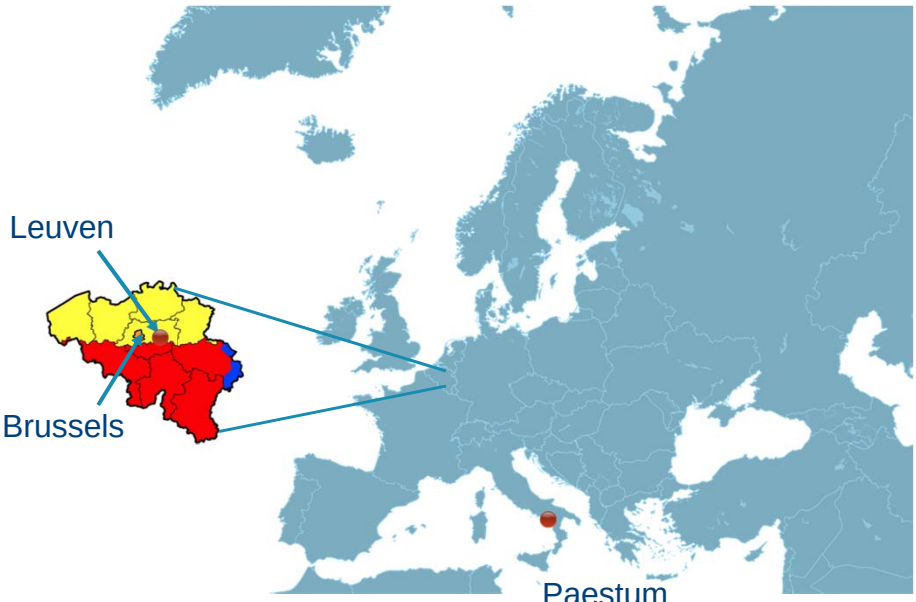
KU LEUVEN
RESEARCH & DEVELOPMENT

Communication in the world of tech transfer: Sensu Stricto and Sensu Lato

Wim Fyen
Innovation manager and coordinator Lcie

Summer School, Sept 12-15, 2016
Communication of research and innovation to maximize impact



KU LEUVEN
RESEARCH & DEVELOPMENT

- Capital of province Flemish Brabant
- About 100,000 inhabitants
  - (Incl. 40,000 students)
- Hometown of University of Leuven
  - Founded in 1425

KU Leuven University: General info

- KU Leuven (Academic Ba and Ma degree)
  - 55,523 students (2015-2016)
  - 10,158 FTE employees (2014)
    - 1,053 professors / 5,793 researchers / 3,312 staff

- Leuven University Hospitals
  - 2,000 beds
  - 7,642 FTE employees (2014)

- 5 university college clusters (prof. Ba)
  - 54,425 students (2015-2016)
  - Members of Association KU Leuven

KU Leuven:
16 faculties organized into 3 ‘groups’

Humanities & Social Sciences	Biomedical Sciences	Science, Engineering & Technology
Philosophy	Medicine	Science
Theology	Pharmaceutical Sciences	Engineering
Canon Law	Kinesiology & Rehab. Sc.	Bioscience engineering
Law		Engineering Technology
Economics & business		Architecture
Social Sciences		
Arts		
Psychology & Educ. Sc.		

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Most innovative university in Europe

- With regards to innovation, Reuters ranks KU Leuven
  - 1st in Europe (*)
  - 16th worldwide (**)
- The Reuters study is based on
  - Academic publications
  - Patent applications
  - Citations of patents and publications
  - Industrial collaborations
  - …

Reuters Top 100 (2016)
1. KU Leuven
2. Imperial College London
3. University of Cambridge
4. École Polytechnique Fédérale de Lausanne
5. Technical University of Munich
6. University of Erlangen Nürnberg
7. Delft University of Technology
8. University of Oxford
9. University of Munich
10. University of Zurich

*Reuters Top 100 Europe’s Most Innovative Universities, 2016
**Reuters Top 100 World's Most Innovative Universities, 2015
www.reuters.com

KU LEUVEN RESEARCH & DEVELOPMENT

KU Leuven Research & Development

Established in 1972

One of the first technology transfer offices in Europe

Profitable management of the economic potential of research results by means of:
Contract research
Managing intellectual property rights
Founding spin-off companies
Promoting entrepreneurship and innovation
Supporting regional development

Key figures:
2015: 2117 new contracts managed
2015: 118 million revenue from intellectual property
2005-2015: 796 million external capital investment in spin-off portfolio

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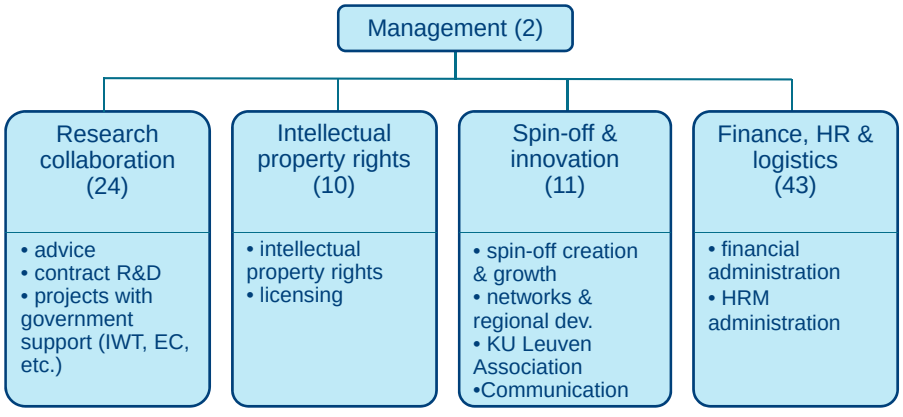
LRD multidisciplinary staff



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Stakeholders

TT is a “contact sport”, involving many stakeholders

- Society at large
- University Board
- Research Coordination Office
- Doctoral Schools
- Faculties and Departments
- Professors
- Researchers
- Students
- …

Communication Sensu Stricto

Resources and activities

- Communication & PR responsible in TT office
  - Communication materials for broad audience
- Business developers in TT office & research managers embedded in research groups
  - Interface to external stakeholders, visits, …
  - Providing content for communication materials
- Leuven.inc
  - Network of high-tech entrepreneurs
  - Visionary seminars on breakthrough science
- Leuven.Mindgate
  - Cluster of excellence of Leuven Region, focus on international promotion
- Other clusters and networks

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The Virus Hunters: Banishing the Scourge of AIDS

written by Natalia Drozdiak

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Three years later, in 1981, the AIDS disease was first reported in a publication in MMWR magazine as "Kaposi's Sarcoma and Pneumocystis Pneumonia among homosexual men." It was quickly established that the disease was not as rare as initially thought, nor was it reserved exclusively for the homosexual community. The infections spread swiftly, while the nature of the disease remained uncertain until 1984, when the HIV virus was finally isolated. With the virus isolated, more effective treatment could then be researched and developed. Antonin Holý and Erik De Clercq's previous studies on DNA and RNA viruses laid the foundation for what would become invaluable breakthroughs in the field of HIV/AIDS research.

Martin, De Clercq and Holý in Santa Fe 1986

It was out of their DHPA nucleoside study that the derivative HPMPA was found. HPMPA has since provided several hundreds of acyclic nucleoside phosphonates for drug development, including cidofovir, adefovir and tenofovir (the main compound in the current anti-AIDS drugs). These compounds, however, could only have been developed into life-saving drugs with the help of the American scientist John Martin, who is now the CEO of the pharmaceutical company Gilead Sciences.

By 1985, the successful work of Antonin Holý and Erik De Clercq attracted contract proposals from the American pharmaceutical company Bristol-Myers, now known as Bristol-Myers Squibb. The company's interest in their work brought the two scientists together with John C. Martin, who at the time was the Associate Director of the Anti-infective Chemistry Department at Bristol-Myers. After the HPMPA compound and other phosphonate derivatives were described in various publications, the three began collaborating in 1987 on the production of the crucial anti-viral drugs. Holý helped John Martin synthesize these acyclic nucleoside phosphonates — the most important of which included HPMPA, cidofovir (HPMPC) and adefovir (PMEA). These compounds were then sent to Erik De Clercq for analysis. He compared the test results to Holý's initial compounds and also specified which phosphonates should be developed to fight which diseases. In the results, De Clercq remarked that HPMPC (or cidofovir) is like both DHPA and HPMPA in that it can fight herpes virus infections, including cytomegalovirus retinitis, but is even more efficacious and less toxic. Of HPMPC's sister nucleoside, PMEA (or adefovir), he noted that it should be developed to treat HIV/AIDS since it "inhibits retrovirus infections with a potency that is 25-fold greater, and a selectivity that is 5-fold greater, than that of azidothymidine (AZT)."

The actual development of the drugs only began once John Martin moved to Gilead in the fall of 1990. Martin, who was the new Vice President of Research and Development at Gilead, brought the phosphonate collaboration along with him. In September of 1991, Gilead CEO Michael Riordan, Erik De Clercq (Director of the Rega Foundation in Leuven) and Karel Martinek (Director of the Institute of Chemistry and Biochemistry in Prague) all signed an agreement to transfer the licensing for the HPMPA collaboration from Bristol-Myers over to Gilead Sciences. The license covered the existing phosphonates HPMPC (cidofovir) and PMEA (adefovir), as well as all the phosphonates that would follow, including the most important one, PMPA (or tenofovir).

Products, resulting from the Holý-De Clercq collaboration and commercialized by Gilead® (photo courtesy of Gilead Sciences, Inc.)

With the new license, Gilead went straight to developing cidofovir to treat herpes, pox, adeno and papillomaviruses, and cytomegalovirus retinitis, in particular. (CMV retinitis is a virus that affects the retina and is often seen in late-stage AIDS patients). The cidofovir drug, Vistide®, was approved for the market in 1996, and it was due to its success that Gilead could begin marketing the next anti-viral treatment, Viread®.

Meanwhile, in March of 1992, when Gilead was still considering development of PMEA (adefovir) as its next drug, De Clercq (after conversations with Holý and Martin) noted that PMPA should be considered as the next best substitute to PMEA for the treatment of HIV. The phosphonate PMPA, known as tenofovir, was first described a year later in 1993. In the end, tenofovir was actually preferred to adefovir for the treatment of HIV since the PMEA compound was deemed too toxic for long-term use against HIV. At a lower dosage, however, adefovir is very suitable to fight hepatitis B, so Gilead developed it into the drug Hepsera®, which was released

* Products, resulting from the Holý-De Clercq collaboration and commercialized by Gilead:
1) Vistide®: cidofovir
2) Viread®: tenofovir disoproxil fumarate (TDF)
3) Hepsera®: Adefovir dipivoxil
4) Truvada®: combination of tenofovir disoproxil fumarate (TDF) with emtricitabine
5) Atripla®: combination of tenofovir disoproxil fumarate (TDF) with emtricitabine and efavirenz
6) Complera®: combination of tenofovir disoproxil fumarate (TDF) with emtricitabine and rilpivirine
7) Stribild®: combination of tenofovir disoproxil fumarate (TDF) with emtricitabine, elvitegravir and cobicistat

In 2002. Yet, given the urgency for effective HIV treatment, the development of tenofovir was the first priority. The development of a drug usually takes more than ten years, but Viread®, or tenofovir disoproxil fumarate (the form in which tenofovir can be taken orally), was out on the market by 2001 — faster than normal. This was due to high demand for the drug, but also because several clinical trials had already proved the drug to be effective.

Now more than 75% of all HIV patients (and 90% of those who have never been treated before) are treated with Viread® or a combination thereof. These are not surprising numbers since, even today, tenofovir is still the most successful agent on the market to prevent HIV from reproducing. Tenofovir is most effective when combined with other compounds, but alone it can already reduce the amount of HIV-infected cells in the blood while increasing the number of virus fighting immune system cells.

It is these crucial T-cells (the immune system cells designed to clear foreign pathogens) that the HIV virus targets.

Rechotherque and Martin visiting De Clercq, Brussels 1996. They and their collaborators brought the chemical compounds from 'bench to bedside'.

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A LONG TRADITION OF FOSTERING INNOVATION AND HIGH-TECH ENTREPRENEURSHIP

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The world's leading anti-HIV drug

Leuven has a long tradition of developing innovative and effective medications. One such medication is the antiviral agent tenofovir disoproxil fumarate, discovered in 1993 by Professor Erik De Clercq and Professor Jan Balzarini of the KU Leuven Rega Institute for Medical Research, in collaboration with Professor Antonín Holý of the IOCB in Prague and Dr. John Martin of Gilead Sciences. Tenofovir was licensed to the American biopharmaceutical company Gilead Sciences, which further developed it and now produces and distributes the drug under the trade name Viread® in exchange for royalty payments to KU Leuven. Tenofovir is also an essential component of the combination drugs Truvada®, Atripla®, Complera® and Stribild®, and has become the most commonly used anti-HIV drug in the world. In 2013, sales of Truvada® and Atripla® each totaled over $3 billion, while sales of Viread® reached about $950 million. Drugs containing tenofovir are effective at reducing the HIV-titre in the blood, so that HIV-infected patients treated with these medications can manage the disease for many years. The discovery of the phosphonates, the class of compounds to which tenofovir belongs, has also contributed to the creation of the KU Leuven spin-off company Okapi Sciences, which specialises in the development of drugs for the treatment or prevention of viral infections in animals, such as swine fever and foot-and-mouth disease. In 2014, Okapi Sciences was acquired by Ariana Therapeutics.

Lighter, stronger suitcases

Samsonite, a leading luggage manufacturer, wanted to develop a lightweight, strong suitcase using a synthetic composite material called Curv®. Professor Ignaas Verpoest of the KU Leuven Department of Metallurgy and Materials Engineering (MTM) teamed up with Samsonite in the early 00's to adapt the material for the production of suitcases. The team developed a layered design in which a top layer of material provides protection against scratches, while additional middle layers enhance the impact resistance. ▶

This new design requires a specific method of manufacturing, because the Curv® panels have to be stamped in the shape of a suitcase. The first prototypes of the suitcases were made in Leuven in collaboration with Professor Vandepitte of the Department of Mechanical Engineering. In 2009, Samsonite launched the Cosmolite® line of suitcases based on the KU Leuven technology. Over 500,000 suitcases have sold worldwide, making Cosmolite® Samsonite's best-selling line of suitcases to date. Samsonite reports that production capacity has increased in order to keep up with demand.

Medication for the prevention of heart attacks and strokes

In 1979, Professor Désiré Collen of the Faculty of Medicine isolated and characterised tissue plasminogen activator (tPA), a key protein involved in the breakdown of blood clots.

Administered as a medication, tPA prevents heart attacks and strokes, and has saved numerous lives. Millions of patients have been treated with this medication. tPA was first licensed to the American biotech company Genentech, and is now produced and distributed under the name Actilyse® by Boehringer Ingelheim.

Professor Collen later founded the KU Leuven spin-off company ThromboGenics. ThromboGenics is a biopharmaceutical company focused on developing innovative medicines to treat eye diseases. The company's lead product, ocriplasmin, has successfully completed two Phase III clinical trials for the pharmacological treatment of symptomatic Vitreomacular Adhesion (VMA). In October 2012, the U.S. Food and Drug Administration (FDA) approved ocriplasmin in the United States for the treatment of symptomatic VMA. Ocriplasmin is the first pharmacological agent to be approved for this indication.

Refined cochlear implants

The Australian company Cochlear, a global leader in implantable hearing solutions, collaborates closely with several partners in the Leuven region. KU Leuven and imec, together with the spin-off companies Easics, ICsense and AnSem, and the multinational company NXP Semiconductors have all contributed to refining cochlear implants. KU Leuven and Cochlear have partnered for more than ten years. Cochlear develops hearing implants that use electrical stimulation, known as cochlear implants (CIs), which consist of two parts: a surgically implanted component that electrically stimulates the auditory nerve, and a speech processor worn externally that receives the sound and converts it into a pulsed electrical code. This code is sent through a wireless radiofrequency (RF) connection to the internal implant, which then stimulates the auditory nerve. ▶

RESEARCH FOR A BETTER WORLD

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LEUVEN.INC
INNOVATION NETWORKING CIRCLE

Leuven.Inc Visionary seminar 'Novel Computing Paradigms'

Trends and Insights in 'Quantum & Neuromorphic Computing'

Organised by Leuven.Inc in cooperation with imec.

The cloud is no longer used just for storing documents. As we move from using laptops to smartphones as our primary computing devices, the cloud is used for real time processing of data. This is prompting the need for not only higher computing power in the server farms but also for computing paradigms better designed to solve specialized tasks.

Quantum computing is one of the main computing paradigms that holds the promise for solving faster than classical computing certain classes of problems such as sorting and solving systems of linear and differential equations. Such problems have many applications in daily life and scientific discovery with possible applications ranging from medicine discovery to cryptography. The first part of the seminar with introduce the theory and current technological status of quantum computing.

A second computing paradigm is the so called neuromorphic computing, a form of large-scale computing inspired by biological principles. The computation elements and memory are closely connected in this paradigm and distributed over large arrays of highly interconnected devices. The seminar will provide a deep dive in the theory and implementation of neuromorphic computing and a close look at neuromorphic sensors. These sensors are deemed to provide a very low power option for tracking multiple objects and fast reaction to detected actions. Possible applications range from self-driving cars to retinal implants.

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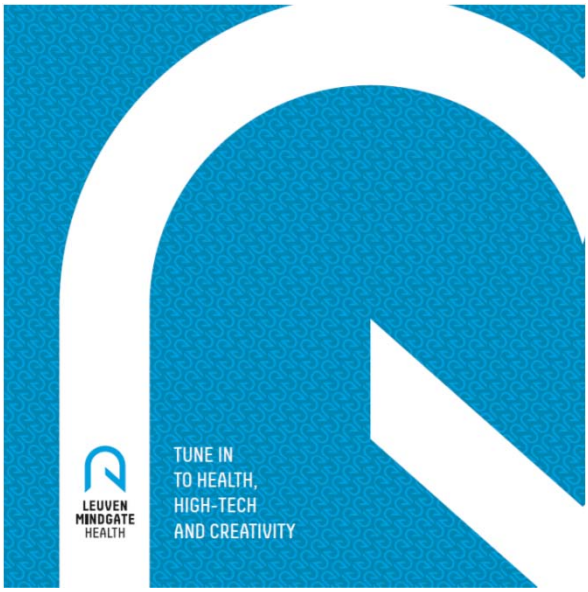

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Other clusters and networks …

- Membership of various external clusters

dsp valley designing smart products
LOSEC LEADERS IN SECURITY
Flanders Smart Hub
FlandersBio BUILDING BIOTECH BRIDGES

- Internal research structures

LEUVEN mrc Materials Research Centre
PharmAbs The K.U.Leuven Antibody Center
Leuven MTC Medical Technology Centre
CDD
LEUVEN ICT
LFoRCe Leuven Food Science and Nutrition Research Centre
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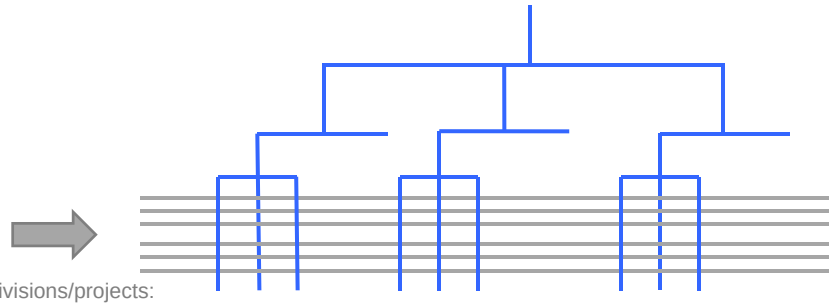
Communication Sensu Lato

Creating a culture of innovation

- Professors & researchers
  → incentives for TT activities
- PhD students
  → Training course on research exploitation
- Ba/Ma students
  → Launch of entrepreneurial students network Lcie

LRD research divisions & projects

Faculties, departments, research groups:
quality in research and educational activities



LRD divisions/projects:
Contract and budgetary autonomy and flexibility incentives

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LRD research divisions & projects

Incentives for researchers:

- Contract research:
  - 83 % goes to research group, 50% of net profit can go to individuals (rarely used)
- IP licensing:
  - Up to 40% of net income to researchers
  - Large part of remainder to research group
- Spinoff creation:
  - Inventors/founders can receive shares for their contribution

LRD divisions/projects:
Contract and budgetary autonomy and flexibility incentives

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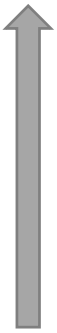
LRD research divisions & projects

Money can be used for:

- Hiring staff
- Buying equipment
- Investing in IP protection
- Investing in spinoff companies



LRD divisions/projects: Contract and budgetary autonomy and flexibility incentives

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"Over the last decade the operations of LRD have professionalised dramatically, making LRD a solid partner, known for its credibilty and quality."

"LRD has always been able to find the right attitude and looked upon the exploitation of research as an opportunity rather than an imperative."

"Anyone who has worked with LRD for any length of time will realise that in fact there are no professors who do not benefit in some way from the services offered by LRD."

"LRD drives and facilitates the interaction between academic research & development and solutions for real-life challenges."

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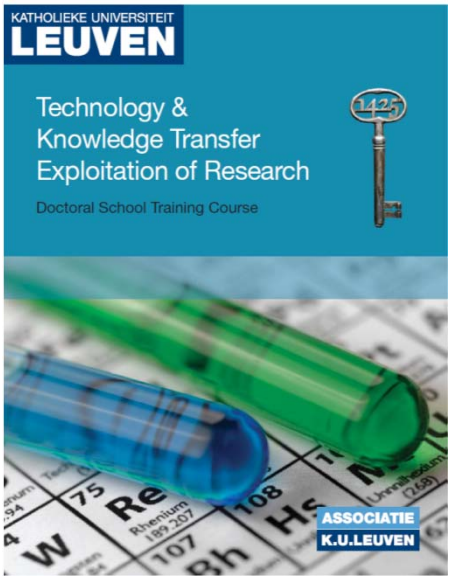

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Exploitation of research

- Started in 2009
- Coordinated by LRD, in collaboration with doctoral schools
- Goal: promotion of 'awareness' of valorisation with PhD students

- Modular programme [theory + practice]
  - Setting the scene
  - Collaborating with industry & starting a spinoff company
  - Managing intellectual property
  - Funding the innovation process
  - Presenting the exploitation plans

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Timeline

Registration participants & topics

Team formation & coach selection

coaching

Sep Oct Nov Dec Jan Feb Mar Apr May

1 2 3 4 Dry run 5 Final pitch

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Leuven ~ university wide
Community for ~ bottom up & student driven
Innovation driven ~ link to research base
Entrepreneurship ~ using everyones entrepreneurial drive

º20/10/2014

LCE

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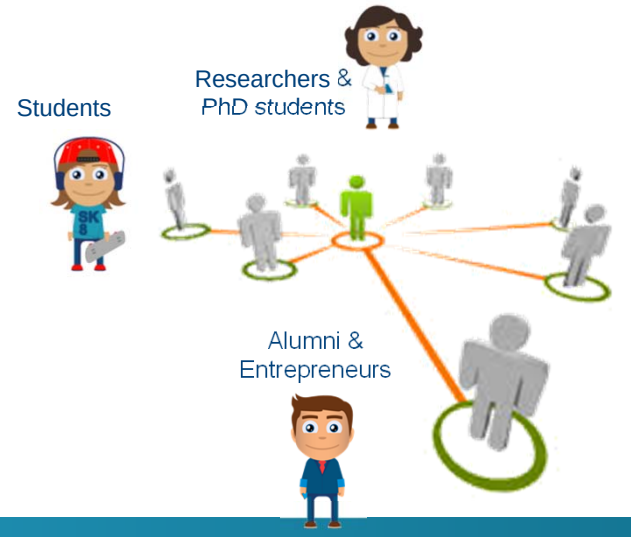
What is Lcie?

A university-wide initiative to promote, stimulate and support entrepreneurship with and by students, researchers, professors and alumni



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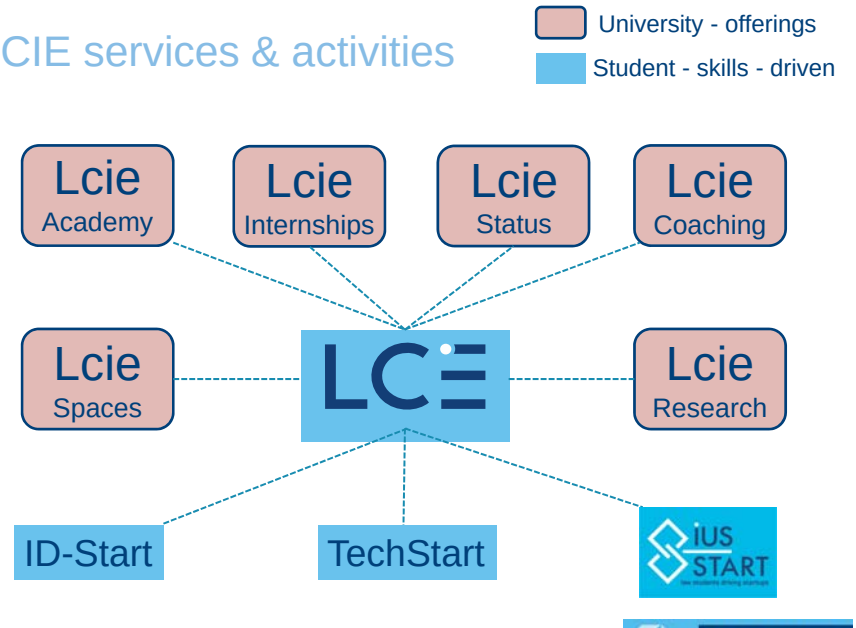
LCIE services & activities



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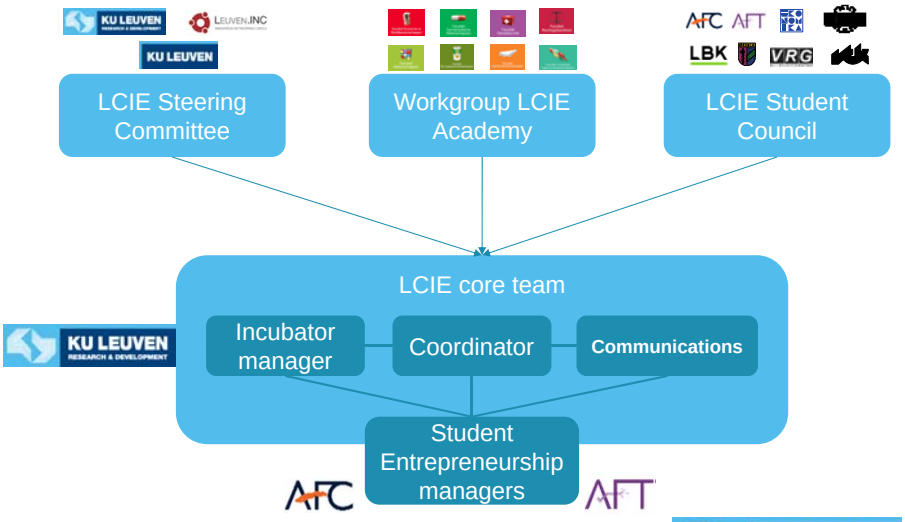
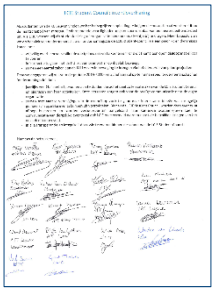
LCIE governance structure



LCIE student council

- Voluntary participation by student organizations actively promoting entrepreneurship
  - Engineering, business, medicine, law
  - Representing > 60% of students
- Regular meetings
- Joint activities/events
- Charter signed April 2016



Thank you for your attention !!

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