The Triple Helix Model for Innovation

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• Models of Innovation Management
• What is the Triple Helix Model?
• The Entrepreneurial University and its new mission
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What is innovation?

Innovation is:

"Turning an idea into a solution that adds value from a customer’s perspective"

Nick Skillicorn
@improvides

idea to value.com
Popular view of innovation:

The lone inventor/mad professor.

But, such views lead to misunderstanding.
Science does not equal innovation.

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Research and Development

- **Basic Research**
  - Discovery process
  - No set timing
  - Unpredictable returns
  - Long term

- **Technology Development**
  - Loosely structured
  - Difficult to plan
  - Less predictable
  - Medium term

- **Product Development**
  - Structured methods
  - Planned timing
  - Predictable outcome
  - Short term
Invention vs. Innovation

• Radical -------------------------------------------Incremental

Compact fluorescent and LED lamps – incremental
TECHNOLOGY READINESS LEVEL-TRL

Overview

- System Test, Launch & Mission Operations
- System/Subsystem Development
- Technology Demonstration
- Technology Development
- Research to Prove Feasibility
- Basic/Applied Research

Technology to be explored, developed, assessed and used

Contract research

Market Pull

Technology Push

Fundamental research

Time
Models of innovation management

Linear Innovation Models

Technology push

Research and development → Manufacturing → Marketing → User

Market pull

Marketing → Research and development → Manufacturing → User

FINGERTIP TOOTHBRUSH

Good Grips Angled Measuring Cups
Science and technology base

Creation of new knowledge dominated by universities and large science-based organisations

Technology development-dominated by organizations

Consumers express their needs and wants through the consumption of products

Interactive model

Needs of the market
Product Development Process

1. Identify Customer Needs
2. Establish Target Specifications
3. Generate Product Concepts
4. Select Product Concept(s)
5. Test Product Concept(s)
6. Set Final Specifications
7. Plan Downstream Development

- Mission Statement
- Develop Economic Analysis
- Benchmark Competitive Products
- Build and Test Models and Prototypes
Network models

Innovation management framework

EXTERIAL INPUTS:
- macro factors
- ROI
- costs
- competition

Organisation and business strategy

Organisation's knowledge base accumulates knowledge over time

EXTERNAL INPUTS:
- societal needs
- competitors
- supplier partnerships
- distributors
- customers
- strategic alliances

EXTERNAL INPUTS:
- scientific and technological development
- competitors
- suppliers
- customers
- university departments

New products

Source: Trott, 2005
The Innovation Chain: Converting Science into Wealth

ACADEMIA → COLLABORATION → INDUSTRY

Knowledge Development → Technology Development → Business Development

TRL 1 → TRL 2 → TRL 3 → TRL 4 → TRL 5 → TRL 6 → TRL 7 → TRL 8 → TRL 9

- Basic technology research
- Research to prove feasibility
- Technology demonstration
- Technology development and prototypes
- Pilot plan and scale up
- Market launch and commercialisation

Source: uk-cpi.com
The entrepreneurial university

• As suggested by Prof Henry Etzkowitz, there are three stages to the development of the university role:

• **Phase One**: focus on teaching and training (funded through donations, tuition fees and grant income or resource providers)

• **Phase Two**: focus on research & development (marketing technology transfer capabilities to get more income from commercializing the intellectual property arising from the activities of its research groups and centers.

• **Phase Three**: play a proactive role in improving the efficiency and effectiveness of its regional innovation environment in collaboration with industry and government actors.
University Missions

• **Teaching and Training:** Individuals and Organizations
• **Conducting Research:** Individual and Research Group/Centers
• **Generating regional economic growth and playing a primary, rather than a secondary, role in society:** technology, spin-offs and start-ups.
The triple helix model (THM)

Triple Helix was developed in the 1990s by Henry Etzkowitz and Loet Leydesdorff.

• THM is defined as “a set of interactions between three entities: university, industry, and government, to enhance the economic development of the country. Hence, this generates innovation through this synergy” (Etzkowitz, 2002).
The state plays a primary role in controlling academia and industry, but it also restricts them from generating and developing innovative renovations (Ranga & Etzkowitz, 2013).
The industry is the driving force, with the government and academia having a limited interference and roles in enhancing innovation and economy, in which they act as a secondary support (Etzkowitz, 2003a).
Innovation and Sustainable Development
Triple Helix 3: The balanced model

- Each institutional sphere preserves its unique identity and key roles, while at the same time they overlap, collaborate and take the role of one another (Etzkowitz, 2003a).
Triple Helix 3: The balanced model

• Hybrid organizations and appropriate environments for innovation developing at the intersections of the spheres (Etzkowitz & Leydesdorff, 2000).

• Universities are significant actors and equal partners with industry and government (Ranga & Etzkowitz, 2013)

• The three spheres are seldom equivalent, as one sphere of activity usually plays the role of a motive force, or the ’innovation organizer’, while the other two spheres spin around it (Etzkowitz, 2003a).
University-industry interactions:

Students, Researchers, Labs, and knowledge generation

Securing more industrial students' internships and higher employability

Bringing practical industrial problems

Jointly funded research projects

Technology & Knowledge transfer,

Industry Ph.D. Students

Professor of Practice

Jointly firm formation and regional development

Consulting, patenting and firm formation lead to a knowledge-based regional development.
Benefits to Industry

• Expand long term and risky research activities to experts in the field
• Obtain patented technology through licensing agreements
• Leverage funding through matching grant projects
• Collaborating research labs are source of new recruits
Benefits to Academia

- Excellent source of funding with industry and government sharing the load
- Funding allows for critical mass of personnel and in general, more efficient research
- Training of highly qualified personnel in industrial related research good for job placements
- Research generally based on strategic needs and has long range benefit to the community
Benefits to Government

- New industries and new products can lead to higher employment
- Financial benefit from taxes and duties
- Helps support strategic RD initiatives
- Many products have impact on citizens in providing a better live style
- Achieving regional economic growth
Sharjah Oasis for Technology and Innovation (SOTI)

**SOTI’s Ambition**

- Serve the community
- Enhance Sharjah’s international reputation
- Help Sharjah be a knowledge driven economy

**Key Objectives as per SOTI Emiri Decree, Jan 2019**

1. Spur new businesses
2. Foster applied research
3. Create triple helix linkages
4. Transfer knowledge and patents
5. Develop a R&D based economy
Swedish-Emirati collaboration in Aviation management under the Triple Helix Framework

- In the year 2017, SEAM researchers from the University of Sharjah met with Swedish delegates from academic, industry, and governmental organizations. As a result, three projects were identified:

Project 1: Simulation, Visualization and Management of Unmanned Air Traffic.

Project 2: Stochastic Models for Air Traffic Flow Management (ATFM)

Project 3: Operator tracking and load balancing for ATC operators (OP-TRACK-DXB)
The History of Triple Helix Projects at the UOS

UAE – April 24 - 26, 2018:
• The SEAM 1st Triple Helix Technical Meeting: kick-off

UAE – April 23 - 25, 2019:
• The SEAM 2nd Triple Helix Technical Meeting: to discuss the progress on the projects

UAE – February 23 - 25, 2020:
• The SEAM 3rd Triple Helix Technical Meeting: testing with the UAE stockholders
The 4th Technical workshop: unmanned aviation scenario development

2nd June 2021
Project 1: Simulation, Visualization and Management of Unmanned Air Traffic

- UAV
- UAS
- Civil Aircraft
- Beyond-line-of-sight
- Air Traffic Control
- Ground Control Station
THE UNIVERSITY OF SHARJAH HOLDS THE THIRD FORUM FOR MANAGING DRONE ACTIVITIES

In the attendance of Prof. Maamar Bettayeb, Vice Chancellor for Research and Graduate Studies, the Sustainable-Engineering Asset Management Group of the Research Institute of Sciences and Engineering (RISE) at the University of Sharjah organized the Third Forum for the Management of Unmanned Aerial Vehicles under the title "Management of Unmanned Aerial Vehicle Activities (Drones)."
Project 2: Stochastic Models for Air Traffic Flow Management (ATFM)

The aim is to highlight the impact of unifying airline and air traffic managers decisions under a central authority through information sharing, and to study the effect of considering weather uncertainty and the dynamic nature of the airspace on the network costs.
Project 3: Operator tracking and workload balancing
Organizations involved

Universities

Government and Industry
Examples of outcomes of the collaboration

- UTM simulator including the maps of the UAE with routing algorithms has been developed.
- Many publications have been either submitted or will be submitted to international conferences and journals.
- One PhD student graduated from Paris Saclay University (France) was co-supervised by researchers from University of Sharjah.
- One master student defended his Thesis in 2020.
- Four MOUs were signed between the University of Sharjah and
  - Linkoping University, Sweden.
  - LFV, Sweden.
  - Dubai Air Navigation Services (DANS), UAE.
  - Department of Civil Aviation in Sharjah (SDCA), UAE.
Cooperation with Sharjah Municipality Started 2017.
Pictures last Thursday

Email received today

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Cooperation with Taxi Dubai started November 2018
Conclusions

• To achieve more socio-economical impactful value, we need to:
  • Orient the research projects and SDPs to the needs of the industry and society
  • Be more flexible in allowing active researchers to establish spin-off firms, taking research out of the laboratory, starting their own commercial firms in partnership with UOS.
  • Allow the transfer of personnel between academia and industry (Professor of Practice)
  • Change the performance and promotion criteria to encourage building links with industry and forming new firms.
  • Be more flexible with the teaching load allocation. This would be possible by the new teaching allocation system suggested by Prof Ahmed Al-Shammaa (Dean of College of Engineering)
Thank you for your listening
Any Question?