Tempus Project Code: ETF-JP-00544-2008

Project Title: "Enterprise-University Partnership: Educational and Training for Technology Transfer (EUPART)"

- Technology and Knowledge Transfer
- Patenting
- Licensing
- Start-ups and Business incubation

Partners:

AUC, Egypt
Assuit University, Egypt
Cairo University, Egypt
Politecnico di Torino, Italy
Technical University of Vienna, Austria
Science and Technology Development Fund, MOHE, Egypt
Egyptian Patent Office, Egypt
6th of October City, Investors, Association, Egypt
Freie Universität Berlin, Germany
Helwan University, Egypt
Linkoping University, Sweden

Assiut University Team:

Prof. Dr. Mohamed Ragab Bayoumi
Dr. Gamal A.Roshdy El-Sayed,

Meeting on 13 October 2009 at AUC

Technology and Knowledge Transfer

From Idea to Market

Definition

- Technology Transfer is:
  - The commercial exploitation of cutting edge research results
  - The process of converting scientific findings from research laboratories into useful products by the commercial sector
  - Applying the results of research to a practical application
  - the process of transferring scientific findings from research laboratories to the commercial sector
  - the transfer of technology or know-how between organizations through licensing or marketing agreements, co-development arrangements, training or the exchange of personnel

Technology Transfer Office (TTO)

- TTO is the part of the university that is responsible for commercializing university-owned intellectual property.
- TTO in each institution is therefore designed to help that institution promote and exploit innovation through:
  - Auditing of all R & D projects
  - Patenting of all innovations and research results
  - Commercialization of patents through licensing or development in an incubator to create high-tech start ups and spin offs
  - liaising with entrepreneurs to monitor R & D projects and attract funding enhancing strong research-industry linkages

University-Enterprise Partnership

- From research on commission to “partnership research”
- Partnership is a way to create a new joint research laboratories with a more rational use of investments
- A strong and direct flow of know-how and human resources between universities and companies
- Universities can be a strong partner for research needs outsourcing as in most cases R&D departments can not accommodate all different research aspects economically.
- PhD courses can be tailored to serve research needs at firms by close collaboration.

Impacts of TTO on the Society

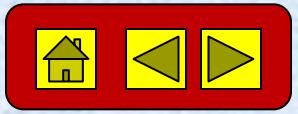
- The transfer of new knowledge out of the university;
- Providing the source of new innovative ideas for industry;
- Providing opportunities for income generation by industry and the university;
- Generating positive social and economic impact;
- Promoting subsidiary companies as spin-offs for the University.
- It is important to emphasize directly to researchers in the university that technology transfer is a good thing for them personally, and for a number of reasons:
  - the chance to use any income generated as discretionary research funding;
  - the chance to see their science used for benefit of society;
  - exposure to the intellectual challenge of turning laboratory scale research into products;
  - increased awareness of interesting applied problems;
  - the opportunity for personal wealth

Needed Resources

- **People** – dedicated staff in the TTO, who, over time, develop the skills and experience to transfer technology from the university out to industry.

- **Patent budget** – a dedicated budget available to a TTO to invest in the protection of inventions arising from the research base. The budget needs to be large enough to allow for the protection of inventions before they are marketed, and for sufficient time to learn whether or not there is commercial potential.

- **Proof of Concept budget** – in due course it is desirable for the TTO to have access to funds to bridge the gap between university research and move technologies closer to market. Proof of Concept funds are used to build prototypes, conduct market research, complete preclinical development of a drug, etc. Such developments shape technologies beyond the initial research stages enabling them to be presented to industry in a form that increases the likelihood that companies will recognize them as ideas they should pick up and invest in.



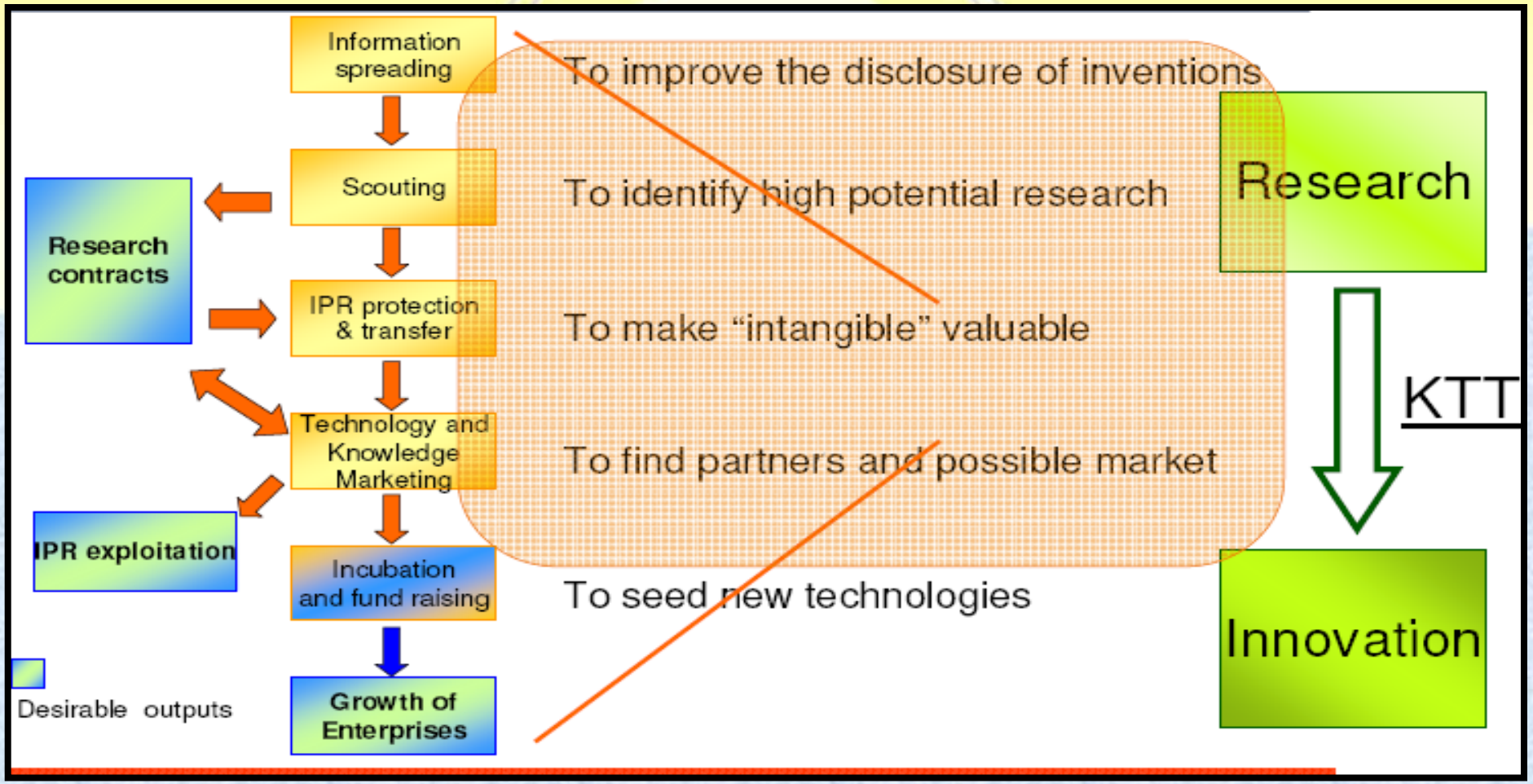
Policy Framework for Technology Transfer

- There are a number of areas in which a clear policy on technology transfer is required within the university. Rules and regulations must be unambiguously set out. These include:
  - ownership of intellectual property generated by university staff and students;
  - transfer of rights between university and researchers;
  - revenue sharing arrangements;
  - arrangements for formation of spin-out companies;
  - identifying and managing conflicts of interest;
  - dispute resolution framework.

TTO Main Activities

- Information about ways of exploitation of research results
- Scouting within the departments to identify projects with high potential
- Tutoring activities to promote knowledge and technology transfer outside the university
- Technology brokering between entrepreneurial needs and university technology offer
- Promotion of the structures and competencies of Politecnico toward industries
- Legal proceedings related to associations, consortia, and other institutions

A Simple Model for Innovation Pathway



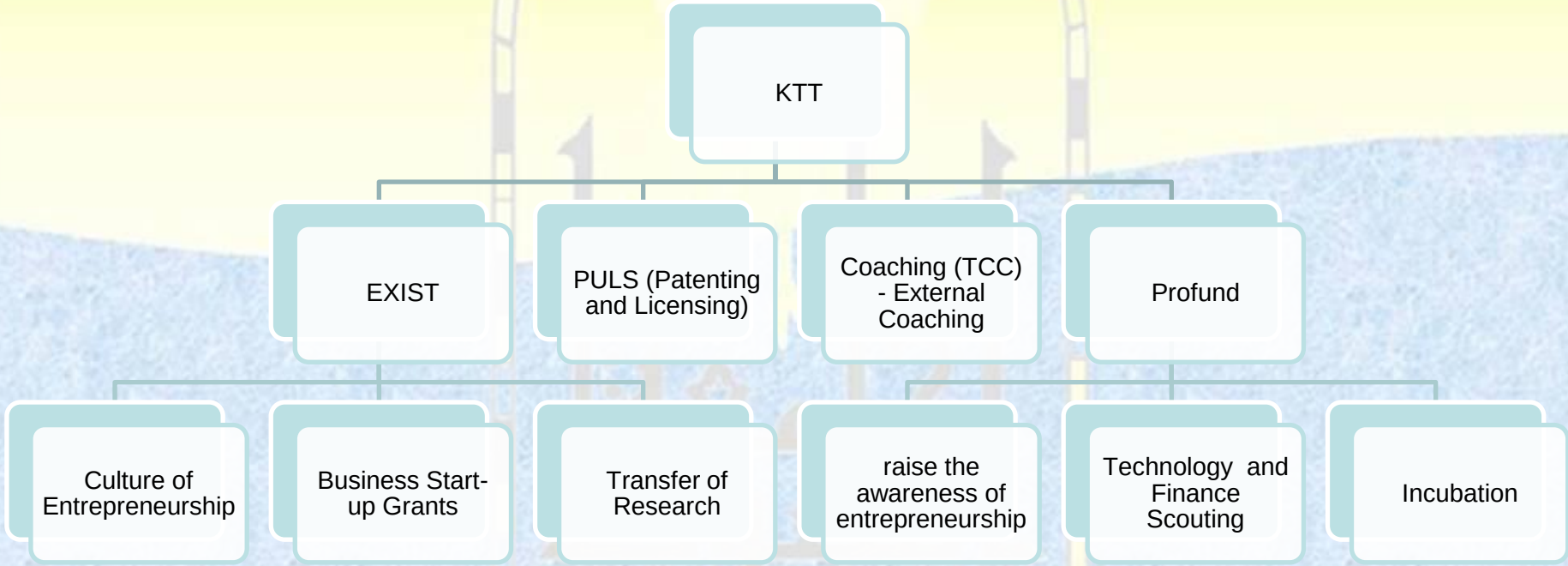
EU Partner Universities

- **Freie Berlin University, Germany.**
- **Linköping University (LiU), Sweden.**
- **Vienna Technical University, Austria.**
- **Politecnico Di Torino, Italy.**

Freie Berlin University, Germany

- main goals that is aligned with the federal government goal is to create jobs in Berlin by encouraging and fostering entrepreneurial activity
- The necessity of fostering entrepreneurship; Start-ups:
  - Act as a motor for technological progress
  - Promote innovation and technology transfer
  - Accelerate competition
  - Contribute to structural change
  - Create sustainable jobs

KTT Mechanism @ FU Berlin



Success Stories @ FU Berlin

- Number of spin-offs has increased significantly, before year 2006 only 2 spin-offs a year, but the latest number of spin-offs have gone to 11 last years

Linköping University (LiU), Sweden

- Knowledge and Technology Transfer (K/TT) at LiU is an important part of LiU, since LiU was established by SAAB as a source for technical assistant for the car and small airplane Manufacturer

- Hence, the strong relation with industry is why the university originally found. As a consequence, sixty percent of funding comes from private sector

- Swedish universities do not own any rights of research results and innovations; researchers own %100 of their own research results and innovations

- LiU Knowledge and Technology Transfer focuses mainly on commercialization in areas of strength in the university (include organic electronics, sensor technology) rather than on everything.

From Idea to Product

Raising the awareness of entrepreneurship

- Undergraduate students study entrepreneurship and get five points.
- PhD students have to know something about innovations and patent by taking courses helping them to understand what can be patent, branding, etc.

Ideas scouting and Coaching

- *Scouting*: this done by contacting newly hired faculties and researchers to get to know what they are doing.
- *Coaching*: helping the scientist to take their ideas and do the licensing, filing patent application

Pre-incubation

- researchers act as if they have a company (a virtual company)

Go to the market Lab

- Prototyping; show prototypes to market the product

From Idea to Product, Continued

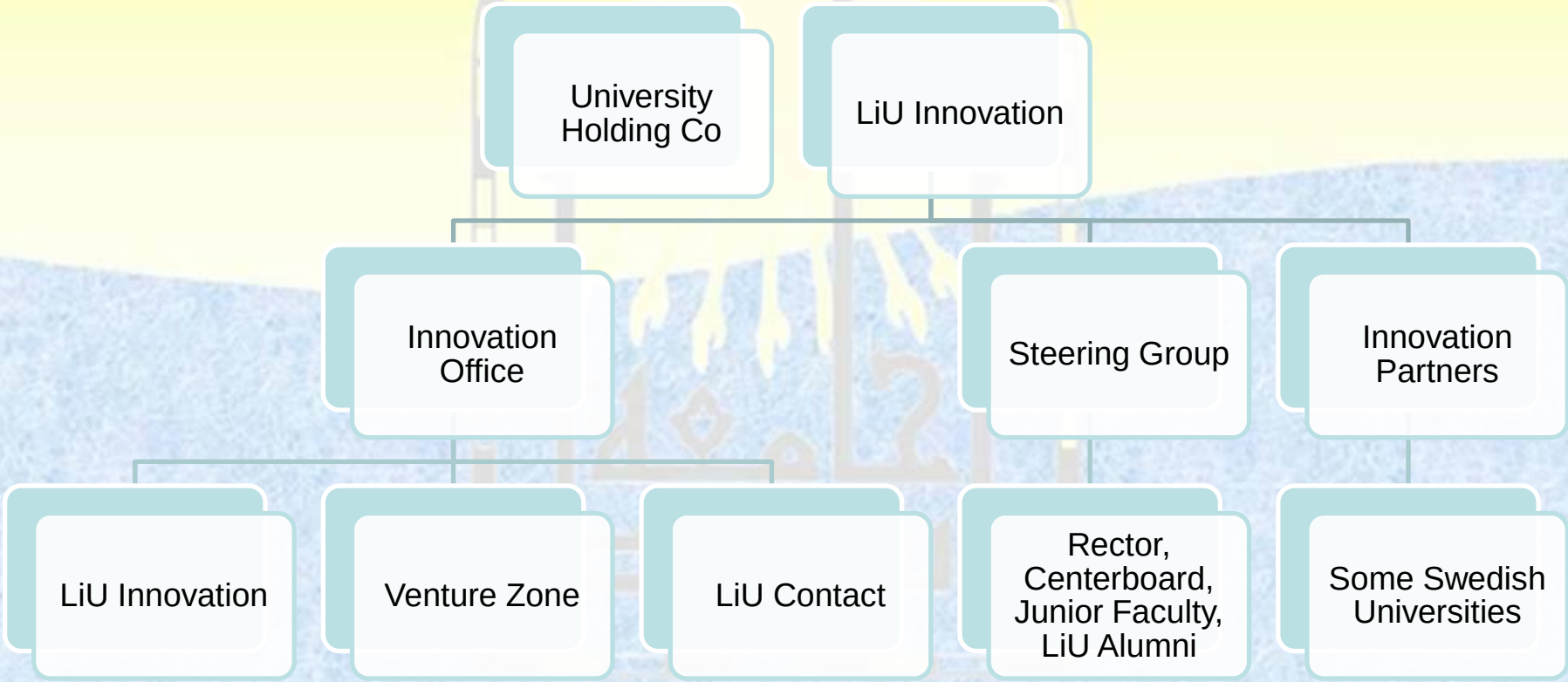
the holding company

- If the university should own something, the ownership has to the holding company as LiU can not own any rights over the innovation and product by law

business incubator

- *LEAD*(Linköping Entrepreneur and Acceleration Development). LEAD takes over the innovation center job when a research group knows that they want to start up a company and they are approximately six months from starting that company

Innovation Office Structure @ LiU



Commercialization @ LiU

- LiU has a target of ten commercializations per year, but they accomplished five per year as of right now. Also, for a thousand ideas, three hundreds are patented and ten get commercialized.

Politecnico Di Torino, Italy

- Politecnico and industrial collaboration provides an almost ideal model for collaboration between research institutes and industry
- This collaboration provides new opportunities for companies as well from research on commission to partnership research
- As a figure shows the success of such partnership, research contract has moved from 500 to 700 contracts per year with net worth more than 23 Million Euros.
- Partners include big industrial enterprises like FIAT, Motorola, Nokia, Siemens, General Motors Power-train Europe, Ferrari, HP, Microsoft Italia and others

Technology Transfer @ Polito

- Politecnico is interested in developing permanent relations in research and education with companies which are interested in working the university to develop innovation
- For that reason Business Research Center (BRC) is established
- Within the Technology Transfer unit there are several offices, Research Support and Technology Transfer service and Research Contract and Technology Transfer office.

Business Research Center (BRC)

- It is a dedicated area to cooperation in research and education with industries
- Offices and laboratories and industry facilities are available for this purpose.
- As of right now there are 66 patents out of BRC of which 19 are co-owned by the Politecnico, and 12 spin-offs that Politecnico is a share holder and 6 academic spin-offs Politecnico is not a shareholder but participates with personnel, offices and other logistics.

Research Support and Technology Transfer service

covers all research related activities with 3 main areas:

- National funds
- EU and international funds
- Research contract and industrial liaison office

Research Contract and Technology Transfer office

- Information about ways of exploitation of research results
- Scouting within the departments to identify projects with high potential
- Tutoring activities to promote knowledge and technology transfer outside the university
- Technology brokering between entrepreneurial needs and university technology offer
- Promotion of the structures and competencies of Politecnico toward industries
- Legal proceedings related to associations, consortia, and other institutions

TTO Structure @ Polito

- The office employs 9 persons, the head of the office, 4 lawyers, 1 PhD student with technical and commercial background and 3 administrative employees with expertise in contracts.

- The main training activities within the office are:
  - Advance courses in IP management, priority art research, contracts and agreements, and high-tech entrepreneurship
  - Staff exchange with TTO over Europe.

I3P Business Incubator

- I3p stands for Incubator, Impress, Innovative, and Politecnico
- It is a non-profit joint-stock company which owned by six share holder among them is Politecnico
- I3p mission is to support the creation of knowledge-based startups with high grows potential
- There are 150 business ideas that are received by I3p per year, they are examined and filtered to about one third – about 50 are approved. The space can accommodate with maximum capacity up to 32 startup companies working at the same time.
- The incubation period is on average 3 years that could be extended to a 4^{th} year at most.
- Renting fees covers only %35 of the operation expenses, and the remaining %65 comes from grants from EU and other sources like share holders.
- The work force of I3P is 12 fulltime employees which include the president, business planning, administrative, logistical secretariat, public relation and media, 4 junior tutors, and 3 free lance consultants.

Patenting

Patenting

- **What is a painting?**
- **A Legal Monopoly right to prevent others from making, using ,offering for sale, selling or importing a product that infringes the patent in the country that issued the patent.**
- **The rights can sold or transferred to another party through assignments or licensing.**
- **The rights last for up to 20 years from the date of filing of the patent application.**

What can be patented?

- **Inventions that are:**
  - Inventive (non-obvious to someone with knowledge and experience in the subject).
  - Novel or new to the world (no previous public notice)
  - Capable of being made or used in some kind of industry.
- **Exceptions:**
  - A scientific or mathematical discovery, theory or method.
  - A literary, dramatic ,musical or artistic work
  - A way of performing a mental act, playing a game or doing business (except US).
  - The presentation of information, or some computer programs (except US).
  - An animal or plant variety.
  - A method of medical treatment or diagnosis.
  - Against public policy or morality.
  - Elsewhere you can protect a system which has a technical effect.

•What does a patent look like?

Bibliographic information

Inventor, Application, date of filling, technology class etc

Abstract

150 word summary used as an aid for funding other patents

Description

Summary of the prior art (e.g. known Technology)

The problem the invention is meant to solve

An explanation and at least one way of carrying out the invention.

Claims

Define the external of the protection.

Drawings

Visualization representations of the subject matter.

Post-filed support data.

National Patent Office

- National patent only valid in that country
- Foreigners can apply for a patent
- One year of priority for international applications

•Regional Patents (e.g. European patent office)

A European patent is equivalent to National patents in the countries for which it was granted (the application chooses the countries; each country attracts additional fees)

•Patent Cooperation Treaty

Just one application covers over 100 countries.
After the initial application phase, the international application leads to one or more national phase applications.
There is no international patent!

Patent Strategy- what is the patent for?

- To protect your marketed products and services- infringement.
- To protect an asset which can be traded with others-licensing
- As a bargaining tool for assessing other IP-cross-licensing or patent pooling
- To add apparent value for spinout fundraising-investment
- To capture experience of applying the technology-know-how
- To surprise a market incumbent-troll.

Patent Strategy-Drafting-implications

- **Researcher**
  - Have the best understanding of the technology
  - But are not experts and may not cover broad applications; should not they be teaching and conducting research.
- **Technology transfer staff**
  - Some have necessary patent backgrounds.
  - But will they have the necessary skills and experience for sales; may not be experts at filling applications in some technology areas (e.g. life sciences)
- **Patent agent/attorney**
  - Can be selected for technology and/or market knowledge
  - Can add value by strengthening coverage
  - Can suggest additional experiments
  - Can deliver bad news to the researcher
  - Can give you someone to blame when mistakes happen
  - But, costs money and introduces another party to manage through the technology transfer process
  - The best external agents often have industrial experience.

Patent Strategy-managing Cost

- Take advantage of local rules e.g. universities in Spain do not pay fees to the patent office.
- Do deals with your patent agents; university cases are interesting and good marketing tools for the agents; fees can be fixed and back loaded (lower initial costs in exchange for higher fees later)
- Take advantage of territory combinations e.g. EPO for European patents; PCT to keep initial costs low and buy time for marketing
- Take advantage of payment delays/penalties-but only of you have a patents admission function and good database.

Patent Strategy-Selecting .....

- Where will products incorporating the technology be used, offered for sale, solid or imported?
- Who are the possible licenses and where do they do business?
- How strong is the legal system should you need to defend your rights in court?
- Can the projected levels of profits on sales by a licenses justify the patent costs?

Other protections

- Trademarks
  - Made by “Nokia”
  - Product “N95”
  - Software “Symbian”, “Java”
- Copyright
  - Software code
  - instruction manual
  - Packaging artwork
- Design (some registered)
  - Form of the phone enclosure
  - Arrangement of the buttons in oval shape.
  - Three dimensional wave-form of the button
- Secrets
  - What are secret
- Patents
  - Data Processing methods
  - Semiconductor circuits
  - Chemical Compounds

Other Protection- ……

- Has been developed over a number of years
- By a number of People
- Cannot be downloaded from the web
- Is under continuous development
- Contains some clever coding
- Is documented
- Is market ready
- Is needed urgently by people lacking the time and expertise to duplicate the software.

Other protection-Research Questionnaires

- PDQ-39 copyrighted
- Oxford Health outcomes Questionnaires developed at the University's Health services research unit.
- PDQ-39 is gold standard measure of Health status for Parkinson's Disease

  -Widely validated and translated into over fifty languages.

  -Isis has licensed the questionnaire to 17 pharmaceutical companies for use in clinical trials.
- Knee, Hip and Shoulder scores also licensed.

Licensing

Valuation-Outlines

- Why value Technology?
- Introducing the Examples
- Accountancy Economics Theory
- Practical valuation Techniques
  - -Expert judgment and gut feel
  - -Sunk Costs
  - -Value Based Pricing
  - -Benchmarking
  - -Road-mapping
  - -Discounted Cash Flow
  - -Options and Decision Trees
- Which Method?
- Non-financial Considerations
- Summary

V.....

- To assist in decisions regarding patent prosecution and/or resource commitments
- To reward those contributing to technology development
- To provide inputs into the process of negotiation
- To demonstrate to others achievement of a fair price

Valuati……

- RiskOx: a software tool designed to aid decision making
- PainMeter: a questionnaire used by physicians to assess back pain
- WaveFQ:an instrument for accurate measurement of purity of laser light output
- QuantAi:a diagnostic test for diagnosing early onset Alzheimer’s disease
- PSO123:a phase lla drug candidate for the treatment of psoriasis
- WindyCo:a spinout company based on novel wind turbine technology

Valuation……

- Behavior of ideal markets
- Effects of information asymmetry
- Impact of uncertainty
- Valuing established companies
- Stock markets
- Goodwill

- Theoretically the last resort
- Almost always the starting point
- When you first took on the technology you had some idea of how much it was worth
- Example: who in their mind ranked the phase lla drug candidate (Pso123) as more valuable than the research questionnaire (PainMeter)?

Val……

- How much money has been invested to get the technology to this stage?
- How much money would company A need to spend to develop their own version?
- Does it have the time to develop its own version?
- Does it have the necessary skills to develop the technology?
- Are patents granted or filed protecting the technology?

Valuation-value……

- **How much is it worth to the buyer?**
- **Technology can save companies money**
- **If you understand the value you offer to a business then you can charge a fee representing a fraction of the value**
- **Example: new software has been developed to reduce waste on a manufacturing line currently loosing £1m per day in defective product; the company does not have the skills to develop their own version-and they have no time to learn how**
- **Technology can rescue failing companies**
- **Example: a vaccine company announces a failure of their lead drug candidate; they urgently need to fill their product development pipeline; their share price is under pressure and they are subject to a hostile takeover approach; they may be prepared to pay extra for the additional value you offer.**

Val……

- **Crudely by finding out what someone else paid**
- **SEC filings; court judgments; charts of industry norms.**
- **Example:**
  - **-Winston laboratories, inc. Sirius Laboratories,inc.2006**
  - **-Pharmaceutical products containing anthralin**
  - **-Range 15.00-25.00%**
- **25% rule**
  - **- Spilt the profits 25:75 between the technology inventor and market developer**
  - **-ask for an appropriate percentage of the net sales-because profit is less easy to police and too easy to manipulate with irrelevant overheads**
  - **-negotiate around these figures (company: but this technology was very early stage so we have done most of the development)**
- **Better route is to find out how much money was generated when something similar reached a similar market and was exploited by a similar company**

Val……

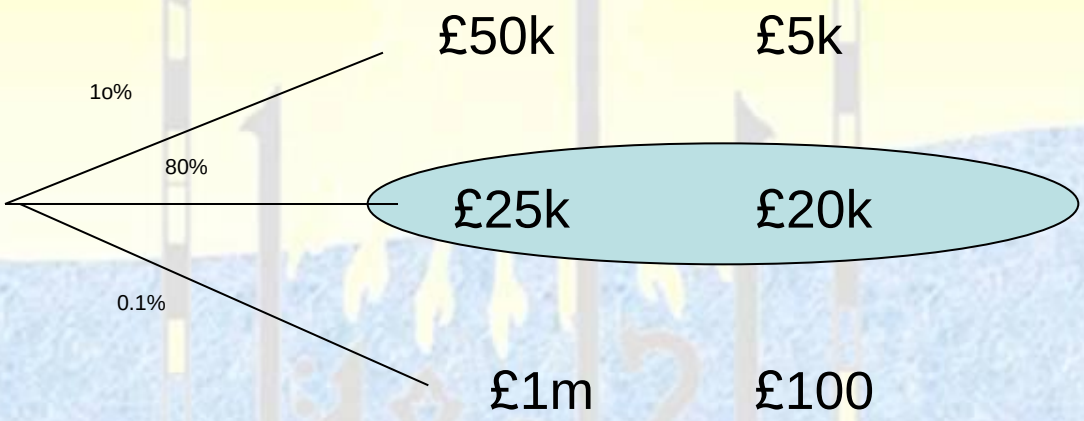
- You need to understand alternative applications of the technology; different applications have different economics.
- Example: new chemical compounds for use in organic light emitting polymers display and as markers on bulk materials formulations.
- Appropriate royalities:5-10% of net sales as pure materials ;0.1-0.5% as blended bulk materials.

Val……

- The cumulative cash flow resulting from technology exploitation discounted for risk.
- £1 today is worth £1
- £1 next year is worth less
- How much depends on the rate of inflation (not adjusting for risk)
- Agreements are commonly linked to an appropriate price index

Val……

- When there is choice



Val……

- Example: the company offers you a one-off payment of£100k having recently provided you with a forecast suggesting you will receive £1m over the next 10 years
- Assume the deal terms are index linked so there is no time value of the money
- Do you take the money?
- Discounted cash flow is the most correct way of valuing an investment

  -Present value =(CF1)/(1+r)+(CF2)/(1+r)²+ …

  -Where CF represent cash flows; r represent a risk factor

- But what is the appropriate value for r?

Val……

- **Soft versus hard returns**

  -Getting a technology exploited in the developing world is not just about money

  -Do you want to sell technology to someone who wants to shelve it?

  - Are you happy to sell technology to a patent troll who has no intent on development

  -PR has its own value

  -Does the customer fund a lot of research at your institution?

  -Does the customer have a powerful position politically?

  -How keen is the researcher on the proposed deal?

- A balanced scorecard approach may be appropriate for technology transfer offices

Identify Customer-The ideal license

- It is helpful to have these in mind-you can develop your own
- **Generic**

  -Has a patent portfolio of their own

  -Has links to Universities

  -Has experience of in-licensing

  -Is not prone to litigation

  -Is active within the main geographic market

  -Is active in the territories where you have patents

Project Specific

-Has development facilities close to your institution (for ready input from your research team where projects require know how transfer)

- Has good links with standards boards (where the technology will require board industry adoption)

-Had existing relationships with specific customers (where the technology is particularly suited to a specific end user)

-Has a corporate venturing unit (if a corporate investor is desirable)

Nego……

- Be prepared
- Know what you really care about
- Work out in advance all of the deal breakers-not just financial terms
- Make copious notes of exactly what has been conceded by either side
- Remember cultural factors e.g. saving face
- Send a team if the deal is big enough; but makes roles clear
- Do not take a lawyer until you need to
- Expect some game playing around key issues (dirty tricks…)
- Prepare your academic; boss;colleagues

Nego……..

- Behind your Back

  -Very common for companies with faculty inventors (particularly, funding relationships)

  - While you feel both parties are proceeding fine, the negotiator on the other side contacts the faculty inventor, and tells them you are totally screwing up the deal

  -Usually with an implied threat to abandon plans for laboratory research funding

  -The inventor then blasts you (or your boss) for running everything, and pressures you to back down

Nego……

- Over your Head

  -The other side contacts your boss and explains that unfortunately, they are not making any headway with you. They suggest that the boss should appoint someone else, have a sit-down with you or handle negotiations personally
- Reasons given are your inexperience, your lack of flexibility, or lack of authority(…incompetence)
- They usually try to keep the door open for a follow-up with the boss, to keep you on edge
- Not very effective if the boss knows and trusts you
- Not a true high Hat unless you are unaware of the contact

Val……

- Good Cop, Bad Cop
- Virtually everyone has experienced I t in one form or another comes in many variations)
- Designed to lower aspiration level of negotiator
- One person is constantly confrontational, stubborn, and demanding; the other is understanding, supportive, friendly
- Good cop is equal to or subordinate to bad cop
- The fallacy is that the good cop is trying to help you satisfy the bad cop.

Val……

- Serious marketing discussions are almost always confidential
- Common issues:
- Term 2-25 years
- Reduction to writing
- Allowing your consultants access to the information
- Export regulations particularly military technology
- Some companies/investors are reluctant to sign
- Freedom of information- which gives third parties access to some information.
- Narrowly defining the scope
- Agreeing the governing law
- Agreeing the location for legal action
- Checking you are insured
- Avoiding disclosure by the researcher.

- The grant of a license allows a third party to use your intellectual property for their business-usually for money.
- You can grant more than one license for each piece of intellectual property; you can grant licenses containing several rights
- If you are granting a license on university intellectual property it is important to retain the rights to use the IP for your universities research and teaching
- Licensing to an existing business can be less risky than licensing to a new start-up.

- Defined patents and know-how
- Licensed products
- Territory
- Supporting documents
- Historic costs
- Signing fee
- Milestones
- Royalties
- Development plan
- Improvements’
- License back for university staff

- Develop a standard
- Develop a set of guides to allow some flexibility
- Have a clear understanding of those clauses you consider to be most important.
- **Common issues:**
- Scope of improvements; pipelines agreements
- Warranties
- Indemnities
- Legal action
- Quality of development plan
- Access to audit information
- Rights on termination

Start-Ups

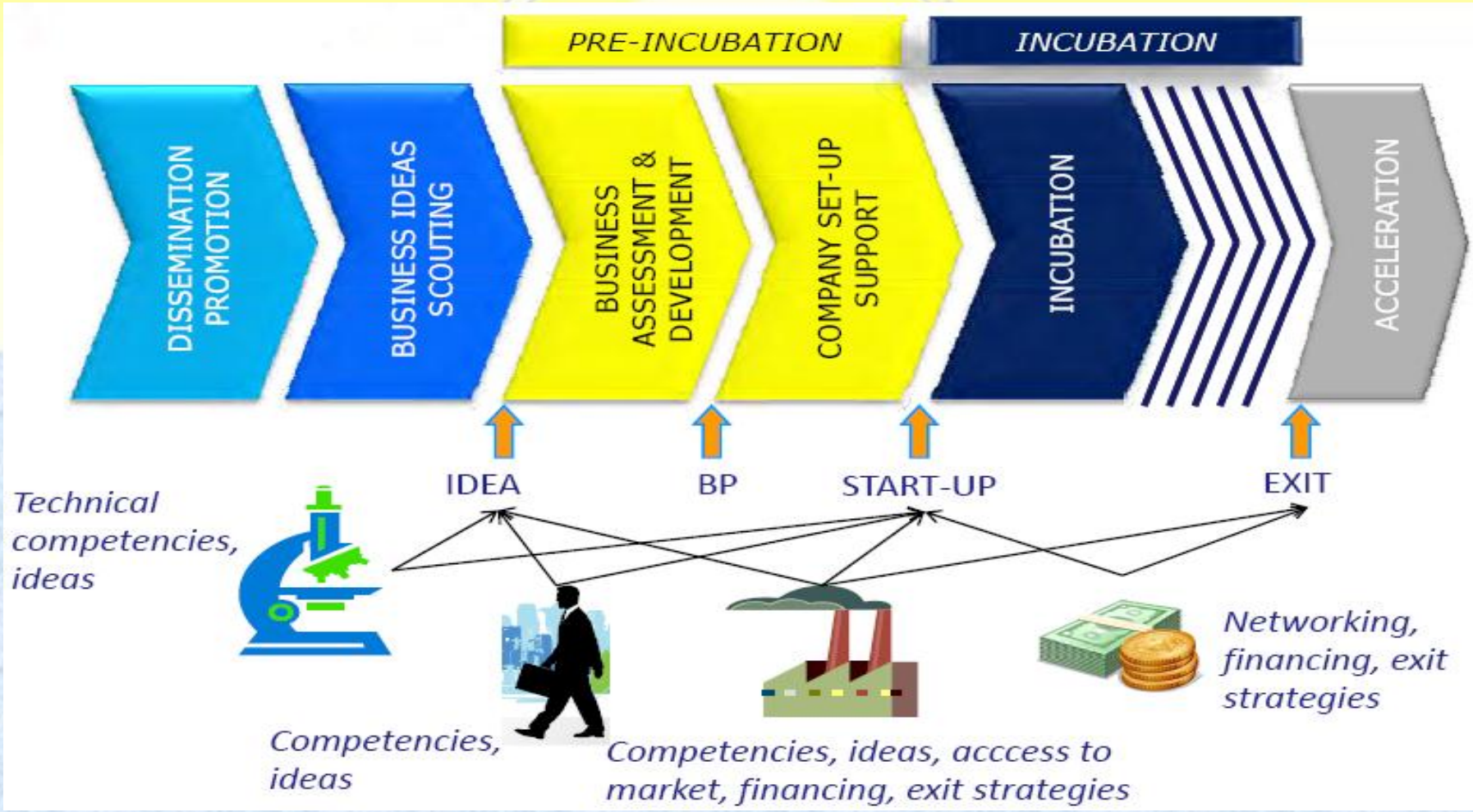
Start-Ups

- Professors, researchers and students who decide to exploit their research results by setting an entrepreneurial spin-off
- These start-up companies could be owned partially by universities and research institutions.
- Even if the university does not own any share, mutual benefits can be explored:
  - Start-ups from its proximity to university research laboratories
  - University from spreading the knowledge and innovation, socio-economic impact of both the society by job creation and professors by increasing their income

Business Incubator Objectives

- mission is to support the creation of knowledge-based startups with high grows potential, and this is accomplished by:
- Providing value-added consultancy services along the process from idea to company
- Managing a high-profile marketplace and network linking entrepreneurs, professionals, managers, and inventors
- Offering high quality logistic services to host startups and foster motivation and collaboration
- Supporting national and international partner for the establishment of new high-tech business incubators worldwide
- target groups:
  - Students, researchers and professors from Universities, public research institutions, and enterprises interested in setting up an entrepreneurial spin-off
  - Anyone willing to create an innovative company and who can benefit from the proximity of Universities laboratories

Business Incubation Services

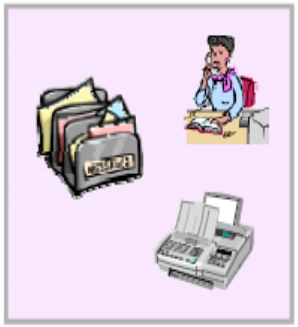


Pre-Incubation

- The pre-incubation period is the training period during which an innovative idea develops into a start-up company
- Under the guidance of a tutor; business incubator provides the competencies and expertise for the following:
- Assessing the business opportunity of the idea
- Designing a sustainable business model
- Developing a consistent business plan
- Enriching the entrepreneurial team
- Raising pre-seed capital

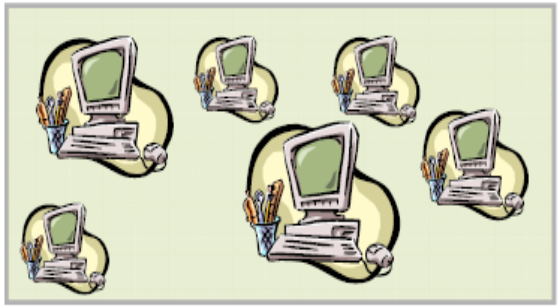
Logistic Services

Secretarial services



Serviced offices

Broadband Internet



Meeting & ConferenceRooms

Guidance During Incubation

- **Tutoring/Coaching**

-Tutors are constantly in touch with the start-ups

-A team of specialist consultant are available for technical and managerial topic.

- **Company check-ups and progress reviews carried out by senior experts:**

-Strategic and management analysis for enterprises.

- **Mentoring program with a strong network of managers**

Financing

- Advisory and support to strategic financial planning.
- Access to funding opportunities promoted by local public bodies and institutions.
- Preferential agreements with banks, with advantageous terms and conditions for loans.
- Networking with individual and industrial investors (Business Angels and Corporate venture capital)

Acceptance Criteria

- Experts in different field evaluate the business idea or business plan
- Companies have to be not older than one year (real start-up)
- Typical incubation period is 3 years maximum

Below market-Value Services

- An Inclusive fee covering all services (logistics, consulting, advisory, networking, etc.)
- Part of the fee can be substituted by a revenue-sharing agreement.
- Companies can choose to have their premises outside virtual incubation.
- Low initial fees, approaching market prices at the 3rd year.