

Innovation and Technology Transfer for Business Development

**Nicolae GOGA
Bujor PAVALOIU**

Outline

- **Introduction**
- Technology Transfer Examples and Models
- Technology Transfer Types, Instruments and Stages
- Phases of Technology Transfer
- Practical Details for Technology Transfer

Introduction

- Technology Transfer (TT) or Transfer of Technology (ToT) is the transmission of data, designs, inventions, materials, software, methodologies, procedures, knowledge from one organization to another or from one function to another.
- It transforms early stage intellectual property into tools for direct use by the research community or directly into products for the market.
- It take place between universities, businesses and governments, either formally or informally, to share skills, knowledge, technologies, manufacturing methods.

Technology Transfer

- Technology transfer is an important process in innovation where the results from research and academia are transferred towards industry.
- The process is important as it assures on one hand the usage of research and on the other hand helps industry to innovate and have competitive advantage.
- Technology can result from the application of science to add value, simplification, diversification, and productivity to a management process or product.
- However, technology's value wanes unless it can be transferred to a user who can apply the technology to create a tangible benefit.

Benefits for the promoters

- Recognition of talent
- Recognition of innovation
- Transformation of academic/ theoretic discoveries to practical products/ technologies/ services
- Financial benefits
- Support for research, development and education
- Opportunities for universities
- Possibility for alliances

Benefits for the society

- New products/ technologies
- New services
- Recognition of talent
- Promotion for the culture of innovation and entrepreneurship
- Better life quality
- Better medical services
- Cleaner environment

Technology Transfer Process

- Technology transfer is an important part of the technological innovation process, promoting scientific and technological research and the associated skills and procedures from R&D laboratories to the wide society and to the marketplace.
- The adoption process is seen differently by experts, with a general view or with detailed observation.
- We will examine several of the different views because they offer insight in this crucial process.

Outline

- Introduction
- **Technology Transfer Examples and Models**
- Technology Transfer Types, Instruments and Stages
- Phases of Technology Transfer
- Practical Details for Technology Transfer

Technology Transfer Examples

New things are invented this moment and are integrated into products.

Autonomous vehicles/ Self-driving cars related:

- 40+ Corporations are currently working on Autonomous Vehicles [1];
- Artificial intelligence for control;
- Sensors -lidars, radars, video...;
- New engines;
- Powerful battery packs, with smart and fast charging;
- Regenerative braking...



Technology Transfer Models

TT models were developed after WW2 to control the implementation of TT activities and their application to marketplace. Important early models [2]:

- The Appropriability Model - good technology sells/transfers by itself. The market drives the TT.
- The Dissemination Model (Rogers, 1983) – experts will disseminate dedicated knowledge to the willing user.
- The Knowledge Utilization Model (Gibson and Slimor, 1991) – includes a technology application level and acknowledges that transfer requires a profoundly human endeavor.

Technology Transfer Models (2)

Newer TT models improve on the linearity of the initial ones [2]:

- The Communication Model – TT is regarded as “a communication and information flow process with communication understood to be concerned with full exchange and sharing of meanings”
- Current models - Gibson and Slimor’s (1991) and Sung and Gibson’s (2000) address the limitations of the traditional models by expansion and improvement to three layers and respectively four layers of involvement: Level I (Knowledge and Technology Creation), Level II (Sharing), Level III (Implementation), and Level IV (Commercialization) [3].

Outline

- Introduction
- Technology Transfer Examples and Models
- **Technology Transfer Types, Instruments and Stages**
- Phases of Technology Transfer
- Practical Details for Technology Transfer

Types of Technology Transfer [4]

- **Vertical Technology Transfer.** Includes basic research to applied research, applied research to development, and development to production. It is also known as internal technology transfer. This type of transfer is mostly carried out between research associations, universities, and governments.
- **Horizontal Technology Transfer**– It is the process when the technology that has already been put in place or use within one organization is further transferred and used in another place. It is also known as external technology transfer. This type of transfer takes place between private companies, small and large business organizations.

Types of Innovation and Technology Transfer

TT, as well as **innovation** and **product development**, can be:

- **Market/Demand pull**, which tries to provide solutions and products for the market demands;
- **Technology push**, which tries to introduce to the market new products or new solutions for existing products.

The innovation models based on these were described in a previous lecture.

Technology Transfer for market pull

Once a production problem is identified, the TT depends on the:

- Ability to find and select the most appropriate technology for application;
- Ability to master imported technology and use it successfully for converting input into output;
- Ability to institutionalize the search for innovation that is more important and groundbreaking;
- Ability to adapt imported technology to suit local production conditions and continue to develop more appropriate technologies through engagement in local innovation initiatives.

Technology Transfer for Technology Push

Technology push requirements:

- Cross-functional teams;
- Integration of lead users in the development process;
- Advanced simulation mechanisms for the integration in the markets;
- Direct, informal communication with potential user groups;
- Risk management;
- Important marketing and social component.

Technology Transfer Instruments [4]

- **Licensing.** Agreement between the owner of the technology (Licensor) and the receiver (Licensee). It gives the right to use the technology developed or owned by the former to the latter for a specified time period.
- The two broad categories of licensing include the one which grants exclusive rights to use the technology and another which grants non-exclusive rights wherein the owner reserves the right to further transfer the technology to other company apart from the receiver. It may also include the right to sub-license, permitting the licensee to grant someone else the right to use the technology.

Technology Transfer Instruments [4]

- **Joint Venture Agreement** – The company executes a joint venture agreement with respect to technology transfer for a particular business with a vision to incorporate long-term cooperation between the parties, the motivation of all participants in the successful transfer, and to incur lower costs as compared to working independently.
- **Franchising**– It is one of the most preferred methods of transferring technology. The companies generally transfer technical know-how or skill involved under this type of agreement.

Technology Transfer Instruments [4]

- **Original Equipment Manufacturer.** It is a kind of sub-contracting agreement wherein a foreign company transfers a relevant portion of its technologies and a local company manufactures according to the specifications in the agreement. This enables local companies and firms to absorb technologies and restructure their production mechanism.
- **Buy-Back Contracts.** It is a form of agreement between stakeholders from developing entities and large foreign companies, where the latter supplies industrial equipment in exchange for profits derived from the sales. This kind of technology transfer is often used in the construction of new plants and other related businesses.

The three steps/stages of Technology Transfer

The standard stages for TT are the general steps to put any product into operation:

- Preparation
 - Type of transfer. Technical preparation. Market preparation. Scope, roles and responsibilities. Risk management.
- Installation
 - Teams. Operational data. Timelines. Troubleshooting.
- Application/Utilization.
 - Efficient. Assessment.

Outline

- Introduction
- Technology Transfer Examples and Models
- Technology Transfer Types, Instruments and Stages
- **Phases of Technology Transfer**
- Practical Details for Technology Transfer

Phases of technology transfer

Technology transfer process usually goes through the following phases [5]:

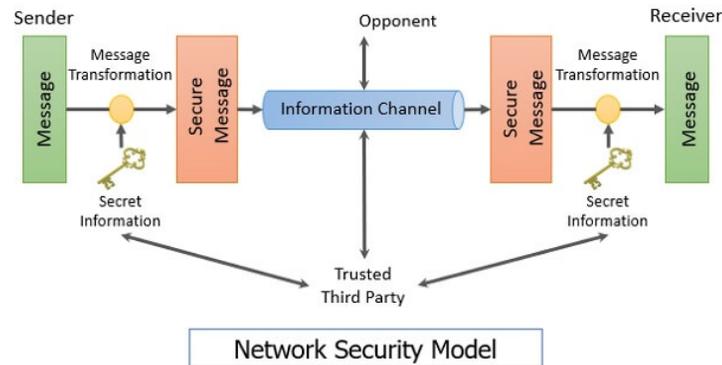
- Technology innovation
- Technology confirmation
- Targeting technology consumers
- Technology marketing
- Technology application
- Technology evaluation

Phase One: Technology Innovation

- The TT process begins when a scientist starts communicating ideas of how science can be used to solve a problem or improve a situation in a research priority area.
- This technology innovation phase is represented by the exchange of information which takes place between the scientist, colleagues and administrators to advance ideas on the application of science.

Phase one: Technology Innovation

- A diagram is the first step toward communicating and refining ideas. The next step would be when the scientist starts discussing his or her theories with colleagues.



<https://binaryterms.com/network-security-model.html>

- This activity may aid the scientist in further refinement of the theories and gains suggestions for other possible commercial applications of the technology.
- In-house seminars and group discussions should be actively organized and supported by all scientists to encourage analysis and support or development of ideas.

Phase One: Technology Innovation

- After refining theories arising from the technology innovation, the scientist should submit research proposals communicating the concept to the appropriate funding agency.
- Such proposals should include plans as to how the research will in fact be applied. Scientists need to be proactive in suggesting end uses for the technology they have created.
- Example of platforms for research proposal (EU, RO): Eureka, Horizon. Eurostar, UEFISCDI

Phase One: Technology Innovation

■ **Examples of Key Actions:**

- Idea of management practice or product innovation.
- Developing diagrams of technology innovation.
- Discussing theories with colleagues.

■ **Examples of Indicators of Transfer:**

- Display of technology diagrams.
- Presentations communicating technology.
- Research proposals advocating technology.

Phase Two: Technology Confirmation

- The technology confirmation phase is represented by the scientist first conducting research which provides data in support of the underlying theory about technology and then communicating the results to colleagues, peers and administrators.
- Researchers should balance the economic benefits versus the deficits of sharing research progress or results with colleagues and competitors.

Phase Two: Technology Confirmation

- **Examples of Key Actions:**
 - Conducting research on technology innovation.
 - Discussing results with colleagues.
 - Reporting to science organizations.
- **Examples of Indicators of Transfer:**
 - Reports on research progress.
 - Communication of results to peers.
 - Documentation of results in science journals.

Phase Three: Targeting Technology Consumers

- During the third phase of the process decisions need to be made concerning who needs and can potentially benefit from the technology.
- The people involved in the targeting technology phase would be scientists and marketing personnel.
- These specialists need to be aware of factors such as cost, convenience, etc. which influence users' acceptance of new technology or factors which might serve to prevent the adoption of technology.

Phase Three: Targeting Technology Consumers

- **Examples of Key Actions:**
 - Deciding characteristics of potential consumers.
 - Targeting consumers with prescribed traits.
 - Estimating number of prospective users.

- **Examples of Indicators of Transfer:**
 - Reports of research results to key business leaders.
 - Communication with potential consumers.
 - Negotiation of potential acceptance barriers.

Phase Four: Technology Marketing

- The technology marketing phase of the process is concerned with disseminating the technology beyond the research centre.
- Key actions for science liaison involve the talents of scientists, business leaders and marketing specialists to educate potential consumers to the social, economic and environmental benefits of the new technology.

Phase Four: Technology Marketing

- There should be frequent interaction between research and marketing personnel.
- Knowing where the potential client usually gains knowledge of specialised products and or services will influence the selection of communication methods.
- There should be a variety of communication channels to stimulate public awareness and understanding of science or technology.

Phase Four: Technology Marketing

- **Examples of Key Actions:**
 - Analysing demographic profile of anticipated consumers.
 - Preparing information-educational materials.
 - Transmitting information through mass media.
- **Examples of Indicators of Transfer:**
 - Organise and categorise market constituency.
 - Production of educational materials.
 - Contacts with a variety of communication channels.

Phase Five: Technology Application

- The technology application phase concerns the understanding of users or consumers behavior and establishing predictable steps to monitor the commercial application of technology.
- The talents and skills of social and financial consultants, and marketing personnel are required to identify consumers' behavior and application patterns.
- The ratio of the number of consumers applying the technology to the number of potential consumers needs to be carefully monitored, to establish the market share reached.

Phase Five: Technology Application

- **Examples of Key Actions:**
 - Identifying consumers' behavior patterns.
 - Establishing application criteria.
 - Developing ways to monitor change and/or application.
- **Examples of Indicators of Transfer:**
 - Document steps leading to adoption.
 - Monitor percentage of consumers changing.
 - Document changes, adoptions or applications.

Phase Six: Technology Evaluation

- The sixth phase of the technology transfer process documents the success or lack of success of the technology to be adopted.
- Key actions for the technology evaluation phase are to establish assessment criteria for authenticating socio-economic and environmental benefits or harm.
- Assessing technology transfer effectiveness generally requires specific criteria which can provide a basis for measuring the extent to which key actions have been attained.

Phase Six: Technology Evaluation

- The method of defining specific criteria for indicators of transfer is essentially moving from broad to specific actions.
- The stronger the indicator of transfer, the more useful the indicator is for making decisions on present and future public good science funding.
- The technology transfer process ends when the scientists reports the evaluation findings back to the funding agency.

Phase Six: Technology Evaluation

- **Examples of Key Actions:**
 - Establishing socio-economic benefits.
 - Establishing environmental benefits.
 - Establishing evaluation criteria.
- **Examples of Indicators of Transfer:**
 - Document % of consumers satisfied with technology.
 - Document benefits acquired from technology.
 - Report evaluation results to funding source.

Outline

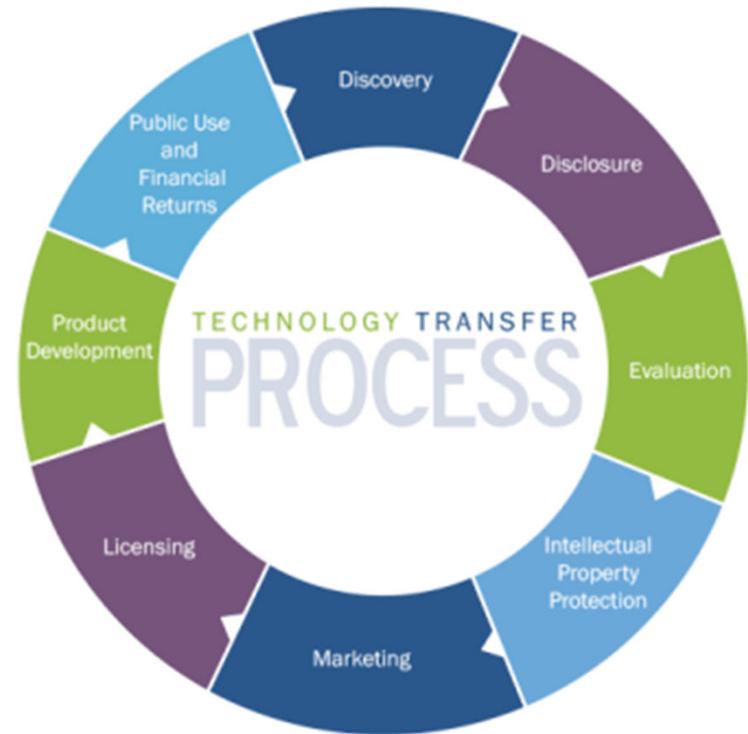
- Introduction
- The three stages of Technology Transfer
- The five stages of Technology Transfer
- Phases of technology transfer
- **Practical Details for Technology Transfer**

Technology Transfer Process

The TT Process transforms the results of scientific and technological research to the market and to society.

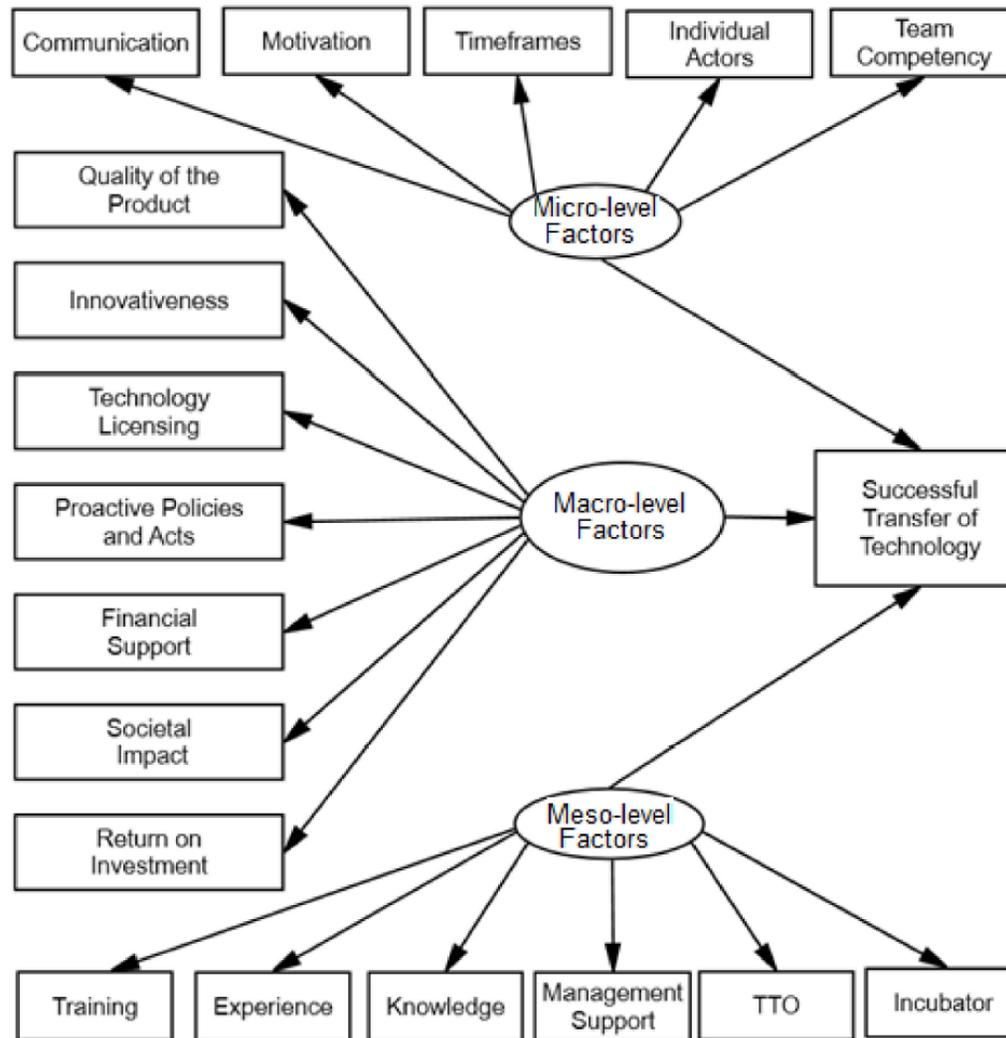
“Research transforms money into knowledge ... technology transfer transforms knowledge into money.”

Geoffrey Nicholson, father of the Post-It



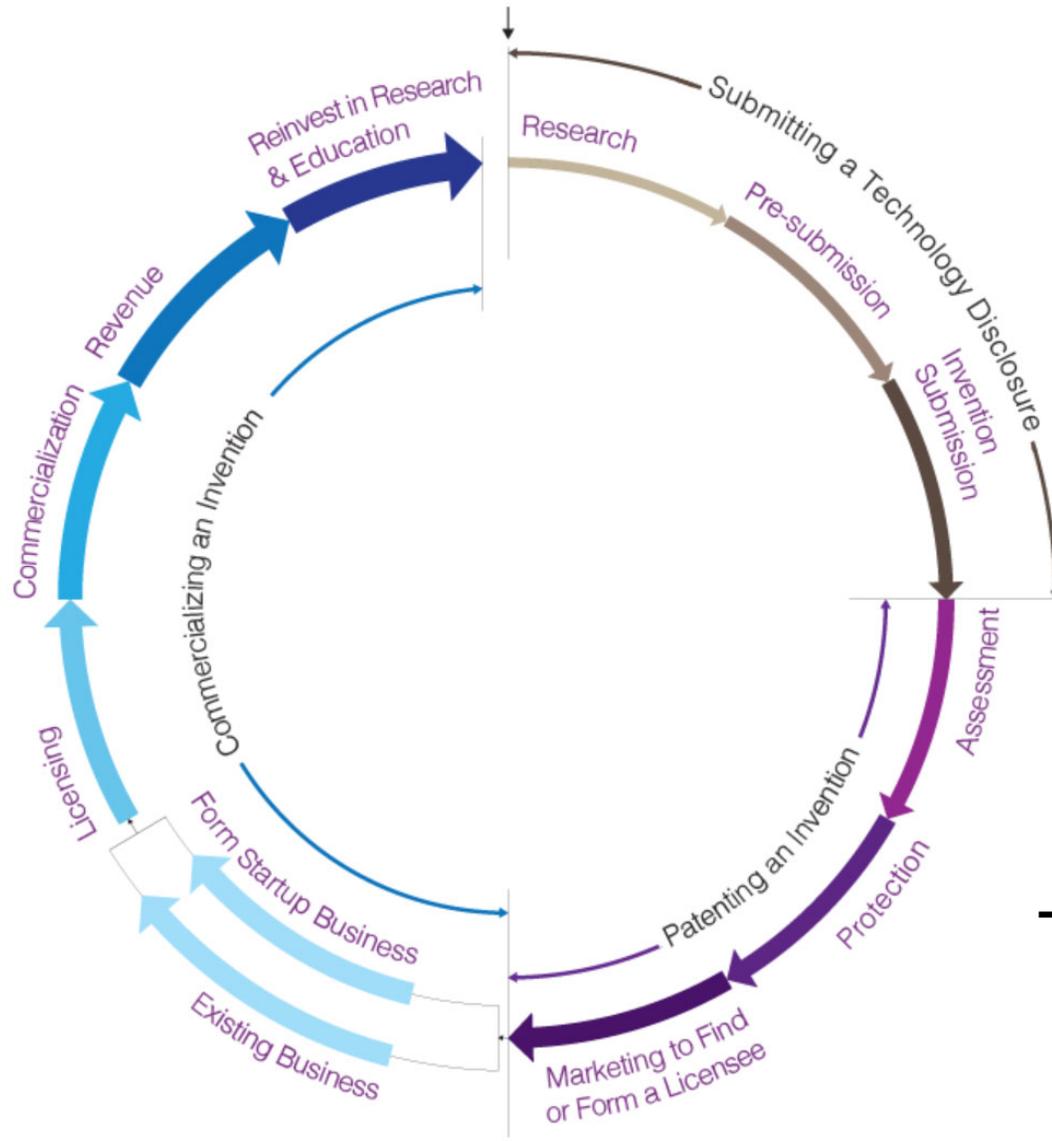
https://knowledge4policy.ec.europa.eu/technology-transfer/what-technology-transfer_en

Successful TT from public-funded ARIs to SMEs



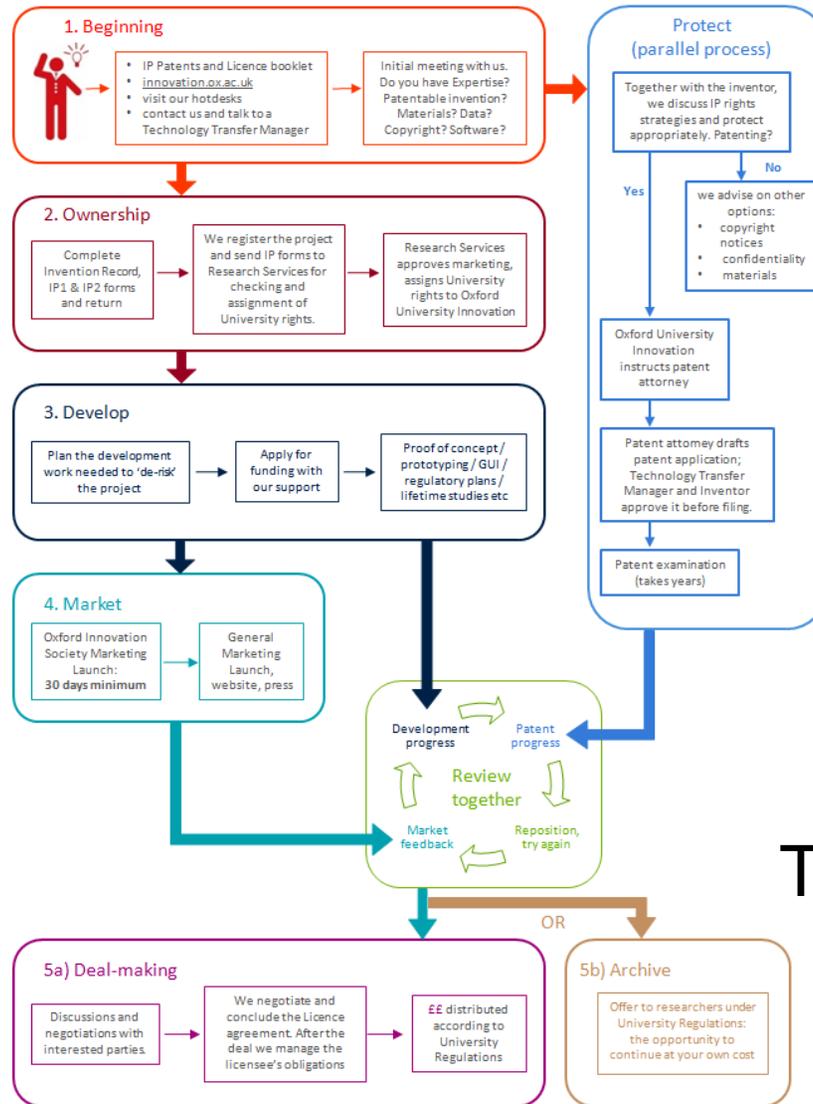
S. Singhai, R. Singh, H.K. Sardana, A. Madhukar, Analysis of Factors Influencing Technology Transfer: A Structural Equation Modeling Based Approach

Technology Transfer Process in Universities



TT at MIT [6]

Technology Transfer Process in Universities



TT at OXFORD [7]

Technology Transfer Process in Universities - UPB

The technology transfer process from universities [8,9] is performed at University POLITEHNICA of Bucharest by the **Innovation and Technology Transfer Office** [10]. The general steps are:

- **Disclosure**

The researchers submit a Technology Disclosure Form describing the invention, detailing the funding used, the name of the inventor(s), any public disclosures or publications, and other information.

- **Evaluation**

The Office evaluates the invention disclosure for its unicity, market availability and commercial value, patentability, and the best modes of intellectual property protection and commercialization. If the invention is useful, novel, and non-obvious to those skilled in the field, then a decision would be made on whether or not to file a patent application.

UPB Innovation and Technology Transfer Office [10]



Comercializare pas-cu-pas

Home / Comercializare pas-cu-pas

Depunerea ideii tale

Evaluarea ideii

Finanțare

Brevetarea și protecția ideilor

Lansarea pe piață

- Dacă aveți o idee sau o invenție brevetabil sau nu, veți contacta **Serviciul de Inovare si Transfer Tehnologic (SITT)** care vă va ajuta să evaluați ideea dvs., să verificați potențialul acesteia și, eventual, să vă ajute să o dezvoltați în continuare. Ideea dvs. nu trebuie să fie complet dezvoltată înainte de a contacta SITT. De fapt, va fi în avantajul dvs. să luați contactul cât mai devreme, deoarece vă crește șansele de reușită pe piață.
- Lucrul cu SITT nu este un obstacol în publicarea rezultatelor cercetării tale. Dar pentru a vă putea proteja ideea, este important să discutați cu SITT înainte de a vă face publică ideea.
- SITT vă ajută, de asemenea, cu inovația deschisă și aplicarea cercetării dvs. în produse, servicii sau metode noi care contribuie la societate. Puteți discuta și primi sfaturi despre o strategie bună despre impactul și aplicarea cercetării dvs. Pentru a face acest lucru, contactați SITT și trimiteți-vă ideea.
- Trimiteți ideea dumneavoastră aici (pagina pentru trimitere idei).....

Practical Phases of technology transfer

■ Protection

The Office evaluates the necessity to apply for a patent at the State Office for Inventions and Trademarks – OSIM [11]. The University does not file patent applications for all invention disclosures it receives. The commercial potential of the technology will be carefully considered before an application is filed.

■ Marketing

Once the process of filing a patent has started, through the close collaboration between the inventor, the Innovation and Technology Transfer Office and neutral intellectual property experts, a sustained marketing activity is started, which will maximize the chances of placing the results on the market. patented technology; the marketing activity implies a close communication, as the case may be, with the “start-up” company or with the existing one, involved in the marketing process.

Romanian State Office for Inventions and Trademarks [11]

OSIM OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

State Office for Inventions and Trademarks

Search ...

Română English

Home About O.S.I.M. Industrial property Publications e-OSIM Contact

MENU

- Forms
- Online applications
- Useful links
- Regional Centres – PATLIB
- Industrial Property Attorneys

Opoziție la înregistrarea mărcii - notiuni de baza

Valentin Cretu | Oficiul de Stat pentru Invenții și Mărci

Arhivă NEWS

Amounts and time-limits for payment off fees:
• valid from 01.01.2021

Bank transfer for payments in EUR
State Office for Inventions and Trademarks – OSIM

Our bank account details are:
BCR – Sala Palatului
Address: 33, Ion Campineanu Street, Sector 1, zip code 010035, Bucharest, RO

Swift code: RNCBROBU

IBAN number EUR:
RO38RNCB0080005630320005

Your Europe
This webpage is part of an EU quality network

Practical Phases of technology transfer

- **Licensing or sell**

The University's goal is to put our inventions and discoveries in the hands of the public. Patented inventions are transferred to industry through licensing or selling.

- **Commercialisation**

Once a licensing agreement has been executed, the University monitors the licensee's business development and compliance of performance milestones, coordinating patent prosecution, processing license income and distributing revenue according to the University's IP Policy.

Romania's TT Institutions

- Ministry of Education, Innovation and Digitalization
- Technology Transfer Offices (TTO) – accredited by the National Authority for Scientific Research and Innovation. For 2011 – 39 Accredited TTOs and 10 Temporary Accredited [12].
- Technology and Business Incubators
- Technology Information Centers
- Industry Liaison Offices
- Science and Technology Parks

Conclusions

- The technology transfer process describes the linkages which integrates the adoption of new science knowledge, and the functional interrelations of the different specialists within the process
- It is an important process and a key one as it helps industry to define new products and research to get the results of their work exploited.

References

- [1] <https://www.cbinsights.com/research/autonomous-driverless-vehicles-corporations-list/>
- [2] Sazali Abdul Wahab, Raduan Che Rose, Jegak Uli, Haslinda Abdullah, A Review on the Technology Transfer Models, Knowledge-Based and Organizational Learning Models on Technology Transfer, European Journal of Social Sciences – Volume 10, Number 4, 2009
- [3] Sung, T.K., Gibson, D.V. (2000), Knowledge and Technology Transfer: Key Factors and Levels. Proceeding of 4th International Conference on Technology Policy and Innovation
- [4] <https://www.origiin.com/2020/09/13/technology-transfer-meaning-types-and-steps/>
- [5] https://www.africa.upenn.edu/Comp_Articles/Technology_Transfer_12764.html
- [6] <https://tlo.mit.edu/learn-about-intellectual-property/technology-transfer-process>
- [7] <https://innovation.ox.ac.uk/university-members/commercialising-technology/ip-patents-licenses/technology-transfer-process/>
- [8] <https://www.lsu.edu/innovation/faculty/techtransferprocess.php>
- [9] <https://www.jsums.edu/technologytransfer/technology-transfer-process/>
- [10] <https://upb.ro/comercializare-pas-cu-pas/>
- [11] <https://osim.ro/en>
- [12] <https://www.research.gov.ro/ro/articol/4728/sistemul-de-cercetare-infrastructuri-de-cercetare-infrastructura-de-inovare-si-transfer-tehnologic-entitati-de-inovare-si-transfer-tehnologic>

Bibliography

- Sazali Abdul Wahab, Raduan Che Rose, Jegak Uli, Haslinda Abdullah, A Review on the Technology Transfer Models, Knowledge-Based and Organizational Learning Models on Technology Transfer, European Journal of Social Sciences – Volume 10, Number 4, 2009
- Everett M. Rogers, Diffusion of innovations, 5th edition, Free Press, 2003