Present and Future of Knowledge Transfer

The perspective of an investor

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Netval Summer Conference, Rome, 17th Sep 2019
The socio-economic impact of Deep-Tech startups in Europe is significant.

- 257 related Spin-off companies among the largest European RTOs
- 13,800 job places created
- €1.8 billion turnover
- €350 million fiscal return

Source: *How to Exploit the Untapped Potential of RTOs’ Deep-Tech Start-Ups in Europe, EARTO, 2017*
American Digital startup model significantly differs from the European Deep-Tech one and a different approach should be adopted for European countries.

<table>
<thead>
<tr>
<th></th>
<th>US-type Digital Startups (i.e. Unicorns)</th>
<th>EU-type Deep Tech Startups (i.e. RTOs' Spin-offs*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>No own / commonly available</td>
<td>Deep tech, protected / hard to reproduce</td>
</tr>
<tr>
<td>Clients</td>
<td>B2C</td>
<td>B2B</td>
</tr>
<tr>
<td>Business approach</td>
<td>• Leverage on business model</td>
<td>• Leverage on technology</td>
</tr>
<tr>
<td></td>
<td>• Service based</td>
<td>• Technology based</td>
</tr>
<tr>
<td></td>
<td>• Disrupting existing value chains</td>
<td>• Connects existing value chains</td>
</tr>
<tr>
<td>Pre-foundation needs</td>
<td>Very low resources</td>
<td>Significant resources</td>
</tr>
<tr>
<td>Time to market</td>
<td>Almost immediate</td>
<td>3 to 5 years for proof of concept / minimum viable product</td>
</tr>
<tr>
<td>Growth model</td>
<td>• Exponential / fast growth</td>
<td>• Linear / controlled growth</td>
</tr>
<tr>
<td></td>
<td>• Resource intensive</td>
<td>• Linked to customers acquisition and revenues</td>
</tr>
<tr>
<td></td>
<td>• Achieve global leadership</td>
<td>• Targeted approach</td>
</tr>
<tr>
<td>Societal impact</td>
<td>Short / medium term with disruption</td>
<td>Long term / sustaining industry</td>
</tr>
</tbody>
</table>

Source: our elaboration based on EARTO 2017 analysis

* RTO – Research and Technology Organisation
Creating a Deep-Tech start-up is like launching a rocket into space

Our elaboration on EARTO (2017) model

- **FUEL**: smart and long lasting
- **MINDS**: researchers with promising technologies
- **MANAGEMENT**: entrepreneur and team with clear market vision
- **MARKET**: acquire industrial customers
- **INFRASTRUCTURE**: research, prototyping, piloting and testing

Diagram shows a rocket with labeled sections for different aspects of a start-up.
Pre-seed phase is critical and is performed within RTO’s facilities before spin-off is incorporated. IP licensing and access to RTO facilities are fundamental after incorporation.
PoC is the most critical phase of the technology transfer process and investments might be effective only if supported by strong industrial competences.

<table>
<thead>
<tr>
<th>DEVELOPMENT PHASE</th>
<th>Base research (&lt; TRL3)</th>
<th>Proof of Concept (TRL3 -&gt; TRL5)</th>
<th>Prototyping (TRL6 -&gt; TRL7)</th>
<th>Commercialization (&gt; TRL7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>THREATS</td>
<td>• Limited alignment between corporate business needs and research objectives both in universities and corporate R&amp;D labs</td>
<td>• ≈ 80% of final product lifecycle costs are determined in this phase</td>
<td>• Technology and market risk are still high</td>
<td>• Corporate have limited knowledge in venture investments</td>
</tr>
<tr>
<td></td>
<td>• Scouting requires specific skills and dedicated team</td>
<td>• Lack of customer centred approach in technology, product and business development</td>
<td>• New products should be engineered and industrialised in order to fit corporate needs</td>
<td></td>
</tr>
<tr>
<td>FINANCIAL NEEDS</td>
<td>€ millions</td>
<td>€50k - €200k</td>
<td>€200k - €700k</td>
<td>€ millions</td>
</tr>
</tbody>
</table>

CURIOSITY DRIVEN (mainly public funding) → MARKET DRIVEN (mainly private funding)

(*) Source: D.P.Schrage, GeorgiaTech

The less expensive yet most critical phase, lacks the knowledge of final and direct customers.
We have designed a novel PoC investment program, which combines technology development, education and test facilities, and is performed before spin-offs are incorporated.
“RTOs have the role of supporting value chains by managing complex large scale research and technological infrastructures/facilities including multi-use research (prototype) and low-rate manufacturing (test & validation) facilities supporting piloting and pilot-production. These are essential to the creation of deep-tech start-ups but they are too expensive for any single industry investment. Access to RTO in-house infrastructure allows a company to grow and create value with a low capital need.” (*)

(*) Source: How to Exploit the Untapped Potential of RTOs’ Deep-Tech Start-Ups in Europe, EARTO, 2017
Future Technology Transfer models should stretch today ones to cover all dimensions

Our elaboration on EARTO (2017) model
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ETO* analysed the process to create successful Deep-Tech startups and suggested five key dimensions should be connected:

**DIMENSIONS**

**INFRASTRUCTURE**
Excellent research, multiuse (prototyping) and low rate manufacturing (test and validating) facilities. Allows to grow and create value with a low capital need. Can be used to investigate completely new technology piloting and spin-off incubation, to test changes in existing products, and validate emerging concepts.

**MINDS**
Technology experts with access to infrastructure developing a promising market-oriented RTO technology into a product, with strong IP. An RTO’s deep-tech start-ups usually start with a promising technology at a close-to-market level of development, with potential applications in different markets.

**MANAGEMENT**
Strong, smart and versatile team with good market vision, willing to convert disruptive technologies into ready-to-invest businesses. Leadership dilemma: the RTO needs to find a motivated entrepreneur who will act as a driving force to develop the market. Minds and Management together form the Smart Team.

**MARKET**
Strategy with interested and committed industrial partners/clients. Market Development: develop the market and the technology to identify the industrial clients interested in the technology market perspectives. The higher the number of industrial partners the start-up acquires, the lower the risks are.

**MONEY**
Smart capital from investors seeking to transform technology based investment opportunities into business value and growth. A strong and smart team of Minds & Management developing a promising technology with a smart market strategy including several committed industrial clients will make it much easier to attract and secure smart money.
The most successful European technology transfer models share a long term/evergreen/very early stage investment model, coupled with active support and, in some cases, direct spin-off management.

**KU LEUVEN**
- House TTO with HR and budget autonomy. Among the first in Europe. 95 members, €250M contract research managed in 2015 and 70 IP licences per year. Uses Gemma Frisius Seed Capital evergreen fund managed by KBC and dedicated to KU Leuven only.

**IP Group/Imperial Innovations**
- Evergreen, independent public company. Have investments with various universities in UK, US and Australia. Concentrate on investments from PoC phase onwards, supporting portfolio companies with managerial services. The NAV at the end of 2018 was £1.1 Bln. IP Group acquired Imperial Innovations on 2016.

**ETH ZURICH**
- House TTO, with a staff of 30 people. Manages 60 to 80 IP licenses per year and since 1996 it span-out 260 companies. Investments are performed in cooperation with VI Partner, an evergreen fund created in joint venture between McKinsey&Co and ETH, later joined by leading Swiss industrial companies such as ABB, Astra, Schindler.

**KAROLINKSA INNOVATIONS AB**
- Wholly owned subsidiary of Karolinska Institutet. It supports university’s research teams from initial IP assessment up to full scale development. Manages Karolinska Development, a public, evergreen investment company listed in Nasdaq Nordic market. The team offers business development support to research teams. It focuses on lifescience.

**FRAUNHOFER VENTURES**
- A central department of Fraunhofer Institute. Creates, on average, 10 spin-off companies per year. Offers a 12 weeks accelerator program with TU of Munchen, the FFE program – similar to a PoC grant – and the FFM one, long term loan up to €100k for management recruiting. In Feb 2019 it launched a TT fund supported by EIF.

**ASCENION**
- Wholly-owned subsidiary of the Life Science Foundation for the Promotion of Science and Research, it provides university hospitals and universities with services in all areas of technology transfer in the life sciences. It works as an early stage investor from PoC (in exchange of services) and as an IP broker.
IP Group (including Imperial Innovations, acquired in 2016) is expanding globally and had a significant impact in financial and societal terms.

IP Group annual report, end of 2018

PORTFOLIO RESULTS 2018

- **£1,128m** Fair Value
- **£100m** Invested by IP Group
- **£695m** Collected by Portfolio

TOTAL IMPACT

- **300** Companies formed and supported
- **£850m** Invested in UK science startups
- **£4bn** Raised by portfolio companies
- **5,000** Job places created

Source: IP Group annual report, end of 2018