## Manufacturing as a percentage of GDP, 2006***

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>29.8</td>
</tr>
<tr>
<td>Singapore</td>
<td>27.6</td>
</tr>
<tr>
<td>Korea</td>
<td>24.7</td>
</tr>
<tr>
<td>Taiwan</td>
<td>21.4</td>
</tr>
<tr>
<td>Japan</td>
<td>21.0</td>
</tr>
<tr>
<td>USA</td>
<td>12.6</td>
</tr>
</tbody>
</table>

*** Source: Economist.com Country Briefings, Economic Structure

**Message:** Create in-country talent pool
<table>
<thead>
<tr>
<th>Economic Activity</th>
<th>Level of Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustaining transformational inventions and business</td>
<td>The role of the innovation in research and development</td>
</tr>
<tr>
<td>growth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Jobs and Wealth</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventing new products and services</td>
<td>PhD’s with experience in Academic Entrepreneurship</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Innovation Economy</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Improving existing products and services</td>
<td>Master and Bachelor degrees</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing of existing products</td>
<td>Jobs</td>
</tr>
<tr>
<td></td>
<td>Associate – 2 year – and Bachelor degrees talent base</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Knowledge Economy</strong></td>
</tr>
</tbody>
</table>

*STEVENS Institute of Technology*
Innovation

“The design, invention, development and/or implementation of new or altered products, services, processes, systems, organizational structures, or business models for the purpose of creating new value for customers and financial returns for the university, the region and the nation.”

Academic Entrepreneurship

Definition

Academic Entrepreneurship (Æpreneurship) is the mindset of the faculty and students to pursue research that transforms its domain and to realize the benefits of their research for business, industry and government through the creation of shared value.

The Effect of Æpreneurship

- The mindset for innovation is established among faculty and students
- Æpreneurship enables the research university to be a source of sustained innovation
Traditional Research University Model

Research → patents/ trademarks → license to outside → universities get royalties

The Stevens Æpreneurship Model: Path to Sustained Innovation

Academic Entrepreneurship as a core academic value → Research → Patents/trademarks → Prototypes with business models

Investors → Companies launched with ownership by university, faculty, students, investors → Exit Strategy – sale/IPO
August 30, 2007 – The Business Week article titled “Who Needs the Ivies?” cites the strong entrepreneurial environment at Stevens: “Schools like MIT and Stanford don't graduate more founders than Stevens Institute of Technology or Arizona State University. Even the famed Indian Institute ...”
## Successful Examples of Æpreneurship

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Disruptive Features</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROGLOBE</td>
<td>Removes heavy metals from water</td>
<td>Effective at small scales</td>
<td>Sold to Graver</td>
</tr>
<tr>
<td>PLASMASOL Corporation</td>
<td>Medical Sterilization Equipment</td>
<td>Quick turn around sterilization, portable, safe for sensitive surgical instruments, no environmental disposal</td>
<td>Sold to Stryker</td>
</tr>
<tr>
<td>SPOC, Inc.</td>
<td>Diagnostic medical device – locates specific muscles causing pain</td>
<td>Redefines pain mgt – Prevents unnecessary treatments &amp; surgeries.</td>
<td>Clinical trials; Institutional investments received; Kaiser Permante trials; FDA approved</td>
</tr>
<tr>
<td>Attila Technologies LLC</td>
<td>Intelligent multi network radio/router - dynamically connects to all accessible networks for high throughput, non-interrupted connectivity</td>
<td>First of a higher level class of communication systems - works in the space of channels not signals – a cognitive network.</td>
<td>WHCG field tests; interest in internet enabled car; private inv. Received; units purchased</td>
</tr>
<tr>
<td>InStream Media, LLC</td>
<td>Unobtrusive stego based advertising s/w for digital media; Consumer interactive &amp; initiated. Real time advertiser feedback.</td>
<td>Creates an advanced advertising paradigm for digital media – next generation product placement.</td>
<td>Negotiations with broadcast and cable TV; seeking additional investors; BIG INTERACTIVE, PTE, LTD. distributor</td>
</tr>
<tr>
<td>Predator Vision, LLC</td>
<td>Mid IR camera with images of ultrahigh optical resolution and hyperspectral imaging</td>
<td>Operates in range of 8-10 micrometers; penetrates optical barriers; highly sensitive chem/bio detection</td>
<td>Uncooled resolution of 3 Megapixels; negotiation with investors and manufacturers</td>
</tr>
<tr>
<td>Castle Point Scientific LLC</td>
<td>Ultra sensitive optical sensors for automated perimeter and border security</td>
<td>Displaces current sensors – 40% greater sensitivity and lower cost</td>
<td>Military tests of prototype outperformed industry standard; tests at US border by DHS</td>
</tr>
</tbody>
</table>
SIT’s Experience
Department of Homeland Security
National Center of Excellence
For Port Security

Research Areas
- HF Radar
- Resiliency
- Vessel Tracking
- Policy Assessment
- Research and Education
- Satellite-Based Surveillance
- Maritime Domain Awareness
- Recovery and Continuity of Operation

COE Partners

STEVENS Institute of Technology
RUTGERS School of Environmental and Biological Sciences
MONMOUTH UNIVERSITY where leaders look forward
AMERICAN SAMOA
NERSC
Rosenstiel School of Marine & Atmospheric Sciences
MIT CENTER FOR TRANSPORTATION & LOGISTICS
LOCKHEED MARTIN
JBC International
THE PORT AUTHORITY OF NY & NJ
U.S. DEPARTMENT OF HOMELAND SECURITY

Marine Sciences LFRM
SIT’s Experience

WebCampus.Stevens

• Stevens Institute of Technology’s China Program — management and technical degrees delivered in collaboration with top universities in China—has been named “most outstanding online teaching and learning program” by the Alfred P. Sloan Foundation in 2007

• December 2007: WebCampus.Stevens reached its 12,000th enrollment

• U.S. Distance Learning Association’s 21st Century Award for Best Practices in Distance Learning for 2005

• Named Best Institution-wide Online Teaching and Learning Programming for 2003 – presented by the Alfred P. Sloan Foundation’s Sloan Consortium

43 States 40 Countries
Having met the criteria for measuring the depth and maturity of established programs in the field of information assurance, Stevens Institute of Technology is hereby re-designated as a National Center of Academic Excellence in Information Assurance Education in Academic Years 2006-2009.
SIT’s Experience

Comprehensive criteria for educating and implementing Systems Engineering at National Security Administration

Universities

- Boeing
- Cal Tech
- CSM
- DAU
- GMU
- JOG
- JHU
- MIT
- PSU
- SIT
- SMU
- UMD
- UA
- USC
- UMR

- SE Requirements
- Sys Integration
- Eng Economics and Cost Analysis
- Sys Logistics and Support
- PM for Sys Engineers
- Sys Reliability and Maint.
- Risk Management
- Sys Design and Arch
- Intro to SE
SIT’s Experience

Graduate Resource Book

Professor of Physics
Stefan Strauf’s Research

Undergraduate Textbook

CYBER SECURITY
EDWARD AMOROSO

nature photonics

Biomedical Engineering Principles
SIT’s Experience

Graduate Resource Books

- Competing in the Information Age
  - Jerry N. Luftman

- Managing the Information Technology Resource
  - Jerry N. Luftman
    - Christine V. Bollen
    - Donald Liao
    - Elrey Naeih
    - Carl Neumann
Undergraduate Class of 2008 – Accepted Salary Offers

- Biomedical Engineering
- Business and Technology
- Chemical Engineering
- Civil/Environmental Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Engineering Management
- Mechanical Engineering
- Engineering Management
- Business and Technology
- Biomedical Engineering

Stevens Average
National Average

$40,000.00 $45,000.00 $50,000.00 $55,000.00 $60,000.00 $65,000.00 $70,000.00 $75,000.00 $80,000.00 $85,000.00 $90,000.00
Lessons Learned

1. Nurturing attributes among the faculty and students
   - Desire to create new things
   - Courage to take a risk
   - Perseverance
   - Incentives and Rewards

2. Active commitment of the University Leadership
   - The leadership must make entrepreneurship a mandate along with teaching and research, championing a model that suits NCKU
   - Be Generous in sharing value with inventors
   - Provide infrastructure
Lessons Learned

3. Sources of Capital – advantages/disadvantages
   University
   Venture capital
   High net worth individuals
   Corporate

4. Infrastructure
Infrastructure

University

- Funding for faculty and student research
- Policies and practices to implement and sustain entrepreneurship – incentives, rewards and recognition for faculty and students
- Networking to attract external collaborators and partners

For Profit Division

- Licenses IP to startups jointly owned by the university, inventors and investors
- Supports prototype development
- Develops business plans
- Attracts investors (seed and follow on rounds)
- Investment decisions must be made by business persons to business standards
- Hires CEO’s
- Develops exit strategy

Legal Firewall
Transition to academic entrepreneurship is difficult but rewarding for the university, faculty, students and Taiwan.

Success will be realized through:
- Leadership and commitment of the university leaders
- Active engagement of key faculty, who will inspire other faculty and students

Pursue this Goal with Passion and Perseverance!

Thank you
Dr. Harold J. Raveché is the sixth President of Stevens Institute of Technology, a private university founded in 1870 in Hoboken, NJ. The founders of Stevens, who pioneered steam transportation in the U.S. and who were early advocates for U.S. Patent Law in 1790, are said to be America’s First Family of Inventors.

Dr. Raveché pioneered the unique Technogenesis® learning environment (SIT Model), wherein students, faculty and external partners join in creating shared value from the intellectual property developed by launching new companies. Many companies have been formed with investors and some have been sold to larger corporations.

Dr. Raveché has promoted multi-disciplinary research centers to meet the needs of government agencies, and business and industry. These include: Maritime Systems Laboratory, Wireless Network Security Laboratory, Center for Environmental Systems, Joint Center for Pharmaceutical Research, CyberSecurity Center, and the Design and Manufacturing Institute. New initiatives launched in alternate energy sources and biomedical technologies. The graduate programs in Systems Engineering and Information Systems, among the largest in the world, extend beyond U.S. to Latin America, Europe, Asia and India.

Dr. Raveché championed WebCampus.Stevens in 2000, which has reached 12,000 enrollments with student in all continents. It was named the best online graduate program in the U.S. by the Sloan Foundation in 2003 and by the U.S. Distance Learning Association in 2005. In 2007, the SIT program in China received the distinction of “most outstanding online teaching and learning program” by the Alfred P. Sloan Foundation.

He holds a PhD from the University of California, San Diego in Physical Chemistry, lectures widely on the role of universities in promoting entrepreneurship and economic competitiveness. He serves on corporate boards and is a global advisor on technological innovation.