

Development of Technology Transfer Structures in Turkey

Manual and toolbox

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1 Foreword

Considering the developments in the last 3 decades; for better improvement of productivity it has been focused on creating value-added process, in addition we are observing that competition and competitiveness become more important. It is commonly known that technology developers, traders and great profit gaining give R&D and innovation high importance for developed countries on. Today R&D and innovation is not only playing an important role for the country's wealth and prosperity but also as an important instrument of global competition. Therefore, it is not possible to create high value-added products competing in the market without producing technological products based on R&D and innovation. From this aspect it becomes extremely important to improve the efforts in R&D and innovation for creating technological products. Without producing technology, tracking technology producers or producing with license, agreements can provide a solution in short term but their contribution in technological development will be limited.

To reduce the gap of development between developed countries and developing countries technology transfer or in other words, converting information to product and commercialization process of products; creation of public-university-industry collaborations and covering the needs with this collaborations will be highly beneficial. The interfaces, the so called Technology Transfer Structures; play an important role in capabilities of knowledge on technology development and commercialization on individual, institutional, regional, national and global levels. Interfaces of Technology Transfer are extremely relevant and effective mechanisms in terms of sustainable technology development and innovation activities.

Common feature of these structures constituting an effective and efficient process is that they are highly benefitting from universities' knowledge in new or developed products, processes and service provision. Gains of converting reciprocal knowledge and experience within the framework of university-industry collaboration are social and economic benefits. Technology transfer structures have gained an increasing popularity. For this reason, developing direct tools and methods for technology transfer right from the beginning, as well as an effective and efficient operation of these structures have to be ensured.

This book results of the valuable outputs of the "Economic Development in Anatolia " Project which has been jointly managed by GIZ and KOSGEB for two years, who both are as well responsible for the preparation and publishment of this book, in favor of supporting upcoming studies in technology and innovation.

I think and wish this book would be very useful for individuals and institutions of technology transfer structures during their establishment and management phases. I would like to express my thanks to the authors of this book, as well as all project members and ending my words with wishing success for technology and innovation-based entrepreneurs.

Mustafa KAPLAN
President,
KOSGEB

2 Introduction

The global competition forces policy-makers to look for various possibilities to improve the competitiveness of entrepreneurs and SMEs in order to enable them to meet the challenge of ever tougher global competition. At the same time, the growth of global competition makes it even harder for SMEs to be successful on their own. Cooperation, strategic partnerships and university-industry collaborations getting more important while offering great advantages for SMEs.

The interfaces of Technology Transfer have generally triple helical structure. It is acting as a bridge between University-Industry-Government. So called "Technology Transfer Structures" are appearing under various names which are for example Technopark, Technology Transfer Office, Technology Development Center and so on. Some of the advantages of these interfaces are to get access to new technologies through research institutes, to make joint research, to use the accumulated knowledge and experience for technology producing, to benefit from the outcomes of research and development.

In dealing with Technology Transfer Structure; concepts, methods and processes must be well understood. The similar examples of "Technology Transfer Structures" must be examined in order to achieve success. The manager must have some qualifications and skills for effective management of Technology Transfer Structures. The Manager must know the demands of the business world. It is also extremely important that managers and employees of TTS are well qualified. Technology Transfer Structure with high-quality personnel will have significant advantages.

The Project of Economic Development in Anatolia is implemented by KOSGEB and GIZ under the cooperation of the German government and the Turkish government. In the frame of this project, training and consultancy services have been provided in order to enhance service capacity of TTS. As a result of these activities this book has been published.

We hope that this book will be useful for SMEs and the Turkish economy. We would like to thank Prof. Dr. Utz Dornberger, Mr. Peter Sommer and Mr. Alfredo Suvelza who are responsible for the content of this book. Especially, we thank Mr. Alfredo Suvelza since he shared his wide knowledge and experiences with us.

Selim ÖNDEŞ
Presidential Consultant, KOSGEB
Project Coordinator

Carl TAESTENSEN
Country Director, GIZ

3 Conceptual Introduction

What is technology transfer?

Key Questions:
What is technology transfer? What is the role of Universities in the technology transfer process? What are the main benefits?

Technology transfer is playing an important role in the today's world, where knowledge is becoming an ever more significant factor of production and a valuable economic commodity.

The transition from manufacturing-based to knowledge-based economies enhances the importance of universities in generating new knowledge. Many governments on national or local level are designing and implementing programs to foster economic development through technology transfer from universities and research institutes. The increasing key role academic institutions play for social, environmental and economic development will lead to more complex relationships and interactions between stakeholders from the private, academic and public sector¹.

Technology Transfer (TT) is the process of transferring tools represented as knowledge, skills, methods, technologies and facilities between a transferor and a transferee in order to produce innovative products (goods and services) to be competitive in local and global markets.

The term technology transfer has evolved over time. Nowadays the definition is no limited to tangible objects such as machinery, instead there is used a wider definition involving intangible elements such as people and processes.

Links between universities and the industry are of particular importance as many inventions come out of universities but have to be further developed in order to become socially and economically relevant innovations.

A transferor is known as the technology provider who can be represented as a university, a research centre or a higher education institution (HEI). A transferee is the technology receiver and is usually an actor of the private sector that employs the transferred technology or knowledge for its own value creation and innovation processes, regardless of producing physical products, services or combinations of them. These actors are normally known as the private sector.

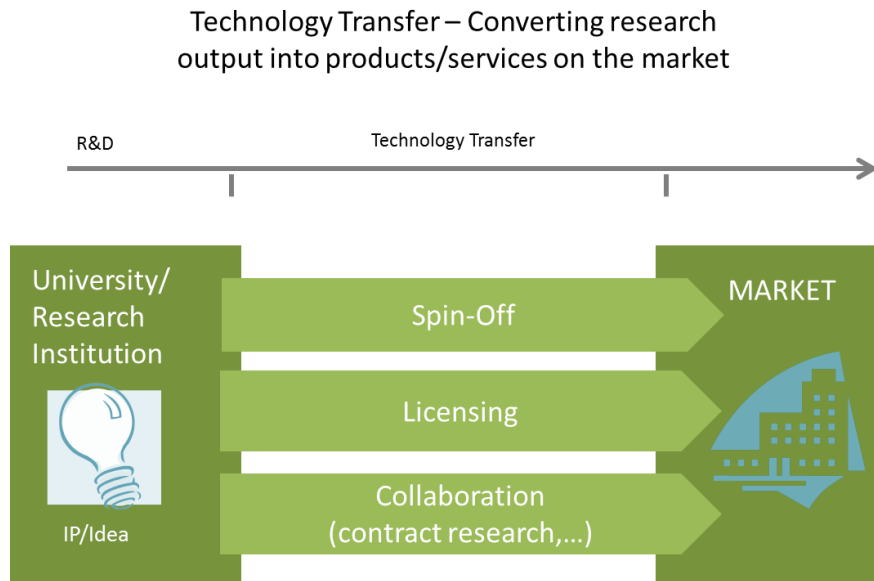
The process whereby an enterprise transforms scientific findings from research institutions and universities into marketable products and services can take place through three main channels (Figure 1)²:

- Creation of new companies (spin-offs), which can involve also the transfer of personnel (mobility of researchers);
- Collaboration between universities, research institutions and the private sector for example via research contracts; and/or
- Licensing of IP.

¹ See also http://autm.net/Tech_Transfer.htm

² Darcy et al. (2009)

Figure 1 The Basic Model of Technology Transfer



Source: EIF (2014)

What is the role of a TTC?

Transferring knowledge and innovation from a public research institution to the private sector for commercial application and public benefit requires several processes and interactions between all involved stakeholders. Capacity and culture of research and development (R&D) activities vary considerably from country to country and between universities. However, it is important to create a formal structure provided with a team and resources that can coordinate the transfer activities. This formal transfer mechanism is called technology transfer center (TTC).

Darcy et al. (2009) explain that successful technology transfer depends not only on the quality of the research and the involvement of the inventor, but also on the size and the experience of the TTC. For this reason it is essential that (younger) TTC's strengthen their own capabilities through continuous training and coaching activities.

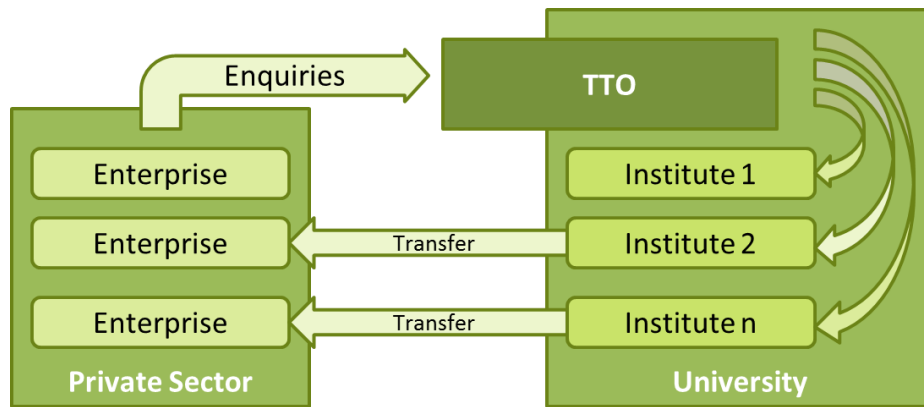
TTCs differ in terms of the scope of activity fields, business model, size, legal form and other characteristics. The strategy, research focus and strengths of the stakeholders will have an important influence on the TTC mission, on the resources allocated, on the activity fields and on the performance of the TTC in general.

The TTC acts as a bridging and intermediary organization that:

- facilitates the commercialization of research results for the public good
- initiates, builds, manages and cultivates closer linkages to industry
- fosters an innovation and entrepreneurial culture in the university and in its environment
- generates income for further research and education and promotes economic growth

One core function of the TTC is to establish strong linkages to the private sector and to channel the enquiries from the enterprises to the specific researchers in the universities. The TTC is responsible for identifying opportunities in the industry that will be then translated to the universities.

Figure 2 TTC as a channel for private sector enquiries



Source: Own elaboration

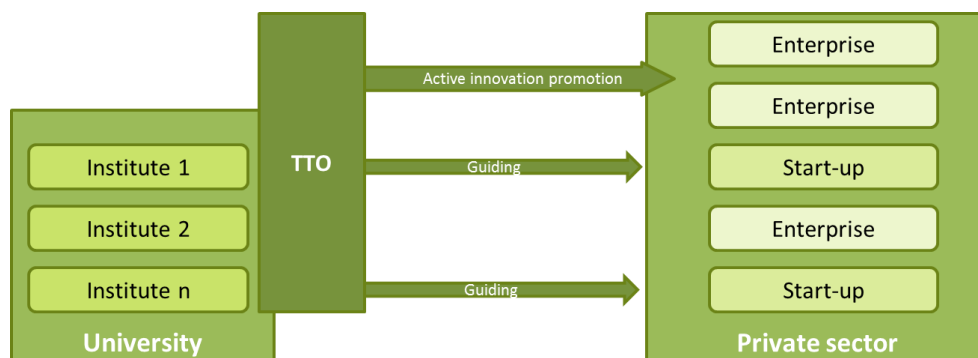
What is the role of Universities in the technology transfer process?

Universities are under increasing pressure to assert, improve and measure their impact on national prosperity, with attention primarily to the economic, social and environmental development.

Universities are seen as sources of new knowledge and innovative thinking, providers of skilled personnel, contributors to innovation, etc.

Many universities in the Asia, Europe and United States follow a new paradigm of technology transfer. They don't focus only on licensing activities, but work with a combined approach, where the universities or research institutes are also provider of consulting services (e.g. innovation management) and the source of start-ups. A TTC can support the university to fulfil this broader mandate and meet expectations.

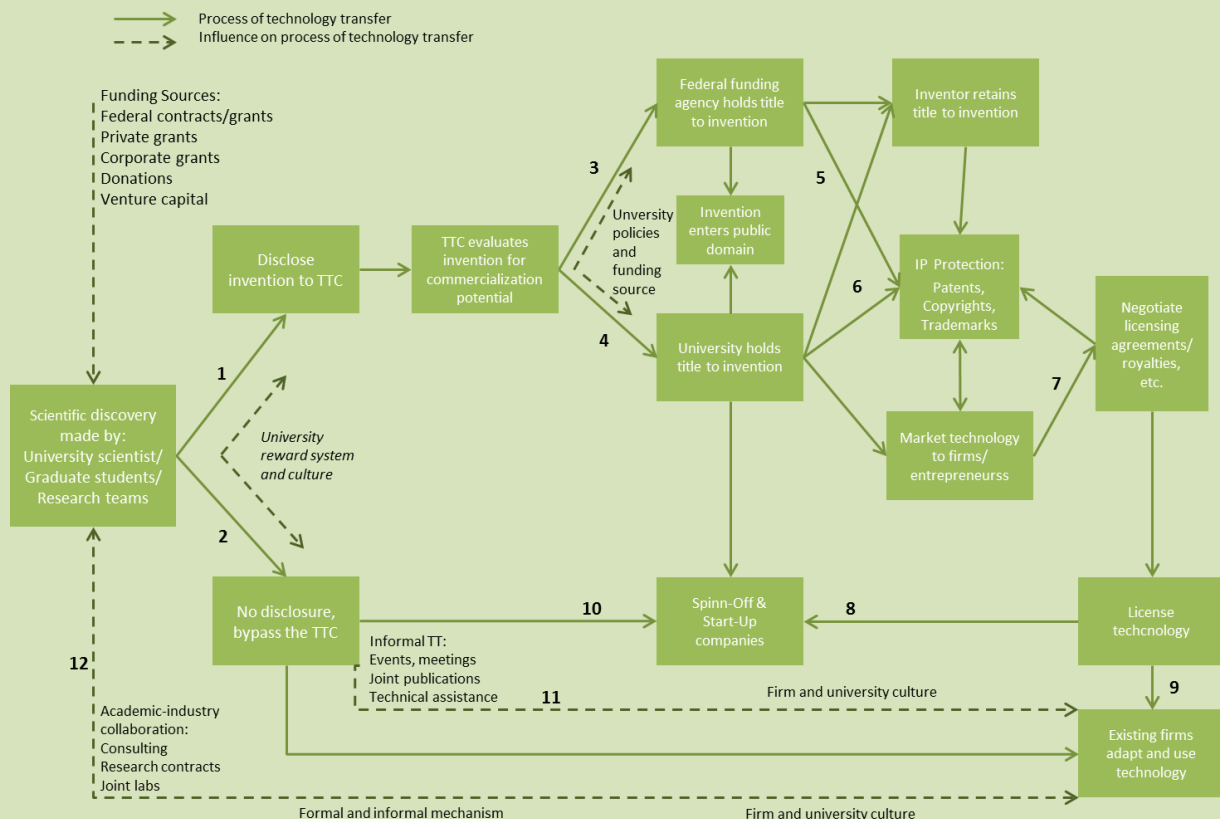
Figure 3 TTC as a channel for start-up creation



Practical Example: Technology Transfer in an entrepreneurial university – University of North Carolina

The UTT model incorporates the concept of an entrepreneurial university:

Figure 4 UTT Process Model



Source: Bradley et al. (2013)

The technology transfer process is illustrated in Figure 4 and explained hereafter:

Beginning of the process

The model begins with a discovery or invention made by researchers and students. It also indicates the possible funding sources, including federal contracts/grants, private grants, corporate contracts, donations and venture capital funds.

Process 1

When the discovery or invention is made, the technology transfer process may follow two paths: the inventor can choose to disclose the invention to the university's TTC.

Process 2

Or the inventor can choose not to disclose the invention, skipping the university's TTC. The inventor's decision to disclose or not the invention is, for example, influenced by the university's reward system and organizational culture. The inventor might be more likely to get involved with the formal mechanisms of technology transfer if the university provides incentives to engage in commercialization activities. If there are too many barriers or disadvantages, the inventor might adopt informal mechanisms of technology transfer. When the inventor decides to disclose the invention to the TTC, the office will evaluate the invention's market potential, profitability, return on investment, etc.

Process 3

If the TTC decides to work with the invention, the issue of the ownership of the invention becomes important. In process 3, it shows the case where a government agency holds ownership of the invention.

Process 4

Or there might be the case where the university holds ownership of the invention. In a TTC process, government funding is still the most common source of funding; however for private sources of funding, the university always holds ownership of the invention (unless the patent is sold 100% to the industry).

Process 5

If the university declines to hold ownership of the invention, the government funding agency has 3 options:

- Request the title of the invention to enter the public domain.
- Allow the inventor to retain the title of the invention.
- Request the title of the invention and apply for IP protection (patent).

Process 6

If the university accepts to hold ownership of the invention, it can decide how to proceed with the commercialization:

- Spin-off or start-up companies.
- Market the technology to firms.
- Acquire IP protection in the form of patents, copyrights, trademarks, etc.
- Allow the inventor to retain the title of the invention.
- When the invention is unlikely to have significant commercial value or there is no market interest, it may be allowed to enter the public domain.

Process 7

The processes of marketing the invention, acquiring IP protection and negotiating licensing agreements do not necessarily follow a linear path. They can overlap and occur simultaneously.

Process 8

Once the invention has been protected and a licensing agreement is done, the technology is officially licensed to an entrepreneur or an organization.

If the technology has been licensed to an entrepreneur, a spin-off or start-up company is established around the invention.

Process 9

Or if the technology has been licensed to an existing organization, which then adapts and uses the technology.

Process 10

If the inventor has chosen to skip the TTC (process 2), the technology transfer process is done through informal mechanisms, including consulting, joint publications, presentations and conferences, and other communication processes between faculty members and the industry. The knowledge that is transferred through informal mechanisms can result in spin-off or start-up companies.

Process 11

The knowledge transferred through informal mechanisms can also be adapted and used by an existing organization.

Process 12

The university (researchers and students) and the firm developing the invention often maintain a working relationship based on academic-industry collaboration. This collaboration can include consulting, research contracts, and other partnerships between the university and the firm, and they may involve formal and informal mechanisms of technology transfer.

Source: Bradley et al. (2013)

What are the main benefits of technology transfer?

There is little doubt about the potential of university technology transfer when it comes to supporting the adoption of new technologies, enhancing entrepreneurship, developing new products and services, creating jobs, and adding prosperity through economic development³. The clustering of high technology companies and start-ups around universities shows the positive impact technology transfer and strong industry-university linkages can generate.

Within universities, sound and competent technology transfer activities can also have many important benefits different from royalty income. For instance⁴:

- productive interaction with industry: exchange of ideas between the academy and the private sector, which often increases the quality and applicability of research
- increased industrial support of university research
- more willingness from central and local governments to support university research for economic, social and environmental development
- student exposure to the business world and to the commercial opportunities of research (including training in entrepreneurship), influences their future career options and ultimately impacting the country's economy

³ See also Nelsen (2007)

⁴ See Nelsen (2007) and McDevitt et al. (2014)

The importance of realistic expectations

According to Nelsen (2007) unrealistic expectations can lead to frustration and can be a cause of failure. Universities often expect their programs not only to bring in industrial sponsorship for research but also to provide royalty income and entrepreneurial spin-offs that will support the entire university.

Government expectations are often equally unrealistic. Some governments, for example, have expected royalty income from technology transfer to replace government support of their universities. Too often, local and national governments believe that just a few years of financial support for technology transfer—coupled with pressures on universities to produce measurable impacts—will almost instantly create dynamic clusters and innovation hubs.

It is important that all relevant stakeholders are aware that it takes time to generate strong and sustainable impacts in the economy and that TTCs need to be supported financially in order to secure the operations and the covering of a broad service portfolio.

Ten things to know about setting up a technology transfer center

Lita Nelsen, Director of the M.I.T. Technology Licensing Office, describes ten things to know about setting a TTC:

“THE ECONOMIC FIVE

- Technology transfer will not make your university rich. A successful program will make a small profit, but it will, however, provide many other benefits to the institution and the community.
- Building a robust technology transfer program takes sustained financial investment. Investments are required to develop a patent portfolio, attract expert talent, and train office professionals.
- It will likely take eight to ten years before your program stops losing money—and it may never make your institution any substantial amount. It takes time to build an IP portfolio, establish contacts, and develop skills in technology transfer. Following the set-up, the TTC may begin to make money.
- It may take two decades or more before a university technology transfer program (including entrepreneurial spinouts) substantially affects the local economy. Impact in regional economic development takes 20 to 30 years. Expecting substantial returns in a few years leads to underinvestment and disappointment.
- The ultimate impact may be very large—both economically and culturally—for the university, its graduates, and the community.

THE IMPLEMENTATION FIVE

- Sustained effort requires visible support—fiscal and otherwise—from senior administration. Senior management must not only lead the way, but also sustain the effort to change the culture of research and investment.
- Only senior administration can set the mission, policies, and priorities for the program. Clear mandates will help technology transfer professionals choose among competing priorities and the ever-present trade-offs between business and academic values. These policies will ultimately help to define the university. They need to be clearly stated, and supported from the top, so that technology transfer professionals can make the best decisions and withstand pressure from competing interests.
- Clear policies on IP ownership, the roles of researchers in interactions with industry, and other ground rules should be set up before the program begins. Working out such policies in the middle of making deals leads to confusion and bureaucratic lethargy, slows down the learning process, and hurts a university's reputation for being able to consummate deals.
- Conflicts of interest, both real and perceived, are inevitable. Clear policies and a well-understood review and appeal process need to be put in place early. Much can be learned from the experience of others in the technology transfer field. Again, support from senior administration is critical.
- Technology transfer is a talent-based business. It is difficult to find people who can speak the two languages of academia and industry and who also have the creativity to craft agreements that meet the needs of both sides. One should not underestimate the combination and level of skills required. These skills and experiences are very different from those needed to conduct research.”

Source: Nelsen, L. (2007)

4 Strategy

Key Question:
Why is it important to develop a TTC strategy?

To evolve TTCs into key players, intermediaries and bridging institutions inside the local, regional and national innovation systems and to develop them into effective tools for promoting the competitiveness of SMEs and generating social and economic benefits for their environment, it's crucial to develop a TTC strategy:

A strategy provides the TTC with a guideline and roadmap of how the TTC will achieve its objectives. It establishes a common direction with well-defined, results-oriented milestones. A strategy gives thus an answer to the question: "How do we achieve our objectives?"

Figure 5 Strategy – How to achieve the objectives



Source: Own elaboration

What are the key issues in strategy development?

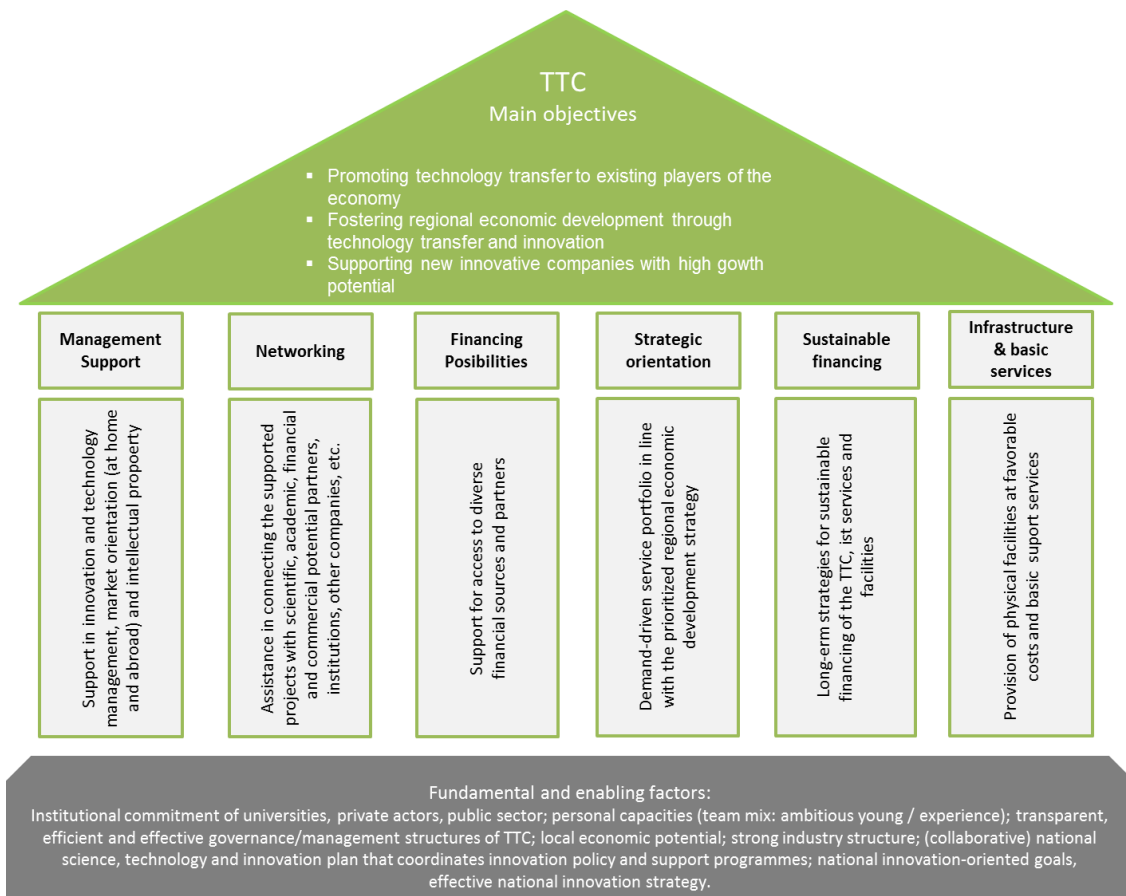
- The strategy should be derived from the mission and the objectives of the TTC.
- The strategy should be based on a sound analysis (see also the tools in this chapter)
- The strategy development should be developed collaboratively and involve all relevant stakeholders of the TTC
- The strategy should include concrete measures

4.1 Strategic setting and success factors

Key Question:
What are the main factors for a successful TTC performance?

The figure below shows an adopted model depicting the success factors of an institution related to technology transfer and innovation. The columns or pillars are the most relevant success factors to be considered in order to accomplish the goals.

Figure 6 Success factors for technology transfer centres (TTC)



Source: Own elaboration

- Fundamental/enabling factor: Strong industry clusters, regional or national strategies and national support programs for innovation and technology are for example, decisive enabling factor for a successful TTC performance.
- Management Support: A TTC should offer demand-oriented management support (e.g. market-oriented innovation management, intellectual property) (see also chapter 4.5 and 4.7).
- Networking: A TTC is responsible for connecting stakeholders and for creating and cultivating a dynamic network at local, regional, national and international level (see also chapter 7).
- Financing Possibilities: One task of a TTC is to identify and to inform about adequate funding sources for research projects (see also chapter 4.3).

- **Strategic Orientation:** It is important that the TTC develops a demand-driven service portfolio aligned with the priorities of its stakeholders and the needs of its clients (see also chapter 3).
- **Sustainable Financing:** A big TTC challenge is to assure sustainable financing with diversified sources of income (see also chapter 6).
- **Infrastructure and Basic Service:** A TTC obviously needs basic infrastructure and services (e.g. IT) (see also chapter 5).

Practical Example: Common characteristics of TTCs in the USA

Young (2007) presents the result of a study, conducted 2000 by Dr. Louis Tornatsky. The study, elaborated for the National Governors Association (NGA) in the United States, identifies the common practices of the most exemplary TTCs in the USA. The study highlights seven characteristics that were common to most centers:

1. A clearly stated TTC mission
2. Transparent TTC policies and procedures
3. Entrepreneurial staffing and an entrepreneurial environment
4. Customer-friendly relations with both internal and external constituents by TTC staff
5. A highly supportive university administration and community (local, regional, and national)
6. Strong TTC links to potential industry cooperation partners
7. TTC with access to risk, or venture capital

There is no universal and unified TTC model in the world. There exist a variety of characteristics and orientations. TTCs differ in sizes: ranging from a part-time professional at a small research institute, to centers with teams of more than hundred persons. Furthermore, sources of TTC funding, the organizational structure, activity fields, services portfolio, and other operational elements vary from TTC to TTC.

The quantity of research activity and the quality of the research results within the university are the main factors that determine the characteristics and the performance of a TTC. At the end of the day, research is the key source for innovations and collaboration opportunities.

Source: Young (2007)

4.2 Alignment with strategies on institutional, regional, national Level

Key Question:

How can the TTC evaluate if activity fields and projects are aligned with strategy on institutional, regional and national level?

Any TTC should be aligned with and supported by the institution it serves. The TTC's mission should be consistent with the institutional mission to assure that the TTC activities really support and add value to the institution⁵. The TTC and the institution should discuss and determine what type of services and activities can add value. Campbell (2007) emphasizes that the agreement regarding the service portfolio is so important because financial returns alone are an insufficient measure of value for universities. Long-term returns, such as sustained partnerships, cultural change, job creation, and social development should be part of the value provided by TTCs.

One important success factor for a TTC is the focus on local, regional and/or national economic strengths and areas with strong growth possibilities. The TTC strategy should be aligned with University priorities and capabilities, with local, regional and/or national development strategies and with the private sector potential (clusters, strong existing or emerging industries).

⁵ See Campbell (2007)

When an ecosystem exists and all of the elements are aligned, technology transfer can be truly transformational to a university and a community.

National and regional policies and strategies also should function as a framework for defining and adjusting the focus of the TTC. In the Aachen⁶ and Ruhr region of Germany, for example, the challenge for local economic development was to shape the transition from a traditional coal mining region into a high-technology hub for innovation. Special promotion programmes and funding have encouraged the development of new businesses within the region. Universities, innovation and entrepreneurship promotion agencies and TTC have been central to foster this transition offering, for example, a variety of supporting technology-transfer services.

Tool 1: Compliance Check

Why using this tool?

The compliance check helps the TTC to evaluate if existing or new technology transfer activities or collaborative research projects are in line with local, regional and national strategies and the priorities of the university.

To get a more concrete result you have to first develop criteria (formulate key questions) which can check compliance and potential, then you have to define the weight and importance (1-10) of each question, the next step is to grade the evaluated project regarding the criteria (1-10), afterward you can calculate the value of each criteria and the average value.

Table 1 Compliance with university priorities - Example

Key Questions / Criteria	Weight (1-10)	Grading (1-10)	Value (Weight x Grade)
Is the TTC activity or the project in line with the mandate of the university?	7	7	49
Does the project consider the research focus of the university?	9	10	90
Is the university equipped with the necessary capacities to support the research project?	8	5	40
... add more key questions if needed			
Total Value (ø)			59,7

Source: Own elaboration

Table 2 Compliance with local / regional / national (development) strategies - Example

Key Questions	Weight (1-10)	Grading (1-10)	Value (Weight x Grade)
Does the project focus on the local/ regional/ national community needs?	9	10	90
Is the project aligned with national strategies and policy priorities?	8	5	40
Is the project aligned with the focus and objectives of industry clusters in the region?	7	8	56
... add more key questions if needed			
Total Value (ø)			62

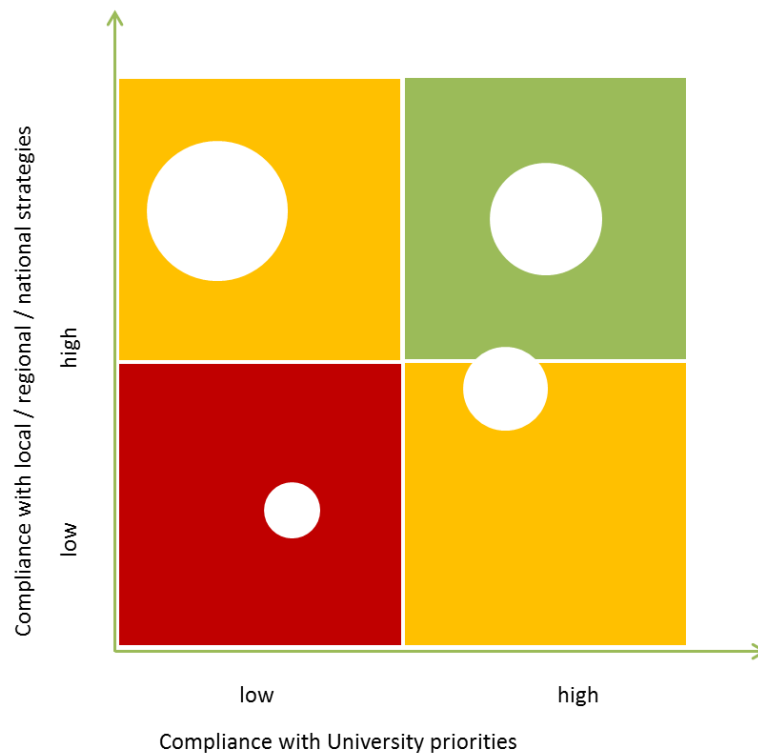
Source: Own elaboration

⁶ See for example: <http://www.agit.de/en.html>

If you have finished the evaluation of the relevant projects you can map the values in the coordination system.

To represent the importance and strength of the corresponding target group/cooperation partner in the private sector you can vary the size of the circles: A big circle for a joint project with a strong industry cluster, a smaller circle, for example, for individual companies.

Figure 7 Compliance and potential analysis



Source: Own elaboration

What to consider when using this tool?

Projects that are located in the green area are aligned with the local, regional or national strategies and consider additionally the priorities of the university. If there are projects in the yellow areas (in particular with big circles representing a strong private sector partner) the TTC should evaluate if it's possible to adjust the project orientation in order to move more into the green area. Although some projects in the red quadrant may seem even apparently attractive or have a strong support of certain scientists or executives of the university, these are normally a lesser contribution to the achievement of strategic goals and will take resources and effort that may have been used for other projects of the portfolio.

4.3 Strategy Development

Key Question:

How to design an objective-oriented strategy that provides guidance to the TTC?

Strategy development is an important but also complex task for the TTC. The first crucial step is the establishment of a transparent mission statement. According to Young (2007), TTC missions can focus on three primary objectives or combinations: (1) service, (2) economic development, or (3) income.

Service mission

The TTC can be considered as a service provider for its main stakeholders and customers. Set up a demand and needs-oriented service portfolio is one of the major challenges of a TTC.

Economic development mission

Institutions focusing on economic development see their primary mission in terms of creating jobs and economic growth in the local community—and maybe at regional or national level —through spin-off companies and through licensing to local firms. Industry clusters or innovation hubs could be created around technological core areas.

Income mission

When income is the main objective, the focus lies on earning income through licensing and the commercialization of innovations. Such institutions are very selective, identifying innovations with the highest market potential.

TTCs don't have to focus on a single mission. Of course, they can pursue a combination of missions that best satisfies and serves their institution. The mission statement serves as a guide for implementing these goals.

When TTCs are units within academic institutions, the mission statements of these centres increasingly include a societal role. If social responsibility and a contribution to social welfare and environmental sustainability fit within the TTC's mission, these objectives can easily be incorporated into the service mission of the TTC⁷.

Practical Example:

Mission Statement of the Technology Transfer Center of West Virginia University (WVU)

The mission statement emphasizes that the TTC exists to serve the faculty, staff, students, and administration of the University and the public by carrying out its mission to:

- Encourage invention and innovation at WVU. Protect the Intellectual Property (IP) rights of WVU by patent, copyright, or other means. Transfer the results of WVU research to the public by bringing researchers and the business community together in a relationship of mutual advantage.
- Generate income for future research and education.
- Contribute to local, state, regional and national business competitiveness and economic development.

Source: http://techtransfer.research.wvu.edu/mission_statement

The following tools serve as an orientation that allows the TTC to design an objective-oriented strategy.

⁷ See Young (2007)

Tool 2: Cyclical Strategy Development:

Why using this tool?

This methodology divides the strategy development process in 4 phases⁸:

1. Analysis
2. Strategy Development
3. Implementation
4. Monitoring & Evaluation

In order to manage this process more efficient you can subdivide the 4 phases into 6 strategy components. These components describe work packages with different tasks that need to be elaborated by the TTC team (see also figure 8).

Figure 8 Cyclical Strategy Development Process



Source: von Zallinger (2011): 51

1. Strategic Analysis:

First, the TTC should realize a sound internal and external analysis by using tools and concepts such as *strategic fit*, *strategy diamond*, *stakeholder and environment analysis*, etc. Component 1 is the foundation for the following strategy development process by providing the necessary information. The internal analysis is targeted at assessing the structures, resources and capabilities of the TTC and the university (if the TTC is embedded in an academic institution), while the external analysis implies the analysis of potential clients, markets and cooperation partners in order to identify the relevant key success factors.

⁸ See von Zallinger (2011)

2. Goals & Strategy

Second, the TTC has to formulate a vision/mission and setting the goals of the strategy.

3. Measures

Third, based on the goals the TTC has to define concrete measures and activities according to jointly agreed milestones.

4. Operational Plan

Fourth, the TTC elaborates an operational plan including the measures and activities, responsibilities, resources and timing.

5. Implementation

Fifth, the TTC has to develop the necessary organizational structures, processes and instruments for the implementation of the strategy.

6. Monitoring & Evaluation (M&E)

Sixth, the TTC defines indicators and develops a smart M&E system in order to monitor and evaluate the effectiveness of the measures, to provide feedback and to ensure continuous improvement of the strategy.

What to consider when using this tool?

The TTC team should set a specific timeframe for the elaboration of each strategic component and define a person who monitors the strategy development process.

The strategy components could also be used to structure the content of the strategy document:

Example of Content of a Strategy Document

Executive Summary

1. Introduction

- Background
- Description of strategy development phases

2. Analysis

- Internal analysis
- External analysis
- Stakeholder and TTC environment analysis

3. Strategy

- Vision/Mission
- Objectives
- Measures

4. Strategy Implementation

- Operational Plan
- Timetable
- Organizational Structure and Processes
- Information and Knowledge Management

5. Monitoring and Evaluation

Tool 3: Strategic Fit

Why using this tool?

The so-called strategic fit⁹, used by GIZ as an important methodological key concept for developing IT strategies in developing and emerging countries, is also applicable in a TTC context: The strategic fit describes the idea of designing a strategy which bridges the capabilities of a TTC (internal view) with the requirements and key success factors of the target markets/groups (external view) in order to create a sustainable competitive service portfolio and to successfully position the TTC.

Internal view:

The internal view describes the actual strengths and weaknesses of the TTC, the existing structures and capabilities (including research capacities of the university). The objective is to derive main problems and challenges for the TTC.

External view:

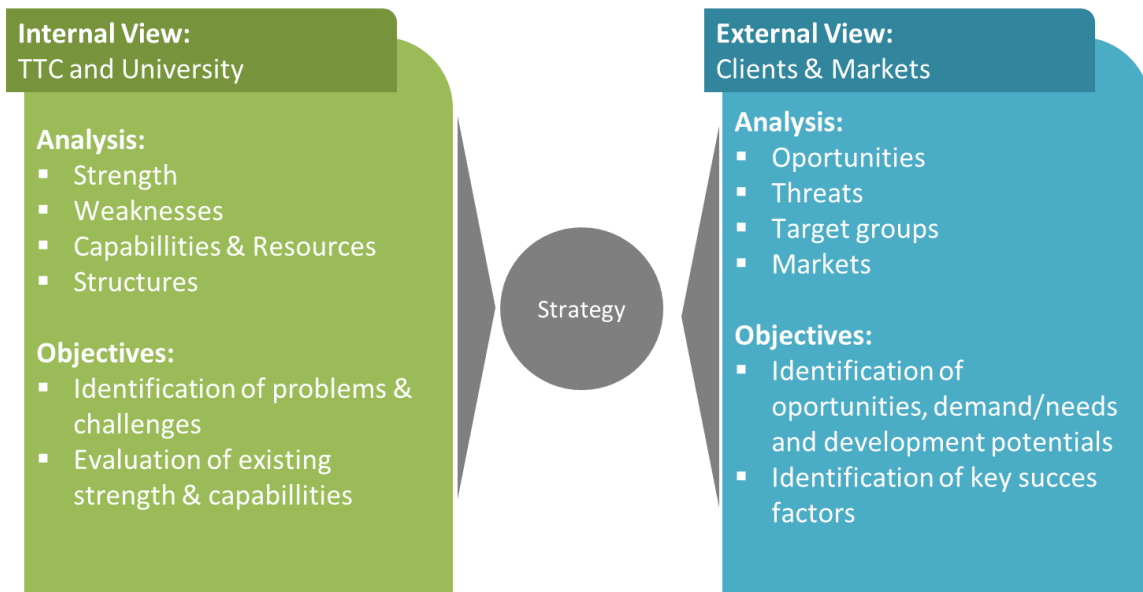
The external view tries to describe opportunities (new projects, cooperation schemas, services, etc.) and threats and analyses potential cooperation partners, clients and markets. The objective is to identify demands and needs, for example, of industry clusters and derive opportunities and development potentials for the TTC.

What to consider when using this tool?

Develop the strategic fit in a collaborative way. Another key point to consider: If the TTC is strongly linked and embedded in the university you can include the university, into the internal view. If the TTC is an independent private organization, the university could be considered also as an external player.

⁹ See von Zallinger (2011)

Figure 9 Strategic Fit for a TTC



Source: Based on von Zallinger (2011): 57

Tool 4: The Strategy Diamond

Why using this tool?

The “The Strategy Diamond”¹⁰ describes 5 elements which are central to the strategic management process. The consideration of all 5 elements and the answers the following key questions can help the TTC to develop an integrated strategy.

¹⁰ <https://new.edu/resources/the-five-elements-of-strategy>

Table 3 The Strategy Diamond – Key questions and examples

Element	Key Question	TTC relevant examples
Arenas	Where will we be active?	<ul style="list-style-type: none"> ▪ Geographical focus (local, regional, national) ▪ Technology focus ▪ Research focus ▪ Target groups ▪ Service segments
Vehicles	How will we get there?	<ul style="list-style-type: none"> ▪ Alliances and cooperation (e.g. with industry clusters, technology parks) ▪ Networks ▪ Local TTC “branch” offices ▪ Liaison persons in e.g. business associations
Differentiators	How will we win in the marketplace?	<ul style="list-style-type: none"> ▪ TTC positioning (Branding) ▪ Awareness raising activities ▪ Demand and customer-oriented TTC service portfolio ▪ Specific services ▪ Technology specialization
Staging & pacing	What will be our speed and sequence of moves?	<ul style="list-style-type: none"> ▪ Milestone timing ▪ New TTC service launch timing ▪ Expansion
Economic logic	How will we obtain our returns?	<ul style="list-style-type: none"> ▪ Service charges ▪ Public funds / Subsidies ▪ Licensing

Source: Own elaboration

What to consider when using this tool?

The 5 elements are interrelated. When they are aligned and mutually reinforcing, the TTC is generally in a position to perform well.

Figure 10 The Strategy Diamond



Source: Own elaboration

Tool 5 Transformation Map

Why using this tool?

The transformation map¹¹ provides clarity around what the TTC needs to achieve in the future (vision/goals) and what activities will get the TTC there.

The transformation map:

- provides a focus point for key decisions to be made
- focuses on outputs
- captures a longer term view
- offers an integrated view of a transformation “journey”

What to consider when using this tool?

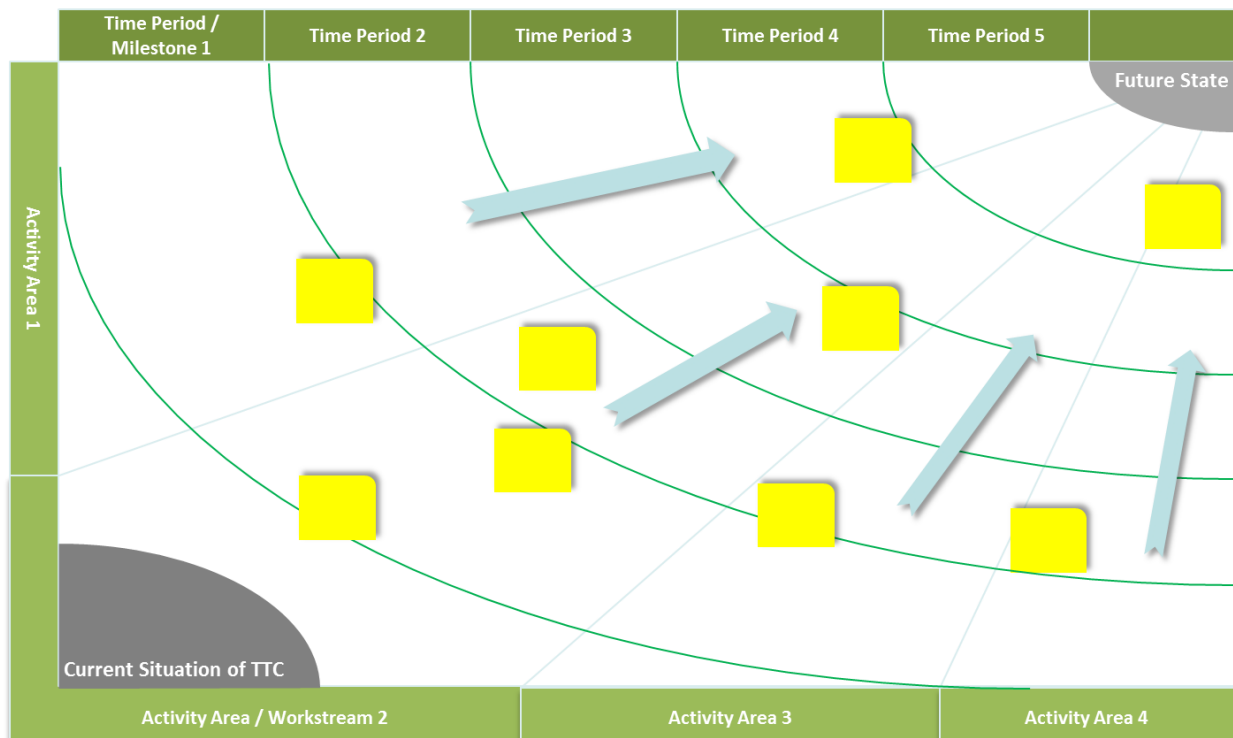
To construct a transformation map you should consider:

- The best way to develop the map on brown paper taped on the wall of a workshop.
- Determine the main categories or workstreams (e.g. 5 service components of a TTC) around the perimeter of the transformation map
- Mark your timeline across the top of the transformation map, breaking it in to milestones.
- Describe the current state (lower left corner) and the future state/vision (upper right corner). It is important to build upon existing capabilities and strengths of the TTC and his environment.

¹¹ See <http://www.excellencegateway.org.uk/node/13687>

- Determine the main activities of the transformation map necessary to achieve the milestones and the future state (vision/goals). This process should be done in a collaborative, creative, and iterative way. The group should mark key activities on the map using post-it notes. The post-its represent available capabilities or functions – use verbs in the past tense (e.g. TTC staff training in innovation management completed).
- After agreeing on the activities the transformation map should be transferred to a one page document and can serve then as a basis for a standard project plan (including activities, timetable and responsibilities).

Figure 11 Transformation Map



Source: Own elaboration

4.4 R&D and Innovation strategic considerations in the Turkish scenario

R&D Overview

According to OECD report 2014, the gross domestic spending on R&D¹² of Turkey was 0.9% in 2012. This percentage was relatively low compared with that of OECD in total, which was 2.4% of its GDP. However, the statistics also indicate that since 2000 Turkey is continuously increasing its effort on R&D development. The percentage of GDP spending on R&D rises gradually almost every year from 0.4% in 2000 to 0.9% in 2012. According to, European Commission

¹² Gross domestic spending on R&D is defined as the total expenditure (current and capital) on R&D carried out by all resident companies, research institutes, university and government laboratories, etc., in a country. It includes R&D funded from abroad, but excludes domestic funds for R&D performed outside the domestic economy. This indicator is measured in million USD and as percentage of GDP

¹² All the information in this section is adopted from Reisman, et al. (2004)

(2013), the R&D intensity has experienced an average annual growth rate of 5.8% between 2000 and 2010. Despite of this, Turkey's R&D intensity decreased from 0.85% in 2009 to 0.84% in 2010 due to a corresponding decrease in public R&D intensity from 0.51% to 0.48%. Despite the decrease in Public R&D intensity and the economic crisis, R&D expenditure in all sectors has increased and business R&D intensity has grown from 0.34% in 2009 to 0.36% in 2010. However, its business R&D intensity is still well below the EU average of 1.26%, catching up with an average annual growth rate of 8.4%.

Technology Transfer (TT) Overview¹³

The Marmara Research Center of The Scientific and Technical Research Council of Turkey (TUBITAK-MRC) was established to support and conduct technological development in cooperation with local industry to solve their technological problems, and increase their competitiveness in Gebze, an area near Istanbul housing most Turkish industry since 1972. TUBITAK initiated a program with the aim of fostering university-industry cooperation, giving priority to research areas meeting the needs of the industry in 1996. Besides, in 1990, Small and Medium Sized Industry Development Organization (KOSGEB) was established to developing SMEs' technological skills.

Internationally, Turkey actively builds bilateral, multilateral, and regional cooperation in science and technology with other countries. There are bilateral agreements signed between the Government of Turkey and the governments of the USA, the Russian Federation and Hungary. In addition, Turkey also actively participates in science and technology with numerous international organizations such as UN, NATO, OECD, the Organization for Islamic Conference (OIC), the European Science Foundation (ESF) and the International Council of Scientific Unions (ICSU). Domestically, in 1993, the document entitled "Turkish Science and Technology Policy: 1993 - 2003" was approved. This document represented a turning point in the Science & Technology policy of Turkey, from focus on national promotion of science, towards welfare creation through establishment of a national innovation system. Moreover, it paved the way for new policy initiatives, such as the industrial R&D support programs. The current science and technology policy of Turkey is based on the 1993 document, which suggested seven broadly defined priority areas of Science & Technology.

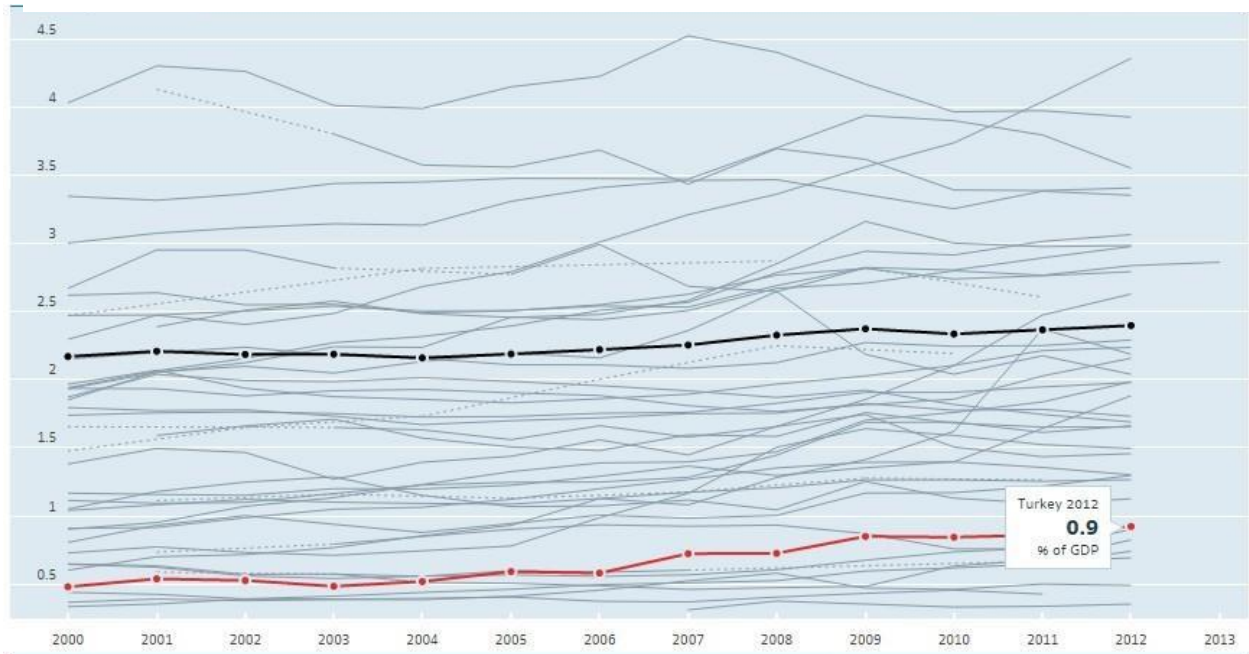
Scholar Opinion

According to Kaplan (2011), Turkey has demonstrated remarkable progress in R&D in the recent years. The challenge now will be to boost output from science and technology and to transform R&D results into innovation and viable business opportunities for the benefit of both society and the economy. In this respect, public intervention needs to address longer-term drivers and relatively short-term direct needs of the private sector and academia.

Overall STI strategy

The National Science, Technology and Innovation Strategy (2011-16) aims to strengthen national R&D and innovation capacities in order to upgrade the industrial structure towards high-technology industries. Since 2011, a new Ministry of Science, Industry and Technology is in charge of STI policy design, implementation and co-ordination of R&D and innovation activities. The TUBITAK and the Turkish Academy of Science are affiliated to the Ministry. Evaluation policy has been reinforced and an inter-ministerial co-ordination board has been set up to review all R&D, innovation and entrepreneurship support schemes under the presidency of TUBITAK.

Figure 12 Gross domestic spending on R&D (total, % of GDP, 2000 - 2013)



4.5 The environment of a TTC

Key Question:
How to evaluate and create a conducive TTC environment?

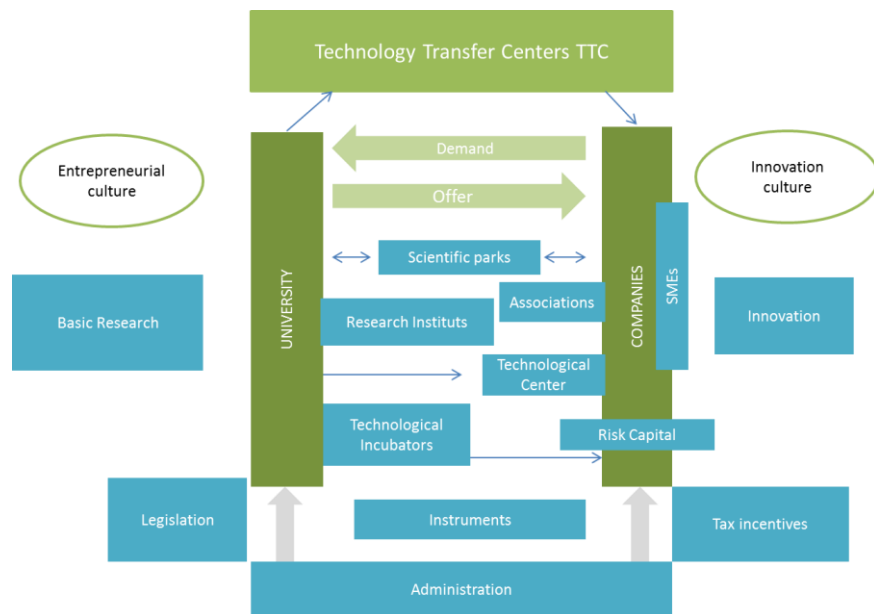
TTCs act like bridges, they are intermediaries who link and connect the academic with the private sector. An enabling environment is essential for the success of a TTC. The TTC should also try to support actively the creation of a conducive environment for technology transfer and innovation.

Clusters can constitute an ideal environment for technology transfer. A cluster links the main stakeholders for innovation generation: Academic, private and public sector (Triple helix). Geographic concentration¹⁴ is an important factor for successful university-industry relations and academic spill-overs. Universities for example are more likely to license technology to companies located in the area as the further development of the technology often requires additional collaborative efforts: This means that proximity still matters: Technology transfer requires much face-to-face interaction.

Figure 12 illustrates the role of a TTC as an intermediary between academic and private sector and gives an overview about the closer environment of a TTC:

¹⁴ See also Darcy et al. (2009)

Figure 13 Technology Transfer Center – Intermediaries between universities and private sector



Source: COTEC (2003)

It is important that the TTC understands the environment and the stakeholders acting in this environment to make the correct strategic decisions. The following tools help the TTC to analyse key actors and the environment of the TTC.

Tool 6: Stakeholder Analysis

Why using this tool?

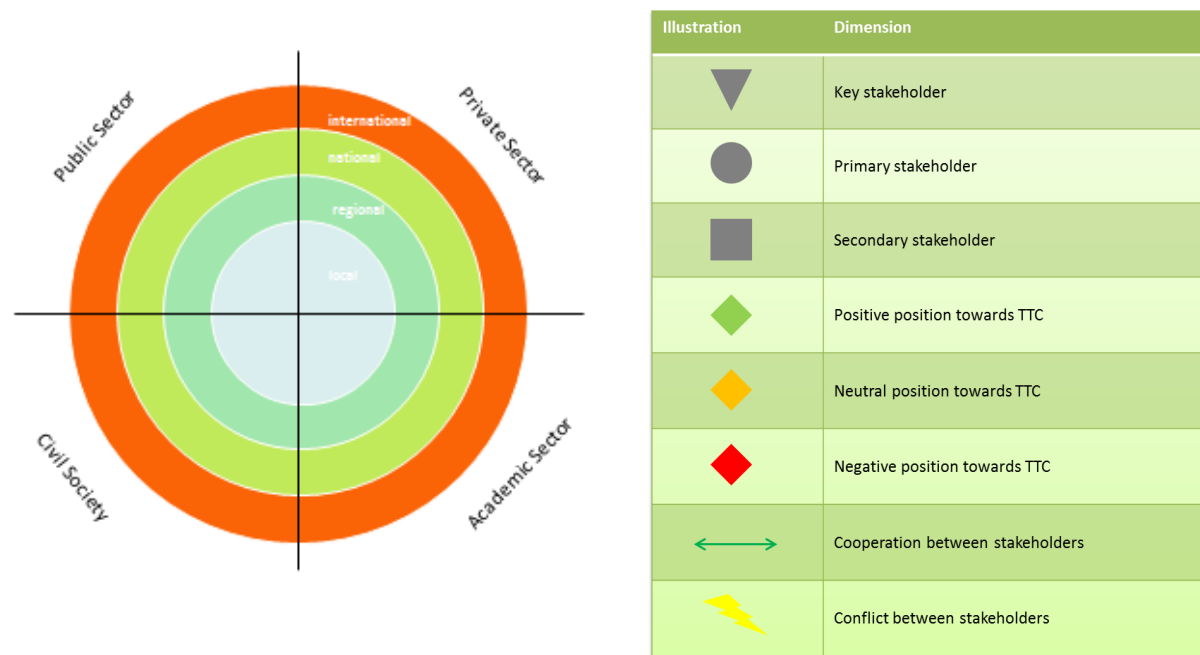
The tool provides a structured overview about key stakeholders, their influence, position towards the TTC and relationship between them and towards the TTC. You can evaluate the following dimensions:

- Sectors: Public, private, academic and civil sector (indicated by the quadrant)
- Level: Local, regional, national and international (indicated by the level of the ring)
- Influence: Key actors, primary and secondary stakeholder (indicated by the form)
- Position/attitude towards TTC: Positive, neutral and negative (indicated by the color)
- Relationship: Cooperation or Conflict (indicated by the type of the arrow used to connect and the direction(s) of the arrow)

What to consider when using this tool:

The TTC can apply this tool, for example, in a strategic workshop and map the actors on a large brown paper. If the variety of actors and dimensions lead to an unclear and confusing map, it's recommended to omit 1-2 dimensions and just focus on e.g. sectors, influence and relationship.

Figure 14 Stakeholder Analysis



Source: Own elaboration

Tool 7: TTC Business Environment Analysis

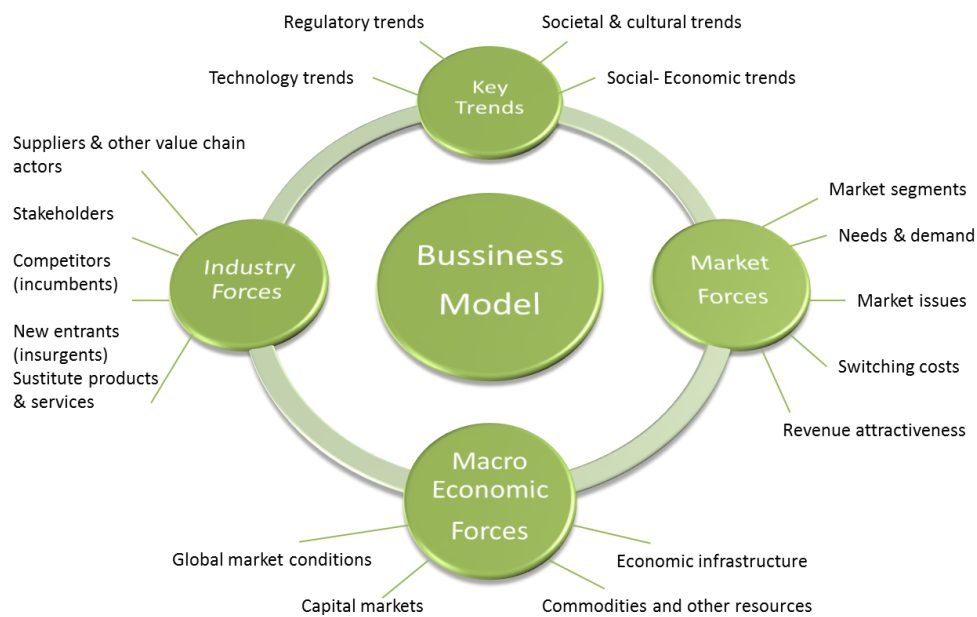
Why using this tool?

To get a better understanding of the TTC environment this tool helps to develop a competitive business model and to react on changes. It is important that the TTC continuously scans the environment because of the dynamic and complex economic landscape. If the TTC understands this changing environment, it is possible to adopt rapidly the model. Osterwalder¹⁵ proposes to map out four main areas for the scanning of the environment:

1. Market Forces
2. Industry Forces
3. Driving Trends
4. Macro-Economic Forces

¹⁵ <http://businessmodelalchemist.com/blog/2009/07/scanning-your-business-models.html>

Figure 15 TTC Business Environment Analysis



Source: Osterwalder/Pigneur (2010)

What to consider when using this tool?

To use this tool effectively its important adjusts and translate it to the TTC context. For example, possible customers and segments from the TTC perspective are:

Table 4 Possible TTC Customers

Private Sector	Academic Sector	Public Sector
<ul style="list-style-type: none"> • Associations • Chambers • Industry Clusters • Individual Companies • Foreign Direct Investments 	<ul style="list-style-type: none"> • Universities • Research Institutes • Investigators • Students / Entrepreneurs 	<ul style="list-style-type: none"> • Ministries • Economic Promotion Agencies • Development Agencies

Source: Own elaboration

Table 5 Key questions for the business model environment analysis

Force	Key questions relevant for the TTC
Market Force	<ul style="list-style-type: none"> ▪ What are the most important customer segments? ▪ Where is the biggest growth potential? Which segments are declining? Which segments deserve more attention? ▪ What do customers need? Where are the biggest needs from unsatisfied customers? ▪ Where is demand increasing? Declining? ▪ What binds customers to the TTC and its offer?
Industry Forces	<ul style="list-style-type: none"> ▪ Which stakeholders might influence the TTC business model? ▪ Who are the dominant players in the technology transfer sector? ▪ What are the main offers of other TTCs? ▪ Which customer segments are they focusing on?
Key Trends	<ul style="list-style-type: none"> ▪ What are the major technology trends? ▪ Which regulatory trends influence the TTC market (e.g. IP policy)? <p>Other relevant trends: Knowledge-economy, open innovation, new funding models (crowd-funding)</p>
Macro-Economic Forces	<ul style="list-style-type: none"> ▪ What is the situation of the capital markets? ▪ Is seed capital, venture capital, public funding available?

Source: Based on Osterwalder / Pigneur (2010)

Tool 8: Porters Diamond - Analysis of sector, potential for cluster or cooperation schemas

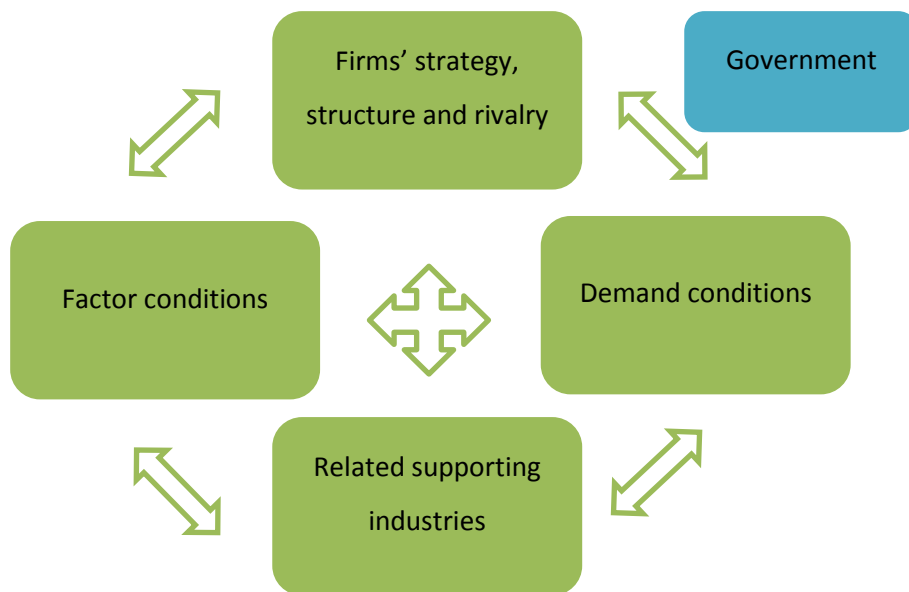
Why using this tool?

TTCs need to identify and prioritize opportunities for approaching a sector or a group of companies in order to start more intensive cooperation and promotion activities related to technology transfer and innovation.

Porter's Diamond¹⁶ is a tool that eases the analysis of economic sectors in a region, making easier the decision to move more towards a sector or another (e.g. decision about incubating more companies which will be involved in that particular sector or supporting the companies of a given value chain or cluster). There are four factors influencing on it, and an external, additional player is the government:

¹⁶ Porter (1990)

Figure 16 Porter's Diamond



Source: Porter (1990)

What to consider when using this tool?

To use this tool correctly hereafter some additional explications:

1. Firm's strategy, structure and rivalry: Who or what are the main sectors, firms and economic activities in the city or region? Relevant criteria for the analysis and selection of the 'main sectors' are their relative significance in terms of jobs provision and income generation. Here, the strengths and weaknesses of these sectors must be analysed. To this analysis belong the structure of the sector and the rivalry in the domestic market. These affect the number, skills and capabilities of the participants in the sector.
2. Supporting industries: This part of the analysis also focuses on firms and their strengths and weaknesses. One of the main challenges is to distinguish between lead firms and supporting firms. The latter are the suppliers of parts and inputs, subcontractors and providers, etc. that give inputs to the lead firms (it includes laboratories and specialized consulting companies, among others).
3. Factor conditions: It is recommended to analyse this issue in terms of strengths and weaknesses of the "supporting institutions" in fields such as training and education for the labour force and technical staff, technology (e.g. a center for technical application specific to the sector or an institute dedicated to the area) and transfer, finance, business associations and other forms of structures of the sector such as networks, and infrastructure. The question to be answered is which ones are the determining factors that impact local firms.
4. Demand conditions: This issue may be approached by analysing the regional manifestations of sophisticated or unusual demand. This is usually an aspect that local actors do not find so clear or easy to define. Precisely for this reason, it is often particularly enlightening if there is no sophisticated demand at all, which is a major weakness for a cluster, or if there is some unusual demand that local actors have not considered an asset or opportunity up to now.
5. Government: This additional element is related to the strengths and weaknesses of the government and its policies to enable a favorable business environment for these sectors.

4.6 The business model of a TTC

Key Question:
How to design a sustainable TTC business model?

TTC are often departments within academic institutions or subsidiary companies. As a department, the TTC is embedded in the university and clearly aligned with institutional objectives. Managing technology transfer through a subsidiary company, however, can evoke a positive perception of technology transfer and demonstrate the commitment and the seriousness with which it is viewed by the university¹⁷. A subsidiary company gives definitely more operational flexibility. It is furthermore easier to establish, for example, staff incentives and award performance-related bonuses for meeting targets. An incentive system can work well when the objectives (outcomes not activities) can be easily defined and measured.

Another option is to outsource technology transfer to an independent third party. Outsourcing minimizes on the one hand investments and risks for the institution but on the other hand it also reduces the returns to the institution. The partner will take the major part of them. Such models are usually focused on income generation, and so the partner will direct activities towards high-value opportunities rather than technology transfer for the broader public good.

A short business plan should be developed by the TTC to describe the business model and to specify all service-oriented activities:

¹⁷ See Campbell (2007)

Content of a TTC Business Plan

1. Executive Summary
2. Vision / Mission / Strategic Objectives
3. TTC legal form
4. Policies and Procedures (*define ownership of IP, etc.*)
5. Service Portfolio (*incl. Processes*)
6. Market / Sector (*target groups/customers*)
7. Marketing
8. Organisation and Management of the TTC
9. Personnel Structure (*Staffing the TTC*)
10. Key Partners
11. Financial Planning (*Financing the TTC*)
12. Capital and resource requirements

What is the difference between TTC Strategy and TTC Business Plan?

- There is a close conceptual relationship between the TTC strategy and TTC business plan
- The strategy describes the long-term vision and the overall strategy of the centre
- The business plan serves as an operational planning and management instrument for the centre's market-oriented activities

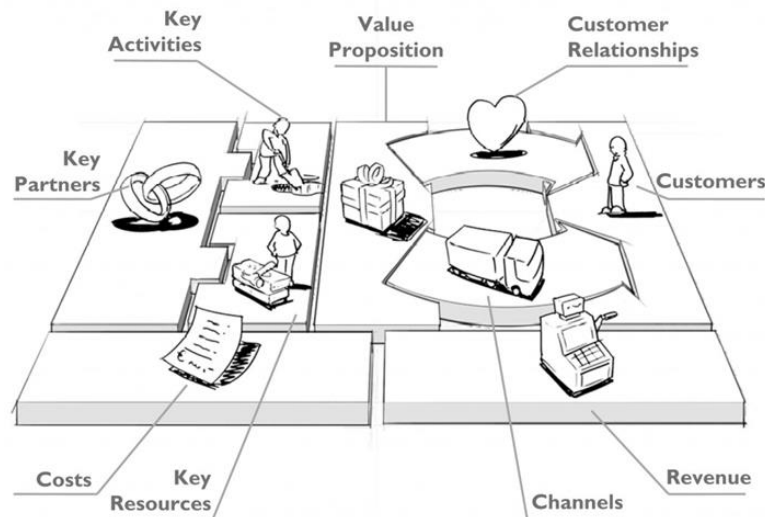
Tool 9: Business Model CANVAS

Why using this tool?

The Canvas is a concept that allows you to describe and think through the business model of your TTC (or your competitors/other TTCs). This concept has been applied and tested around the world and allows you to easily describe business models to discuss and create new strategic alternatives.

A business model can be best illustrated through nine basic building blocks. The nine blocks cover the four main areas of a business: customers, offer, infrastructure, and financial viability. The business model is like a blueprint for a strategy to be implemented through organizational structures, processes, and systems.

Figure 17 Business Model CANVAS



Source: Osterwalder /Pigneur (2010)

What to consider when using this tool?

As with the Business Environment tool, it's important to adjust the tool to a TTC context:

Table 6 Business Model CANVAS – 9 Building Blocks

Building Block	Explication
Customer Segments	<p>The Customer Segments Building Block defines the different groups of people or organizations a TTC aims to reach and serve.</p> <p>Customers comprise the heart of any business model. In order to better satisfy customers, the TTC may group them into distinct segments with common needs, common behaviors, or other attributes. A business model may define one or several large or small Customer Segments. An organization must make a conscious decision about which segments to serve and which segments to ignore. Once this decision is made, a business model can be carefully designed around a strong understanding of specific customer needs.</p>
Value Propositions	<p>The Value Propositions Building Block describes the bundle of services that create value for a specific Customer Segment.</p> <p>The Value Proposition solves a customer problem or satisfies a customer need. Each Value Proposition consists of a selected bundle of services that caters to the requirements of a specific Customer Segment. In this sense, the Value Proposition is an aggregation, or bundle, of benefits that the TTC offers customers.</p>
Channels	<p>The Channels Building Block describes how the TTC communicates with and reaches its Customer Segments to deliver a Value Proposition.</p> <p>Communication, distribution, and sales channels comprise a TTCs interface with customers. Channels are customer touch points that play an important role in the customer experience.</p>
Customer Relationships	<p>The Customer Relationships Building Block describes the types of relationships the TTC establishes with specific Customer Segments.</p> <p>A TTC should clarify the type of relationship it wants to establish with each Customer Segment. Relationships can range from personal to automated services.</p>
Revenue Streams	<p>The Revenue Streams Building Block represents the income a TTC generates from each Customer Segment.</p>

Key Resources	<p>The Key Resources Building Block describes the most important assets required to make a business model work.</p> <p>Every business model requires Key Resources. These resources allow a TTC to create and offer a Value Proposition, reach markets, maintain relationships with Customer Segments, and earn revenues. Different Key Resources are needed depending on the type of business model. A TTC requires, for example, well trained staff.</p>
Key Activities	<p>The Key Activities Building Block describes the most important things a TTC must do to make its business model work.</p> <p>Every business model calls for a number of Key Activities. These are the most important actions a TTC must take to operate successfully. Like Key Resources, they are required to create and offer a Value Proposition, reach markets, maintain Customer Relationships, and earn revenues.</p>
Key Partnerships	<p>The Key Partnerships Building Block describes the network of suppliers and partners that make the business model work.</p> <p>Partnerships are a cornerstone for TTCs. TTCs have to create alliances to optimize their business models.</p>
Cost Structure	<p>The Cost Structure describes all costs incurred to operate a business model.</p> <p>This building block describes the most important costs incurred while operating under a particular business model. Creating and delivering value, maintaining Customer Relationships, and generating revenue all incur costs. Such costs can be calculated relatively easily after defining Key Resources, Key Activities, and Key Partnerships.</p>

Source: Own elaboration

5 Service Portfolio

5.1 The typical services of a TTC

Key Question:
What type of services can/should offer a TTC?

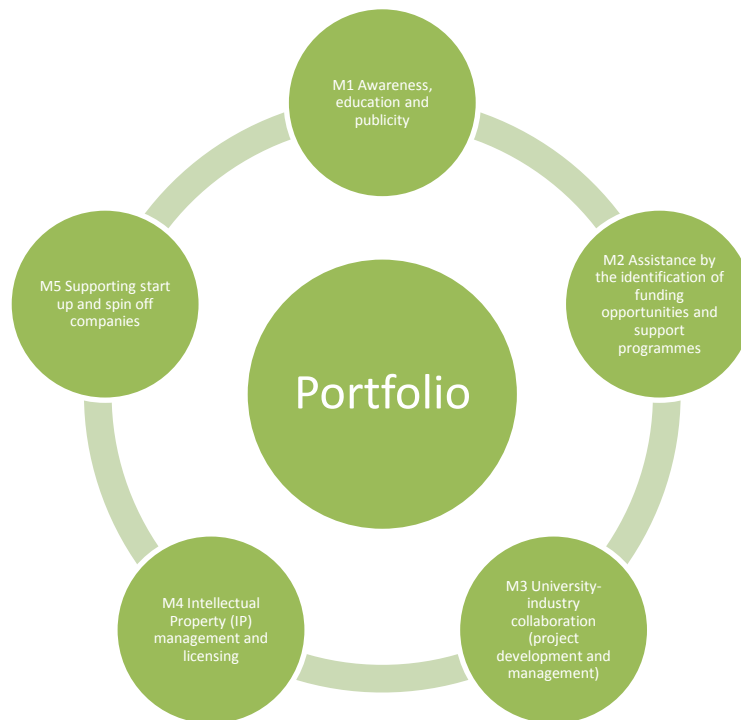
TTC should act very service and customer-oriented and try to satisfy the demands of the different stakeholders (university, industry and government).

There is a variety of different services that a TTC can offer, for example:

- **Consultancy and technical services provision:** Providing advice and consultancy in innovation and technology management or IP related topics.
- **Exchange programs:** Managing personnel transfer to exchange expertise and information from industry to universities and vice versa.
- **Cooperative R&D agreement:** Arranging agreements between one or more universities and one or more firms under which the universities side provides experts, facilities or other resources with or without reimbursement; and the firms side provides funds, personnel, services, facilities, equipment or other resources to conduct a specific research for product/service development.
- **Research contracts:** Initiating a time limited contract between the university and a firm to perform R&D. The firm usually provides funds and the university provides the knowledge. Time frame is important.
- **Licensing:** Concluding licensing agreements where the owner of the patent (licensor) allows another party (licensee) to make, sell and use the patented invention on an exclusive or non-exclusive basis, without transferring ownership of the patent. Usually, a licensor receives a financial reward in exchange of the license, typically in the form of royalty payments.
- **Spin-off Promotion:** Supporting university's spin-offs. They are initiated either by the researcher who made the invention or the TTC. A spin-off agreement can involve also a financier, usually a venture capitalist or a business angel.
- **Training:** Training programs to transfer research results or to adopt a new technology can be offered to the industry. It sometimes accompanies the licensing or research project contracts.

In Turkey, accordingly to regulations, the portfolio of services and, therefore, the functions of the TTO are organized in five modules, which are service or activity fields predetermined by the corresponding legal instruments of the country. The figure below shows these fields.

Figure 18 Components of a TTC Service Portfolio



Source: Own elaboration

Practical Example: Humboldt-Innovation

The Humboldt-Innovation (HI) is the dedicated knowledge and technology transfer office of the Humboldt-Universität Berlin. As a 100% subsidiary enterprise of the University, Humboldt-Innovation acts as an interface between university and industry - between science and business.

In its organisation as a GmbH Humboldt-Innovation is a professional private-sector company which can operate more flexibly, more independently and with higher speed. As such expertly positioning itself in the demanding world of business and academia.

Humboldt-Innovation is presently active in four major fields: the area of research covers scientific services, contract research and research co-operations; the area of training and education offers trainings to entrepreneurs ("Spin-Off School") and managers ("Professionals & Executive Education"); the area of spin-off coaches and supports research-based spin-off enterprises and the area of marketing conducts traditional merchandising for the Humboldt Store.

Source: <https://www.humboldt-innovation.de/en/home.html>

5.2 Service 1: Creation of awareness, education and publicity

Key Questions:

How can the TTC create awareness among the main stakeholders?

What are the benefits of technology transfer?

It will be necessary to raise awareness among the different bodies of the universities, among private sector organizations and companies, among government institutions and the civil society to disseminate the fundamental concepts of linkage, cooperation and technology transfer and its importance to the economy and society. Public events (Innovation Festivals, Roadshows and Open Science Days at universities), Match-Making meetings, trainings and awareness workshops are effective mechanisms in this field.

It is important to show to the public and potential cooperation partners success examples and stories to illustrate the benefits of technology transfer. Exhibitions in the context of technology transfer events can demonstrate and illustrate the output of technology transfer (innovative products/services) in a concrete and tangible way.

Benefits of university technology

One crucial part of awareness rising is to communicate and illustrate the benefits of technology transfer. Technology transfer can¹⁸:

- Create a dynamic culture of entrepreneurship and innovation inside the universities and in the community.
- Increase student success and job prospects through participation in (“real world”) applied research, education about the patenting and licensing process, training about starting a business.
- Helps to fulfill the university’s missions to address social, medical, environmental, or technical problems at local, regional or national level.
- Generate revenue through license income.
- Facilitate the establishment of international research relationships.
- Help to recruit high level scientists.
- Support new university spin-offs creating knowledge-intensive, high-wage jobs.
- Support local and regional companies and sectors to remain or become competitive by applying university technology.

Awareness Rising in Universities

TTC staff could work with academics to sensitize and educate them in entrepreneurial behaviors. This work could include, according to Campbell (2007), training in how to engage with business and respond to its needs, how to act as consultants, and how to identify partnership or licensing opportunities. All academics should know the intellectual property (IP) rights process, including disclosure, confidentiality, types of protection, etc. Such awareness training may be delivered by the TTC itself or in partnership with external providers. For example, IP specialists, lawyers, and research sponsors are often willing to provide specific trainings.

Possible Measures for Awareness Rising

The following practical examples show some measures for Awareness Rising:

Practical Example: Regional initiative „Industry meets Science“



The Chamber of Commerce and Industry (IHK) and universities in Leipzig started 2003 a joint initiative called “Industry meets Science”. On a regular basis they organize events to discuss actual topics regarding the promotion of technology transfer and to present success stories. During a parallel exhibition universities and regional institutions present their service offers. Based on an agreement between IHK and universities, they support selected cooperation projects between regional companies and universities to develop or improve new products and technologies.

Sources:

- <https://www.zv.uni-leipzig.de/forschung/wissens-und-technologietransfer/wirtschaft-trifft-wissenschaft.html>
- www.leipzig.ihk.de/unternehmen/geschaeftsfelder/innovation-und-umwelt/innovation-forschung-entwicklung/wirtschaft-trifft-wissenschaft.html

¹⁸ McDevitt (2014)

Practical Example: T³ Technology Transfer Day

The Technology Transfer Day (T³) is a joint event between „Berlin Partner für Wirtschaft und Technologie GmbH“, ZAB ZukunftsAgentur Brandenburg GmbH, Enterprise Europe Network - Berlin Brandenburg, network of university transfer offices in Brandenburg and Humboldt Innovation GmbH.

During the Technology Transfer Day in 2013 the participants could for example:

- Visit Germany's most modern technology park in Adlershof, including a guided tour through labs of selected research institutes.
- Meet leading scientists, successful business man and professionals from promotion agencies.
- Learn about good practice examples of cooperation projects between industry and science.
- Initiating contacts to potential clients, cooperation or network partners during beforehand booked meetings in a match making platform.

Source: <https://www.b2match.eu/ttt2014>

Practical Example: Map of Research Expertise

New ideas and current research results are turned into innovations in compatible partnerships. The "Map of Research Expertise" facilitates finding suitable experts for research projects.

The Map of Research Expertise offers a topic- and industry sector centred overview of Humboldt-Universität's scientists and their innovative research. Its goal is to initiate implementation oriented research projects, e.g. contract research or scientific services.

Source: www.expertise-landkarte.de/index_eng



5.3 Service 2: Assistance for funding identification and support programmes

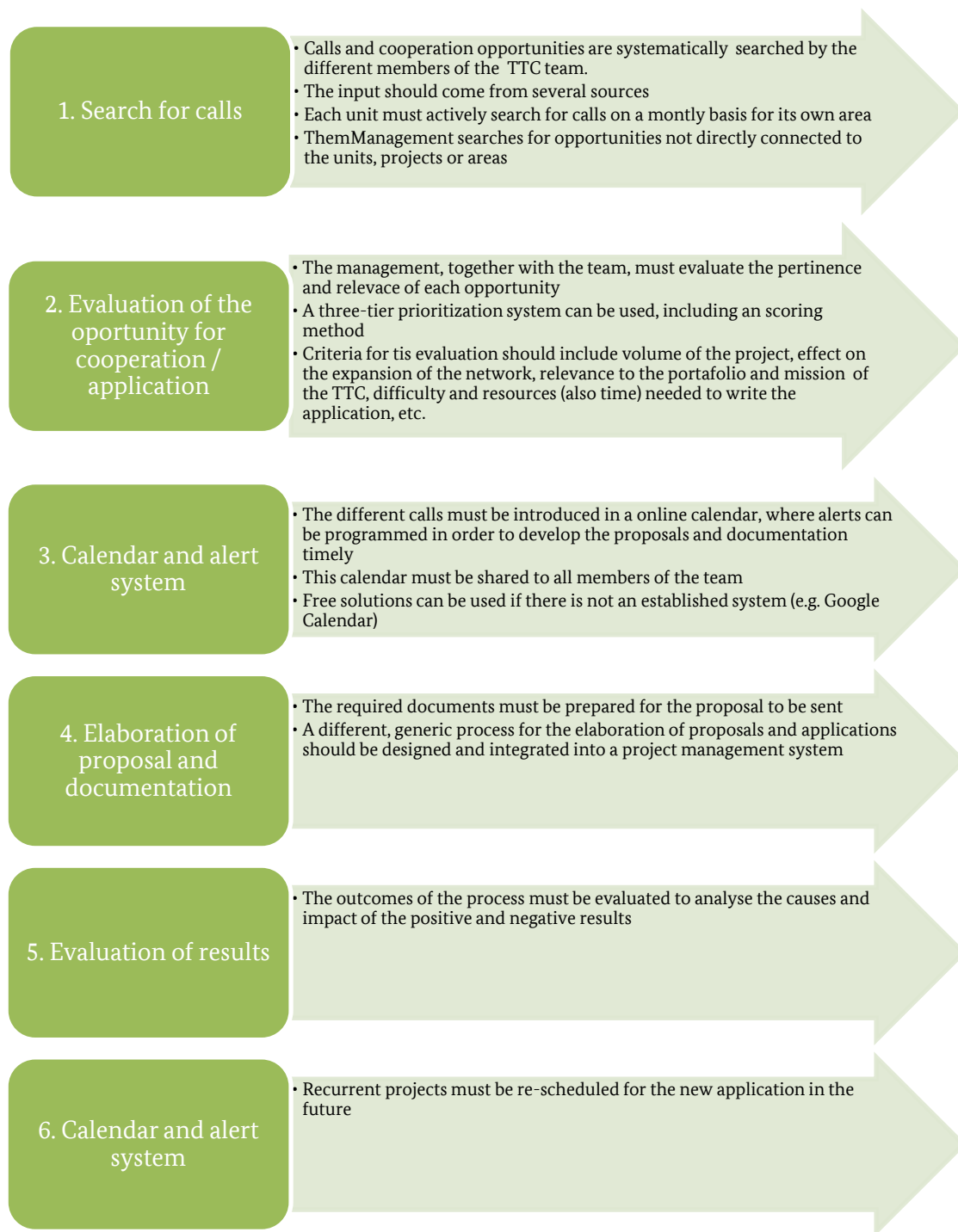
Key Question:

How can the TTC identify funding opportunities and support programs?

The monitoring of calls for projects and cooperation opportunities with different actor is a crucial activity among the general processes of the TTC. This will generate new possibilities to acquire resources and knowledge, as well as an increased interconnectedness with other players, developing the network of the TTC.

The following process aims at the establishment of a systematic search and processing of information:

Figure 19 Monitoring process for calls for applications and other opportunities of cooperation



Source: Own elaboration

Complementing this process, an important component of the system is the online calendar, which must be shared with all members of the TTC team and offer some basic configuration features, for example, inclusion of different calendars in the system and determination of deadlines and types of alerts. For the initial phases, free solutions can be used, e.g. Google Calendar.

The increasing number of individuals and organizations attended in different areas of the service portfolio leads to an increased complexity and volume of information. If the organization pretends to offer an effective and efficient service, all requests will have to be processed fast and accurately. This requires a system capable of managing data from

supply and from demand sides. A database, organizing the data by categories, will ease the identification and matching process.

In order to do so, it is recommended to select the categories taking into account the sector or field of action of the client (start-up, established company, student, academician, etc.) and the stage of development in which the idea or business is currently. This is important since the funding sources usually organize focus their offer through programs or funds oriented to selected sectors or selected stages in the development process or live of start-ups and established companies.

Following the same logic, the information of the supply side, the funding sources, must be categorized according to their target groups, type of projects supported, size and nature of the supported structures, e.g. some programs will support only networks and some other sole companies or entrepreneurs. Other programs could include several modules or a varied portfolio of financial possibilities for different needs and types of clients.

This simple system will save time in the classification and matching process and will allow to invest more time in specific advisory and coaching for each request of assistance.

It is recommended to create an online database to which all members have access. The roles and rights of the different user profiles must be configured so that the trained personnel can modify the data and administer the categories according to their competencies.

Domestic Sources

The next Table shows internal funding sources. The *Technology Development Zones* program has been working since 2001 and the *Patent, Investment, Advertising & Marketing Program* and *Pre-Competition Cooperation Projects* are also supporting technology transfer activities.

Project Name	Since	Aim	Funding structure	Duration
Industrial Thesis Program	2007	Support R&D and innovation projects conducted by university-industry collaboration	75% Ministry as grant, 25% projects's budget in cash, university's contribution, e.g. Lab.	36-42 months
Techno-Entrepreneurship Capital Support Program	2009	To support entrepreneurs who will transform their research into innovative, technology based and high value-added products.	An unsecured and non-repayable grant program. Total amount per year is 27.5 million \$ (2011-2023)	<ul style="list-style-type: none"> • only once, • unsecured and non-repayable, • maximum 55,000 USD for one year.
R&D Centers	-		106 certified firms can benefit from tax incentives	

Source: Karapinar, B. (2011),

Practical Example: European Project Center (TU Dresden)

The European Project Center (EPC) in Dresden is one of the few university providers that offers support throughout all phases of EU-funded projects. As a unit of the Directorate for Research Promotion and Technology Transfer at TU Dresden, the consultancy and management services are available to all researchers at the University. EPC provides the following services:



Advisory: EPC provides information on European funding programs and open EU calls for proposals, as well as on the challenges involved in implementing a project. The main area of experience is the submitting of proposals and the management of EU-funded projects. EPC guides the academics in identifying the optimal funding program and open calls for their project idea, and advise them on financial opportunities. EPC assures continual and confidential communication with the researchers and the funding bodies.

Administrative Project Management: EPC offers assistance with all financial and administrative tasks - from submitting the proposal up to completing the project. The work focus lies on the administrative management of EU-funded actions. EPC offers comprehensive supervision throughout all phases of the project.

Events and Seminars: EPC holds thematic events concerning EU funding for research, structure and collaboration. At regular intervals, EPC organizes presentations and events where they provide general information about European funding programs and about open calls for proposals. Depending on the target group and topic, these may be information sessions, seminars, round table discussions, specialist lectures or conferences.

Incentive System: EPC offers additionally financial support for researchers of TU Dresden during the application process for EU-funded projects.

Source: <https://tu-dresden.de/forschung/epc/services/services>

Useful links

Name	Description	Link
HORIZON 2020	<p>Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020). The main objective is taking ideas from the lab to the market.</p> <p>Two year work programmes, with 18 thematic sections, announce the specific areas that will be funded by Horizon 2020. The online Participant Portal can be used as a calendar for the calls for proposals ('calls'), to be published during the year. The Participant Portal is also the entry point for electronic administration of EU-funded research and innovation projects, and hosts the services for managing the proposals and projects throughout their lifecycle.</p> <p>All calls can be found in the EU's Official Journal – the official source for all EU documents – as well as on the Participant Portal. Turkey will get full access to the European Union's new seven year research and innovation program, Horizon 2020, under an agreement signed in June 2014 in Istanbul.</p>	<ul style="list-style-type: none"> ▪ http://ec.europa.eu/programmes/horizon2020/ ▪ http://ec.europa.eu/programmes/horizon2020/en/how-get-funding ▪ http://ec.europa.eu/research/participants/portal/desktop/en/funding/reference_docs.html#h2020-work-programmes-2014-15-main-wp ▪ http://publications.europa.eu/official/index_en.htm

5.4 Service 3: University-Industry collaboration

Key Questions:

What are effective measures to foster university-industry collaboration?

What to consider when closing a cooperation agreement?

An essential TTC goal is to foster innovation and to ensure successful commercialization of ideas and research for the use and benefit of society. TTC can initiate and manage research co-operations, contract research and scientific services.

Given the difficulties imposed by the commercialization of knowledge, it is always suggested to orient the research & development efforts of the university and its scientists to the existing demand. One way to increase the chance of successful commercialization of the innovations is to motivate the researchers to direct their efforts more towards

local needs, if possible working together with networks that could favour multidisciplinary approaches when looking for technological solutions to existing problems.

This does not imply to stop or reduce research & development in those areas where the university has already developed its strengths. However, a stronger emphasis in the areas that are more relevant to the local economic reality is likely to increase the utilisation of the generated knowledge and technologies. This will augment the university-industry collaboration and the portion of projects that will find its implementation in the market and, hence, the impact of the TTC in the local economic development through technology transfer and innovation activities.

The establishment of roles and responsibilities in cooperation projects represents often a problem for the TTC. The following list shows indispensable parts of a generic cooperation agreement for research & development projects.

1. Names and identification of the legal parties, location
2. Object of the cooperation (Type of project and clear identification of the product, invention, patent, technology, process or any other object of the cooperation)
3. Purpose and objectives of cooperation
4. Scope of work
5. Legal form of the relationship between the cooperating partners and, if necessary, with third parties
6. Start, duration and termination arrangements (including a time plan with milestones)
7. Capital contributions (if any), regulation of contributions, costs
8. Rights and obligations of all cooperation partners
9. Administrative arrangements
10. Use and application of the outcomes of the project (including intellectual property and industrial use rights)
11. Non-competition clause
12. Confidentiality and non-disclosure clauses
13. Dispositions over conflicts and jurisdiction

The following practical examples illustrate the range of possible measures to promote collaboration between university and industry:

Practical Example: Humboldt-Innovation GmbH

Humboldt-Innovation GmbH (HI) is a 100% subsidiary of Humboldt-Universität Berlin (HU). It is the privately organized technology transfer unit of HU collaborating closely with the Research Service Centre (Servicezentrum Forschung – SZF) and acts as an interface between university and industry – between science and business. HI's goal is to foster innovation and to ensure successful commercialization of ideas and research for the use and benefit of society.



HI manages research co-operations, contract research and scientific services of any scale commissioned by commercial and public entities or government. HI also supports project resulting from CFPs (calls for proposals) including orders from federal ministries and/or sub-contracts from DFG or EU projects. HI administrates the project in its own name. Thus, scientists can focus entirely on their research

Private-sector orientation

In its organization as a GmbH Humboldt-Innovation is a professional private-sector company which can operate more flexibly, more independently and with higher speed. As such expertly positioning itself in the demanding world of business and academia.

Research Management - Cooperation between Science and Business

- Service for scientists (“contractor” / “service provider”)
Humboldt-Innovation (HI) supports scientists with initiating and realizing applied research co-operations, contract research and scientific services of any scale commissioned by commercial and public entities or government. HI also supports project resulting from CFPs (calls for proposals) including orders from federal ministries and/or sub-contracts from DFG or EU projects. HI administrates the project in its own name. Thus, scientists can focus entirely on their research.
- Services for companies and other contracting entities (“contracting party” / “customer”)
Humboldt-Innovation GmbH (HI) is a 100 per cent subsidiary of Humboldt-Universität Berlin (HU). It is the privately organized technology transfer unit of HU. HI's goal is to foster innovation and to ensure successful commercialization of ideas and research for the use and benefit of society.

Source: www.humboldt-innovation.de/en/hioverview.htm

Practical Example: InnovationScouts of RWTH Aachen

...From Idea to Product



The InnovationScouts of the RWTH University in Aachen head individual advising conversations and coachings with individual researchers. They support researchers at the universities in their questions on intellectual property, and the development and implementation of technology oriented establishments.

Establishing and Mediating Contacts

The Innovation Scouts also support in providing contact to collaborative partners in the private sector. Contact mediation also occurs in the other direction. They help companies locate the thematically necessary institutes and research groups within RWTH Aachen and to establish contact with them. Upon need, they organize collaborative events, such as informational interviews, workshops, events on the initiation of new collaborations or the expansion of already existing research and development collaborations.

Transfer of Knowledge and Fairs

Another area for the transfer of knowledge from the university into society is technology fairs. InnovationScouts are responsible for planning and coordinating RWTH Aachen's image together with the Forschungszentrum Jülich at the Hannover Messe.

Cooperation

RWTH university does not only serve as a producer and distributor of knowledge, but rather supports its partners in the industry with research oriented services and consulting. They possess a number of unique test benches and dynamometers that are available to companies, even outside the framework of research projects.

Spin-off promotion

In the last 25 years, around 1,000 high-tech businesses have been founded in the Aachen region, half of them spin-offs from RWTH Aachen University. The InnovationScouts are the first contact for any questions about realizing ideas for a start-up business. For many technology-oriented start-ups, the protection of intellectual property is a central concern. RWTH InnovationScouts offer their know-how and give advice on how to develop an appropriate intellectual property protection strategy.

In order to assist young entrepreneurs with creating business plans and developing project sketches, they closely collaborate with the RWTH Aachen Entrepreneurship Center. This cooperation allows to support RWTH researchers by providing comprehensive advice, individual coachings, and continuing education opportunities such as funding seminars.

Sources:

- www.rwth-aachen.de/cms/root/Die-RWTH/Einrichtungen/Verwaltung/Dezernate/4-0-Technologietransfer-Forschungsfoer/~rdg/Abteilung-4-1-Technologietransfer/?lidx=1
- www.rwth-aachen.de/cms/root/Wirtschaft/~ekp/Kooperation/lidx/1/

Practical Example: InnovationLab

InnovationLab GmbH (iL) is a combined, application-oriented platform for research and knowledge transfer in science and business in the Rhine-Neckar metropolitan region. It is supported by the Universities of Heidelberg and Mannheim, the Karlsruhe Institute of Technology (KIT) and by the companies BASF SE, Merck, Heidelberger Druckmaschinen AG and SAP AG.

iL's goal is to create research platforms which allow the partners to work together under one roof across all disciplines and along the entire value chain. The company focuses mainly on cooperative research, transforming inventions into marketable products, and training the next generation. iL is initially working on the future technology of organic electronics, forming a central component of the strategy for success of the BMBF Leading-Edge Cluster Forum Organic Electronics. As part of the promotion of this excellence cluster, many research projects are being driven forward at InnovationLab GmbH, including the development of semi-transparent organic solar cells or organic sensors for medical applications.

Source: <http://www.innovationlab.de/en/homepage/>

Practical Example: Transfer BONUS - Promotion of technology transfer to SME in Berlin

SME normally can't finance own R&D departments inside the company. But scientific know-how is very often the crucial input for innovative product and service development.

SMEs in Berlin receive through the Transfer BONUS subsidies for cooperation projects with academic institutions.

Who?	What?	How much?
SME in Berlin	Subsidy for R&D projects	Max. 15.000 EUR

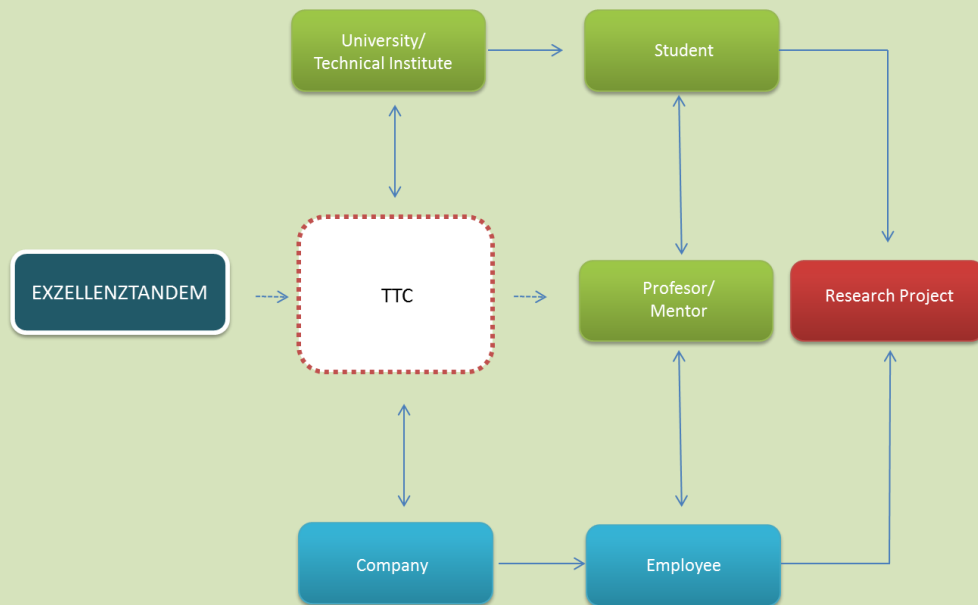
Source: www.transferbonus.de/Transfer_BONUS_Foerderprogramm.phtml

Practical Example: ExzellenzTandem

The University Beuth supports technology transfer through the creation of „Tandems“ between innovative, technology-based regional companies and excellent students, graduates or PhDs of the University Beuth in Berlin. The students (Diploma, Master, Bachelor) and PhD candidates work in strong cooperation with selected enterprises. It takes place an Intensive coaching of the thesis done by the professor (mentor). The mentor structures the project and adjusts also the Tandem to the training need of the employees of the participating enterprise. The program grants scholarships for up to 8 month to university graduates who establish tandems as a part of their pre-doctoral studies.

The project ExzellenzTandem is supported by the European Social Fund (ESF).

Figure 20 ExzellenzTandem – A simplified illustration



Source: Own elaboration

Source: www.beuth-hochschule.de/exzellenztandem/

5.5 Service 4: Intellectual property management and licensing

Key Question:

What is the role of the TTC in the licensing process?

Licensing could be one important source of funding for the university TTC. Technology can be transferred through a license agreement in which the university retains ownership of the intellectual property, while the partner from the private sector obtains conditional rights to use and develop the technology. Before the technology transfer can be realized, inventors must define and disclose the nature of their invention to the university TTC. New inventions are evaluated by technology licensing experts, who determine the intellectual property position and the market potential for the technology. The TTC will not be able to proceed with the invention if there is no intellectual property available, no value to industry or appropriate competitiveness in the market. On the other hand, inventions with an appropriate intellectual property and market position are given the green light and intellectual property rights are pursued. Once the intellectual property rights are established, the commercialization strategy can start.

The goal of the commercialization strategy is to establish a commercial relationship with a partner and negotiate a contract. A license is a contract between a licensor (e.g., the holder of a patent) and a licensee (e.g., a private sector partner) that includes a number of conditions that the third party must satisfy. The licensee may be an established company or a new business start-up (that may be founded by the researcher).

TTC's often face difficulties with the commercialization of the patents of inventions that researchers of universities have developed. This can find its explanation in several factors. A question that inevitably rises is the one referred to the capacity of those inventions and technologies to provide a technical solution that is actually more convenient (e.g. being more effective, less harming, or less costly) than other substitute technologies available in the market already in full commercialization phase. This question makes evident the need of analysing the composition of the patent portfolio of the university and to evaluate each one of the patents.

Another key factor for the success is the one related to the effectiveness of the patent to protect the rights in that particular case and to secure the return of the innovation once this is commercialized in the market. In some cases, given the nature of the market and the players involved, patents are not effective for this purpose. The inventions achieved in a university are more likely to be licensed in cases where patents are effective; this means when they can actually protect the rights and serve as mean to appropriate the earnings generated by the innovation. When patents are effective, university technology is generally licensed to non-inventors; and this increases the chances of commercialization of the invention and the duration of licenses. In this case, when the patent is effective, licensing back patents to their inventors could enhance the likelihood of license termination, as well as affect negatively the changes to successfully introduce the invention to the market. This may be related to the fact that when patents are not so effective, inventors may attempt to establish a company to utilize the knowledge generated (Sahne, 2002).

Regarding the capability to manage the commercialization of knowledge and technology, here understood as patents, it is recommended to systematize and document the invention-related processes and information in as much as possible; unfortunately, these type of capabilities are rather more tacit (Teece, 1981), are developed in the long term and a product of the experience gained in the different commercialization attempts. This means that much of these capabilities are embedded in the head of the researching scientists and other team members and is not documented.

Other important factor that affects the commercialization of patents is the one related to the time or stage of the process in which these are commercialized.

The extent of involvement that the inventor is also a determinant factor; in any case, the scientist of the university will have to choose the level of his involvement. Information asymmetry and the problems generated by non-codified knowledge to be transferred usually make the involvement of the inventor in the further development of the invention very important. The inventor may decide to continue working on the invention with a high involvement, starting up a business as a spin-off and managing the company at the same time the invention is further developed. When the invention is licensed to an external, he inventor could also decide to assume a role of consultant or even be part of the development team on a part-time basis. If the invention is licensed externally, the nature of the project and the personality and goals of the scientist may also determine that he/she temporarily leaves the university in order to work on the invention on a full time basis. Of course, some inventors could decide just to stick to their usual academic activity and research projects and detach from the invention and the further development of the project. The latter situation may cause difficulties for the licensee and could also hinder the process of licensing and commercialization of the invention (Buenstorf/Geissle, 2011).

Additionally, it is important to bear in mind that inventions are frequently offered to potential licensees before these reach the proof-of-concept or prototype stage of the process (Buenstorf/Geissle, 2011). This strongly depends on the sector and on the involvement of the inventor in the further development of the invention.

Limitations and structure of the local industry may indicate that the demand for the inventions included in the University's portfolio will be low or inexistent. In this case, a more intensive effort to market this patents abroad would be recommended. However, this international commercial effort has its inherent difficulties: the integration of the inventors (scientists) in the further stages of development are much more limited and may imply major changes in his/her professional life. Also the cultural boundaries such as language and other communication elements may make this cooperation difficult, even starting from the negotiation for licensing. In general, it is expected that information asymmetries with international potential licensees are larger than with national actors.

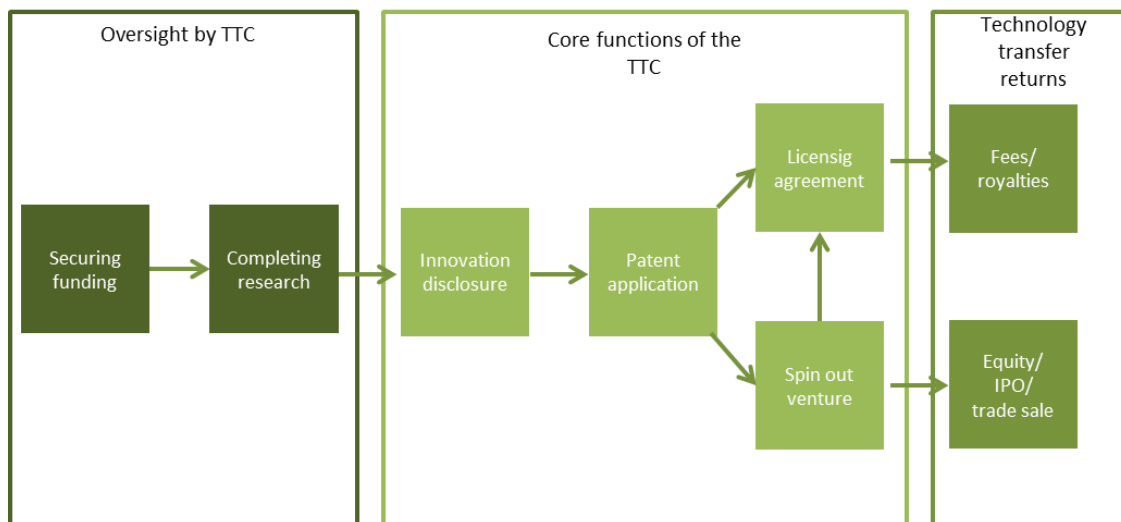
All the mentioned facts characterize knowledge commercialization and have important implications for the entrepreneurship promotion activities of a TTC. Decisions regarding more support and promotion of spin-offs or rather increasing the efforts to license the patents to external licensees will have to be made in each particular case considering the mentioned criteria.

Technology Transfer Process

According to Darcy et al. (2009), the technology transfer process can be divided into 3 core processes (Figure 20):

1. Oversight by TTC: TTC is responsible of evaluating the projects before approving the funds to be expended on it. They measure the invention's probabilities of success in the market and decide whether or not funds should be provided to the university. TTC are responsible for approving, but most importantly, also getting the funds.
2. Core function of the TTC: The TTC has to administer and manage the university's patents; its core function is to transfer the technology from the university to the industry. The most commonly applied mechanisms to transfer technology are licensing and spin-offs.
3. Technology transfer returns: The transferred technology generate income through fees or royalties when licensing the technology; and equity or trade sale when doing spin-offs.

Figure 21 Technology Transfer Process



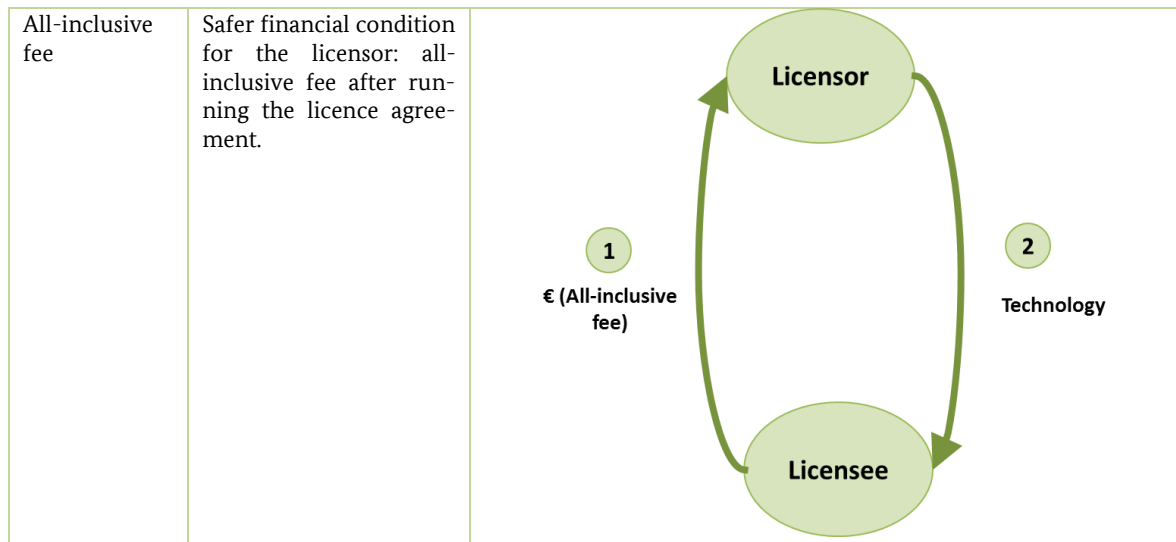
Source: Darcy et al. (2012)

Licensing Models

Table 7 describes different licensing models which can be applied. The TTC could provide advice which model in the specific case is the most adequate.

Table 7 Licensing Models

Licensing Model	Description	Illustration
Royalty payment	<p>License fees as a percentage of net sales</p> <p>Technology assessment Disadvantage</p> <ul style="list-style-type: none"> No licensing fees until the product has been commercialized 	<p>The diagram illustrates the Royalty payment model. It features three main entities: Licensors, Licensees, and End-users. The flow is as follows: Licensors provide Technology (1) to Licensees. Licensees develop a New drug (2) and provide it to End-users. End-users provide Profit (3) to Licensees, who then provide Licence fees (% sales volume or profit) (4) to Licensors.</p>
Milestone payment	<p>Payment by the licensee in specific phases of the R&D process.</p>	<p>The diagram illustrates the Milestone payment model. It shows a linear R&D process with stages: Patent, Grant of the Patent, Proof of concept, Pre-clinic, Clinic, Approval, and Launch of the product. The Licensee is responsible for these stages. At each stage, a milestone payment (€) is made from the Licensee to the Licensors.</p>
Service fee	<p>Payment of service fees only in case of using the technology (once or several times).</p> <p>Payment of service fees by biotechnological, pharmaceutical companies and R&D Institutions in order to utilize the technology.</p>	<p>The diagram illustrates the Service fee model. It features two main entities: Licensors and Licensees. The flow is as follows: Licensors provide Technology (2) to Licensees. Licensees provide Service fees (1) to Licensors.</p>



Source: based on SEPT / University of Leipzig material

License fees are the most profitable but also the most risky model, because the licensor receive fee until the innovation has been commercialized.

Figure 22 Licensing Financing Models



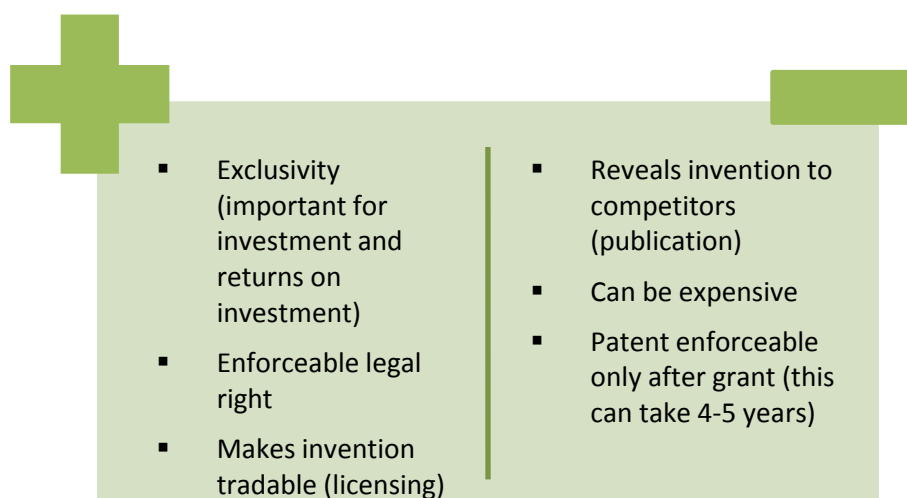
The role of the TTC in the licensing process

Young (2007) describes the following IP related TTC activities/steps:

1. Identification of research results with potential commercial value through the TTC “Technology & Innovation Scouts” and document the discoveries through a disclosure process. The disclosure-of-invention form should be simple and make it easy for the inventor to document the discovery.

2. Evaluation of the commercial potential of the disclosed innovations. The task of the TTC is to explore and find marketable applications. Such evaluations are one of the most difficult tasks for a TTC. Future decisions about IP protection and marketing are based on the results of this evaluation process.
3. Decision whether or not to protect IP rights in the innovation; acquire funding for filing patent, trademark, or copyright applications; and manage the protection process. The challenge of acquiring funding for protection of intellectual property internationally can often be a complicated and complex process. This is especially problematic if there exist only very small or no commercial markets for the innovation in the country of origin. It is recommended in most of the cases is to first secure protection in the country of origin and meanwhile to find a corporate partner to pay the patent costs internationally as a business expense in the license agreement.
4. Conduct market research to identify potential partners from the industry (licensees), and then market the innovations. The inventors are often the best source for the identification of licensees. Through their professional network they have access to the private sector and they know well the demands of the industry.
5. Negotiate legal contracts (license agreements) with identified industry partners to transfer IP rights in exchange for royalties or other consideration. The goal should be to negotiate a fair arrangement that facilitates the commercial partner in successfully developing and marketing the product. Other (unexpected) benefits, beside the licensing income, from developing and cultivating industry partnerships are sponsored research, student employment opportunities and consulting opportunities.
6. Maintain and manage administrative functions of IP protection and technology transfer. These functions can include: Accounting, royalty distributions, licensee performance management, and patent application management.
7. An additional activity could be to accompany professionally technology search in patent data bases. Many patents are expired and free to use. However the patent data bases represent a rich inspiring source for technological problem solving.

Figure 23 Advantages and Disadvantages of Patenting



Source: Own elaboration

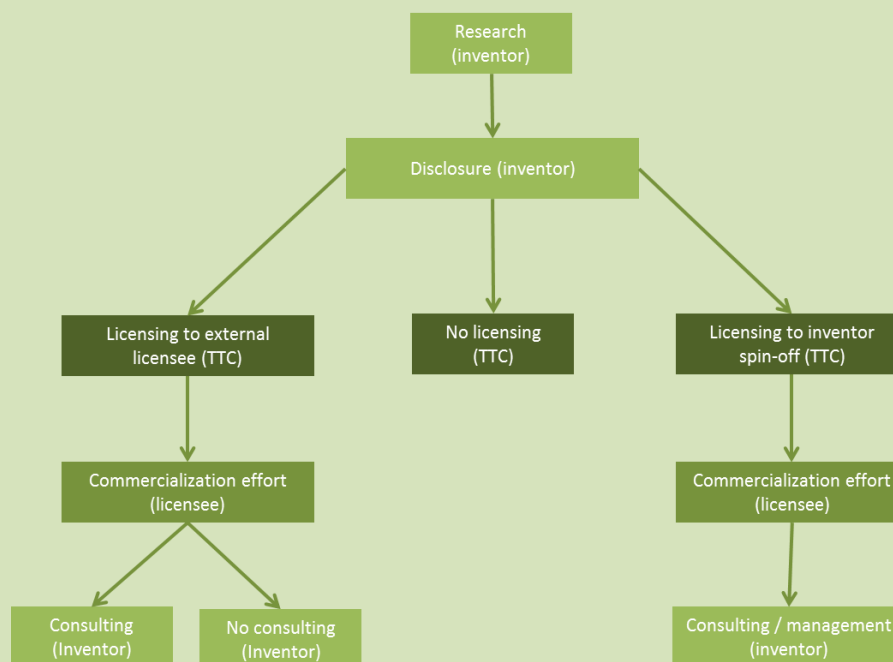
Practical Example: Max Planck

Buenstorf/Geissler (2011) explain the licensing process at the Max Planck Society: The process how academic research evolves to the successful commercialization of an invention is sketched in Fig. 23. Once an academic invention has been made, it has to be disclosed to the Max Planck Society and becomes its intellectual property. As an agent of Max Planck Society, Max Planck Innovation then tries to license the invention. However, when inventions are marketed to potential licensees, the technology has often not advanced beyond the proof-of-concept or prototype stage. Licensees need substantial further development efforts to obtain a marketable product.

Upon disclosure, an academic inventor has several options to pursue the invention further:

1. One possibility for the inventor is to focus on his academic research activities and to refrain from any further development activities. In this case, the fate of the invention entirely rests with Max Planck Innovation, which will try to find an external licensee for the technology. This may or may not be successful. For the Max Planck Society, successful licensing of technologies shows the societal relevance of its research activities to policy makers and the broader public.
2. The inventor's second option is to become involved in the further development of the invention. If the invention is successfully licensed to an external licensee, he may choose to support the licensee's development efforts as a consultant. Such continued involvement of the academic inventor is often crucial for the successful commercialization of the invention, as it allows the licensee to draw on the inventor's non-codified knowledge. The disadvantage is that the inventor needs to allocate time to these consulting activities, which may have adverse effects on his research performance.
3. The third option available to the academic inventor is to pursue the commercialization of the technology himself by establishing a spin-off enterprise. The spinoff is required to license it back because the invention is owned by the Max Planck Society. The good news is that the Max Planck Society supports spinoff activities of its researchers in various ways. For example, ongoing involvement of researchers in the spin-off firms is allowed based on explicit consulting agreements. Based on observation, within teams of academic inventors, the more senior partners remain active researchers, while younger co-inventors join the spin-off management.

Figure 24 Licensing Process



Source: Buenstorf/Geissler (2011)

Useful Links:

Name		Description	Link
European Patent Office (EPO)	Patent	The European Patent Office (EPO) grants European patents for the Contracting States to the European Patent Convention.	http://www.epo.org/
Espacenet		Espacenet is a free online service for searching patents and patent applications. Espacenet was developed by the EPO together with the member states of the EPO. Turkey has an Espacenet service in the national language.	http://www.epo.org/searching/free/espacenet.html http://tr.espacenet.com/
WIPO		WIPO is the global forum for intellectual property services, policy, information and cooperation.	http://www.wipo.int/portal/en/
Patentscope		Using PATENTSCOPE you can search 37 million patent documents including 2.5 million published international patent applications (PCT).	http://www.wipo.int/portal/en/
IPR Helpdesk		The European IPR Helpdesk offers free of charge, first-line support on IP and IPR matters to beneficiaries of EU funded research projects and EU SMEs involved in transnational partnership agreements, especially within the Enterprise Europe Network (EEN).	https://www.iprhelpdesk.eu/
European Commission	Commis- sion	EU website addressing the following topics: European patent systems, specific R&D- related IPR issues, technology transfer and university-industry relations, IPR awareness, training and assistance.	http://ec.europa.eu/invest-in-research/policy/ipr_en.htm
USPTO		The United States Patent and Trademark Office (USPTO) is the federal agency for granting U.S. patents and registering trademarks.	http://www.uspto.gov/
JPO		JPO is the Japan Patent Office.	http://www.jpo.go.jp/
Patent Cooperation Treaty (PTC)	Cooperation Treaty (PTC)	The PCT is an international patent law treaty. It provides a unified procedure for filing patent applications to protect inventions in each of its contracting states.	http://www.wipo.int/pct/en/texts/articles/atoc.htm

ipHandbook	Prepared by and for policy-makers, leaders of public and private sector research, tech transfer professionals, licensing executives, and scientists, this online resource information and about intellectual property.	http://www.iphandbook.org/
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5.6 Supporting start-up and spin-off companies

Key Question:

What are effective mechanisms to support start-ups and spin-off companies?

The processes for transferring research results from research institutions to commercial application are complex and diverse. One important transfer channel is the creation of a start-up company.

Start-up promotion process model

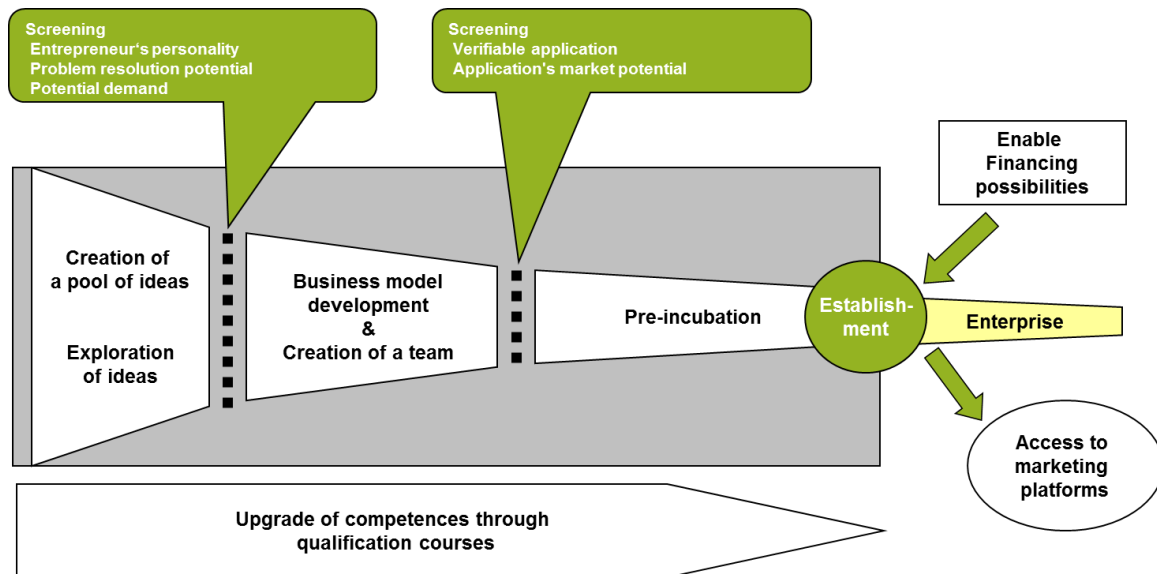
Figure 24 describes a possible start-up promotion process model based on the experience of the Self- Management Initiative at the University of Leipzig¹⁹ (see also the box in this chapter). In order to accelerate the transfer of innovative ideas and technological developments into economic practice, direct implementation and support at the “Point of Research”, i.e. at the respective research institutes and centres, is necessary. TTCs can play an important role to “scout ideas” and identify, evaluate and collect research results and the ideas of high entrepreneurial potential in an idea pool.

Next is a detailed screening that evaluates the initiators’ business personalities, the value of their business ideas for customers, and their initial ideas about the marketing of the research results. Panels of external experts, i.e. Venture Capital firms, Business Angels and other specialists help to assess the ideas. Potential founders will get frequent opportunities to present their ideas before these panels and obtain feedback.

If the result is positive, a more detailed start-up coaching can begin. Right after the first screening and throughout the entire coaching process, the TTC can bring potential team members together and support the development of interdisciplinary start-up teams. These teams will then develop their business models, supported by experts in special workshops. A further screening evaluates the work’s progress. If the outcome is again positive, the pre-incubation of the business at the “point of research” will be discussed with the research institute, and an appropriate action plan will be created. With the support of the coaches, market tests and the preparation of the actual foundation can begin. In addition, access to funding sources and platforms is provided. At this moment, the TTC can initiate the planning of the growth phase and all related strategic planning aspects.

¹⁹ http://in4in.net/fileadmin/user_upload/in4in_InnovativeEntrepreneurshipPromotion_pdf.pdf

Figure 25 Start-up Promotion Phases



Source: iN4iN

A TTC can thus promote and coach start-ups throughout the entire process: From the creation of ideas, over the development of an innovative business model, until the incubation phase. In the following a more detailed description of this coaching process managed by a TTC:

1. **Creation of a pool of ideas:** At the points of research, innovative ideas and technological developments with market potential will be identified. Here it is essential to work closely with the administration of the research institutes and centres. The identified ideas will be placed in a central database or platform and further analysed in regard to their start-up potential.
2. **Screening 1 - Product Idea & Founder Team:** The founders' personalities are central to the success of the company. As part of the first screening, a test evaluates the founders' personalities in order to identify their individual strengths, and
 - to prepare an optimal task distribution within the founding team as well as
 - to determine whether the team can be considered complete, given the skills at hand, or whether other team members are necessary to ensure a successful start.

The coaches will discuss the important elements of customer value and competitive advantage with the potential start-up teams and test them by applying their own market research. The start-up ideas and business models will be evaluated for plausibility through surveys among external experts and through analysis of secondary data.

3. **Formation of a Powerful Start-up Team:** Normally, scientists and engineers lack the necessary business expertise for founding a business. Therefore it is necessary to bring together people of a technical background interested in founding a business with experts from the commercial sector.

We encourage the formation of complementary start-up teams and actively support the development of personal and professional trust. We invite founder teams to get in contact with experienced managers and entrepreneurs who are interested to invest in young start-up firms. Based on our moderation support the interested parties are able to make contact with each other and to develop common goals for joint development of the business idea. The moderator stays neutral towards all members of the founding team and helps to overcome challenges of team building.

The challenges of team building are:

- To discuss objectively emerging differences in opinion on technical or commercial issues at an early stage;
- To demonstrate through practical examples of established companies the possible priorities and harmony between technical and commercial goals, without showing superficial judgment;
- To motivate the participants in a meaningful way to engage with each other.

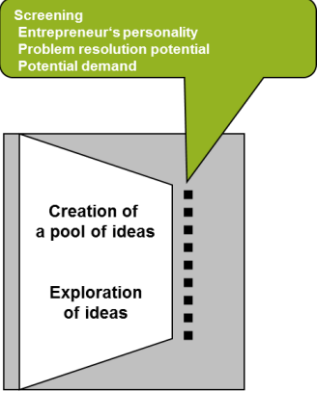
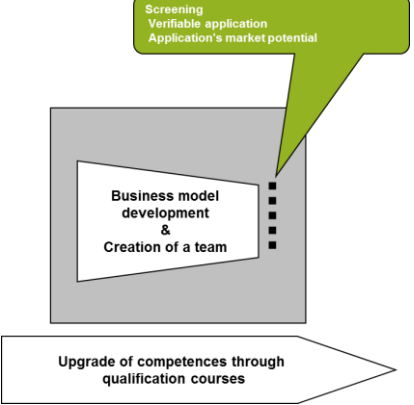
The combination of building interdisciplinary teams and the accompanying training is a key factor to a successful support process.

4. **Business Model Development:** For the commercialization of innovative ideas and technological developments, it is necessary to analyse different business models, especially in terms of the market and competitive conditions as well as customer value. This business model development should be done in a process of several weeks, in which the founding team will be joined by one of the TTC coaches. In addition, interested business students, who are not part of a founding team, can initiate a project to review the business models, realize market research activities and develop appropriate market entry strategies under the guidance of one of the coaches. These projects address specific commercial aspects of the business planning process and bring considerable relief to the founding team.
5. **Screening 2 - Business Model Review:** The business model will be presented before a small panel of experts, e.g. entrepreneurs, managers and investors. This gives the founder team and the participating research institutes a deep insight into the market and the development potential of the respective technologies. This phase acts as a filter as well as positive motivation for founder teams with positive feedback from the expert panel.
6. **Pre-incubation:** The basic idea of pre-incubation is to support the founders in the test and transition phase, when they shift from their former position to develop the start-up business. For this, the founding team (already through intensive coaching) is supported at the “point of research”. This allows the necessary proximity to the scientific mentor (or accompanying research professor) on the one hand and the use of special equipment (existent in the research institute) during the start-up phase on the other.

On the basis of the previous business model and planning analysis, the business plan is also established in this phase. Here the founders are able to gain decision making experience in strategic and operational issues, as the coaches begin to stand on the side to enable a gradual learning experience.

7. **Accompanying Qualification:** The training focuses on the so-called soft skills of the founders. Through the mediation of specific business skills, the founders are able to understand the important principles of the management of a start-up company. The individual courses address relevant management issues in the various stages of a start-up in a comprehensive manner or specific management tasks that are necessary for proper start-up operation. All courses should be offered several times if needed.
8. **Financing Opportunities:** The start-up supporting TTC needs to build bridges between potential entrepreneurs and financiers. Special events could be held so that the potential founders can present their business plan and ideas to a panel of experts and receive professional feedback. Through these panel discussions, contact to Business Angels, Venture Capital firms and private investors is developed. Furthermore an individual support of the founder teams in the negotiation process with potential investors is provided.
9. **Access to Marketing Platforms:** One of the main problems of start-up companies is to get a fast and efficient access to the market. Therefore we support the creation of marketing platforms where networks of young and already mature companies join the marketing efforts in order to develop service and product offers for large customers.

Table 8 Summary of possible TTC activities throughout the start-up process

Start-up Phase	Possible TTC Activities
	<ul style="list-style-type: none"> ▪ Idea competitions ▪ Idea generation workshops ▪ Screening of ideas and technology in close cooperation with institutes and innovation centers ▪ Integration of business administrators ▪ Advisory on Patents ▪ Innovation & Technology Scouts
	<ul style="list-style-type: none"> ▪ Coaching for the entrepreneur ▪ Workshops on concept development ▪ Student's practice-projects ▪ Offer qualification possibilities ▪ Business Angels

Source: Own elaboration

Support Instruments and activities

Figure 25 provides an overview of possible promotion instruments adequate for different phases of the start-up:

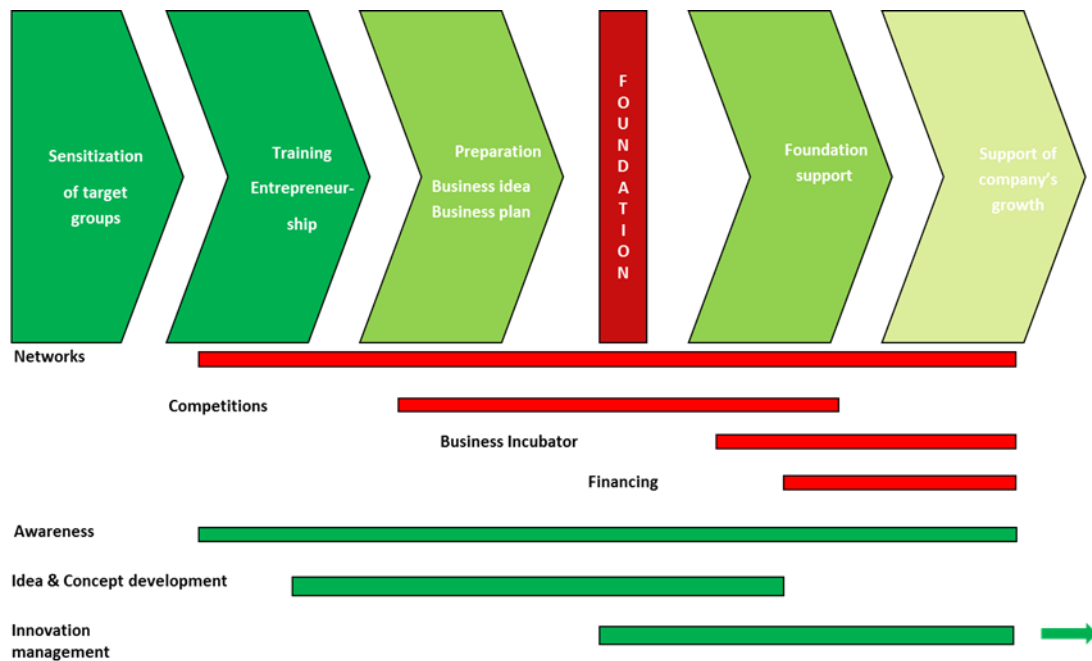
Specific start-up promotion schemes:

- Networks can support the start-up promotion in different stages: From sensitization events to training measures and business angel platforms.
- Competitions can be utilized to create innovative business ideas and prepare business plans.
- Business Incubators support the entrepreneurs with advice and training in later stages.
- Financing support is important in particular after foundation and in the growth phase.

General promotion schemes (supporting start-ups):

- Awareness rising activities can be realized over the whole process.
- Idea and Concept development is a useful support in the early stages.
- Innovation management should be anchored sustainably in the firm.

Figure 26 Start-Up Promotion Process



Source: Own elaboration

Practical Example: Self-Management Initiative Leipzig (SMILE)

The Self-Management Initiative Leipzig SMILE is a well-known regional project to support entrepreneurship and start-ups in Leipzig. The associated partners of the Initiative are the International SEPT Program (www.uni-leipzig.de/sept/) and the Institute for Service and Relationship Management at the University of Leipzig, the Leipzig Graduate School of Management, the Academy for Engineering, Economy and Culture Leipzig and the Helmholtz – Centre for Environmental Research – UFZ in Leipzig. The initiative is cooperating closely with further partners throughout Saxony and Germany to help young entrepreneurs, start-ups and existing companies to succeed. SMILE - the Network for entrepreneurship in Leipzig - is well versed in the supervision and coaching of start-ups and spin-off companies as well as in the training for key and management qualifications. The interdisciplinary team of more than 10 employees with diverse entrepreneurial backgrounds, skills and experiences operates in highly professional and flexible fashion to bring the best ideas to the market. SMILE founders have won several business plan competitions. Up to today more than 3.000 persons have participated in the program and as a direct result more than 250 businesses were founded.



The Entrepreneurship Promotion activities of SMILE have the following **goals**:

- To find marketable innovative technologies/ideas and develop supporting business models
- To train students and researchers in management of start-ups and stimulate interdisciplinary team building
- To support start-ups with intensive coaching at the „Point of Research“
- To provide access to marketing and financial networks

SMILE Methodology – Step by step:

The SMILE coaching methodology follows a stepwise approach in order to obtain four important results

1. Coaching plan: As part of the requirement analysis, the specific characteristics of the start-up in relation to the business idea and the founders are determined. For this purpose, existing property rights, special legal aspects as well as existing competency gaps must be evaluated. Based on this analysis, a binding coaching plan is established. The coaching plan contains a concrete working plan (step-wise) as well as training plan for the start-up team.
2. Business model: As part of the business model development, strategic analysis of the business environment will be conducted with some of the following tools: market segmentation, benchmarking or SWOT analysis, as well as the use of market research methods. The goal is to focus on the customer value of the product or service being offered and work out the attractiveness of the potential market segments as well as the cus-

customer's willingness to buy. Using the market and customer segmentation analysis, the detailed product definition is established. This includes an analysis of the product range with respect to the available competitive offering and the unique differentiation characteristics of the start-up's offer.

3. **Test-Application in the market:** The result of the previous coaching step is that a market-oriented business model is developed. Nevertheless, there is usually uncertainty about the meaning of a whole series of specific design options and the importance of different features for the customer. These questions are either answered with cost-intensive market research before the launch or after the product introduction based on initial experience, however also with substantial costs. This is where the application test lab, the step that tests the market applicability of the business idea, helps to increase the probability of success. In a separate coaching step, key elements of the business idea are transferred into a test for some pilot customers. For this, the key features of the product or service are combined in an initial offer for some test customers. They will test this offer and provide a feedback evaluating the fulfilment of their specific customer requirements. Doing this errors in product design or non-market oriented investments can be avoided while at the same time ensuring optimal market and customer orientation.
4. **Business plan:** The final step contains the development of the whole business plan. Here the coaching focuses on the remaining important aspects like:
 - Marketing & Distribution
 - Business organization
 - Financial planning

Source: http://in4in.net/fileadmin/user_upload/in4in_InnovativeEntrepreneurshipPromotion_pdf.pdf

See also: <https://www.smile.uni-leipzig.de/home/>

Practical Example: Humboldt Innovation – Research Creating Reality – Spin-Off Management

Humboldt-Innovation supports start-ups and entrepreneurs since 2005. Humboldt-Innovation coaches various start-ups in the early phases of the start-up process and consults more than 30 active firms established in the market.

Scouting & Analysis of Potential

Two Transfer Manager at Campus Adlershof and Campus Mitte/Nord validate the innovative basic research of the university for industrial applications. If a potential is identified, the Transfer Managers help to acquire financial support for the transfer.

Intellectual Property

The Humboldt-Universität Berlin supports spin-offs by making invention that occurred in the university realm available to their inventors for the formation of a Spin-Off. Patents for basis technologies can be the scaffolding for fund raising to realize a spin-off.

Spin-Off-Zones

On behalf of the University, Humboldt-Innovation is managing the SPIN-OFF ZONE at Campus Adlershof. The pre-incubator provides space and a creative environment to develop innovative ideas into successful business concepts.

Coaching

The Spin-Off team supports the founding of businesses by creating business plans, assisting on funding applications and coaching in accordance with the established “sparring partner” model.

Funding

Humboldt-Innovation facilitates access to regional and national public and private funding options for university Spin-Offs and talented start-up teams.

SPIN-OFF SCHOOL

The Spin-Off SCHOOL consolidates the seminars and interactive events of the Humboldt-Innovation in context of Entrepreneurship and Spin-Off. A highlight is the education corner with short learning videos.

Network

For optimum support, Humboldt-Innovation has built up an internal university network, to spread the entrepreneurial message in each faculty, and to provide a first point of contact for potential founders and start-ups.

Source: <https://www.humboldt-innovation.de/en/spinoffoverview.html>

Start-up Promotion Instruments in OECD countries

The GIZ publication “Start-up promotion instruments in OECD countries and their application in developing countries”²⁰ provides a very good overview about different start-up promotion instruments regularly applied in OECD countries. In this study you can find a table which contains, for example, the main objectives, the typical mode of delivery, associated costs, the underlying rationale, examples and the key success factors of each instrument.

Practical Example: AplusB (Academia plus Business)



The Austrian incubator network AplusB (Academia plus Business) aims at bridging academia and private sector. Main goals are to:

- stimulate academic spin-offs
- foster knowledge and technology transfer
- transfer entrepreneurship know-how
- give advice and accompany the spin-off process
- give access to relevant networks
- facilitate subsequently funding
- provide infrastructure
- provide financial support in the different start-up phases

To achieve these goals, the program, funded by the Ministry of Innovation and Technology, supports the establishment of incubators in academic institutions. The 9 created centers provide advice, business education, access to networks, financing and infrastructure, and they are also supposed to help stimulating the awareness of entrepreneurship in academic institutions.

Source: www.aplusb.biz

See also: www2.gtzt.de/wbf/4tDx9kw63gma/giz2012-en-start-up-promotion-instruments_klein.pdf

Business Plan Competitions

The establishment of processes and mechanisms in form of competitions combined with support to the next stages of the ideas and projects can have very effective results. The “funnel” effect generated by competitions increase the changes of orienting the support to those applicants (networks or teams) that are perseverant and that have actually started to work together effectively to participate in the processes.

Business plan competitions are an easy to implement activity for TTC. These competitions support the entrepreneurial spirit of students and graduates, in that they review start-up ideas and concepts for their practicability and support successful participants with attractive prizes and the experts' know-how. There exist different types of business plan competitions:

²⁰ http://www2.gtzt.de/wbf/4tDx9kw63gma/giz2012-en-start-up-promotion-instruments_klein.pdf

Table 9 Types of Business Plan Competition

Type of Competition	Type 1 Business idea award	Type 2 Award for complete business plans	Type 3 Step-wise preparation and award for complete business plan	Type 4 Intensive coaching of selected start-up concepts
Characteristics	Hand in of a short schematic business idea. Primordially in small regional competitions.	Hand in of a detailed business plan. Supported by manuals, check lists and introduction seminars.	Accompaniment of the participants during the further development of a business idea into a detailed business plan. Structured in 2 to 3 levels, possible access to any phase. Adjudication depending on the level. Training, advisory and feedback in coaching, workshops and seminars.	Trend since 2001 for the further support of the top participants of business plan competitions. Intensive advisory at the start-up stage.
Diffusion	Low	Low	high	Medium

Source: Own elaboration

Table 11 shows the main steps to implement a business plan competition. This process can be adjusted to the scale and scope adequate for a TTC. Some crucial aspects are the design of a clear, simple process with clear stages, the nomination of a multidisciplinary jury and orient the support to networks or teams and not to individuals. Another important key element is the collaboration with experts familiar with technology focus and with own entrepreneurship experience to assure high quality coaching and evaluation. The award ceremony should be realized in a public event so that the competition serves additionally as a sensitization and awareness rising activity.

Table 10 Guideline for Business Plan Competitions

1. Announcement	<ul style="list-style-type: none"> ▪ The contest is being announced through the TTC, University and relevant stakeholders, and if possible also through TV and radio
2. Application	<ul style="list-style-type: none"> ▪ Students, start-ups and companies apply through the web portal hosted for example by the TTC
3. First Round of Selection	<ul style="list-style-type: none"> ▪ Evaluation of applications through multi-sectorial selection committees consisting of firm managers, sector experts and academics. ▪ The evaluation criteria could include e.g. business model, feasibility, market readiness, degree of innovativeness, profitability.
4. Trainings and Coaching	<ul style="list-style-type: none"> ▪ Workshops for those who passed the first round of selection, on topics such as “How to design an innovative business model?”, “How to orient your innovation to the market?”. ▪ Trainings and coaching sessions could be delivered by directly by the TTC, teachers from universities as well as companies and former participants of the contest (mentors).
5. Second Round of Selection	<ul style="list-style-type: none"> ▪ Evaluation of the business plans prepared during the training, through experts familiar with the topic and situation of the participant.
6. Semi-Finals and Finals	<ul style="list-style-type: none"> ▪ Live presentation of the business plans by the participants in a fixed time format (pitches). A jury then selects the participants for the finals, which could be broadcasted live on TV.

Source: based on GIZ (2014)

Practical Example: Business Plan Competition Berlin-Brandenburg:

Within the business plan competition Berlin-Brandenburg (BPW), the participants can decide whether to draw up a business concept using a traditional business plan (BPW Plan) or using the business model canvas method (BPW Canvas). The applicants decide which start-up tool they want to use for their business idea.

Around two weeks before each deadline for online submission, they receive an e-mail containing all the necessary information for taking part in the competition. They can also find online instructions on how to upload their business concept.

On the BPW website you can find more information in English and learn more about procedures, requirements, evaluation and terms/conditions for participation.

Source: <https://www.b-p-w.de/en/>



Practical Example: LIFE – All you need is an idea!

The Self-Management Initiative of Leipzig (SMILE) is organizing since 2011 an idea competition for young entrepreneurs.

This competition follows a different approach: LIFE is not a classical business plan competition; the objective of the initiative is to motivate students and staff of Universities in Leipzig to develop innovative business ideas and to support their implementation.

LIFE has less strict formal requirements und encourages to submit „experimentally“ ideas. Especially innovative ideas will be supported by SMILE (the entrepreneurship promotion network of the universities in Leipzig).

The applicants just have to submit a sketch of ideas. The focus is on the idea.

An expert jury selects then the 8 best sketches. The selected persons or teams present afterwards their ideas in a public event.

Source: <http://www.smile.uni-leipzig.de>



Business Simulations

Simulating the start-up experiences helps the potential or future entrepreneur understand the multiplicity of factors involved in starting a company and running the businesses for the first months and years. Even if the case of the simulation does not correspond to the sector in which the potential or future undertakers will actually start their businesses, the simulation is a good exercise to develop decision making processes and team work to analyze the information and then make decisions.

There is plenty of software to support this type of activities. It is recommended to choose software that is close to reality and presents a reasonably complex scenario, even though the participants should start with low difficulty levels and increase the difficulty with the time, in order to foster the learning effect.

5.7 Transversal support on innovation and technology management

Key Question:
What type of service can the TTC offer to promote innovation?

It is recommended to internalize a process that allows the TTC to introduce innovation-oriented management approaches into the projects of the target groups. There is a number of reasons for this: for example, the activities of the TTC are, in their nature, closely related to innovation processes; the team of the TTC must understand clearly the concepts of innovation and innovation management in order to be able to comprehend and classify the different ideas and projects that are being developed by scientists in the universities and institutes. This knowledge will also make possible to understand the implication of each case with regard to the private partners and their objectives, resources and difficulties. Secondly, the TTC will be the player in charge of guiding the start-ups, their process of pre-incubation and incubation. A clear view on innovation and innovation management eases considerably the task of business model development, business planning, strategy and portfolio designs, among other activities related to the consulting, coaching and supporting roles. Eventually, after getting more experience and developing strong capabilities in this regard, the TTC could become a reputed actor in the region, getting repositioned and, therefore, providing with a better bargain power and weight in front of all other players of the environment. Considering the other components of the service portfolio, if these capabilities and access to specialized resources are soundly developed, the TTC could become the organizer of the capacity development on innovation management related issues for the different demands coming from the private sector of the region. The following table provides an overview about a potential structure of a short-term training course in market-oriented innovation management. In market-driven innovation processes, the research groups or company's attention is focused on the newly discovered unfilled need of the potential customers. The "customer's voice" must be integrated from the beginning in order to identify the clients' needs, wishes and the changing customer trends. Hence, the fuzzy nature at the front end of innovation processes requires the application of effective techniques and tools to drive this integration in a consistent way.

Table 11 Possible Innovation Management Training Topics

Activity	Aim	Management Tools
1	Answer the question: In which product one should innovate for which customer/market segment?	<ul style="list-style-type: none"> – Portfolio Analysis – Personas
2	Answer the question: In which product characteristics one should innovate?	<ul style="list-style-type: none"> – Quality Function Deployment – Product Clinic
3	Answer the question: How to innovate in this product characteristics	<ul style="list-style-type: none"> – Creativity Techniques – Functional Analysis – Idea Evaluation
4	Answer the question: How is the final concept of the new product?	<ul style="list-style-type: none"> – Kano Model – Target Costing – Innovation Canvas

More detailed information about the innovation management tool one can obtain from the in4in handbook at following web-link: www.in4in.net/publications/.

The team of the TTC should be able to understand and advise the clients of the diverse target groups in the field of innovation management. The TTC should take a leading role for expanding knowledge related to market-oriented innovation management and thus strengthening innovation and cooperation culture in the region.

Practical Example: Innovation Management Training Programme



Since 2011, iN4iN is cooperation with i with the Ministry of Science, Technology and Telecommunications of Costa Rica and Universidad Tecnica Nacional with the purpose of developing the innovation competencies of different actors of the private sector as well as support economic promotion agencies and research centres at universities.

The objectives of the cooperation included the development of innovation management capabilities, improvement of eligibility by funding programs oriented to innovation in SMEs and development of implementable innovation projects by the participating companies and organizations.

The target segments of the measures were composed mainly by participants coming from the Metropolitan Area around San José and including Cartago, Heredia, Alajuela City but also from Liberia, near to the Pacific:

- Companies from the productive and service sectors
- Governmental institutions dedicated to the export promotion
- Education institutions including universities and vocational education bodies
- Chambers from different sectors
- Research & development related organizations
- Personnel of ministries
- Local consultants

The National technical University of Costa Rica acts as the local academic partner in many of the conducted measures, particularly in the organization of the Certified Innovation Manager Trainings, which included the elaboration of an innovation project by each participant as a requisite for their graduation. Around 230 innovation projects were developed and an important portion of these were successfully launched to the markets or implemented in the processes and structures of the companies and organizations.

Other shorter activities measures were organized specifically of chambers for their personnel and affiliates (Chamber of Exporters, Chamber of Food producers, Chamber of IT Companies, etc.)

Source: www.in4in.net

5.8 Portfolio monitoring and management

Key Question:

How can the TTC manage and monitor its service and project portfolio?

With the new resources, the growth of the TTC and the growing attraction of potential prospects from the different target groups (e.g. academicians in spin-off process, networks of professors and/or students starting up firms, local companies looking for cooperation opportunities or support in innovation management, etc.), complexity, volume and quantity of projects and, therefore, the number of activities to be completed, will increase as well.

The portfolio of the TTC should fit the strategic mission of the institution, of the university and of the region. Therefore it is important to establish and use instruments in order to analyse and evaluate the project portfolio in each area or component.

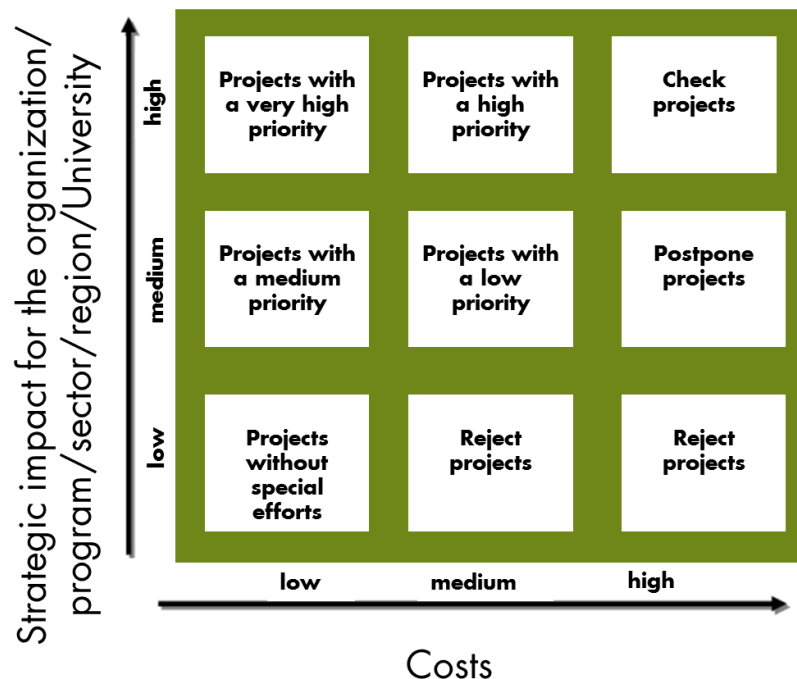
It is recommended to use at least some basic tools to classify the projects and visualize their main characteristics:

Tool 10: Portfolio Analysis Matrix

Why using this tool?

The nature of the projects that are being promoted, supported or incubated regarding risk, technical difficulty, sales potential, relative technological strength and other variables will also determine the proportion of successful outcome. The following matrix allows the TTC to map the projects regarding strategic impact for the organization/program/sector/region/university and costs.

Figure 27 Strategic impact and cost matrix



Source: Own elaboration

What to consider when using this tool?

In order to define the values that determine the position of a project in a given axis, the following table integrates a calculation of several factors that compose a variable, e.g. attractiveness; different weights or importance can be given to these factors.

Table 12 Portfolio Matrix – Value Definition

Criteria of attractiveness	Weight	Level of compliance	Value = weight x compliance
Potential partners	3	3	9
Exclusivity	2	4	8
... (add as many rows as needed)			
Total valuation			X

Source: Own elaboration

Typical criteria to determine the attractiveness of a project are:

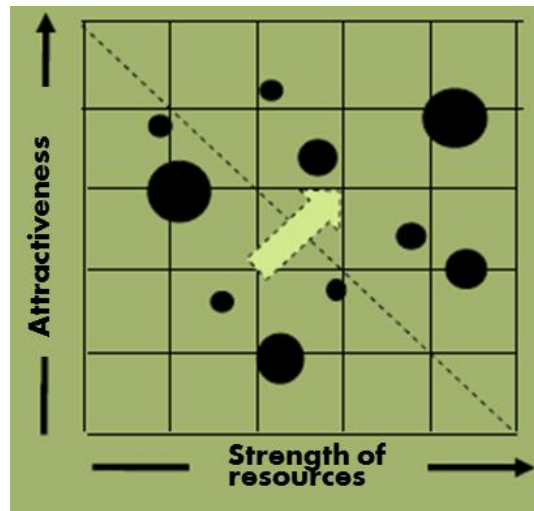
- *Structure*: Number of possible “project partners”
- *Competition*: Exclusive nature of the offer by the organization/department
- *Investment*: Volume of capital required
- *Need and use*: Market potential and growth
- *Technical characteristics*: Chances of technical success

These factors can be modified according to the criteria that the TTC considers most relevant for the attractiveness of a project. On the other hand, typical factors related to the strength of resources for the project are:

- *Technological strength*: Available knowledge
- *Market position*: Intensity of cooperation with potential partners or clients and Market image
- *Legal position*: Acquired intellectual property rights (e.g. patent)

A similar matrix can be also used in a simple version, where only a single variable is represented in one axis. It is strongly recommended to design more matrices including more variables and criteria that will help understand and evaluate better the portfolio of the TTC. Variables such as potential partners for cooperation, sales potential, technical newness, newness of the technology for the entrepreneur or existing company, success potential and synergy potential could be considered when constructing these matrices.

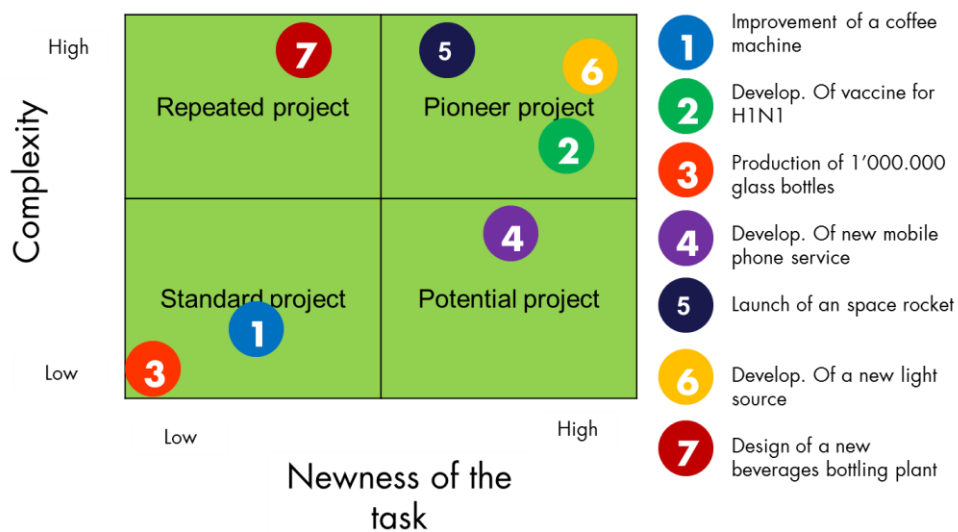
Figure 28 Example of matrix for portfolio analysis



Source: Own elaboration

Figure 28 shows a matrix with different variables. The TTC can evaluate with this matrix if the portfolio is balanced or if, for example, the majority are risky pioneer projects

Figure 29 Project Classification Matrix



Source: Own elaboration

Tool 1 presented in chapter 3.2 is an additional tool to analyze the project portfolio. The compliance matrix checks if the projects are aligned with local and regional strategies and the priorities of the university.

6 Structure and Organization

6.1 Organisational structure

Key Questions:

Which organizational form should choose a TTC? How to organize core processes?

TTCs have implemented various organizational forms, in addition to the most common traditional stand-alone unit or department within the public research organization. Young (2007) distinguish between 4 models:

1. External companies owned by or closely affiliated with the research institution to manage its technology transfer activities,
2. Service or consulting contracts with a third-party company to manage occasional innovations disclosed by researchers,
3. One TTC serving multiple institutions in a region under collaboration agreements,
4. Government agencies serving as a TTC for universities and other research organizations in a region, state, or nation.

It depends on the specific context and factors like the entrepreneurial culture of the institution and of the region or nation which organizational form is the most effective. Young (2007) believes that physical proximity should be an important factor to consider:

He is convinced that the closer the TTC is physically to the scientists and researchers it serves, the more effective it will be. TTC effectiveness diminishes the further it moves physically from its customer base. Even e-mail, SMS, and other video, voice, and digital communication techniques cannot replace frequent face-to-face communication needed between the TTC staff and its customers.

It is important to choose an appropriate organizational structure that facilitates effective collaboration and stakeholders' coordination. Furthermore, the organizational structure needs to reflect the specific project approach, its goals and its activities ("structure follows strategy").

Organizational structure to solve conflict of interests

Technology transfer inevitably brings conflicts of interest²¹. The challenge is to manage them and build necessary processes.

²¹ See also Nelsen (2007)

Table 13 Possible conflicts of interest

Actor	Possible Conflict
University	<ul style="list-style-type: none"> ▪ between goals of maximizing royalty income and promoting publication, ▪ between commitments to fostering spinout companies (for example, by allowing the use of university facilities, staff, or even students) and preserving university resources ▪ between strong IP ownership policies or indirect cost rates and attempts to bring in more research support from industry.
Faculty Members	<ul style="list-style-type: none"> ▪ between time spent in university teaching and research and time spent with the spinout company (time commitment) ▪ Faculty may also be tempted to withhold research data from university research efforts because of potential usefulness to the company for the data to remain secret—or because of harm to the company publishing might cause. ▪ Using students on company projects presents another potential conflict of interest, as does company use of university equipment. ▪ A conflict of interest also arises when a researcher has to decide whether his or her new patent belongs to the university, to him- or herself, or to the spinout company.
Government	<ul style="list-style-type: none"> ▪ between support of basic research in its universities and support of practical focusing on the transfer of new technologies, new spin-off companies, etc.

Source: Nelsen (2007)

Establishing well-functioning processes

A TTC has to establish the following kinds of processes:

- Management processes: these are processes in the area of strategy, planning and management, i.e. processes in the field of strategic TTC management, business plan and M&E
- Core processes: these are processes associated with production within the TTC, i.e. provision of the TTC services, communication, etc.
- Support processes: this kind of process involves providing the infrastructure and resources needed for the organization, ie. IT, Finance, HR and Infrastructure.

Tool 11: Service Blueprinting**Why using this tool?**

The provision of services is the heart of each TTC. Service blueprinting²² is a service planning tool. It can be used for developing new innovative services as well as for improving existing services. The method is also appropriate for ensuring the quality of service processes. It can also be used for new employee training or for showing clients a service cycle overview. It allows identifying which processes are visible for the client and which do not. Service blueprinting with its strong client-focus differs from other methods of process analysis; service blueprinting supports client satisfaction.

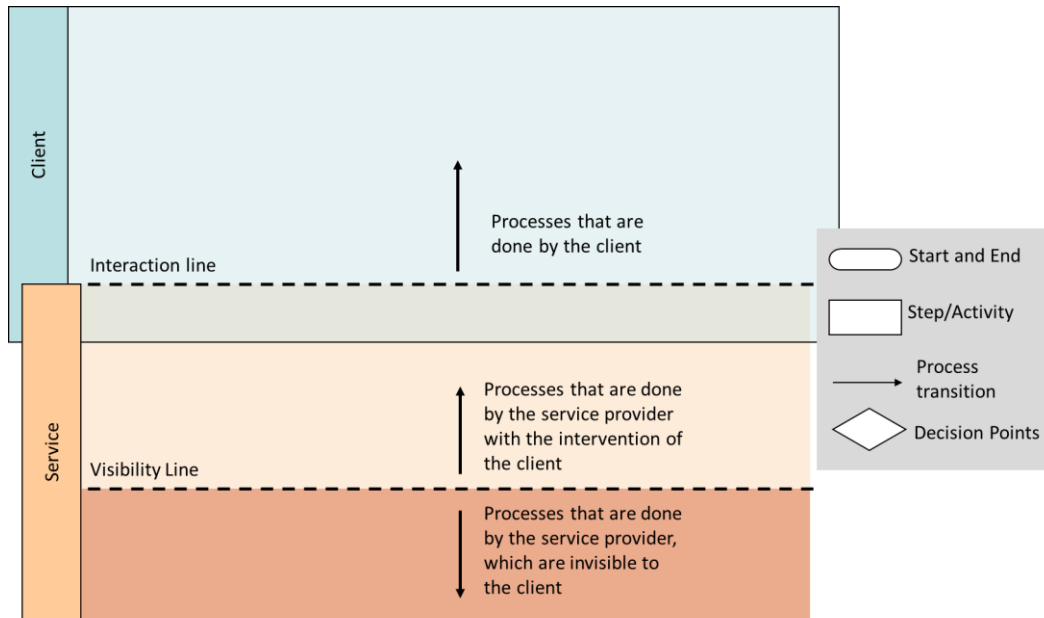
The service blueprinting output consists of a graphically-presented overview of the service process and its activities. Service blueprinting allows for visualization of the service development process in its early stages. In each process step, contact points between client and TTC become visible. It is possible to identify failure points and discover areas for innovation as well.

²² For more information: Dornberger/Suvelza (2012)

What to consider when using this tool?

The process diagram of a service provision must be represented in a continuous way (“service production line”) and all TTC members must be taken into account when elaborating the service blueprint.

Figure 30 Service Blueprinting Structure



Source: iN4iN

6.2 Information and Knowledge management

Key Questions:

Why to install an information and knowledge management system? What are key elements?

A very consistent way to organize TTCs is establishing a structure according to the 5 aforementioned fields of activity. It is recommended establish a more project based organization and, correspondingly, a more project based assignment of tasks, duties and authority. To make sure that the projects can develop their activities in an efficient and effective way, it is necessary to implement some support systems that will ease the flow of information and the execution of activities. The function of information management provides the raw material and means for the proper monitoring and analysis of the markets as well as for the required service portfolio flexible adaptation. This is the reason why the support systems for project management and customer relationship management are critical: these will help to collect, organize, store and analyse the information and, thereby, make a more efficient and effective service delivery possible.

Services which depend on information management will require access to own databases and registries as well as available databases in other institutions. This function also provides information on projects of partners and potential prospects. The outcomes of this function will include, for example, properly processed information about clients' profiles, databases of trainers and consultant in different areas of knowledge and sectors in the country and abroad, very detailed information of the current projects being incubated, supported, promoted or just about the open demands that are waiting to be meet by a partner, among other outcomes.

Customer relationship management, virtual document repository and process documentation

When establishing a TTC, adequate attention must be paid to information management. A TTC has to obtain, organize and maintain key information on IP rights and legal agreements for a long time. The life of a patent as well as the license obligations, for example, may last for up to 20 years. Furthermore, most legal disputes which require access to initial documents come after a successful product launch, often several years after patent filing and licensing.

Patent positions may not be sustainable and income may be lost without adequate access to records. For this reasons and in general, to provide all technology transfer services efficiently, a TTC has to gather, systematize and share project and contact information across the organisation and therefore the installation of a CRM (customer relationship management) style of database is highly useful.

A centralized virtual document repository is necessary to keep information safe and available. This component would include all legal documentation, ready-to-use templates for routinely used documents and description of processes, e.g. the application processes, the business plan development process, the service provision process etc. For this purpose, a Wiki could be the right answer, providing a fast and flexible option for the documentation of concepts, processes, systems, practices, etc.

These components could be installed in the same server where the current systems are and the future project management and customer relationship management systems will be located.

The above mentioned systems can normally be accessed and operated from any computer, and even smart-phones, connected to an intranet or Internet with a log-in function, fostering the mobility of the personnel.

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very detailed information of the current projects being incubated, supported, promoted or just about the open demands that are waiting to be met by a partner, among other outcomes.

6.3 Resources and competence management and outsourcing

Key Questions:

What are the stages of team formation? How to create a winning TTC-team?
What are the most relevant competencies for the TTC staff?

The TTC manager and his team

The core element for successful technology transfer is people, the TTC team. According to Campbell (2007), technology transfer is a “contact sport”. TTC managers must have the ability to contact and communicate with people at all levels and in an international context. They need to be capable of engaging equally well with academics and business people.

The TTC should be led by a person with very good managing skills. Work experience in the relevant industries facilitates to understand the specific needs of the sector, is also very useful. To develop the capability to identify the potential for new opportunities, the TTC manager needs to win the confidence of academics. Therefore it can be helpful for the TTC to be embedded in the university or research institute. So it is easier for the TTC staff to understand what the academics can offer to the business and user community. Likewise, staff must actively engage with the private sector to better understand market needs and gain the necessary knowledge for successful match-making²³.

An effective TTO has a team with complementary abilities. There is no one universal rule for the type of background that TTO staff need; much can be learned on the job and through specific training.

Technology transfer staff - Unusual combination of qualifications:

It's hard to find a TTC manager who is equipped with all the following qualifications. Therefore it is important that the TTC manager builds a diversified team. Nelsen (2007) defines a range of qualifications which a TTC team should cover:

- Understanding of state-of-the-art research with solid background in science or engineering (not necessarily as a practitioner).
- Understanding of the language of industry (Officers must be familiar with markets, how technology is developed into products, accounting and finance principles, and decision-making processes.)
- Understanding of venture capital, start-up promotion, spinout formation, and SME operation
- Familiarity with patent law
- Excellent written and verbal communications skills in both formal and informal situations
- Good negotiation skills
- Ability to deal with multiple constituencies with conflicting objectives, most of whom one has no authority over
- Ability, drive and creativity to solve complex multidimensional problems and arrive at win-win solutions
- Very high personal integrity

Source: Nelsen (2007)

²³ See also Campbell (2007)

Office and Administrative Personnel

TTC operations require additionally a significant office and administrative support for: project summaries, marketing materials, daily correspondence, web site creation and maintenance, etc. Excellent clerical/administrative assistance is essential for the TTC. A TTC that does not have access to appropriate administrative support will always be inefficient.

Outsourcing of specialist advice

Specialist advice can be outsourced (for example patent and legal counsel). An increasing number of legal firms have experience with the academic technology transfer sector, and they should provide a service that responds to the needs of this sector. Most TTCs use external legal advisors, employing in-house advisors and specialist could be an option when the volume and complexity of work make such an appointment financially rational.

The participation in technology transfer networks give access to free advice available to TTOs. Another suitable option could be peer advice provided by experienced people.

Specialized trainings

In order to play a strong role in the local, regional or national innovation systems, it is important to form a competent TTC team. The team should be supported with training and coaching in order to build up the necessary competencies.

There are many opportunities to build core skills in the team through networking, training, and literature. Some ways to improve the skills of the TTC team can be organized for free, e.g. through personal networks and mentors. Internships with business and other TTCs are an attractive way to learn and share good practices. The Association of European Science and Technology Transfer Professionals (ASTP)²⁴, is a professional membership organization for technology transfer managers that hosts conferences across Europe and act as a networking platform.

The following topics are examples for further, intensive trainings oriented to strengthen the overall capacities of the TTC personnel:

- Value chains, local economic development, clusters, innovation systems and special economic zones
- Innovation management at organizational level (product, service, process and business model innovation)
- Innovation barriers and innovation culture
- Intellectual property and Licensing
- Strategic analysis tools
- General management
- Project management
- Business model design (marketplace and marketspace)
- Business planning tools for start-ups

It is of crucial importance that the personnel gains a deep understanding of the research & development and innovation factors and processes, since this knowledge will influence all the action and interventions of the team in a transversal way. These capabilities will enable the team to plan, execute and evaluate all processes in all 5 components of the service portfolio in a much more effective way, not only reinforcing the ability of the members of the team to provide services to the target groups, e.g. consulting for existing companies, coaching to start-ups, etc., but also generating a greater impact in the vision and mission of the institution.

²⁴ <http://www.astp-proton.eu/>

Tool 12: Competency matrix

Why using this tool?

A competency matrix defines the competencies needed in a team, structures the composition of the teams and reflects also soft and managerial competencies.

What to consider when using this tool?

You have to define the levels of proficiency, e.g. on a scale of 1 to 5. For each job the level of proficiency required should be defined.

Table 14 Competency Matrix

		Job1	Job 2	Job 3	Job 4	Job 5
Soft competencies	Initiative					
	Motivation					
	Leadership					
	Teamwork					
	...					
Managerial Competencies	Decision making					
	Communication					
	Delegation					
	Disciplining					
	...					
Technical competencies	Specific technical competency 1					
	Specific technical competency 2					
	...					

Source: Own elaboration

Tool 13 Responsibility Matrix

Why using this tool?

The Responsibility Matrix structures the work and responsibilities e.g. between TTC meetings and involves the people needed for each working step.

What to consider when using this tool?

It is very important to communicate this matrix to the team after each meeting.

Table 15 Responsibility Matrix

	Person 1	Person 2	Person 3
Step 1	R	-	A
Step 2	-	R	A
Step 3	S	S	R
Step 4	A	-	R

r = responsible, s = supports, a = accordance needed

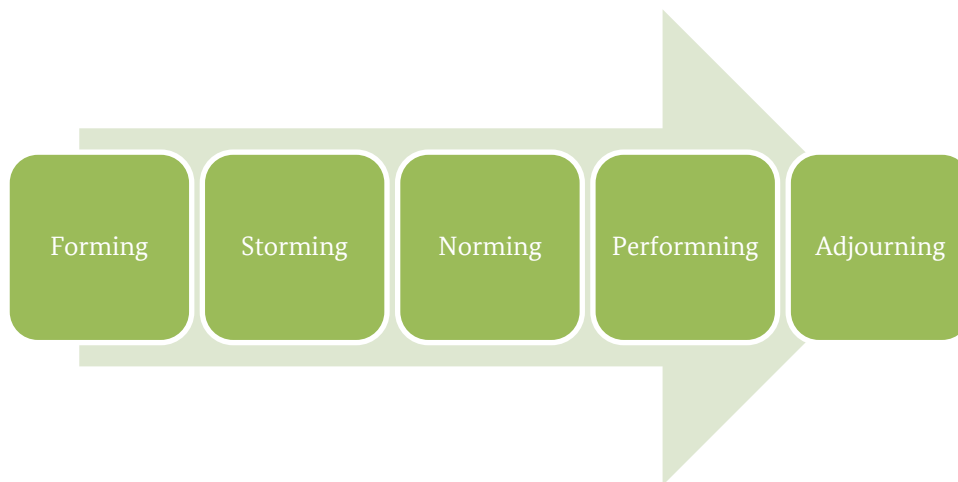
Source: Own elaboration

Tool 14: How to build a winning TTC-Team?

Why using this tool?

Psychologist Bruce Tuckman described 1965 the path that most teams follow on their way to high performance: forming, storming, norming, performing and adjourning.

Figure 31 The 5 steps of team formation



Source: Own elaboration

This tool facilitates the TTC manager to:

- Identify at which stage of development his team is
- Consider what he needs to do to move towards the group formation stage.
- Schedule regular reviews of where his team is, and adjust his leadership approach properly.

Table 16 Group Formation Stages

Forming	Storming	Norming	Performing	Adjourning
Team meets for the first time. Team members are introduced to each other. Information sharing about backgrounds, interests and experience. Team learns about the project, discuss the project's objectives and think about what role they will play in the project team.	Team members compete with each other for status and for acceptance of their ideas. Conflicts because of different opinions on what should be done and how it should be done.	Members work more effectively as a team. Focused on developing a way of working together (processes and procedures). Agreement on team rules and what tools and processes to be used. Team begins to trust each other and now helping each other to work toward a common goal.	Team is highly motivated and focuses on reaching the goal as a group. Trustful work climate. Decision making and problem solve are effectively. Quick consensus building.	Project is coming to an end.
Role of the team leader: Guides and clarifies team goals and provide clear direction regarding the project. Ensures that all of the members are involved in determining roles and responsibilities and establishes together "team norms".	Role of the team leader: Guides the team to solve problems together, settles roles and responsibilities. Establishes processes and structures. Facilitating the team through this stage – learn to listen to each other and assure contributions from all members of the team. Builds trust and good relationships between team members. Coaches in conflict resolution skills.	Role of the team leader: Supports team members take responsibility for progress towards the goals. Ensures that the team members are working collaboratively and begins to function as a coach to the members of the team. Organizes a team-building event.	Role of the team leader: Not involved in decision making, problem solving or day-to-day activities of the team. Delegate tasks and projects as far as you can. Continues to monitor the progress of the team and celebrate milestone achievements with the team. Helps when decisions need to be reached at a higher level within the organization.	Role of the team leader: Celebrates together with the team the success of the project and systematizes best practices for future use. (Or, if it was not a successful project - evaluates what happened and derives lessons learned for future projects.)

Source: Based on Abudi (2010)

What to consider when using this tool?

It is also useful for the TTC manager to consider additionally characteristics that indicate whether a team is working effectively together as a group²⁵:

- Clear communication among all members
- Consensus among team members
- Positive, supportive working relationships among all team members
- Regular brainstorming session with all members participating
- Regular team meetings are effective and inclusive
- Problem solving done by the group
- Commitment to the project and the other team members

²⁵ See Abudi (2010)

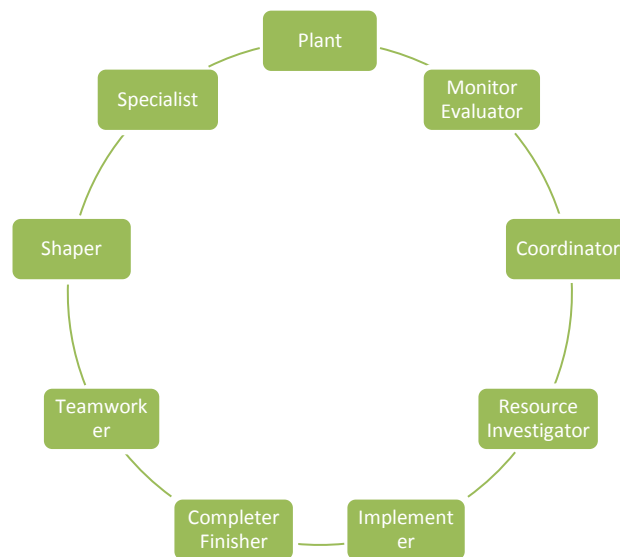
Tool 15: The 9 Team Roles

Why using this tool?

Belbin²⁶ defined team roles to identify people's behavioural strengths and weaknesses in the workplace. This information can help the TTC manager:

- Building productive working relationships
- Selecting and developing a winning TTC team
- Ensuring a complementary "team mix"
- Raising self-awareness and personal effectiveness
- Building mutual trust and understanding
- Facilitating recruitment processes

Figure 32 The 9 Team Roles in a TTC



Source: Own elaboration

The challenge for the TTC manager is to build a complementary team that can cover the 9 roles described by Belbin:

²⁶ See also: <http://www.belbin.com/rte.asp?id=8>

Table 17 Different team roles

	Role	Description
Intellectual	Planter	A TTC needs a creative “planter” to solve problems and think out-of-the-box.
	Monitor / Evaluator	A TTC needs a “monitor/evaluator” because of good judgement and good strategic thinking ability. He is able to derive lessons learnt.
	Specialist	A TTC needs a dedicated and focused “specialist” with in-depth knowledge of key areas.
Social skills oriented	Coordinator	A TTC needs a “coordinator” to enable and facilitate interaction and decision making. Coordinators focus on objectives and can delegate work properly.
	Teamworker	A TTC needs a “teamworker” to build a well-functioning team. A teamworker is a good listener, collaborative, co-operative, and tactful.
	Resource Investigators	A TTC needs a “resource investigator” to develop contacts, communicate with stakeholders, explore new ideas and opportunities, and bring enthusiasm and drive to the team effort.
Action oriented	Implementer	A TTC needs an “implementer” to translate the team’s decisions and ideas into manageable and operational tasks or actions and implement them as efficiently as possible.
	Shaper	A TTC needs a dynamic “shaper” to ensure that the team keeps goal oriented and does not lose momentum. The can also handle well work pressures and is able to overcome obstacles.
	Completer / Finisher	A TTC needs a “completer/finisher” at the end of tasks or milestones to meet high standards of quality. He is meticulous, with attention to detail and the ability to meet deadlines.

Source: based on <http://www.teambuildingportal.com/articles/systems/belbin-team-roles>

What to consider when using this tool?

“The 9 Team Roles” doesn't mean that you need nine individuals in a TTC, each with one strong team role. A team member can easily play two or three roles well, and should learn to adapt the behaviour to the needs of the team's objective.

6.4 Management of specific aspects and support tools and techniques

Each TTC should install an efficient project management system. This system should be able to organize the work in areas (e.g. areas of the service portfolio), subareas (e.g. subareas of the portfolio), large projects or programs (e.g. by sectors or knowledge areas) and single projects (e.g. a specific training, a start-up, networking event, fair, an innovation project, etc.) and activities (i.e. the activities, stages or components that make up one project, for example, the different concrete operations such as arrangement of logistics, purchase of materials, installation of a machine, or the conduction of a meeting).

With the help of the IT department, a system should be connected to existing systems. Open source, cost free, user friendly software is available to be downloaded and installed in a server. Once configured, this can be the operated by selected users, who would have certain access and rights to administer, modify or read contents partially or completely. Additional features of the system should allow, for example, assigning the expected time budget and registering the used time for the completion of each task, easing the aggregate calculation of time (here as a cost factor) planned and invested by project, program or subarea and area. This and other numerous features, together with the automatic

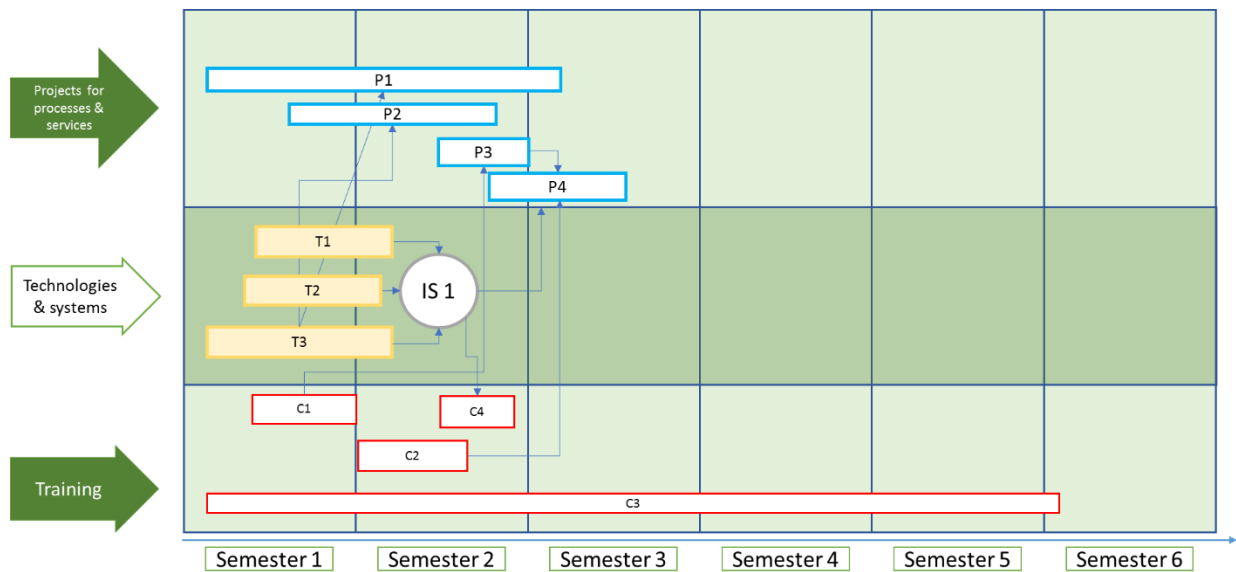
documentation of each intervention by each user in every task, will significantly reduce the time invested in simple administrative jobs and controlling.

Tool 16: Roadmap

Why using this tool?

The following roadmap shows an example plan for the implementation of different possible measures. The roadmap summarizes training measures, the systems or technologies needed and the projects that would enable a TTC to implement, improve or re-launch services or processes.

Figure 33 Roadmap Example



Source: Own elaboration

Example:

Trainings

- C1: In-depth trainings on innovation topics
- C2: In-depth trainings on strategy and business planning topics
- C3: Trainings on English language
- C4: Training on new software and systems

Systems & Technologies

- T1: Project management system (software including calendar management)
- T2: Customer relationship management system (CRM software)
- T3: Virtual document repository and process documentation (including database and categories)

IS 1: Integrated system for project, information and extended relationships management

Projects for processes & services

- P1: Re-launch: Mechanism for funding identification and intermediation
- P2: Internal monitoring process for calls for applications and other opportunities of cooperation
- P3: Adoption and implementation of innovation management process and tool-box
- P4: New process and tool-box for project portfolio analysis and management

What to consider when using this tool?

The above shown roadmap is a representation of the proposed time, sequence and interdependence of the measures. It is recommended that the TTC adjusts this tool to its changing needs, resources and priorities.

Customer relationship management system (CRM)

A further essential system that must be installed is the one that supports the management of communication, history and all relevant information of clients and potential prospects, beneficiaries, companies, scientists, potential entrepreneurs, consultants and any other relevant individual or organization. A *customer relationship management system* (in this case an *Extended Relationship Management System*) makes possible to plan, visualize, carry out and evaluate communication, helping develop the relationships. For the TTC, this system will enable the delivery of significant portions of the service portfolio. Open source and cost free software is also available.

7 Finance

7.1 Funding Sources

Key Question:
What are the main sources for TTC funding?

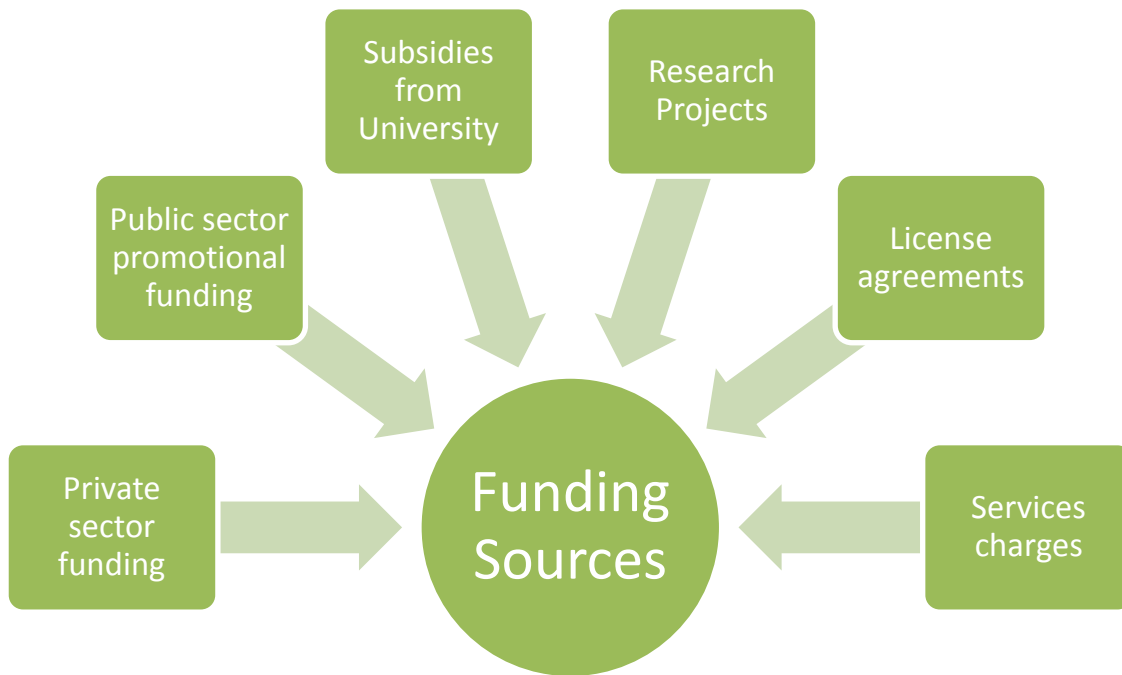
TTC financing comes from different sources. Examples are: A base funding paid by the government, fees for technology transfer and innovation support services or licensing income.

Most of the TTCs today operate as associated private companies, exclusively owned by the corresponding university and supported with university funds. As private companies, these TTCs are very active in business-development services, such as setting up incubators, assisting SME to prepare business plans, supporting new spinout companies.

One example is “Humboldt-Innovation” (HI). HI is a 100% subsidiary enterprise of the University. The advantage is that as a professional private-sector company, HI can operate more flexibly, more independently and with higher speed. So it's easier to position itself as a reliable, open and competent partner.

Using the company model, the TTC can generate income through a variety of related business activities such as consulting, conference management, and training courses.

Figure 34 Overview of different TTC funding sources



Source: Own elaboration

Practical Examples: Financing Models from different countries

Australia's models

In Australia the environment is comparatively unregulated. Public research organizations have to finance their own technology transfer activities. There are two models:

- Formation of an external company: The company generates cash flow through business activities, such as consulting, conference management and training. The profits are used to support its technology transfer function.
- Establishment of an internal-office: In this case, the organization provides direct funding to the TTO. The amount of funding depends on both TTC's ability to demonstrate the benefits it can bring and how important innovation management is to the organization.

India's model

There is no formal legislation for funding TTCs in India. Nevertheless, most technical universities and research institutes have founded their own organizations, which serve as TTCs. Some of them received seed funding from local or central government. For example, Indian Ministry of Human Resource Development has provided the Indian Institute of Technology in Delhi with US\$400,000 funding to establish the Foundation for Innovation and Technology Transfer. Sometimes the universities themselves also fund these organizations.

However, all the financial supports are only for a limited period of time. In a long run, these organizations are expected to be able to generate profits through business activities for its operations. Normally, they can benefit from royalty income from the technology transfer transactions for other public research organizations.

In April 2005, the Society for Technology Management was founded. It is a professional technology transfer society with institutional and individual members.

Japan's model

The Japanese government enacted legislation to create government-approved university TTCs in 1998. The government provides two-thirds of its operating cost, up to US\$300,000 per year for five years for those approved TTOs. The other one-third is provided by the universities. After five years the TTCs are expected to generate profits to run independently. After the Japanese government realized that such expectations could not be realized, it extended its direct subsidy of a portion of the cost of TTC operations, including the direct allocation of funds to secure patent applications for selected top-tier TTCs. In 2004, all national universities were allowed to take part in TTC initiatives because they received independent legal status according to Japanese law.

Finally, a number of Japanese TTCs quickly recognized that the funding from the government was insufficient to support their operations. Therefore, they created associated for-profit companies that facilitated the creation of spin-out companies. Faculty members were encouraged to invest in these companies, which commercialized university R&D. Several faculty-owned companies associated with university TTCs exist to assist the commercialization of R&D through spinout companies. Faculty members were motivated to disclose their inventions because they have a share in the company. However, the government and universities realized that new support systems, for example, incubators, are needed for expanding strategy so that those Japanese institutions become entrepreneurial universities.

People's Republic of China

Nowadays, most public research organizations in China have their own TTCs. Most of the TTCs today operate as associated private companies. These TTCs are very active in business-development services. Frequently, the TTCs negotiate for significant equity shares in new university spin-out companies and may wholly own some spin-out companies. Like their counterparts in Australia, the Chinese TTCs are also expected to become self-sufficient from their equity holdings and the income received from business activities.

South Africa

As a key economic-development strategy, South Africa government supports the research and innovation. In 2002, South Africa's government approved a new national R&D strategy, and discussions continue for implementing the new strategy, including national funding for technology transfer. Funding for commercialization activities and patents is critical, but a major capacity-building and development effort is under way. This effort will build upon capabilities that exist in a few universities and public research councils.

South Africa attempts to build strong links between its emerging technology transfer system and its research system. This means to cultivate a new culture of innovation inside the research community and to ensure that all benefits of research are understood and exploited. For this purpose, the Southern African Research and Innovation Management Association (SARIMA) was formed in 2002 to assume the leading role in national efforts to build capability in research and innovation. SARIMA is supported by the government, academic institutions and philanthropic donors from US and Europe.

South African government established its Innovation Fund to promote technology innovation as a key development strategy. The fund has invested South African Rand ZAR 650 million in more than 100 projects. Patents and spinout companies were produced from those projects. Most recently, the government established the Innovation Fund Commercialization Office, which supports to protect and commercialize intellectual property rights for all of the nation's public research organizations. It complements existing technology transfer offices in South African public research organizations.

United Kingdom

Many policy initiatives and government funding streams were established to stimulate cooperation between the researchers at universities and the country's industrial entrepreneurs after 1998. After that, the way universities in the United Kingdom organize their technology transfer activities changed dramatically. Several prominent universities created separate companies to commercialize high potential IP and innovations. However, the majority of universities still have internal TTOs that collaborate closely with the sponsored-research office and with the UNICOs to develop industry relationships. The growth and development of TTOs have been stimulated more recently by direct government funding to universities through a formula funding process.

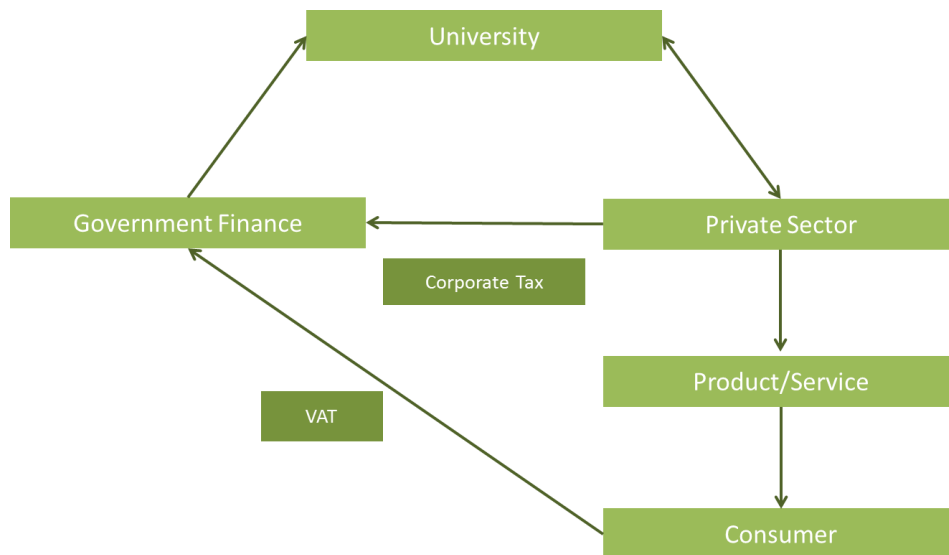
Source: Young (2007)

Public funding

According to Sullivan (1995), the commercialization of academic research (technology) allows monetary proceeds from the research to be returned to the originating institute, ensuring more research, more jobs, thus more progress. Government funds have this funding circulation (Figure 34):

1. Government finances or provides funds to the universities to create or develop technology;
2. Universities transfer the technology to the industry through whichever mechanism agreed between both parties (consultancy, exchange program, joint venture, cooperative R&D agreement, licensing, research contract, or training);
3. The industry produces goods or services with the new technology and sells it to the final consumers;
4. The final consumers return the initial fund to the government through payment of taxes, also known as Value Added Tax. Corporate taxes are also paid by the industry.

Figure 35 Overview of Funding Circulation



Source: Sullivan (1995)

Tool 17: Time and financial expenditure for different forms of transfer

Why using this tool?

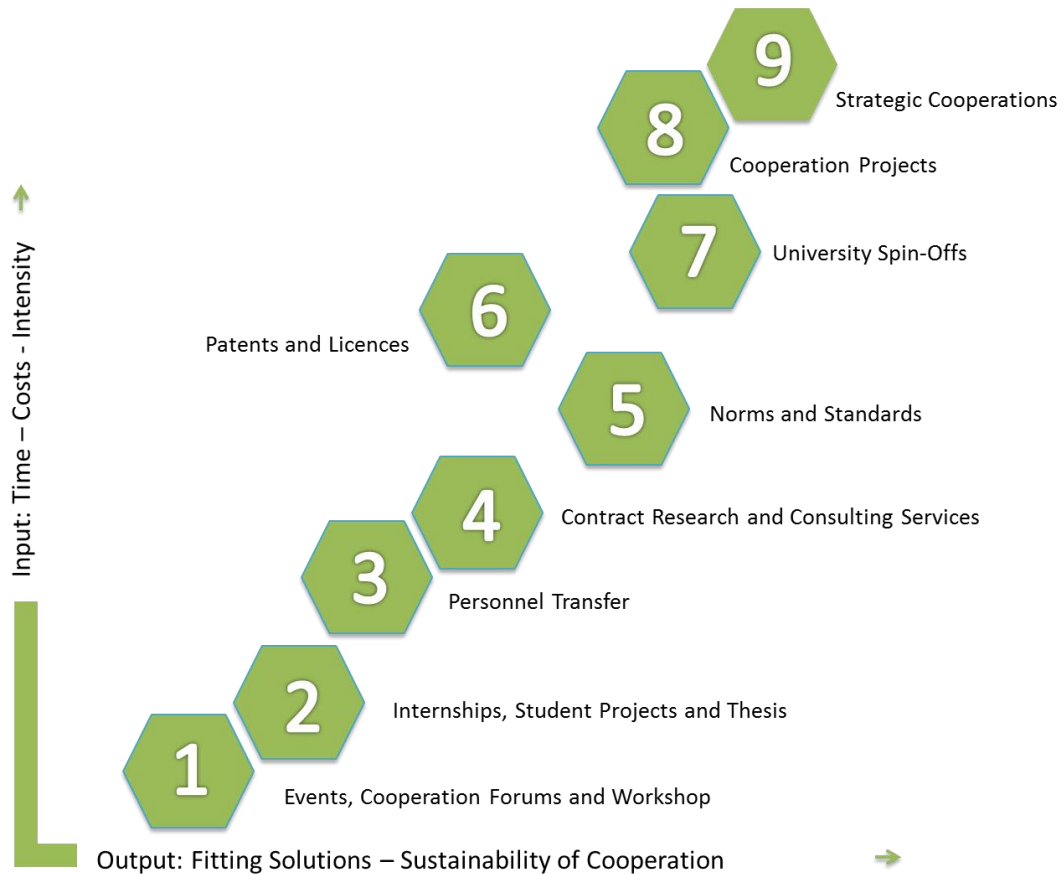
The tool can help the TTC to find an adequate, effective, objective-oriented combination of different transfer mechanisms and promotion instrument in order to achieve maximal success for the cooperating partners. Figure 35 shows an overview of different common mechanisms and compares those regarding inputs and outputs.

What to consider when using this tool?

It is important to check if the TTC provides a good mix of transfer instruments:

- Activities with less effort and costs but quick wins to raise awareness and implement first small cooperation projects to build trust among stakeholders
- Application of input-intensive instruments with sustainable long-term cooperation and strong impacts

Figure 36 Input-Output TT Mechanism Matrix



Source: TSB Innovationsagentur Berlin

International Source for Turkey

International Bank for Reconstruction and Development (IBRD)

According to Reisman, et al. (2004), IBRD is supporting several initiatives to address Turkey's development, which includes 4 components:

Component I: Support to Enterprise Innovation

The implementing agency is Turkish Technology Development Foundation (TTGV), with a total amount of financing of USD 52 million. The activities envisaged under this component will seek to broaden and deepen the system of technology support for enterprises in Turkey. These activities will help to move the enterprise technology support system to a position where (i) any enterprise with the potential to use technology in developing its business competitiveness will be able to access appropriate support at a level commensurate with its needs, and (ii) that enterprises will be able and are encouraged to progress up to more advanced technological solutions as their understanding and need for technology evolves.

Component II: Information Society Development

The implementing agency is the State Planning Organization. The total amount of financing is US\$ 52 million. The objective of this component is to support the application of information and communication technologies (ICT) to (i)

improve the delivery of public services to enterprise and citizens; and (ii) to provide strategic ICT training to senior Government officials.

Component III: Developing Skills for the Knowledge Economy

The implementing agency is Turkish Confederation of Employer Associations, the total amount of financing: US\$19.5 million. The goal of the component is to introduce approaches aiming at increasing the level of knowledge economy skills (KES) in the workforce in order to increase the productivity and competitiveness of enterprises. The proposed component has three distinct objectives, namely to: (i) identify and promote demand for KES services, (ii) deliver KES to workers and the unemployed including first time job entrants, and (iii) to monitor and evaluate the impact of KES.

Component IV: Strengthening the Knowledge Economy (KE) Environment

The implementing agencies: State Planning Organization, State Institute of Statistics, Total financing: US\$6.5 million. This component consists of four types of activities: (i) undertake monitoring and evaluation (M&E) activities for the overall project; (ii) collect KE and Innovation indicators compatible with EU standards and provide quantitative information for an annual white paper; (iii) publish an annual KE and Innovation white paper; and (iiii) raise awareness of KE issues and opportunities for Turkey.

European Investment Fund (EIF)

The Technology Transfer Accelerator Turkey (TTA Turkey) is an initiative designed by the European Investment Fund (EIF) in cooperation with the Ministry of Science, Industry and Technology, the Scientific and Research Council of Turkey (TUBITAK), the Delegation of the European Union to Turkey and the DG Regional Policy of the European Commission. TTA Turkey is co-financed by the EU and the Republic of Turkey under the Regional Development Component of the Instrument for Pre-Accession Assistance (IPA) funds and managed by EIF. The Regional Development Component of IPA is managed by the Ministry of Science, Industry and Technology.

The TTA aims at achieving two objectives:

(i) setting-up a financially sustainable fund by facilitating the commercialization of scientific research and development (R&D) confined in universities and research centers; and (ii) catalyzing development of the technology transfer market in Turkey, with a particular emphasis on spill-overs to the less developed/developing regions of Turkey. The project will encourage the commercialization of R&D is an underserved value chain in Turkey, lacking private investment.

7.2 Service costing and pricing

Factors to consider in pricing

When determining prices to charge for a service you should consider the following factors²⁷:

Table 18 Pricing Factors

Cost-plus pricing	Standard method of pricing in business seeks to first determine the cost of providing a service, and then add an additional amount to represent the desired profit. To determine cost, you need to figure out direct costs, indirect costs, and fixed costs.
Competitors' pricing	You need to be aware of what competitors are charging for similar services in the marketplace.
Value-based pricing	The important factor in determining how much customers are willing to pay for a service may not be how much time you spent providing the service, but ultimately what the perceived value of that service and your expertise is to them.

Source: based on Wassermann (2009)

Calculating costs

Before you set a price for the services your TTC will provide, you need to understand your costs of providing these services to clients. The cost of producing any service is made up of the following three parts:

Table 19 Cost calculation

Materials cost	Costs of goods you use in providing the service.
Labor cost	Cost of direct labor you hire to provide a service (hourly rate).
Overhead costs	Indirect costs to your business in providing services to customers. Examples include labor for other people who run the firm, whether administrative assistants or human resources personnel. Other overhead costs include your monthly rent, taxes, insurance, depreciation, advertising, office supplies, utilities, mileage, etc. The overhead costs can be billed to each service in a percentage (10-20%).

Source: based on Wassermann (2009)

Different Pricing Models

If the TTC understands what are the costs providing a certain service, what your competitors are charging, and how customers perceive the value of your services, the TTC has to decide whether to charge an hourly rate, a per-project rate, or try to negotiate an advance for the services.

Here are some benefits and risks associated with the following pricing models:

²⁷ See also <http://www.inc.com/guides/price-your-services.html>

Table 20 Pricing Models

Charging an hourly rate	Pricing services on an hourly rate is preferred by a lot of companies. This ensures that you are achieving a rate of return on the actual time and labor you invest in serving each customer. Hourly rates are often used when pricing own consulting services, instead of pricing a service that uses labor and materials from others. The rate should be determined by amount of expertise and experience.
Charging a flat fee	Even though customers prefer a fixed rate, the TTC bears the risk losing money on the client, for example, because a project takes longer than expected to complete.
Variable pricing	In addition the TTC has to determine whether to follow a fixed-price policy and charge all the customers the same amount (which is preferable) or whether to apply variable pricing, in which bargaining and negotiation helps to set the price for each customer (for example a price break for quantity).

Source: based on Wassermann (2009)

Test the market for new services and prices

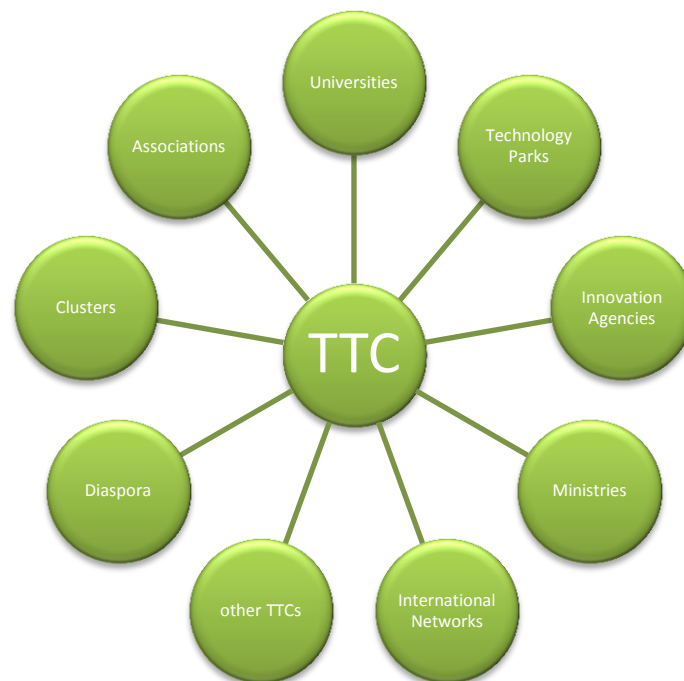
In order to help the TTC to sell more of the services, it is a good strategy testing new prices, new offers, and new combinations of benefits and premiums/bonus.

8 Networking

Networking is an essential task in the technology transfer process. A TTC is the player responsible to generate this space or “ecosystem” for academics, scientist, entrepreneurs and businessman and all other target groups. There are a lot of mechanisms to foster networking and exchange. Networking events can provide, if well designed, an appropriate platform to bring together stakeholders from different sectors. The TTC should develop own context-specific and creative approaches for networking-promotion events. It is recommended (1) combining formal activities with freer, less formal activities, (2) define specific objectives for these events, (3) think carefully about the target groups to be invited.

The challenge of the TTC is to create a broad multi-stakeholder cooperation network with local, regional, national and international partners. The following figure shows a possible partner spectrum:

Figure 37 Potential Networking Partners



Source: Own elaboration

8.1 Actor analysis

Key Questions:

What are the key stakeholders for the TTC? How can the TTC identify these actors?

An essential task for the TTC is to identify and foster relationships with stakeholders. Key actors include academics, representatives of the business and user community, and regional and governmental offices. Successful technology transfer is demand driven, so it is important to understand the partner's needs but also their potential to support or cooperate with the TTC.

Tool 18: Stakeholder Analysis – Identifying Supporters and Cooperation Partners

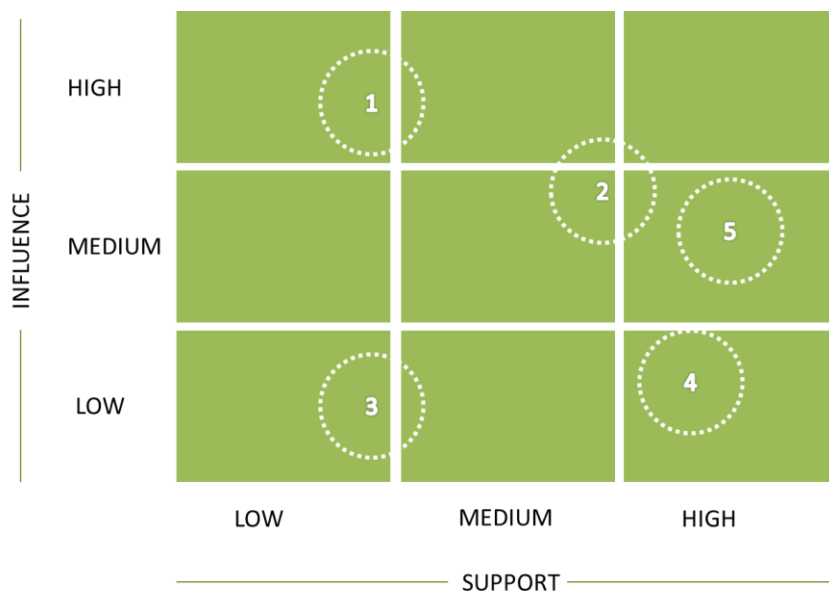
Why using this tool?

Chapter 3 already introduced a helpful tool for the actor analysis. An additional straightforward tool provides a quick overview of relevant supporters and cooperation partners and their importance for the TTC. The stakeholders are mapped considering influence and support possibility. After completing the analysis, concrete measures can be derived to target these organizations.

What to consider when using this tool?

Stakeholders are the organizations (or individuals) who should support (money, know-how, decision makers, etc.) and want to support the TTC and the projects.

Figure 38 Stakeholder Matrix



Source: Scheer/Zallinger (2007)

8.2 Measures for local, regional, national and international networking

Key Question:

What measures can the TTC implement to promote networking at different levels?

The TTC can implement various measures to promote local, regional, national or international networking. The following table and the practical examples give an overview about possible activities and their benefits.

Table 21 Networking Measures

Networking Level	Possible Measures
Local	<ul style="list-style-type: none"> ▪ Organise working-group meetings in order to bring together and establish a communication bridge between research institutes, enterprises and SME unions in order to exchange information, share ideas, identify common areas of interest and explore the possibility of collaboration between actors (technology providers and technology receivers). ▪ Fostering meetings between universities/research centres and companies ▪ Events including local government and civil society to raise awareness about the benefits of technology transfer also for local communities addressing economic, social and environmental problems.
Regional	<ul style="list-style-type: none"> ▪ Match-making seminars where technology offers and requests are presented to potential partners; cluster structures can facilitate to identify the SME with specific requests. ▪ Working sessions and events with clusters / cluster management ▪ Events (e.g. innovation or business plan competitions) to maintaining relationships with venture capitalists and other investors. ▪ Regional Innovation Fairs where the regional research results and excellences are displayed and offered to the national market. ▪ Regional or national network events of TTCs from (public) research organizations to share good practices ▪ TTO organises working-group meetings in order to bring together and establish a communication bridge between research institutes, enterprises and SME unions in order to exchange information, share of ideas, identify common areas of interest and explore collaboration possibilities. ▪ Innovation Club: organization of meeting introduced by guest speakers with the goal of creating a chance to meet and compare experiences of experts working in industries, universities, research centers and public authorities.
National	<ul style="list-style-type: none"> ▪ Technical conferences or working groups with colleagues to elaborate e.g. national policy proposals (IP legislation, etc.) ▪ Innovation Festival: a local or national event with exhibitions, conferences and workshops, that aims at showing to the public and regional, national and foreign stakeholders the activities of the regional or national innovation system, the technological clusters, the new high tech companies, patents and results of regional research. ▪ National Road Show: Public events to present to national stakeholders updated reports of the regional innovation system.
International	<p>International linkages are increasingly important as globalization advances. Building networks with partners from around the world will provide opportunities for many forms of technology transfer, good practice sharing and for capacity building. The TTC can become for example member of:</p> <ul style="list-style-type: none"> ▪ ASTP-Association of European Science and Technology Transfer Professionals ▪ Enterprise Europe Network

Source: Own elaboration

See also: http://www.eie.gr/met3/deliverables/C3_1/C_3_1TechnologyTransferGoodPracticesToolkit.pdf

Practical Example: Speednetworking – Industry meets Science



The TEA-Network in Augsburg, Germany organized in the last 6 years the networking event „Speednetworking“. It is a straightforward, efficient networking mechanism for businessman and scientists. In a short period of time (minutes!) the participants can meet a lot of potential cooperation partners with innovative ideas and learn in which topics businessman and researcher are working on and interested in.

Source: <http://www.tea-transfer.de/index.php?id=speednetworking-2013>

Practical Example: iN4iN Network



As part of its goal to support the growth of innovative SMEs, iN4iN seeks to partner universities and institutions around the world to promote product and service innovations oriented to new or existing markets, as well as the development and implementation of new innovative processes.

iN4iN is present in Europe, Latin America, Africa and Asia. In these regions, iN4iN has partnered universities and institutions to provide approaches dedicated to conveying theoretical knowledge, application-oriented findings and practice-relevant experience with regard to the management and promotion of innovation in Small and Medium-sized Enterprises (SMEs).

Source: <http://in4in.net/>

Table 22 International Networks – Potential Partners

Name of the Network	Brief Description	Link
Wainova	WAINOVA coordinates 25 associations of science / technology parks and innovation-based incubators all over the world. Its mission is to contribute to the world's economic and social development by promoting innovation, technology transfer and the establishment of innovation-based companies.	http://www.wainova.org/
IASP	IASP is the worldwide network of science parks and areas of innovation. We connect the professionals managing science, technology and research parks (STPs) and other areas of innovation.	http://www.iasp.ws/de/home
Enterprise Europe Network	The Enterprise Europe Network (EEN) is a key instrument in the EU's strategy to boost growth and jobs. Bringing together close to 600 business/SME support organisations from more than 50 countries. Member organisations include chambers of commerce and industry, technology centres, research institutes and development agencies.	www.een.ec.europa.eu
AUTM	The Association of University Technology Managers (AUTM) is a global network of more than 3,200 technology transfer professionals who work in academic, research, government, legal and commercial settings. AUTM is dedicated to promoting and supporting technology transfer through education, advocacy, networking and communication.	http://www.autm.net/home.htm
ASTP	ASTP-Proton is the European association for professionals involved in knowledge transfer between universities and industry.	http://www.astp-proton.eu/

Source: Own elaboration

8.3 Measures for cross-sectoral networking or collaboration

Key Question:
How can the TTC promote cross-sectoral collaboration?

Match-making events between technology providers and technology receivers can be, if well designed and implemented, an efficient collaboration measure. Another option is that the TTC facilitates the match-making between two industry sectors (e.g. IT and tourism) to explore innovation potentials. The TTC can support this cross-sectoral collaboration through moderation and research capacities for the development of innovative products/services.

The TTC should consider the following steps when planning match-making events between academic and private sector:

1. Identifying relevant industries with collaboration interest
2. Conducting a needs assessment
3. Presenting the results in a workshop
4. Developing together new products/services
5. Realizing a match-making event
6. Supporting the business development

9 Marketing and communication

TTCs are located in an interface or bridging position that requires excellent communication and marketing skills.

Additionally it's a crucial to develop a high reputation and a strong brand based on reference projects demand-oriented services and M&E results that help the TTC to position like a professional and reliable partner for technology transfer. This can be reached by showing some of positive experiences and success stories. The TTC could show the results of its work in order to enhance the importance of the institutions and improve the positioning and image to the eyes of the private sector. It is important to show numbers related to the achievements; however, testimonial-based marketing of successful cases will have better results regarding the position and role of the university-related institutions in the perception of other relevant organizations and society in general. These cases can be developed and shown as stories for each component of the portfolio. However, the focus of the information to be shown must be fixed in the experiences, positive results of the activities and services. Enhancing the effort or "good execution of activities" by the TTC could even deteriorate the image. Emphasis should be made in positive results experiences and learning processes, even if these are few and of a more qualitative nature.

9.1 Communication channels

Key Question:

How to organize the internal and external communication of the TTC?

The TTC should establish clear internal and external communication channels.

Table 23 Forms of communication

Direct Communication (face-to-face)	Indirect communication
Objectives	
<ul style="list-style-type: none"> ▪ Strategy Development ▪ Project Development ▪ ... 	<ul style="list-style-type: none"> ▪ Information ▪ Coordination ▪ ...
Tools	
<ul style="list-style-type: none"> ▪ Regular/General Meeting (Jour Fixe) ▪ Working Group Sessions ▪ Workshops ▪ ... 	<ul style="list-style-type: none"> ▪ E-Mail ▪ Telephone ▪ Skype ▪ Social Media ▪ Groupware ▪ Newsletter ▪ ...

International Language Skills

It is recommended to become more familiar with this widely spread language. Not only interaction possibilities depend on that, but also the transaction and communication costs with international partners would be reduced.

Moreover, much of the information to be retrieved and processed for the provision of services is in English, as well as most of the available information useful for monitoring, strategic-decision-making and further development of capabilities.

Tool 19: Communication Matrix

Why using this tool?

The communication matrix helps the TTC to organize and structure different types of meetings. The tool gives an overview about objective, medium, frequency, participants, responsible and deliverables.

What to consider when using this tool?

It is important to really realize the planned meetings and elaborate and then share the meeting minutes.

Table 24 Communication Matrix

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable
• Kickoff Meeting	• Introduction of the project team and the project. • Review project objectives and management approach.	• Face to Face	• Once	• Project Sponsor • Project Team • Stakeholders	• Project Manager	• Agenda • Meeting Minutes
• Project Team Meetings	• Review project status with the project team.	• Face to Face • Conference Call	• Weekly	• Project Team	• Project Manager	• Agenda • Meeting Minutes
• Project Status Meetings	• Report the status of the project to management.	• Face to Face • Conference Call	• Monthly	• Project Team	• Project Manager	• Project Status Report
• Project Status Reports	• Report the status of the project including activities, progress, accomplishments, costs and issues.	• Email	• Monthly	• Project Sponsor • Project Team • Stakeholders	• Project Manager	• Project Status Report

Source: Own elaboration

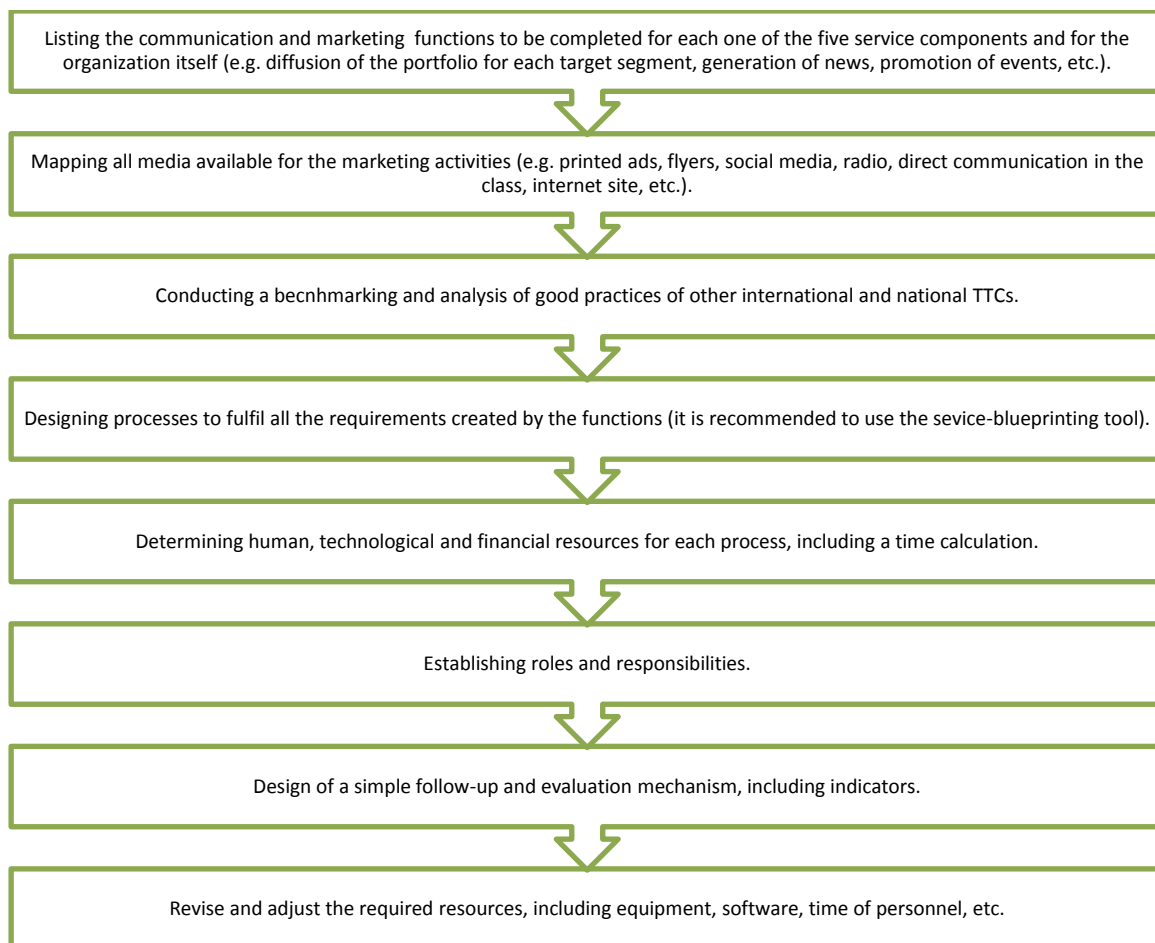
9.2 Marketing tools

Key Questions:

What are the key steps to design a marketing/communication strategy?
What are the main elements of an adequate marketing mix?

The marketing and communication activities of a TTC have to be developed with the assistance of a communication team. The following steps are recommended for the analysis and (re)design of a marketing and communication strategy:

Figure 39 Designing a marketing strategy



Source: Own elaboration

Tool 20: Marketing Mix – The 6Ps

Why using this tool?

The marketing mix helps the TTC to define the marketing elements for successfully positioning the market offer and can also be used to test the existing TTC marketing strategy.

Figure 40 TTC Marketing Mix



Source: Own elaboration

What to consider when using this tool?

The following selection of key questions helps the TTC to identify marketable elements and marketing channels/instruments and to improve the marketing strategy of the TTC:

Table 25 TTC Marketing Mix – Key Questions

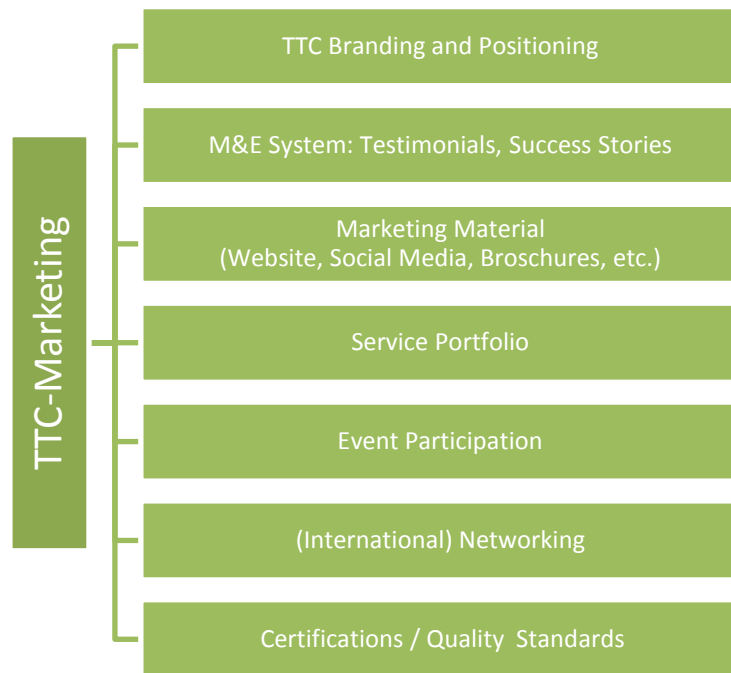
6 P	TTC relevant key question?
Product	Product / service portfolio of the TTC <ul style="list-style-type: none"> ▪ What special features have the services of the TTC? ▪ What customer benefit & value offer the services of the TTC? ▪ What type of specialized / focused services certain technologies, geographical area, etc.) ▪ Does the TTC offer new innovative services?
Price	<ul style="list-style-type: none"> ▪ Does the TTC offer differentiated prices (e.g. according to customers)? ▪ Does the TTC offers bundled package prices?
Place	<ul style="list-style-type: none"> ▪ Where the TTC does offer the services? ▪ In which regions offers the TTC services?
Promotion	<ul style="list-style-type: none"> ▪ Does the TTC have a corporate identity and marketing material? ▪ Does the TTC organize or participate in special events? ▪ Does the TTC have a professional website (also in English) presenting the services and other relevant information ▪ Does the website include references and success stories? ▪ Does the TTC use Web 2.0 applications and social media such as blogs, YouTube, facebook, linkedin ▪ Does the TTC have professional marketing material such as brochures and presentations (also available in English)
People	<ul style="list-style-type: none"> ▪ Does the TTC have a responsible for marketing activities? ▪ Does the TTC act with service and customer orientation? ▪ Does the TTC include “users” into the service development process? ▪ Does the TTC offer incentives to the staff (e.g. bonus, commission)?
Processes	<ul style="list-style-type: none"> ▪ Did the TTC design and implement marketing and sales processes? ▪ Did the TTC define who is doing what, when, and with which resources? ▪ Did the TTC introduce a smart CRM system?

Source: Own elaboration

Components of TTC Marketing

The following figure gives an overview of important components for a TTC marketing strategy:

Figure 41 Components of TTC Marketing



Source: Own elaboration

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- WAINOVA: <http://www.wainova.org/>
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