The Roles of Universities
Many roles

• Universities are different
• Disciplines are different
• Regions and cities are different
• Countries are different

→ No one size fit all model

- Academic science and universities have become increasingly entrepreneurial
- It is an imperative to raise funds for a research group – internal pressure to engage
Models

• Entrepreneurial University

• Triple helix

• Civic university
  o Engaged university - scholarship of engagement, stewardship of place
  o Responsible research and innovation

• Regional Innovation Systems

• New Production of Knowledge
  (Mode 2 knowledge)
The concept of knowledge-based regional economic development is derived from activities of the New England Council, representing academic, business and political leaders. Based on the formation of firms from research at MIT in the 1920s, MIT President Karl Compton proposed to utilize the region’s comparative advantage, its extensive academic base, systematically to create new firms from scientific research. In the 1930s, New England business and political leaders were open to new ideas, given the failure of traditional business models of regional development.

(Jacob & Helsström 2000)
The Triple Helix Model
(Etzkowitz & Leydesdorff 1997; Etzkowitz 2008)

A popular approach for understanding how the dynamic interaction between ‘the three institutional spheres’ (universities, industries and government) fosters entrepreneurship, innovation and economic growth

Key assumptions

- Universities are playing a central role in innovation side by side with industries and governments
- While earlier innovation policy was to a large extent designed and implemented by governments, today it is fairly commonly an outcome of complex interplay between governments, industries and universities
- In addition to taking care of their traditional functions the three institutional spheres also adopt new roles and also perform the roles of the other spheres
  - Not much empirical evidence!
Entrepreneurial University

- Entrepreneurship as additional role alongside teaching and research
- Focus on commercialisation of technology through licences and spin-offs
- Partnership focused on commercialisation and external funding of research
- Focus on science and technology

(Source: David Charles)
Entrepreneurial university

Three steps towards an entrepreneurial university

1. The ability to set a strategic direction
2. A commitment to seeing that the knowledge developed within the university is put to use, especially in its region.
3. Reverse dynamic moving from problems in industry and society, seeking solutions in academia

The key elements

- The organization of group research
- The creation of a research base with commercial potential
- The development of organizational mechanisms to move research out of the university as protected intellectual property
- The capacity to organize firms within the university and “graduate” them
- Integration of academic and business elements into new formats such as university-industry research centers.

(Etzkowitz 2017)
Entrepreneurial university

Interaction
• The entrepreneurial university interacts closely with the industry and government; it is not an ivory tower university isolated from society.

Independence
• The entrepreneurial university is a relatively independent institution; it is not a dependent creature of another institutional sphere.

Hybridization
• The resolution of the tensions between the principles of interaction and independence are an impetus to the creation of hybrid organizational formats to realize both objectives simultaneously.

Reciprocality
• There is a continuing renovation of the internal structure of the university as its relation to industry and government changes and of industry and government as their relationship to the university is revised.

(Etzkowitz 2017)
• As of 2014, MIT alumni have launched 30,200 active companies, employing roughly 4.6 million people, and generating roughly $1.9 trillion in annual revenues.

• 31% have filed patents and 34% consider themselves inventors

• 12% established a company

• 38% worked in early staged ventures

• In the 2000s, alumni launched around 12,000 new companies

• > 30 percent of all the surveyed companies are located in Massachusetts, 8 % in Cambridge; 20 % in California and 23 % in other countries

Robert et al: Entrepreneurship and Innovation at MIT
Why Boston Area and SV: Six elements

• Pillar companies
  o For example, Apple, Google, Facebook and Oracle
  o For example, General Electric and iRobot

• Universities
  o Universities are among the world’s best sources of intellectual property and talent.

• Human capital
  o From pillar companies, universities, and talent from around the world. These places have an ample, if expensive, pool of talent

• Investment capital
  o Start-ups need different kinds of capital at different stages

• Mentoring
  o Experienced investors and executives mentor companies and talented professionals

• Values
  o Silicon Valley and Boston area have a unique set of values that guide the way people behave.

(Cohen 2017)
How Did Boston and Silicon Valley Get There?

• **Great person comes first.** In Silicon Valley and Cambridge, a great person has proven essential for spurring initial success.

• **Universities supply ideas and talent.** Not surprisingly, great persons can't build companies all by themselves

• **Capital, talent, and pillar companies follow initial startup success.** Venture capitalists are pack animals -- if they see that another firm has profited through an investment, they will seek out similar ones

• **It takes a generation**

• **Startup leadership is impermanent.** A city that leads the world today could be in big trouble in future.

(Cohen 2017)
<table>
<thead>
<tr>
<th>No.</th>
<th>Ivory Tower University</th>
<th>Entrepreneurial university</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Isolated from the society</td>
<td>Open and serve to the external society</td>
</tr>
<tr>
<td>2</td>
<td>Teaching on campus</td>
<td>Teaching on/off campus</td>
</tr>
<tr>
<td>3</td>
<td>Knowledge production for own sake</td>
<td>Polyvalent knowledge produced</td>
</tr>
<tr>
<td>4</td>
<td>Meandering stream of basic research</td>
<td>Multiple sources of input into research direction</td>
</tr>
<tr>
<td>5</td>
<td>Useful knowledge as accident</td>
<td>Useful knowledge sought</td>
</tr>
<tr>
<td>6</td>
<td>No organizational technology transfer capability and no firm formation</td>
<td>TTO, Incubator integrated into innovation strategy to foster start-ups</td>
</tr>
<tr>
<td>7</td>
<td>Discipline-based departments as primary units</td>
<td>Departments and inter-disciplinary centers have equal status</td>
</tr>
<tr>
<td>8</td>
<td>Single internal stakeholder</td>
<td>Multiple stakeholders – internal and external</td>
</tr>
<tr>
<td>9</td>
<td>University administration only from academia</td>
<td>University administration from multiple sources, including industry and government</td>
</tr>
<tr>
<td>10</td>
<td>Funding as matter of right</td>
<td>Funding as matter of exchange, something to be earned</td>
</tr>
<tr>
<td>11</td>
<td>Operation for self sustainability</td>
<td>Make significant contribution to regional development as well</td>
</tr>
<tr>
<td>12</td>
<td>Only academic mind-set</td>
<td>With entrepreneurial ethos</td>
</tr>
</tbody>
</table>

Mode I - as traditional disciplinary research  
Mode II - as new form of knowledge production in the context of application  

(Etzkowitz 2017)
Traditional (linear) view of R&D and innovation is flawed

Fundamental
- Autonomous
- Curiosity-driven
- Pure science

Applied
- Practical
- Mission-driven
- Product development (Firms)

‘FUNDAMENTAL’ vs. ‘APPLIED’ IS A FALSE DICHOTOMY
Both motivations may apply simultaneously

Quest for fundamental discoveries?

Is research motivated by practical goals?

Yes

Yes
Stokes’ matrix

<table>
<thead>
<tr>
<th>Quest for fundamental discoveries?</th>
<th>Practical goals?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>?? (e.g., insect taxonomies)</td>
</tr>
<tr>
<td>Pure basic research (&quot;Bohr&quot;)</td>
<td>Pure development (&quot;Edison&quot;)</td>
</tr>
<tr>
<td>Use-inspired basic research (&quot;Pasteur&quot;)</td>
<td></td>
</tr>
</tbody>
</table>
Pure basic research ("Bohr")
- public funding
- peer review
- non-proprietary

Use-inspired basic research ("Pasteur")
- govt&private funding
- National/global mission
  - Defense
  - Health
  - Space
  - Climate
- generic/pre-competitive
- public/proprietary

??
(e.g., insect taxonomies)

Pure development ("Edison")
- corporate/venture funding
- market-driven
- customer/supplier input
- proprietary

(Stokes 1997; Lester)
In practice the distinctions are blurred

Any given innovation typically involves a network of organizations

Universities are active in all quadrants

(Stokes 1997; Lester)
## LIS Case Portfolio

<table>
<thead>
<tr>
<th>Country</th>
<th>Location</th>
<th>Industry/Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>Rochester, NY</td>
<td>Opto-electronics</td>
</tr>
<tr>
<td>USA</td>
<td>Akron, OH.</td>
<td>Advanced polymers</td>
</tr>
<tr>
<td>USA</td>
<td>Allentown, PA</td>
<td>Opto-electronics/steel</td>
</tr>
<tr>
<td>USA</td>
<td>Boston, MA</td>
<td>Bioinformatics</td>
</tr>
<tr>
<td>USA</td>
<td>New Haven, CT</td>
<td>Biotechnology</td>
</tr>
<tr>
<td>USA</td>
<td>Charlotte, NC</td>
<td>Motor sports</td>
</tr>
<tr>
<td>USA</td>
<td>I-85 Corridor, NC/SC</td>
<td>Autos</td>
</tr>
<tr>
<td>USA</td>
<td>Alfred-Corning</td>
<td>Ceramics</td>
</tr>
<tr>
<td>USA</td>
<td>Youngstown, OH</td>
<td>Steel/autos</td>
</tr>
<tr>
<td>Finland</td>
<td>Tampere</td>
<td>Industrial machinery</td>
</tr>
<tr>
<td>Finland</td>
<td>Turku</td>
<td>Biotechnology</td>
</tr>
<tr>
<td>Finland</td>
<td>Seinajoki</td>
<td>Industrial automation</td>
</tr>
<tr>
<td>Finland</td>
<td>Pori</td>
<td>Industrial automation</td>
</tr>
<tr>
<td>Finland</td>
<td>Helsinki</td>
<td>Wireless</td>
</tr>
<tr>
<td>Finland</td>
<td>Oulu</td>
<td>Medical</td>
</tr>
<tr>
<td>UK</td>
<td>Central Scotland</td>
<td>Opto-electronics</td>
</tr>
<tr>
<td>UK</td>
<td>Aberdeen</td>
<td>Oil and gas</td>
</tr>
<tr>
<td>UK</td>
<td>Cambridge</td>
<td>Bioinformatics</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Taipei-Hsinchu</td>
<td>Electronics</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Taipei-Hsinchu</td>
<td>Software</td>
</tr>
<tr>
<td>Japan</td>
<td>Hamamatsu</td>
<td>Opto-electronics</td>
</tr>
<tr>
<td>Japan</td>
<td>Kyoto</td>
<td>Electronics</td>
</tr>
<tr>
<td>Norway</td>
<td>Stavanger</td>
<td>Oil and gas</td>
</tr>
</tbody>
</table>
University roles in path development

**Path creation**
- Forefront academic research
- Science policy
- Licencing/patenting
- Ties between academics and entrepreneurs
- Creation of industry identity
- Standard-setting
- Evangelists

**Path transplantation**
- Bridging between disconnected actors
- Filling structural holes
- Creation of an industry identity

**Path branching**
- Re-education
- Responsive curricula
- Technical assistance

**Path extension**
- Problem-solving for industry
- Re-education
- Responsive curricula
- Global best practice scanning
- Foresight
Types of university–industry relations
(see Bercovitz & Feldman 2006; Mansfield 1995; Louis et al. 1989; Perkman et al. 2011; Martinelli, A., M. Meyer, N. von Tunzelmann 2008)

• **Licensing**: Contractual assignment of university-generated intellectual property (such as patents) to external organizations

• **Academic entrepreneurship**: Development and commercial exploitation of technologies pursued by academic inventors through a company they (partly) own

• **Research student**: Businesses sponsor individual student.

• **Collaborative research**: Research jointly pursued by university and industrial partners – commonly with public funding

• **Contract research**: Application-oriented research and development activities carried out by university – commissioned and funded by industry

• **Consulting**: Application-oriented research and development activities or advice provided individually by academics – commissioned and funded by industry
Source: Hughes and Kitson (2012)
Universities and Different Forms of Knowledge
(Charles 2006)

Knowledge as a Commodity
- technology transfer and spin-off firms
- a number of mechanisms and policies were developed for enhancing the commercialization process

Knowledge as Human Capital
- education of students and training activities for people already in work
- the human infrastructure and the institutional mechanisms that foster interactive learning: reproduction and adaptation

Knowledge as Social Capital
- the social and cultural basis of effective democratic governance and, ultimately, economic success
- The development of networks of civic engagement, and hence in the wider political and cultural leadership of their localities
The Civic University Model

- Not only what universities are good at but also what they are good for
- UTA (TAU) as a case in point
• A sense of purpose
• Actively engaged
• A holistic approach
• A strong sense of place
• Willing to invest
• Transparent and accountable
• Use of innovative methodologies
The ‘un-civic’ university

TEACHING

Rankings

FOCUS OF MANAGEMENT AND LEADERSHIP

Funding targets

‘THIRD MISSION’ ACTIVITIES

Hard boundary between enabling and non enabling environments

RESEARCH

Excellence

THE ‘CORE’

THE ‘PERIPHERY’

By John Goddard
The Civic University

By John Goddard
The original mission of the University of Tampere was endowed with a singularly clear and extensive mission to serve society, and to this day the University of Tampere has retained its strong orientation to society, to public and private services and to professional university education.

BUT

UTA is Civic by history and culture but strategic efforts trail behind.

The University of Tampere is a civic university according to its history, internal culture and values but it did not systematically developed itself as such

- A long history as a ‘civic university’, civic engagement has been seen as a natural part of activities
- The concept of civic engagement is not formalised or officially embedded in the strategy
- The partnerships are not managed strategically and holistically
- ‘The civic nature’ has been taken for granted and development efforts have thus targeted other issues
- **NOTE:** Are we today building an entrepreneurial university?
TABLE 1. The main groups of collaboration, and their geographical nature, % of all responses (source: the UTA survey) (n=195)

<table>
<thead>
<tr>
<th></th>
<th>Local/Regional</th>
<th>National</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private company - less than 250 employees</td>
<td>15.9</td>
<td>15.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Private company - more than 250 employees</td>
<td>8.2</td>
<td>12.3</td>
<td>13.3</td>
</tr>
<tr>
<td>Other university</td>
<td>15.4</td>
<td><strong>62.1</strong></td>
<td><strong>65.1</strong></td>
</tr>
<tr>
<td>Other educational institution</td>
<td>13.3</td>
<td>22.6</td>
<td>11.8</td>
</tr>
<tr>
<td>Research institute (public)</td>
<td>6.2</td>
<td>34.9</td>
<td>20.5</td>
</tr>
<tr>
<td>Research institute (private)</td>
<td>2.6</td>
<td>7.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Government/public sector</td>
<td>15.9</td>
<td><strong>37.9</strong></td>
<td>12.3</td>
</tr>
<tr>
<td>Charity</td>
<td>2.1</td>
<td>4.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Other non-profit</td>
<td>1.5</td>
<td>11.3</td>
<td>6.7</td>
</tr>
<tr>
<td>Policy institute/'think tank'</td>
<td>2.1</td>
<td>8.7</td>
<td>5.1</td>
</tr>
</tbody>
</table>

The main collaborative activities at UTA (n=170)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting local or national public sector policy development</td>
<td>45%</td>
</tr>
<tr>
<td>Consultancy services</td>
<td>45%</td>
</tr>
<tr>
<td>Outreach work aimed at increasing public understanding of science (e.g. sharing research)</td>
<td>40%</td>
</tr>
<tr>
<td>Joint research with non academic partners</td>
<td>40%</td>
</tr>
<tr>
<td>Participating in non academic groups or networks</td>
<td>37%</td>
</tr>
<tr>
<td>Delivering professional training/CPD</td>
<td>35%</td>
</tr>
<tr>
<td>Joint publications with non academic partners</td>
<td>35%</td>
</tr>
<tr>
<td>Arranging internships or placements for students</td>
<td>25%</td>
</tr>
<tr>
<td>Outreach work aimed at increasing participation of young people in higher education</td>
<td>20%</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>15%</td>
</tr>
<tr>
<td>Supporting local cultural organisations with their programmes (e.g. museums, galleries, theatres, A new business startup or spin out (your own or supporting colleagues or students)</td>
<td>10%</td>
</tr>
</tbody>
</table>

(Source: UTA Civic University Survey)
University contributions

- Encouraging the net-migration and retention of skilled people
- Creating open atmosphere
  - "The freedom of thought"
  - "multiple and versatile cognition"
- Regional culture
  - Conventions, etc.
  - Cultural activities
- Media discussion
- Critical counterforce

To boost society's stock of intellectual capital

A pool of knowledge and talented people

Development support

Encouraging the net-migration, retention and birth of new firms

Training skilled labour force

Problem-solving
- technology transfer
- contract research

Research and consulting services

Node in the global networks

Local pipeline to global knowledge and expertise

Media discussion

Image