

Volume

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Training of Trainers in Technology Transfer

Train the Trainers
Handbook

Imprint

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Training of Trainers in Technology Transfer

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INTRODUCTION

This handbook aimed at training of trainers (ToT) was prepared as one of the outcomes of the project NoGAP: Knowledge Transfer Community to bridge the gap between research, innovation and business creation. The overall objective of this FP7-INCO project is to reinforce the cooperation with Eastern Partnership countries to develop a “Common Knowledge and Innovation Space” on the societal challenge secure, clean and efficient energy. Additionally, NoGAP is aimed at knowledge and technology transfer from research to innovative companies and the market take up.

This training material was prepared in order to enhance mutual learning in the area of knowledge and technology transfer. It will be used mainly within the trainings delivered throughout the project in the Eastern Partnership Countries (Belarus, Georgia and Ukraine) aimed at preparing the trainers to bring the knowledge on how to create favourable environment for development of technology transfer between research and business. This transnational training manual could serve also to other European countries for delivering of ToT. It is prepared in such a manner that it can be used also afterwards in other types of trainings not only in this specific area but also in other educational activities.

Even though the primary target group consists of trainers and multipliers, this handbook can be useful also for other types of stakeholders. The handbook is intended to a wider group of users because the training has to be approached in a broader context in which the potential users of this handbook directly influence the quality of the training. It is not the purpose of this training manual to equip the trainers with basic skills but to address trainers who already have certain skills mostly with regard to the topic addressed to proceed to a higher level of training implementation.

Additionally, this manual goes hand in hand with other handbooks delivered within the project NoGAP which are aimed at training of researchers and training of SMEs/Start-up entrepreneurs. These are the main actors of technology transfer and thus, will be the end users of knowledge provided by trainers.

ToT in the area of knowledge and technology transfer using advanced training techniques will contribute to build the capacity to design, implement and monitor the effective technology transfer and to reinforce the potential partners in becoming active participants in the process of transfer of knowledge and technologies.

In the beginning, the handbook focuses on general principles of ToT containing the design, methodology and planning of the training, but also some tips for trainers to improve their skills and to facilitate the training process. The objective is that the trainers obtain some “manual” which will help them to successfully deliver the training of high quality and efficiency. Since the present times require more sophisticated and modern design of training, the multiplication methods shall not be omitted.

The second chapter of this handbook is aimed at the main features of knowledge and technology transfer that should be taken into account by trainers when they want to impart information and knowledge on successful collaboration of research and business.

In order to learn from real life situations and best practice examples, the third chapter is devoted to the case studies related to the successful systems of technology transfer across the European countries: Germany, Slovakia and Romania. The macro-regional approach is captured by the case study from the Danube Region which allows displaying even higher level of networking and partnerships.

Finally, thanks to the chapter devoted to the topic of how to write a successful project proposal, the trainers may pass on the knowledge to the potential trainees (e.g. researchers and SMEs) in the field of project development and proposal writing. The funds obtained through the successful projects may help to further develop the technology transfer process and to bridge the gap between research and industry. ToT in this regard is an important instrument which helps to build the capacities of trainers.

An old saying says:

“Give a man a fish and you feed him for a day, but teach a man to fish and you feed him for a lifetime”.

Even this saying highlights the importance of training which is becoming an inevitable part in the process of imparting knowledge, skills and experience towards practical use in real life.

The authors and the trainers

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General principles of training of trainers

This handbook is intended for training of trainers (ToT) mostly in the area of knowledge and technology transfer. The main specific of technology transfer is that it comprises countless sub-fields of study from R&D, engineering, intellectual property protection, licensing, product development, marketing, etc. This is why it is important for a potential trainer to consider that the training involves wide range of topics, various target groups, methods of training, and other specifics which need attention during the delivery of the training.

In order to train the participants of technology transfer, it is necessary to have a cadre of trainers who can provide training on various topics related to, e.g. knowledge management, establishment and running of technology transfer centres, legislation in the field of technology transfer, intellectual property protection and licensing, etc.

Who is a trainer?

The success of the training depends mostly on the skills, abilities, personal qualities and experiences of the trainer. Trainer is the one who is imparting his/her experiences and knowledge on the trainees in order to improve their competencies. The most important qualities and abilities the trainer should possess are to¹:

- Plan the training precisely;
- Perfectly understand the subject of the training;
- Speak before an audience;
- Listen to the trainees and give appropriate answers;
- Engage participants actively in the training;
- Flexibly react to the needs of the target group;
- Give clear instructions;

¹ EC (2004). Developing and delivering training on the Aarhus Convention for Civil Society: A Manual for Trainers. EU project: "Environmental Information, Education and Public Awareness, Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine" EuropeAid 02-0114. ISBN: 966-8026-51-9.

- Create good atmosphere;
- Be able to solve conflicts and problems that may arise;
- Etc.

It is absolutely clear that the trainer improves with each and every training session s/he conducts. Therefore, it is good to do a self-evaluation after the training in order to determine the level of professional growth.

During the training, the trainer may play different roles. Shandler (1996) defined the following roles: trainer, provider, consultant, innovator, manager.² The first two roles are concerned mostly with maintaining the levels of performance:

Trainer It is a person who delivers the training and his role can be understood as a teacher or a lecturer who is sharing his/her knowledge with the participants of the training.

Provider This is concerned mostly with the design, maintenance and delivery of the training. It is related to designing the training, choosing the best method and evaluating the training.

The other two roles of the trainer are related to the training for change:

Consultant His/her role is concerned mostly with the analysis of problems and provision of recommendations and possible solutions which may also require training. In this regard, the consultant may work with the trainers to establish the training programmes.

Innovator This so called “catalyst” may help organisations to cope with change, manage the change and to facilitate the change through the training.

Finally, there is a fifth role which integrates the activities and behaviours of the other roles:

Manager It is concerned with planning, organising, controlling and implementing the training. The trainer is a manager in all aspects of the training since s/he is responsible for the management of the group and of the training process at all its stages.

Additionally to these roles, the trainer can be seen as an actor, organiser, leader, mentor, philosopher, etc.

² Shandler D. (1996). Reengineering the Training Function. - St. Lucie press, Florida.

Design of training

Before the trainer starts to organise the training it is necessary to prepare a plan which will ensure the achievement of expected results. This will help to multiply the effort devoted to the whole process of training and to achieve the desired outcomes and satisfaction of the trainees. The key element is to prepare the training which will be interactive and thus, will enrich both the trainer and the trainees in terms of mutual transfer of knowledge.

The successful planning should bring answers at least to the following questions:

- Who is the target group of the training?
- What is the number of participants?
- What are the needs of the trainees and their expectations regarding the topic of the training?
- What are the aims of the training?
- What is the proper method of training?
- What is the optimal time that should be devoted to one training session?
- How to evaluate the success of delivered training?
- What is the follow up of the training?

These are the questions that should be answered not only by the trainer but also by others involved in the training. Additionally, other questions may arise during the preparation and implementation of the training. These may be related to the particular theme and topic of the delivered training and to the particular target group.

Preparation of the training is an important step which must reflect different socio-economic, political or legal aspects as they are established and respected in individual countries. The special attention should be paid to the characteristics of various participants of the training related to their nationality and culture. It is necessary to “customise” the training to particular environment and conditions – in other words to adapt the training methods and instruments to the particular place and target group. Since the same design of training cannot fit to all conditions, different training methods and techniques should be applied from one training course to another.

Therefore, the quality of the training is influenced by many factors. Some of them are:

- Target group;
- Number of participants and their expectations;
- Properly selected method of the training;
- Time and energy devoted to the training;
- Place;
- Equipment, materials and hand-outs.

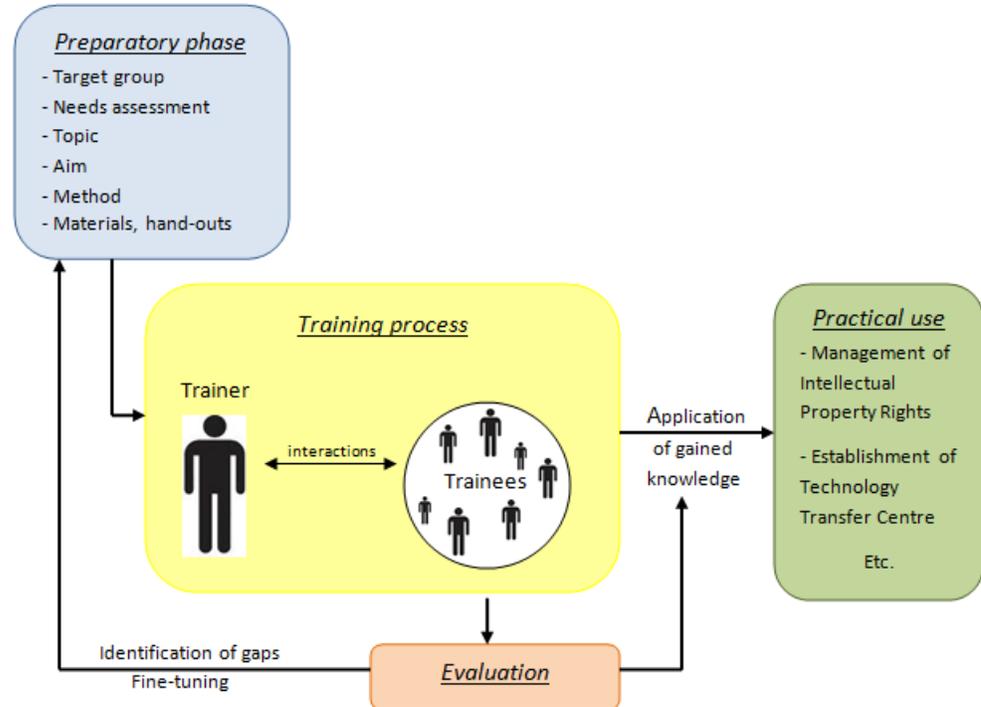


FIGURE 1: Illustration of training process

A lot of factors have to be followed in order to prepare and implement successful training. These can be simply summarised into the “3 E’s”³:

- Effectiveness
- Efficiency
- Engagement

Effectiveness is about the provision of trainer’s knowledge and experience to the trainees in a way which fulfils his/her learning needs and expectations.

Efficiency means how properly and precisely is the training implemented.

Engagement is the process of active involvement of the participants through sharing of their ideas, experiences and visions.

³ Fisher F. (2007). Príručka pre trénerov. – Finančný Manažment pre samosprávu/Financial Management for Local Government, Earthscan 2007. ISBN:978-7-84407-402-2.

Target groups

The target group of the training determines how the training will be delivered, what will be its content, what kind of method will be used, etc.

Since the knowledge and technology transfer can be simply understood as a process in which scientific findings turn into practical solutions, the main target groups of the training should be composed of:

- *Researchers / Scientists* - inventors and technology developers;
- *Businesses / SMEs* – end users of new technologies and innovations;
- *Academia / Universities* – providers of education and training, knowledge dissemination.

These groups create so called knowledge triangle (Fig. 2) which - when working optimally - is able to support the innovation process and to facilitate the development in the particular area. Additionally, if we consider the inevitable links to policy and policy makers, we receive another dimension of this relationship. Policy makers create framework conditions which must be borne in mind when addressing the issues related to single steps in technology transfer process (e.g. licensing, patenting, intellectual property protection, etc.).

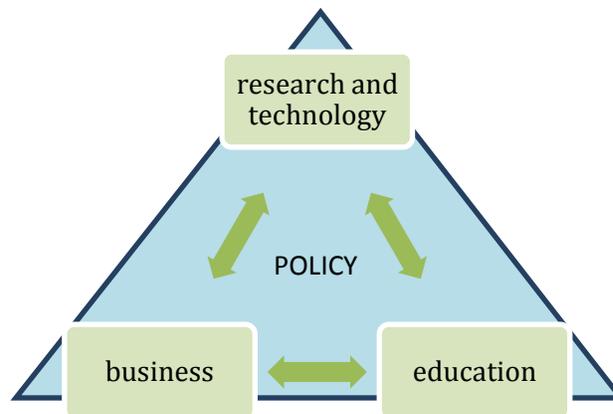


FIGURE 2: Knowledge triangle

The addressed target groups can be divided into smaller sub-groups, depending on the specific area of technology transfer. These sub-groups may involve various experts from various fields in order to capture the specifics of each sector. The training should be provided to each of these groups individually because every target group has its specific roles in the technology transfer and follows its own interests which may differ from one group to another. However, in some cases, the training can be prepared for a mixed group of participants in a way to facilitate the exchange of ideas and to solve mutual issues together.

The selection of target group is an important step in the preparation of the training. In the composition of the target group the trainer should pay special attention to different selection criteria in order to choose:⁴

- The appropriate number of participants;
- Participants who have the necessary skills to cope with the tasks to be carried out during the training;
- Participants who have similar levels of knowledge and skills in order to make the training appropriate for everyone;
- Participants who will be able to practice the gained skills immediately after the training;
- Etc.

⁴ Solter C. – Minh Duc P.T. – Engelbrech S. (2007). Advanced Training of Trainers: Trainer's Guide. – Pathfinder International, Watertown, MA.

Needs and expectations of trainees

It is not possible to know all personal characteristics of the participants of the training, neither it is desirable. What is more relevant to the trainer when preparing the training - its content and approach – it is the assessment of needs of the trainee and his/her expectations. These are different from one target group to another and in many cases even from one stakeholder to another.

Therefore, the needs of a target group can be seen from different perspectives:

Individual needs – needs of each participant of the training which stem from the character of his/her job, professional position, field of interest, etc.

Group needs – these are the needs that are common to all individuals participating in the training. In this case, the target group has to be approached as a whole.

Satisfying and adapting to the needs and expectations should be one of the objectives of the training which bring value added. The assessment of needs is crucial to the success of the training programme since meeting the needs enables the trainer to help the trainees to achieve better results.

Assessment of needs is an important part of the training process since it is difficult to prepare tailor-made training and to address the needs of trainees without prior assessment. It helps to identify gaps in the knowledge, skills and attitudes between the present performance and the desired performance:⁵

Knowledge – consists of the information and understanding necessary to perform some task or activity.

Skills – consist of the practical, hands-on activities necessary to perform some task.

Attitudes – consist of the opinions and beliefs associated with different tasks and activities.

⁵ Solter C. – Minh Duc P.T. – Engelbrech S. (2007). op.cit.



Example. *One of the ways how to assess the needs of potential trainees even before the training course is to send them a questionnaire containing the information that we want to obtain regarding their expectations, what kind of knowledge they expect to obtain from the training, their prior exposure to the topic, the required performance, etc. The questions in the questionnaire have to be specific so that the trainer can make easy evaluation of the answers and cross-checking among the answers of all potential participants. This contributes to the effective design and delivery of the training. Another method is to make an interview with the trainees. However, this method of assessment requires more effort, especially in terms of time.*

This allows to learn about the expectations and to design the whole training process based on real issues that trainees actually face. Assessment of needs helps to the trainer to determine the training content and in many cases also to develop a relationship with participants.

Aims and objectives of training

After assessing the needs of the target group, the trainer can start to think about the aims and objectives s/he wants to accomplish by the training since the training programme is based on their achievement. The aims and objectives are an important part of the training because they determine what steps will follow regarding the design of the training. If the trainer is not clear about the objectives, s/he might overlook some of the expectations of the trainees.⁶

The aim has to be specific, well targeted and result oriented because the success of the training will depend on its fulfilment. The aim should be derived from the topic and from the needs and expectations of the trainees and, if possible, should be measurable in order to be able to evaluate the whole training process. It should result in particular activities and tasks. Clear aim also provides the trainees with an overview of what is expected from them. The aim is usually broken down into multiple objectives which are being fulfilled step by step and thus, lead to the achievement of the main aim.

The main aim of the training related to the knowledge and technology transfer must be set very sensitively in order to address the particular group of stakeholders involved in this area. This applies also to other areas/topics.



Example. *Regarding the particular topic of technology transfer, the aim of the training can be designed in the following way:*

- *To enhance the capability of technology transfer actors in facilitating the knowledge and technology transfer and commercialisation process using tailored tools;*
- *To enhance technical competence regarding the establishment of viable technology transfer centres;*
- *To enhance the capability of stakeholders in particular area in ensuring the flow of knowledge and information from research to practical solutions.*

⁶ Milano M. – Ullius D. (1998). Designing powerful training: The sequential-iterative model. - San Francisco, CA: Jossey-Bass, 1998, p. 87.

Methods and techniques of training

After the trainer decides about what is to be accomplished by the training (aim, objectives), s/he should focus on how it is to be accomplished. Therefore, the trainers need to know the different training methods and techniques that are widely used. The fundamental criterion in selecting a particular method should be its appropriateness to the aims and objectives.

Using proper approach is a prerequisite condition for the effectiveness of conducting a training programme. The selection and use of appropriate methods and techniques becomes all the more crucial as the participatory nature of the activity demands that the training should be not only educative, but equally stimulating. Use of a single most effective approach or combination of approaches promotes greater interaction between the trainer and the trainee and, hence, creates a productive learning experience.⁷

No matter what is the method used for the training. However, one of the basic principles is to make the participants to become actively involved. This on one hand helps to develop the skills of trainees and, on the other hand to receive immediate feedback which can be transformed into new knowledge and ideas. This mutual interaction (Fig. 3) not only improves the training process but also creates the space for new incentives and interfaces. Additionally, it is good to create interactions also among participants. This results in further exchange of knowledge and experience of all involved. Professional trainer with subject matter expertise should achieve that successful trainees will multiply the gained knowledge and pass it on to the others.

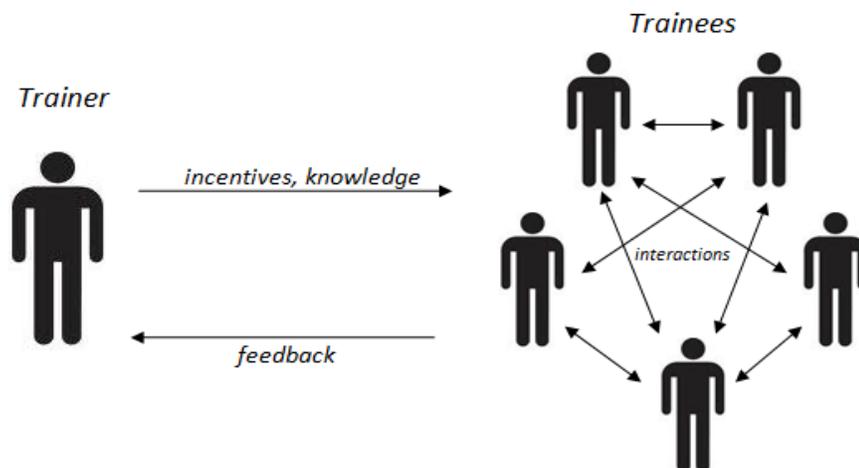


FIGURE 3: Interactive model of training

⁷ Singh Y.P. (1999). Training of Trainers (ToT) Manual. – Haryana Community Forestry Project, Haryana Forest Department.

The most common training methods and techniques are as follows:⁸

Lecturing This method is based on the presentation/speech given by the trainer. Therefore, it is based on the trainers’ existing base of knowledge. It is one of the most popular methods used in the training programme. Even despite its biggest disadvantage, which is usually passive listening of trainees, the trainer can upgrade this method by active involvement of trainees. This participative technique can maximise understanding and retention. Different lecture techniques can increase participation and engagement and thus, improve the effectiveness of the lecture:

- *Cart and chart technique* - it is a combination of lecture and brainstorming. The brainstorming ideas are organised into categories or components.
- *Key words* – as the trainer speaks, s/he writes important key words on a flip chart. These key words create the outline of a content of a lecture.
- *Using examples* – good lectures often contain examples, analogies and metaphors.
- *Multiple choice lecture* – each trainee gets 4 pieces of different coloured paper marked with A, B, C and D. The trainer asks a series of multiple choice questions and the participants answer by holding up the appropriate paper. If the trainees give the wrong answer, the trainer reviews the content.

| <i>Pros</i> | <i>Cons</i> |
|--|--|
| - Cost efficient method | - Trainees are usually only passive receivers of information |
| - Allows transfer of information to a large target group | - It does not ensure automatic learning |
| - Can present large amounts of information | - Good time management is necessary, long monologues discourage the trainees |

Discussion / Brainstorming It is the easiest way to involve the trainees in the training process using their critical thinking and interpersonal exchange of information and ideas. This method allows that everyone can actively participate in the training and express his/her ideas and experience. The best results can be achieved when the discussion is conducted in a guided manner.

| <i>Pros</i> | <i>Cons</i> |
|---|---|
| - Effective, challenging | - It is hard to achieve equal participation of all involved |
| - Bringing unexpected situations requiring flexible reactions of trainees | - Not practical for large number of participants |
| - Pooling ideas and experiences from the trainees | - Easy to get off-topic |

⁸ Solter C. – Minh Duc P.T. – Engelbrech S. (2007). op. cit.

There are many variants of brainstorming, although the basic rules are the same:

- *Classic brainstorming* – the main aim is to bring out as many ideas as possible, as quickly as possible, without censoring them.
- *Rawlinson brainstorming* – the trainer describes the problem and introduces ways s/he has used to solve the problem that have failed. The trainer then asks participants to offer other solutions.
- *Imaginary brainstorming* – imaginary problem with imaginary solutions is brainstormed and then, the same solutions are applied back to the real problem.
- *Trigger brainstorming* – the trainer defines the problem and each participant is asked to write down a list of solutions. The first person reads his/her list of solutions and passes the list to the next person. The next person adds new solution that was not yet mentioned and passes the list to the next person. The idea is that one person’s list will trigger new ideas for the next person.

Workshop

It is one of the most effective training methods involving 10 to 25 participants who are trying to find a solution to a common problem and who are discussing actively in order to solve an issue.

| <i>Pros</i> | <i>Cons</i> |
|--|--|
| - Concentration to reach consensus on common topic | - Requires more time and organisational resources |
| - Use of creative thinking | - Effective only in case if the trainees know in advance what is going to be discussed |
| - Good opportunity for networking | - It may be hard to fit everything that you want to cover into a single workshop |

Case study

In this case the trainees get an opportunity to look at others’ experiences. It means that the trainer (or even other trainees) is providing an example of a real situation, including sufficient details to make it possible for the trainees to analyse the problems or other related issues. The participants reflect to presented experiences and cases and derive new ideas. It is an experiential method which enhances retention and application of knowledge to real situations.

| <i>Pros</i> | <i>Cons</i> |
|--|--|
| - Abstract information is presented concretely | - Insufficient information may lead to inappropriate results |
| - Participatory, encouraging interaction | - The provided case study may be too general to focus on a specific issue |
| - Helps to develop problem-solving skills | - Case studies prepared by one person often include his/her perceptions and ideologies which may distort the reality |

Types of case study:

- *Full information* – all of the relevant information for preparing the case study is given at the beginning.
- *Incremental information* – the information is provided in stages. When the participants finish one section of the case study, it is discussed before moving on to the further section.

Simulations and Exercises

This method is implemented through a set of exercises thanks to which the aims of the training become “tangible”. The exercises can be designed for individual participants or for the group as a whole. Used appropriately, simulations and exercises are an effective way to advance the training objectives. However, all exercises must be well prepared and adequate to the level of knowledge of participants.

| <i>Pros</i> | <i>Cons</i> |
|--|---|
| - Practical orientation | - Wrong understanding of the exercise / task may lead to weak performance and results |
| - Based on learning by doing | - Trainees must be given substantial time to do the exercise |
| - Help to test performance of trainees | - High level of trainees’ cooperation is necessary |

Role playing

This method may help the trainees to experience certain feelings and, at the same time, to practice certain skills. The trainees may confront others and discuss the feelings generated by the role playing experience. Using confrontations, this method may help to generate awareness and utilise the experiences of real life situations. Participants practice skills they have been taught, demonstrate their knowledge and apply it in a role play situation.

| <i>Pros</i> | <i>Cons</i> |
|--|--|
| - Simple and low cost | - Needs careful instructions |
| - Focuses on problems which are real | - It is never successful if the trainees are afraid or embarrassed |
| - Helps to enable the participants to practice constructive methods of confrontation | - It is often time consuming |

Types of role plays:

- *Scripted role play* – the script is prepared in advance and it is followed during the whole training.
- *Coaching role play* – the trainer demonstrates certain skill while including the participants in asking and answering questions about the demonstration.

- *Spontaneous role play* – it is used during the general discussion in order to facilitate it and to demonstrate how to handle certain situation. It is not planned and occurs spontaneously.
- *Rotating trio role play* – the participants are grouped into the groups of three. The role play consists of three different rounds. Each round may be the same and acted out in a different way or according to different scenario. The two persons are acting a role play and the third person is usually an observer commenting on the role play.

Training methods and techniques can be combined in order to achieve the desirable effect.

Multiplication methods

The way we absorb and process obtained information is quite difficult thing. Therefore, the traditional methods and techniques are sometimes not sufficient and need to be supplemented by additional efforts in order to reach the objective. Many factors can amplify the power of training, such as mass media and technologies.

Additional to the above mentioned methods and techniques, there are numerous other ways to train people in various fields. The traditional techniques can be multiplied, e.g. with the use of social media, web-campaigns, public relations or events. These are becoming necessary since present times require flexible solutions in order to make the best use of time of both the trainer and the trainees. Such unique methods are gaining popularity since they help to reach wide target groups by using existing tools and instruments.

Thanks to innovative and engaging methods and techniques, it is possible to explore new ways of training in a social, knowledge-rich environment which is encouraging and entertaining at the same time. In order to achieve better retention, it is necessary to present the information in an engaging and interactive way. This can be achieved thanks to the use of multiplication methods including enticing, interactive training that explores the imagination and makes the development of skills more efficient.

Social media

The share that the media have in the training is constantly growing. Social media have penetrated into the learning and development process mostly because of their interactivity which is a crucial factor in the learning process. New highly developed technologies offer various opportunities which can be used by trainers in order to develop and design the training with new parameters and characteristics. This type of training is quickly becoming highly desirable from SMEs and even research organisations because it offers different ways to communicate, share ideas, connect and solve various problems.

Training through social media belongs to the social learning techniques. Social learning can be defined as learning from and with others using social media. Social media or web trainings are becoming an interesting option since they provide the opportunity to reach wide target group online anywhere at any time, even while traveling on a bus. It is easy to use method since many people are already using LinkedIn, Facebook, Twitter, YouTube and other popular social media platforms. Social media networks can stream live seminars directly to the computer or the smart phone. One of the main advantages is that the participants of the training do not need to be present in one place and therefore, the trainer in one country can train other people all over the world. Additionally, this method offers an easy possibility to record the training and to make replays immediately after it concludes.

Social media combine the traditional methods of training with technologies which help to multiply the learning engagement. This method offers the possibility to design the training with all the steps that form the traditional methods including the evaluation thanks to comments, ratings, trainee contributions and discussions. This allows not only the trainer to obtain feedback on the training but also the trainees to obtain valuable information when selecting training courses and to share their views with other people based on their comments. Some social media and applications provide tools to add and share materials, documents, videos, etc. what results in feeding of knowledge base with up-to-date information.

It would be a mistake not to use social media for training since they are becoming a part of everyday life of most people. If used properly, social media can contribute to a more effective running of organisation including the area of training and development and other associated areas such as knowledge management.

Even though the use of social media is an easy method of training it is important to ensure that the trainees are able to use them. In this regard, the trainer should provide clear instructions and guidelines on how each tool is to be used. In addition, examples and demonstrations may be used in order to explain specific situations.

Other tools for multiplication

Additional to social media, other methods and techniques of multiplication can be used, such as events and various electronic tools. These may help to bring ideas to the market what is crucial mostly in the area of technology transfer.

One of the interesting electronic tools of today is TED⁹ which helps to spread ideas in the form of short but powerful talks. These usually take 18 minutes or less and cover almost all topics – from science to business to global issues. Presentations are given in more than 100 languages. It is based on the viral videos spread worldwide to various groups of people.

Additional to this, TEDx events run independently to share ideas in various communities around the world. These tools aim to share ideas and attitudes of the world's most inspired thinkers with community, both online and at events taking place during the whole year. The main goal is to find the best way to spread ideas, to make them accessible and spark conversation.

⁹ <http://www.ted.com>

Implementation of training

The whole training process is influenced by many factors. These are especially determined by the characteristics of target group and their management. Therefore, special attention should be paid to:

- Classroom management
- Team dynamics
- Effective communication
- Conflict management

Classroom management

The main challenge with regard to classroom management is to keep the trainees engaged and focused. There are numerous strategies of classroom management. Some of them are more effective than the other. Effective classroom management allows to achieve the objectives of the training more efficiently. It involves the design of numerous procedures which influence the quality of the whole training.

The classroom management is composed of various factors. These may include:

Physical environment It is necessary to pay attention especially to the comfort in the classroom, e.g. to have good light, temperature, comfortable place to sit and to see and hear the other participants of the training in order to be able to exchange ideas and work interactively.¹⁰ The setup of the training facility is considered as the cheapest form of classroom management. Therefore, it is advisable to choose appropriate room which offers flexible solutions.

Emotional environment The emotions brought by the training may influence the future participation of the trainees. If they associate some unpleasant experience to the training, they may instinctively refuse future possibilities to participate in the training. Therefore, it is important to demonstrate that they can express their opinions without being condemned by the others and that they can feel relaxed. This includes also social environment created by relationship between the trainer and the trainees.

Materials and hand-outs Effective classroom management includes also the preparation of high quality materials and hand-outs that are provided to trainees during the training. This includes the presentation given by the trainer, as well as exercises which should be printed and a copy should be provided to each trainee. Additionally, many problems connected with classroom management are caused by poor instructions. The trainees have to be accustomed to the materials they receive and have to know what kind of input is required from

¹⁰ Minieri J. (2007). Training for Trainers: A Guide to Designing Interactive Trainings Using Popular Education Techniques. – Research Centre for Leadership in Action, NYU Wagner.

them. Therefore, it is required that the materials are clearly readable, relevant to the training and practical.

Time management It is necessary to divide the training into smaller parts, from introduction, presentation of topic and objective of the training, exercises, discussion, evaluation, etc. Each of these sessions have to be planned for a sufficient period of time and the schedule of the training should take into account potential delays. Long delays should be avoided since it may cause undesirable pressure on the trainer, as well as on the trainees. The participants should be provided the schedule/agenda containing the description of all training activities and their sequence.



Example. *Some aspects of the classroom management are similar either for a group of children at school or for a group of mature experts in particular area. The essential in both cases is attracting the attention of the group. This is usually achieved by friendly attitude, using pleasant tone of voice, being humorous, motivating, encouraging, creative and patient. These characteristics apply to both, the children and the adults and can be used to break barriers in the active involvement in the discussion.*

Team dynamics

When delivering the training to a group of participants it is always desirable to ensure the interactions among all members of the group. Good team dynamics means the ability of group members to talk to each other and to work together.

The training often requires the collaboration of participants. In such collaboration, there are three issues to be taken into account, which are called I, We and It¹¹. Balance between these issues ensures effectiveness of the training and satisfaction of all involved:

“I” express the personal emotions of each individual: What is my role in the training? What am I concerned about?

“We” encompass the behaviour of the participants toward each other, e.g. politeness, openness, etc. This shows the relationships with other participants: Do we make room for different opinions? Do we search for a consensus?

“It” is related to the subject of the training: What are we trained? What do we do together?

¹¹ EC (2004). op. cit.

The trainer should try to keep balance between all these aspects in order to ensure effective fulfilment of the training objectives. Therefore, s/he should manage the work of the participants and intervene if s/he observes that the group dynamics is distorted.



Example. *Imagine that you are a rowing racer and that you are a member of an eight oar boat. All of the rowers have to paddle at the same time and in the same direction. If any of the rowers decides to paddle in the opposite direction, it would disrupt the dynamics of the rowboat. A coxswain is a member of the crew who is navigating the boat by shouting the instructions. Therefore, the coxswain is responsible for the steering and s/he has to ensure that the rowers are doing their best to reach the finish and to win the race. If there is no cooperation of the crew, it is hard to win the race.*

The first group development model has been proposed by Tuckman (1965) and it was called “Tuckman’s Stages”. Firstly, it comprised 4 stages and in 1977, Tuckman, together with Jensen, added a fifth stage:¹²

Forming The team meets for the first time and the members are introduced to each other. They learn about their roles in the group and about the roles of the other members. This is the first stage of team growth during which the members are finding a way to work together on a common issue. The team leader (trainer) is involved to this stage by setting the objectives and providing clear instructions.

Storming At this stage, the team starts to work. It is quite probable that the team members have never worked together before. They have different opinions and are trying to be accepted by the others and thus, they compete and confront their ideas what may bring “storms” and small conflicts. The team leader should moderate the work of the team and ensure the progress towards problem solving behaviour. This stage ends when the members of the team find a suitable way how to cooperate.

Norming This means that the team becomes more effective in mutual collaboration and has a common objective to reach. The essential is to work in favour of the joint success rather than focusing on own individual goals. At this stage, the team works on its own, even without strong involvement of the leader. The members are discussing openly, exchange ideas and learn from each other. The role of the team leader may be only in securing efficient workflow and gathering information from the members.

Performing At this stage, the group is working towards getting the job done since the members constitute a high-performing unit which is motivated and competent to handle the appointed tasks. They are working effectively and are able to solve potential conflicts. The team leader monitors the fulfilment of objectives and assesses the ability to apply the obtained knowledge.

¹² Tuckman B. (1965). Development sequence in small groups. – Psychological Bulletin 63 (6): 384-399.

Adjourning Within this final stage, the training is coming to an end, it is summarised and the members of the group are moving into different directions in order to apply the gained knowledge. The leader compares the outcomes of the training with the tasks and objectives set in the beginning.

The dynamics is different in each and every group and the above stages are not always followed in the order as presented. Additionally, the individual stages may take different duration, depending on the characteristics of group members, as well as on the skills and abilities of the trainer/team leader.

Effective communication

Communication is one of the main abilities the trainer should possess in order to implement a successful training. Effective communication means that the information we want to impart is received and understood by the audience and will be used in the future. The communication affects the training to a large extent since it is the main tool to share ideas, transfer the knowledge and receive feedback.

In this respect, two basic types of communication may be used:

Verbal communication – including what is said and how it is said, mostly by using oral expression.

Nonverbal communication – using body language, gestures, eye contact, posture, facial expressions, etc.

These types are usually complementary and thus, the oral communication is supported by nonverbal expressions.

In addition, to support the interactions during the training or other educational activity, other types of communication may be used. These include bilateral and multilateral communication. Bilateral communication is based on the transfer of information from the trainer to the participants. In this case, the trainer becomes the centre, around which all communication is concentrated. On the other hand, multilateral communications includes the interactions among the participants which thus become more active and open.¹³ This is also illustrated in Figure 3.

The communication may be supported also by the use of technical tools, such as power point presentations, videos, audio records, etc. These have become an integrated part of educational activities since their use is easy and widely spread. However, such tools have to be used very carefully, because the improper use may disengage the participants and affect negatively the whole training process.

The effective communication helps to strengthen interpersonal relationships, manage conflicts and keep the attention during the whole performance.

¹³ EC (2004). op. cit.

Conflict management

Various conflicts may arise during the delivery of the training. These stem usually from the exchange of ideas among the participants, but also among the trainees and the trainer. The reason of a conflict may have various origins, e.g.:

- The excessive information provided during the training may cause that the participants become tired and this may lead to conflicts;
- If the content of the training is not in line with the expectations of its participants, they start to lose interest and their attention is decreasing, therefore leading to conflicts from dissatisfaction;
- The trainees expect that the trainer “knows everything” and will give answers and solutions to all discussed issues;
- If the trainer chooses the exercises which are not understood by the trainees or if s/he provides weak instructions, the disappointment may cause conflicts with the trainer;
- Etc.

The main role of the trainer in conflict management is early detection of conflict situation and application of appropriate strategy to overcome it. The Conflict Resolution Network identified a toolkit of skills which can be used to solve the conflict¹⁴:

Empathy This approach is based on the openness between people. It requires active listening and understanding of what other people need and feel. The essence is to empathise to the feelings of other people and to try to comprehend what is behind their behaviour.

Creative response It is about turning problems into possibilities. The people must think positively and to see what can be done in order to solve the situation in the best possible way. Even failures and errors may bring opportunities for learning.

Assertiveness This approach aims to express the opinion without arousing the defence of the other people. It is about using “I” statement in a way to say how do you feel it from your side rather than to say other people what they should do and how. It is necessary to use calm voice and to be polite in order not to cause any harm.

Broadening perspectives All the people are unique and have distinctive points of view which require consideration and respect in order to form a complete solution. The views of other people may open our eyes to many more possibilities. The conflict is not the only way how to deal with different opinions of others, but taking a broader perspective may lead to increased dynamics and further ideas generation.

¹⁴ Conflict Resolution Network, PO Box 1016 Chatswood NSW 2057 Australia, <http://www.crnhq.org> „CR Kit“ [accessed 28.04.2014]

Win-win approach It is based on the change in the attitude of people who have the conflict. It represents the move from attack and defence strategy to cooperation and to reaching a consensus. Win-win approach is about finding a solution that fits to all involved in the conflict. Therefore, it can be a successful strategy since it leads to mutual gain.

Introduction to mediation This approach is relevant in a situation when the conflict arises among the participants of the training and the trainer is the one who wants to advise. In this case it is necessary to be objective and take into account both sides, to be supportive and make the right atmosphere, not to be judging and saying what is wrong and what is right and to work towards wins for both sides.

Additionally, the following conflict management strategies are widely recognised and used in practice:¹⁵

Accommodating – sometimes to protect the established relationship is more than to win the conflict. It is used to keep the peace.

Avoiding – avoiding conflicts by sidestepping without confrontations.

Collaborating – teamwork and cooperation help to come to a consensus while also maintaining relationships. It leads to creative solutions satisfying all involved parties.

Compromising – winning something while losing a little is a good strategy for everyone when the parties have approximately equivalent power.

Competing – when goals are extremely important, people usually use all existing tools and power to win.

A key component in the conflict management is to listen to the arguments of the opponent. Additionally, effective communication strongly contributes to the conflict solving. The role of the trainer is very important in this regard since s/he should act as a mediator between the people who are facing the conflict, and the one who is making steps toward quick solutions in order to avoid delays and distortions.

¹⁵ <http://smallbusiness.chron.com> „5 Conflict Management Strategies“ [accessed 28.04.2014]

Evaluation of training

Evaluation is an essential component of the training. It helps us to determine whether the training has achieved its aims, assess the value of the training programme, identify areas that need to be improved and identify the appropriate audience for future courses.¹⁶

It should be planned in advance in order to be able to obtain the desired results. The evaluation can be conducted through a prepared sheet / questionnaire including various questions related to the topic or the training. It can also be conducted through discussion with the trainees. In this case it is also advisable to prepare the questions in advance.

We may distinguish among different types of evaluation, depending mostly on the outcomes we want to obtain and on who is doing the evaluation. The evaluation may be done by the trainer, the participants, but also by impartial observer.

Evaluation of effects (Learning)

Bringing the training to the successful end means that it is necessary to evaluate what has been learned. Evaluation of effects brings an overview of how effectively the trainees were trained. This type of evaluation can help to assess the degree and direction of the effect of the training against the aims that were set in the beginning. It can measure the extent of gained knowledge of participants in relation to the topic.

To eliminate the risk of bias, it is necessary to conduct also ex ante evaluation of the knowledge of the trainees. It means that the trainees are asked a set of questions (in discussion or through questionnaire) related to the topics in the beginning of the training. The same (or slightly modified) questions are asked in the end of the training. Comparing the answers from the beginning and the end indicates the gain in knowledge of the trainees during the training.

It is obvious that not all of the trainees manage to acquire the same level of knowledge during the training. Therefore, the effects can be assessed by splitting all the trainees into the groups according to the level of knowledge gained, from *low gain* to *high level gain*. To quantify the effects, the trainer can simply calculate the percentages of the trainees belonging to individual groups of knowledge gainers.

Even though special attention will be paid to the evaluation of effects, this does not ensure that the knowledge gained during the training will be efficiently used in practical life of participants. This can be tested only by real life situations and achievements of individual trainees in the post training phase.

¹⁶ Solter C. – Minh Duc P.T. – Engelbrech S. (2007). op. cit.

Evaluation of training process (Reaction)

Another important task is to allow the trainees to provide comments on the training and the trainer as well. Such information may provide essential incentives which can help to fine-tune the training in the future since the participants are the best to assess the efficiency of the trainer and the training process. This can be done by simple questionnaire including questions on different aspects of the training related to the:

- Level of preparedness of the trainer (level of expertise, reaction to questions);
- Quality of hand-outs and other materials;
- Relevance of selected topics;
- Time management of the trainer;
- Progress of the training;
- Opportunities for active participation;
- Achievement of the objectives of the training;
- Training facilities;
- General atmosphere in the training;
- Etc.

In addition to these types of evaluation, it is also possible to evaluate how the participants are applying their new knowledge gained during the training in real life = *evaluation of behaviour*. Behaviour evaluation is the extent to which the trainees applied the learning and changed their behaviour.¹⁷ This can be done several months after the training through observation, interviews, surveys, etc.

According to Kirkpatrick¹⁸, the fourth level is the *evaluation of impact or results*. It is related to the effects on the business or environment resulting from the trainee's performance. Measures are typically business or organisational key performance indicators, such as volumes, values, percentages, timescales, etc. These measures are usually already in place via normal management systems. Therefore, the main challenge is to identify which of these measures relate to the trainee's input and influence.

Finally, the *return on investment* is becoming the fifth level of evaluation in recent times. It is partially included in the evaluation of impact, but some experts on evaluation think that due to its importance it should be considered a separate fifth level. The measurement compares the monetary benefits of the programme with the costs of the training.

¹⁷ <http://www.businessballs.com> "Kirkpatrick's learning and training evaluation theory" [accessed 28.04.2014]

¹⁸ Kirkpatrick D. (1995). Evaluation Training Programs: The Four Levels. - Beret-Kochler Publishers, San Francisco.



Few tips and tricks for successful training:

- *Prepare yourself in advance;*
- *Do the assessment of needs;*
- *Prepare hand-outs for trainees and provide clear instructions;*
- *Use ICT tools, interactions, exercises in order to get the participants involved and to make them think;*
- *Provide the information clearly;*
- *Have a good time management;*
- *Do not get the trainees bored by long monologues;*
- *Encourage the trainees to ask questions and provide feedback;*
- *Do not let the training go off-topic, keep focused on the tasks;*
- *Summarise the provided information few times during the training and highlight the main points at the end of each session;*
- *Evaluate the training process.*

Knowledge and technology transfer – Bridging the gap between research and industry

Since this handbook was prepared as one of the outcomes of the project NoGAP which is aimed at the area of knowledge and technology transfer, this section is devoted to the basic information on the definitions, types, forms and process as such. It may help the trainer to make better understanding of the essence of this process and to encourage the idea of bridging the gap between research and business.

Definitions of technology transfer

The technology transfer can be viewed in many different ways. These depend on the disciplines of research and on the purposes of the research.¹⁹

Technology transfer can be defined as follows:

“The process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can further develop and exploit the technology into new products, processes, applications, materials or services.”²⁰

“The process of transferring scientific findings from one organisation to another for the purpose of further development and commercialization.”²¹

¹⁹ Bozeman B. (2000). Technology Transfer and Public Policy: A Review of Research and Theory. – Research Policy, 29, 627-655.

²⁰ http://en.wikipedia.org/wiki/Technology_transfer “Technology transfer” [accessed 30.01.2014]

²¹ <http://www.autm.net> “About Technology Transfer” [accessed 11.02.2014]

“The process by which technology or knowledge developed in one place or for one purpose is applied and exploited in another place for some other purpose.”²²

“Mutually agreed upon, intentional, goal oriented and proactive process by which technology flows from an entity that owns the technology (the transferor) to an entity seeking the technology (the transferee). In general, technology transfer is the practice of transferring scientific findings from one organisation to another for further development so that new products can become available to the public and by which basic science research and fundamental discoveries are developed into practical and commercially relevant applications and products.”²³

“Application of scientific principles to solve practical problems.”²⁴

“Movement of physical structure, knowledge, skills, organisation, values and capital from the site of generation to the receiving site.”²⁵

The definitions referring to the technology transfer are usually used to describe the process by which ideas and concepts are moved from the laboratory to marketplace.^{26,27} The concept of technology transfer is often referred to the knowledge transfer. There is no clear line between knowledge and technology transfer and these terms are often used interchangeably and inseparably because when a technological product is transferred or diffused the knowledge upon which its composition is based is also transferred.²⁸

Well-functioning transfer of knowledge and technologies between research organisations and industry brings a lot of benefits not only to its direct actors but also to the society in the particular region. That is why the regions supporting innovations are becoming the most developed what in turn brings benefits to local universities, SMEs and society.

²² <http://www.utrs.com> “Technology Transfer” [accessed 11.02.2014]

²³ Dogra R. – Garg R. – Jatav P. (2013). Technology Transfer in Pharmaceutical Industry: Transfer of Process from Development to Commercialization. – International Journal of Pharmaceutical Sciences and Research, Vol. 4(5): 1692-1708.

²⁴ Levin M. (1996). Technology Transfer in Organizational Development: An Investigation into the Relationship between Technology Transfer and Organizational Change. – International Journal of Technology Management, 2(3), 297-308.

²⁵ Mittelman J.H. – Pasha M.K. (1997). Out from underdevelopment revisited: Changing global structures and the remaking of the Third World. New York: St. Martin’s Press.

²⁶ Philips R. (2002). Technology Business Incubators. How Effective Is Technology Transfer Mechanisms? – Technology in Society, 24(3), 299-316.

²⁷ Williams F. – Gibson D.V. (1990). Technology Transfer: A Communication Perspective. – Sage: Beverly Hills, CA.

²⁸ Bozeman B. (2000). op. cit.

Main benefits of technology transfer to research organisations, institutions and universities can be seen in the following aspects:

- Additional sources of financing of further research and development activities;
- Long-term financial sustainability of research activities;
- Verification of research results in practical situations;
- Obtaining of new information sources, contacts and incentives for further research;
- Higher credibility of these organisations.

Benefits of technology transfer to industry:

- Access to unique research results;
- Shorter innovation cycle of new products;
- Obtaining of competitive advantage;
- Obtaining of research results which are dependent on the use of special research infrastructure, capacities and know-how.

Benefits of technology transfer to society:

- Improved structure of financing of research and higher education;
- Higher standard of living and quality of life;
- Concentration of financial and knowledge assets in the region;
- Better attractiveness and competitiveness of the region.

Highlighting the benefits of technology transfer to the participants of the training helps them to better understand the importance of this process and to start with successful application in real life. Additionally, various definitions of technology transfer help to look at technology transfer from different perspectives and to create own opinion on what could it mean to the research organisation, SME and/or other actors of this process.

Types and forms of technology transfer

Technology transfer may take various types and forms depending on the parties involved, on their capacity, the degree of their involvement, the quality of the information available, the size of technological gap, etc. Additionally, the type of technology transfer may depend on the following factors:

- Means of technology transfer, such as goods (machinery or products) and knowledge (information, know-how);
- Type of the technology being transferred;
- Complexity of the technology being transferred;
- Transfer mechanism selected;
- Relationships between the parties involved, their mutual trust, core competencies, organisational culture and mutual understanding.

Types of technology transfer can be viewed from various perspectives, such as:

Private technology transfer – it can be understood as a transfer from one company to another.

Public – private technology transfer – it is a transfer from universities or government laboratories to companies.

Internal technology transfer - it is a process where control over the ownership and usage of technology is assigned to the transferor.

External technology transfer - in this case the control over the ownership and usage of technology is usually assigned to the recipient, e.g. joint ventures, licensing agreements, contracting agreements, enterprise acquisition, etc.

Informal technology transfer - it is based on personal contacts and thus, on the tacit dimension of knowledge transfer.

Formal technology transfer - this type typically involves a legal contract on a patent or on collaborative research activities.

On the other hand, there are various **forms of technology transfer**. The use of particular form depends on the type of outcome for commercialization, content of contract between the research organisation and industry, ability of research organisation to ensure the individual form of technology transfer, etc.

The most common forms of technology transfer include²⁹:

- Sale of license to the research results;
- Customised (contracted) research and development;
- Partner research and development;
- Provision of advisory, expert and lecturing services;
- Sale of complex studies, analyses and methodologies;
- Establishment, operation and development of spin-offs.

All of these forms require different sources. These include, e.g. well-trained research and development staff, research infrastructure, professional information and know-how, financial sources, etc.

During the delivery of training related to technology transfer it is necessary to teach what types and forms exist because it is essential for the actors of technology transfer to know all the possibilities and to choose the best option.

²⁹ Krč K. (2012). Transfer technologií: Příležitost i nezbytnost pro české univerzity. – Mendelova Univerzita v Brně. ISBN: 978-80-7375-655-0.

Technology transfer process

The essence of the whole process lies in the invention of a technology, development into a final product and its commercialisation. The development of new product, service or process based on early-stage research discoveries requires a significant investment in terms of time and money. It is unusual that the organisation that creates a technology brings it to the market simply because it may not have the necessary resources such as finances or equipment for manufacturing. Even if the organisation has these resources, the technology may not be viewed as a strategic product for it, especially if the technology was created as a by-product of some research activity.³⁰

Therefore, the main incentive for technology transfer arises because the needs of the organisation in which the technology is developed are different from the needs of the organisation that brings the technology to the market. The expertise in product development, marketing activities and sales typically fall outside the scope of research organisation and thus, collaboration with industry becomes necessary. Different needs of various actors of the whole process are usually met through the linkages between research organisations and business. In order to develop these linkages, the industry has to be engaged in research from the early stages.

The technology transfer can be understood as a complex process involving the research site disposing with technical resources and equipment (e.g. laboratory) and a user (e.g. SME). The main objective is to accelerate the application of laboratory technology and other resources to private and public needs. This simplified relationship is illustrated in the Figure 4 below.

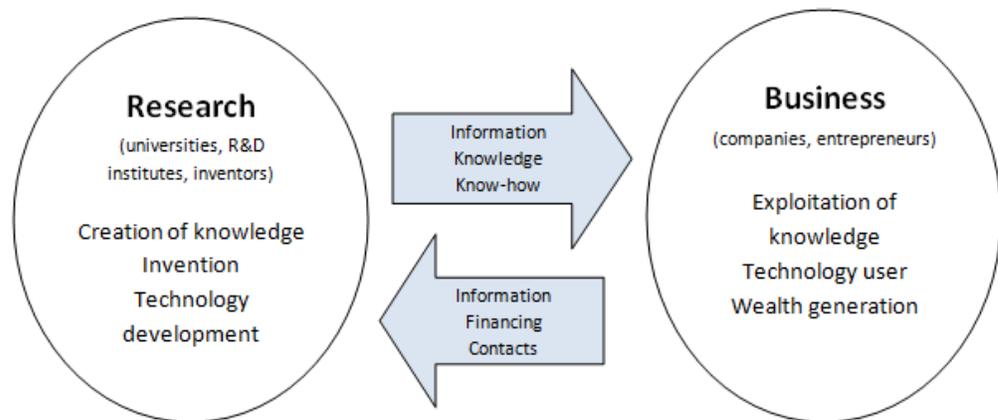


FIGURE 4: Simplified model of technology transfer

³⁰ Carayannis E.G. – Alexander J. (1999). Technology-driven strategic alliances: tools for learning and knowledge exchange in a positive-sum world. – In Richard C. Dorf (ed.), *The Technology Management Handbook*, Boca Raton, FL: CRC Press.

Various other actors and facilitators of technology transfer can be invited. Their main role is to support the efficient running of this process and to bring added value. In order to contribute to the evolution of the environment in which they perform their tasks and to ensure the sustainability of the whole process from the first idea to the final application on the market, it is necessary to equip the actors with necessary skills through the training. Therefore, the main target groups of the training and, at the same time, the key participants in technology transfer and commercialisation are illustrated in the above figure.

A lot of diagrams showing the steps in the technology transfer process have already been developed. These include various phases resulting in certain outcomes (Fig. 5).



FIGURE 5: Technology transfer process³¹

In the first step, the **research and development activities** take place. These should lead to the discovery which is innovative and commercially applicable in order to maximise the public impact and financial returns in the later phases. The invention brought by R&D activities is further **prototyped** in order to be able to test the technical viability and feasibility of the technology. The **evaluation** should show what is the best way to translate the discovery and thus, to assess its

³¹ <http://www.unh.edu> „Technology transfer“ [accessed 03.03.2014]

commercial potential. In many cases, it is also desirable to pursue patent or other **intellectual property protection** of the invention.

Further, it is necessary to market the technologies to companies and other potential commercial partners capable of translating the invention into new products and services. This step is called **technology commercialisation** or **marketing**. After the identification of these partners, a **license agreement** should be prepared to grant the company the right to develop and commercialise the invention owned by the inventor. Licensing prepares the ground for further step which is the **translation of invention into a useful product or service**. This stage requires significant resources mostly in terms of money.

After the product design and manufacturing the company ensures that the fully developed product reaches the public through its **sales and marketing**. The returns obtained thanks to this last phase may help to get back to the first step which is development of new ideas, inventions and innovations and the whole process may start from the beginning.

Role of innovation in technology transfer

Innovation has irreplaceable position in the activities related to knowledge and technology transfer. The whole process of technology transfer begins with the inventions brought by research and development efforts. However, the invention is only the creation of a new idea. In order to bring the whole process of technology transfer into successful end, this newly created idea has to be turned into tangible outcome, e.g. in the form of new product with commercial value which is assigned by the market.

When considering the first step leading to innovation, the research and development efforts are usually represented by research laboratories and universities. Research goes hand in hand with product development. In order to make the innovation **technically viable**, the new idea has to be materialised and/or prototyped. Prototype helps to test various parameters and the novelty of the product.

Once an innovation can be realised technically, it should be considered whether it will be **economically viable** to launch it on the market. This is connected with added value the product will bring to its users but also to the management and other focus groups. The market dimension of the innovation is of central importance in this regard. The innovation is successful if it generates benefits to the organisation that commercialises it.

Further, in order to keep the innovative position of the company, it has to ensure that the innovation becomes a continuous phenomenon. Therefore, it is necessary to have appropriate innovation strategy, to set the objectives related to the future innovation process and to analyse where the competitors are going. This is the core element of innovation management.

The innovation may take various roles:³²

Change agent Innovation is a major engine of change which drives today's world. It creates change – new knowledge, methods, processes, etc. Additionally, innovation leads change by setting directions through new ideas turned into reality.

Value creator Successful innovation brings benefits to the company through revenues and to customers through satisfying their needs. Therefore, the value of an innovation is owned by those who benefit from it and who pay for it. Return on investment enables new innovation which then delivers new levels of value to the customers.

³² Loeffler J. - Gohla R. – Hermann E. - Chiran D. (2011). Innovation in SMEs. Contract POSDRU/92/3.1/S/61289, Dezvoltarea competențelor manageriale și antreprenoriale în vederea creșterii competitivității și valorificarea oportunităților de afaceri. Proiect cofinanțat din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013 “Investește în oameni.

Leader Innovation influences decisions, including corporate strategic directions and areas of investment. Effective innovation leads businesses, companies and even whole industries. It leads markets and opens doors to the new ways of doing things.

Strategy Innovation is a strategy for achieving goals. Innovation management also develops ways (strategies and tactics) to realise the vision of the company.

Opportunity generator Every innovation brings opportunities for further innovation. It constantly seeks strategic opportunities which can be used in order to improve the position of a company on the market, especially when it faces competition pressures and downsizing.

Wealth creator Innovation, when commercialised on the market, brings financial incentives which increase the wealth and promote the growth of a company. The wealth created by innovation may be further used to develop new products and services and thus, to bring further innovations.

Role of partnerships in technology transfer

Working in partnerships, collaboration of various stakeholders and mutual sharing of resources and tasks became one of the most important aspects of today entrepreneurship, research and development activities, as well as of everyday life. The global times require joint solutions which better reflect to the needs of individuals and of the economy as a whole. These can be brought by joint efforts of collaborative character.

“Partnership is a voluntary collaborative agreement between two or more parties in which all participants agree to work together to achieve a common purpose of undertake a specific task and to share risks, responsibilities, resources, competencies and benefits.”³³

The area of technology transfer also requires partnerships since it is a complex process which may bring together various actors from different fields that work together on a common problem or issue. Regarding partnerships, some steps need to be done and some principles need to be followed in order to ensure successful transfer of knowledge and technologies:³⁴

1. **Identification of the most relevant partners** who could contribute to the fulfilment of the tasks and objectives. Bringing together different types of actors and partners requires a lot of effort since it may not be easy to have around one table, e.g. entrepreneurs, academic and scientific sector, NGOs, etc. These are the main actors of technology transfer and their interests and attitudes to certain problems are usually different.
2. **Mutual understanding of the roles and tasks of all partners** is necessary in order to avoid conflicts and to create favourable environment for further cooperation. The relationship of partners is usually specified in a contract or agreement. This represents a formal commitment of partners to share joint strategy during a certain period determined by the partnership.
3. **Equal rights should be applied for all partners** and in cases they do not, this should be particularly specified and agreed in a contract.
4. **Ownership** is a necessary condition which has to be clarified since intellectual property protection is one of the essential parts of knowledge and technology transfer.

³³ Loeffler J. – Chiran D. – Gohla R. – Hermann E. (2011). Transnational partnership for SMEs: Challenge and benefits. – Contract POSDRU/92/3.1/S/61289, Dezvoltarea competențelor manageriale și antreprenoriale în vederea creșterii competitivității și valorificarea oportunităților de afaceri. Proiect cofinanțat din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013 “Investește în oameni.

³⁴ OECD LEED Forum on Partnerships and Local Governance (2006). Successful Partnerships: A Guide. – Collective of authors. <http://www.oecd.org/cfe/leed/forum/partnerships>



Example. *Imagine that you want to build a big tent. You have a manual how to do that but you have nobody to help you. Even if you manage to put together the whole construction, you will need the help of at least one more person to make it stand and to fix it on the ground so that it withstands any climate conditions. In this case, not only manual work requires cooperation but it is a good idea to look into the manual with other person in order to obtain another view which may in many cases simplify some steps in constructing the tent, especially when the other person has some experience in building a tent.*

There are a lot of reasons to create a partnership when dealing with technology transfer. These depend on the capabilities of all involved in the process and may create the whole chain of partners that ensures the success of the technology transfer at all its stages:³⁵

- **Forming alliances with partners who have the manufacturing capability.** Even though the inventor is able to bring the idea of a technology with all its parameters and specifications, s/he may not have the capability or resources to manufacture the product and must find someone who would manufacture the product for him/her = collaboration in the manufacturing.
- **Forming alliances with partners to ensure the intellectual property protection.** The inventor may have the resources to conduct the research and development, but may not be able to take the technology through the process of patenting and licensing = collaboration in the product registration.
- **Forming alliances with partners that can progress the development to take it to the market.** The inventor/developer of certain technology may have the resources to bring the technology to a particular state of development, but s/he may not be able to bring it to the market = collaboration in the commercialisation.
- **Forming alliances with partners who have the marketing and distribution capability.** The developer of the technology may be able to fully develop the technology, but s/he lacks the marketing and distribution channels to launch the product commercially = collaboration in the marketing.

Partnering in the area of technology transfer allows combining different resources from various organisations and institutions. These include not only tangible assets, but also human capital. Technology transfer using the principle of partnerships may lead to better results thanks to the fusion of knowledge of various subjects, combination of more research fields and areas of application. One of the important aspects in this regard is the decision on the share of each partner in financing of joint activities, and how the incomes from the commercialisation of joint efforts will be divided among partners.

³⁵ Dogra R. – Garg R. – Jatav P. (2013). op. cit.

Local or regional partnerships sometimes do not satisfy the needs of involved parties. In technology transfer, there is often a necessity to cross the border in order to find a suitable partner who would fit to the context of activities. Therefore, transnational partnerships are getting higher importance.

One of the crucial steps in building transnational partnership is to ensure, that it will bring value added to the whole process of technology transfer and that the international partner will contribute to the achievement of the aims we want to accomplish. Additional aspects have to be respected when involved in the partnership of transnational character. These include cultural aspects, regulatory framework in different countries, language and communication, etc.

All partnerships should be based on a win-win approach. It is necessary that all the partners benefit from the collaboration in the form of financial incentives or other strategic benefits. Otherwise they would not put their efforts to the tasks they perform.

Case studies: Success stories in technology transfer

The main objective of this chapter is to provide some best practice examples related to the technology transfer from three countries: Germany, Slovakia and Romania. In relation to ToT these should serve as success stories that could be disseminated to the trainers and further to the participants of the training aimed at researchers and SMEs in order to learn from these examples and to use them in the process of practical application of technology transfer in individual countries and by individual stakeholders. Case studies and good practice examples support the training process since they provide practical approach which is often appreciated by the trainees. Additionally, it is one of the most effective methods of training.

Steinbeis network: Danube Transfer Centres (Germany)

During the last years the Steinbeis Network has become synonymous with the successful transfer of tangible, market-based knowledge and technology. Managed by entrepreneurs, Steinbeis Centres build solid, steady bridges between science, academia, trade and industry – always focused on how everyone involved in the transfer will actually benefit.³⁶

The Steinbeis Network was founded in 1971 as a non-profit foundation. It comprises i) centralised brand “Steinbeis” with an organisational and legal framework and ii) decentralised Steinbeis Enterprises and subsidiary companies as well as cooperation and project partners worldwide. The decentralised structure of **Steinbeis Enterprises** means that each of the enterprises as a unit in the network is headed up by the individual manager, who is in charge of what is called either transfer centre, a consulting centre, a research or innovation centre, a transfer

³⁶ <http://www.steinbeis-impact.com> „The Steinbeis Network – A brief overview“ [accessed 12.12.2013]

institute or simply a GmbH (German limited liability company). Managers of each enterprise, the majority of which are professors at knowledge and technology sources, see themselves as problem solvers at the disposal of trade and industry. On behalf and in cooperation with their client – company from industry – they arrive at comprehensive, customer-oriented solutions to each problem. Steinbeis' success is rooted in the added value the network gives to each project and challenge its customers face. Currently, the network involves almost 1 000 Steinbeis Enterprises serving approximately to 10 000 customers per year covering more than 50 countries.³⁷

The network of transfer centres established by Steinbeis expanding throughout Germany and the world, contributes to the entire spectrum of current technology and management know-how from a single source. The established interdisciplinary teams craft customised solutions for specific challenges in a broad range of subjects.

How does it work?

During its existence, Steinbeis has generated various sources of knowledge and technological innovation. These have been connected into the network involving higher education institutions, universities, research facilities and businesses, thanks to which Steinbeis strengthen effective cooperation between science and academia, but also between businesses in order to ensure the practical use of scientific findings.

The whole process of knowledge and technology transfer begins when a customer presents his/her challenge. Regardless how specialised the issue may be, the network's experts from specific field invent a fitting solution in order to overcome the challenge. Within this process, the Steinbeis Network with its units (Steinbeis Enterprises) is using the potential of research facilities, particularly at universities and brings professional tailor-made solutions based on scientific findings which can be applied in business. Decentralised structure of Steinbeis Enterprises means that the directors of each enterprise act autonomously and independently and their work keeps them in direct, confidential contact with their customers.

The solutions brought to customers and partners can be flexibly matched to structural and technological developments, as well as market demands. The transfer of know-how is ensured primarily through the Steinbeis Enterprises which are continually developing and thus, strengthen the transfer potential of the whole network. These units are organised as a “company in a company”.

The main mission of this network is to foster effective and efficient cooperation between the world of science and academia on one hand, and trade and business on the other. Covering a wide range of technologies, customers plug into expertise and skills throughout each and every project. Competitive knowledge and technology transfer is the interface, the linchpin that connects pre-competitive academia and science with the market's demand for research results in business, as well as practical applications of

³⁷ <http://www.steinbeis.de> „Technology.Transfer.Application.“ [accessed 12.12.2013]

those results. Pre-competitive research must receive state support and subsidies; the actual transfer however, on the other hand, benefits business by translating research results into marketable products.

Support for the Danube Region

In order to support the knowledge and technology transfer in the Danube Region, Steinbeis is establishing a network of transfer centres as a pilot study for strengthening the economic development in this region. These transfer or competence centres are being established at selected universities in the Danube Region, starting with some local networks coming up to regional and macro-regional network with central management. This network will form the **Danube Transfer Centres** (DTCs) which will help to support the regional development and innovations and will foster the application of technology transfer in the Danube Region. Additionally, DTCs help to enhance and streamline the technologies in SMEs.

The main mission of DTC is:

- To promote innovation;
- To enhance research;
- To facilitate competitiveness in an efficient manner.

The overall aim of DTC is to foster the competitiveness of the industry in the Danube Region by supporting innovation and technology transfer. This will help in filling the gap between research and innovation what is one of the main roles of knowledge and technology transfer. This will be achieved by:

- Creating new products and services;
- Advancing knowledge;
- Fostering inter-regional cooperation.

Services provided by DTC include:

- Identifying technology needs of industry, particularly of SMEs (innovation audits);
- Identifying marketable technologies and service offers from the universities and research institutes (technology scouting);
- Fostering an active dialogue between industry and science;
- Organising an efficient knowledge and technology transfer from universities to enterprises;
- Initiating joint research projects between industry and academia;
- Advisory and support services for accessing European research and technology transfer programmes;
- Assistance in preparing European projects;
- Developing technology oriented partnerships at regional, national & European level;
- Trainings (management, technology transfer, etc.).

The cooperation partners of DTCs are located in:

- Germany / Baden-Württemberg – Steinbeis Innovation gGmbH with its departments Steinbeis-Donau-Zentrum and Steinbeis-Europa-Zentrum;
- Slovakia – Technical University in Bratislava and Slovak Agricultural University in Nitra;
- Romania – Technical University of Cluj-Napoca, Babes-Bolyai University Cluj-Napoca, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, University of Medicine and Pharmacy Cluj-Napoca;
- Serbia – Technical University in Novi Sad.

DTCs implemented in selected universities in the macro-region have become a flagship project of the Danube Strategy in the priority area 8 “Competitiveness and Clustering” which can be transferred to all Danube countries. DTCs are linking existing stakeholders and networks in order to create synergies among existing projects and to prepare a Joint Action Plan for innovation and technology transfer in the Danube Region for the period 2014 – 2020.

Cooperation with DTCs in individual projects allows businesses to enhance their competitiveness and innovation potential. Entrepreneurs may benefit from the utilisation of existing knowledge and technology transfer network and its experts, from professional skills and competences of transfer centres, from knowledge based scientific services, from the utilisation of existing infrastructure at universities and from the cooperation at all stages of the value added chain. On the other hand, universities may benefit from DTC services by getting access to demand-driven projects, as well as to the knowledge about the market. Additionally, participation in DTC network helps to increase the reputation of university in regional economy, to increase income thanks to fees for using its research infrastructure, to generate new research activities and/or to enhance the equipment by investments in the context of transfer projects.

This initiative received a start-up funding by the Ministry of State of Baden-Württemberg. The overall aim of this pilot initiative is to submit several project proposals within structural funds, Horizon 2020, etc. These proposals will assure the financing of the annual DTC running costs in order to ensure the sustainability of the initiative and to find additional partners willing to join the network and to establish new DTCs in other Danube countries.

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National infrastructure for supporting technology transfer in Slovakia: NITT SK (Slovakia)

Since the need for bridging the gap between research and industry is increasing and the topic of knowledge and technology transfer is becoming very up to date, many local centres of technology transfer are emerging at universities and research institutes. It appears to be necessary to ensure the coordination of activities of individual centres and to establish an effective system of national support of technology transfer.

This will be achieved by the establishment of the **National Centre for Technology Transfer** which will provide additional support necessary for the development and successful operation of the local offices of technology transfer by providing methodological support, contacts, information and specialised services. Additionally, it is essential to provide support to those universities and research institutes which do not have their own transfer centres and which are specialised to a specific area of research. These produce a wide range of high-level R&D outputs in the form of knowledge and technologies that could be commercialised in the market.

National project implemented by the Slovak Centre of Scientific and Technical Information in Bratislava under the Operational programme for Research and Development is implemented from June 2010 until December 2014.

The strategic goal of this project is to establish and implement the nationwide system to support application of research and development results into social and economic practice in order to contribute to the development of the knowledge-based society. The system of national support entails the establishment of a non-material infrastructure (a system of auxiliary services) with marginal input into material infrastructure which mostly deals with the completion of information systems to support technology transfer.

The national system is trying to endorse those R&D activities which result from the real needs of the entrepreneurial sector. This is achieved through a systematic coordination of individual components of the system so as to support transfer of knowledge into practice. As a consequence, this will lead to an increased application of R&D results and technologies in the industry and, at the same time, it will support the creation of a long-term cooperation between academia and industry. This will promote advancement in the academic and scientific sectors and also contribute to the sustainable development of the knowledge-based society as a whole. The R&D institutions are also provided with assistance in the process of the

application of intellectual property rights and in the process of the commercialisation of intellectual property.³⁸

The project's primary objective is to propose and put into effect the national infrastructure to support technology transfer, and thus contribute directly to more intensive and efficient state support to research and development.

The project's activities are focused on achieving the following three specific objectives:

- To establish a Technology Transfer Centre at the Slovak Centre of Scientific and Technical Information in order to ensure systematic support for the technology transfer at national level.
- To assist the scientific community in the process of technology transfer via utilisation of the existing capacities and resources of the research and development information and communication technology infrastructure.
- To render the process of the transfer of scientific knowledge and technology into the economy and society more efficiently through the popularisation of science.

The primary role of the National Centre for Technology Transfer is to ensure the systematic coordination of activities of individual organisations, institutions and departments operating in Slovakia in the area of knowledge and technology transfer from research and development into industrial practice. Such effective system of technology transfer will ensure additional resources required for intensive development of R&D activities through the commercialisation of knowledge, as well as through the creation and implementation of joint research projects of R&D base with industry. The interconnections between various players in the technology transfer support system are illustrated in the Figure 6 below.

³⁸ http://nitt.cvtisr.sk/uvodna-stranka/o-projekte.html?page_id=255 „Národná infraštruktúra pre podporu transferu technológií na Slovensku – NITT SK“ [accessed 10.02.2014]

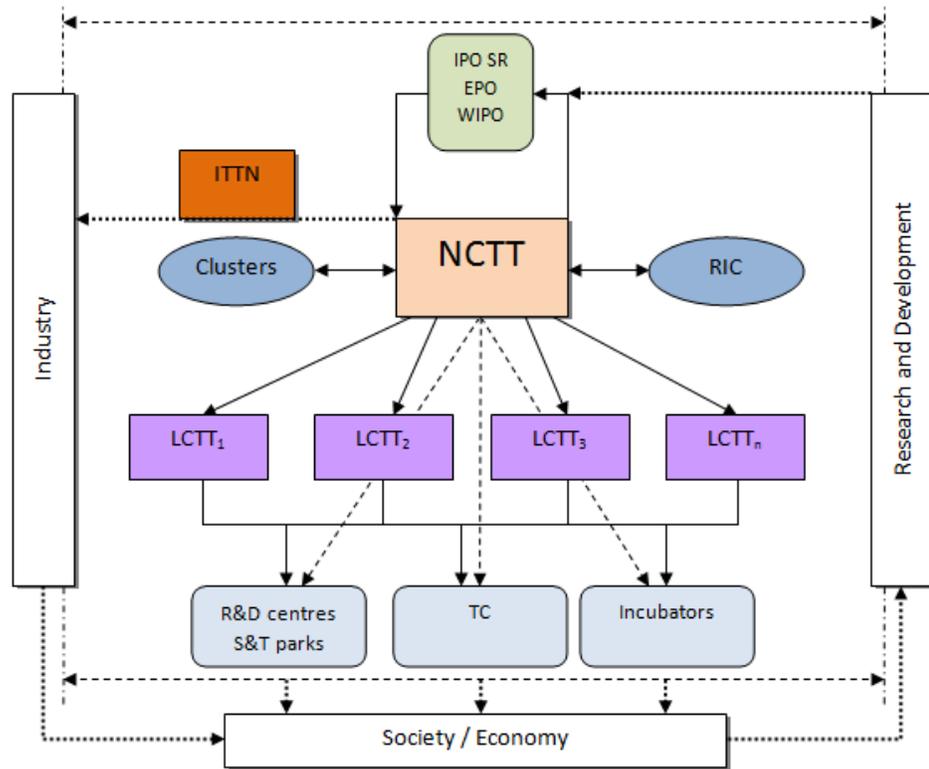


FIGURE 6: Technology transfer support system³⁹

Legend:

| | |
|--|---|
| NCTT | National Centre for Technology Transfer |
| Industry | Technologically oriented and innovative SMEs |
| Research & Development | Universities, R&D institutes, other R&D organisations |
| Society / Economy | National economy and society |
| IPO SR / EPO / WIPO | Industrial Property Office of the Slovak Republic / European Patent Office/ World Intellectual Property Organisation |
| Clusters | Manufacturing, technological, research driven regional associations of various players (companies, R&D institutions and other organisations operating in selected industrial sectors) |
| RIC | Regional Innovation Centres |
| LCTT | Local Centres of Technology Transfer |
| ITTN | International Technology Transfer Networks |
| R&D centres / S&T parks | Research and Development Centres / Science and Technology Parks |
| TC | Technology Centres |
| Incubators | Regional and university incubators |

³⁹ http://nitt.cvtisr.sk/uvodna-stranka/o-projekte.html?page_id=255 op. cit.

The process of technology transfer is represented by interconnections between R&D and industry. R&D is represented by key knowledge holders and creators and technology developers. Industry involves SMEs at national and international level including transnational corporations. Technology transfer process and all its actors must respect legal framework and other aspects of societal development as set by the economy and society. Technology transfer support system starts with the National Centre for Technology Transfer (NCTT). It works in close cooperation with intellectual property and patent offices at national / international level. Additionally, NCTT strengthens the transfer of knowledge through cooperation with clusters and regional innovation centres which are responsible for the implementation of innovation systems in individual regions within Slovakia. As mentioned above, NCTT ensures the coordination of activities of numerous local technology transfer centres (LCTT) established at universities and R&D institutions which work in close cooperation with: i) R&D centres and S&T parks associating innovative companies and research institutions to promote the development of new technologies, ii) technology centres associating technology-oriented domestic and foreign companies from selected industries, and iii) incubators supporting the development of newly established technology-oriented companies (start-ups and spin-offs). In order to obtain further international dimension of this process, the collaboration with international technology transfer networks (ITTN) is established. These networks represent organisations dealing with technology transfer in neighbouring countries and other countries around the world, including international networks supporting R&D, innovation and technology transfer in the EU and beyond.

Another instrument which is part of the National technology transfer system created within the national project mentioned above is the National technology transfer portal. The portal is a point where all relevant information about the activities in technology transfer in Slovakia is collected, as well as a point of access to support services provided to research institutions in the process of technology transfer. Its content covers the area of intellectual property protection and commercialisation. The portal gives the opportunity for an active access to technology transfer by requirement of expert consulting services. It provides a complex set of services from search services and expert consulting services allowing to ensure the implementation of separate steps in the technology transfer process, including patent application drafting, technology marketing, partner searching in the process of licensing, license agreements drafting, monitoring of license conditions retention policies, etc.⁴⁰

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Website: <http://nitt.cvtisr.sk>

⁴⁰ <http://nptt.cvtisr.sk> "Národný portál pre transfer technológií" [accessed 05.02.2014]

DTC as a facilitator of research and innovation (Romania)

The following case study details a current collaboration project that involves the DTC as a technology transfer unit, the Technical University of Cluj-Napoca as a technology provider, and the Transylvanian Furniture Cluster (namely one of its members) in a complex endeavour to develop innovative plastic components for the furniture industry, as well as to develop technical and human capabilities to operate an R&D department centred upon this topic at the end of the project.

As already mentioned, the cooperation began within the Furniture Cluster, established in the Transylvania region in 2012, which has applied for funding to become a competitiveness pole from the European Regional Development Fund that finances the Sectorial Operational Programme “Increase of Economic Competitiveness” in Romania. This type of financing call for projects is a complex one, dedicated to helping clusters become concrete engines of regional economic development through innovative production, increased employment and a strong market presence. Within the projects package for the pole, there must exist three types of projects, i.e. i) infrastructure development (for buying new equipment and building new facilities), ii) research (for incorporating innovation and leveraging competitiveness), and iii) “soft project” (for promotion, management and other administrative issues). Due to the complexity of this approach, the projects have been under development and evaluation for 1.5 years and they are now in the contracting stage. After this, the objectives should be achieved through implementation in about 20 months.

The involved company is a start-up that was established in 2013 with the goal to produce innovative plastic components for the furniture industry. The decision to initiate such a business comes from the fact that these plastic elements can contribute significantly to the achievement of advanced features of modern furniture which are sought after by the sophisticated customers of the present. Some of the possible product lines are listed below:

- Advanced assembly solutions that allow for quick installation and modularity, while at the same time requiring little knowledge and maintenance (closing/opening mechanisms, raising and distancing elements, elements used for creating compartments, elements used for integrating lighting, electronics or IT equipment into the furniture itself);
- Ergonomic, user friendly and in-trend partial or whole plastic elements for the interaction of the user with the furniture: plinth, handles, mechanisms that require user input, supports, hooks, connectors, shelves, accessories, cleaning tools, etc.;
- Furniture types entirely made from plastics (either injected or extruded) either due to tradition, trends or functional constraints: garden furniture, children furniture, playground furniture, some laboratory furniture, disposable furniture, etc.

The university team is going to include the following types of specialists, in order to provide the expected solutions:

- Designers and design engineers, equipped with artistic skills, 3D CAM/CAM skills and deep knowledge of innovation and oriented design related concepts;
- Material engineers, capable to integrate advanced materials into the products, while ensuring a high recyclability at the end of the product lifecycle;
- Technology engineers, that should ensure quick transition into the production stage, and smooth manufacturing with little losses and nonconformities;
- Economists, for the initial stages of market survey and requirements analysis, as well as for ensuring an economically viable production that can be sold competitively;
- Managers, with significant research management experience and a broad overview on the addressed engineering and economic challenges.

The actual technology transfer that is going to take place involves all the stages of the project: innovative design, development of own capability, implementation into production. The university team will work closely with the start-up company and will ensure that its processes are planned and deployed in accordance with the product family and production line realised within the project. In the end, the company should possess an advanced infrastructure (a moulding centre with CNC technology and CAD/CAM software), a number of skilled and trained personnel (between 2 and 7 employees), and a competitive product line of plastic components (35 prototypes and 10 moulds). The DTC is involved in the project as a facilitator of research and innovation and as a coordinator of the cooperation process.

These activities have started from the initial stages and will continue until the successful completion of the project. Due to the complexity of the situation, many technology transfer tools have already been used for developing the project proposal: preliminary market survey for identifying opportunities based on manufacturing and innovative new product development, innovation audit to determine the capabilities and plans of the partner company, technology scouting for creating a proper fundament for the research project, start-up company establishment issues.

Besides these, the project will include, especially towards its conclusion, a strong effort for protecting the intellectual property (submitting 4 patent applications) and for bringing the results to the market via a push strategy, inside and outside the furniture cluster. A long-term prospect could even include exporting the products to other EU countries or even licensing other producers to manufacture them, which would also entail the involvement of the DTC with the partner company.

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Danube Innovation Partnership: Networking of transfer centres

Joint Research Centre (JRC), in collaboration with European Commission Directorate-General for Research and Innovation and Directorate-General for Enterprise, set up in 2011 the European Technology Transfer Offices Circle (TTO Circle). These create a network which brings together the technology transfer offices of major European Public Research Organisations. The TTO Circle operates as a laboratory for the development and testing of new tools, methods and instruments to support technology transfer and the commercialisation of research results in Europe. The members of TTO Circle include 25 largest research organisations in Europe.⁴¹

JRC, leveraging on the expertise of the TTO Circle members, the World Intellectual Property Organisation (WIPO), and the European Investment Fund (EIF), proposes to gather stakeholders in the innovation value chain of the Danube Region into a partnership that will design and implement actions to accelerate innovation and technology transfer. JRC will build on the results of a pilot initiative of Danube Transfer Centres launched recently by the Steinbeis Foundation with 4 partners.

The JRC formally launched the **Danube Innovation Partnership (DIP)**⁴² in October 2013. The Partnership is composed of various actors from 14 countries of the Danube Region, such as universities, research centres, technology transfer offices, local and national governments. DIP is an integral part of the JRC's Scientific Support to the Danube Strategy. The main aim of this initiative is to create a network designing and implementing measures that could accelerate innovation and technology transfer, support the commercialisation of research in the Danube Region and deliver a roadmap of initiatives and actions to undertake.

Based on the DIP roadmap, various instruments to enhance innovation could be deployed. JRC will rely for this on the expertise of the TTO Circle members, and will involve EIF and WIPO for specific instruments. The Steinbeis Foundation will also be closely associated to the development of various instruments. These instruments include, e.g.:⁴³

- **TTO Set-up Guidelines** – practical guide for the set-up of technology transfer offices developed by JRC in collaboration with members of the European TTO Circle and the League of European Research Universities.
- **Innovation funding guidelines** – practical guide on the different sources of funding for innovation available at EU-level.
- **Technology Transfer Summer School** – covering the basics of technology transfer for approximately 100 participants from universities

⁴¹ COM(2010) 546 Innovation Union flagship initiative. [Electronic resource] - Access mode: http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf

⁴² <http://www.ec.europa.eu> „JRC launches the Danube Innovation Partnership“ [accessed 05.02.2014]

⁴³ EC (2013). Joint Research Centre. Danube Innovation Partnership: A proposal

and research centres in the Danube area. The course would leverage the expertise available within the partners of the TTO Circle and organisations like WIPO, OECD, and others such as the League of European Research Universities, etc.

- **Technology Transfer Secondment Programme** – allowing technology transfer professionals from the Danube Region to be hosted by member TTOs of the TTO Circle and learn on-the-job in some of the most advanced technology transfer offices in Europe.
- **Technology Transfer Financial Instruments** – strengthening financial support mechanism for innovation in the Danube Region which would be based on existing financial instruments.
- **E-learning module** – could be rapidly put at the disposal of innovation actors of the Danube Region and would be based on an e-learning module on intellectual property management and technology transfer that was made by JRC for scientists and researchers of organisations part of the TTO Circle.

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The basics of applications for European research projects

The programming period 2014 -2020 is knocking on the door. In order to prepare the trainees active in the field of project development and proposal writing it is necessary to deliver the training which will help to provide the practical experience for successful preparation of project proposals for European funding programmes. Firstly, the possibilities within the new programming period are presented, mainly with regard to Horizon 2020 and new dedicated SME Instrument.

The trainers in this regard must clearly teach how to compose and submit a project proposal with a high probability of success. This section of the handbook contains not only basics of applications for European research projects but also examples of exercises that could be prepared by trainers in order to execute efficient training with measurable outcomes.

This kind of training may be intended for a target group of researchers but also SMEs which are dealing with the challenge of obtaining funds for their research and innovative ideas. In many cases, a lot of stakeholders involved in knowledge and technology transfer would not be able to accomplish their goals without project funding.

The role of the trainer is to reveal how to write a proposal that would fit to the call and that would have a high degree of acceptability. This section can help the trainers to enhance the skills of trainees in developing sophisticated project proposals, to show them how to implement projects within their organisations and institutions, to get the most benefits from the implementation and to help the trainees to understand a project's value as an instrument to achieve the objectives of their organisation. Additionally, it is crucial to identify the incentives and ideas that led the organisation to apply for a project.

Therefore, the main roles of the trainer should be to teach how to:

- Find the most suitable funding scheme and related call;
- Plan a proposal;
- Find the most appropriate transnational partners and create a consortium;
- Establish an action plan including budget issues.

Possibilities of the new programming period 2014-2020

The new programming period offers numerous possibilities to receive funding for project ideas. The main instrument in this regard is Horizon 2020. It is the EU funding programme for research and innovation with almost €80 billion of funding available in the period 2014-2020.

One of the possibilities is represented also by the new SME Instrument which can play a major role in the support of innovative ideas of small and medium-sized enterprises.

Horizon 2020

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. EU funding for research and innovation is focused on the three main priorities, corresponding to the pillars of Horizon 2020 (Fig. 7):⁴⁴

- **Excellent Science** – to reinforce and extend the excellence of EU's science base and to consolidate the European Research Area in order to make the EU's research and innovation more competitive on a global scale.
- **Industrial leadership** – to speed up development of the technologies and innovations that will help to innovative European businesses to grow into world-leading companies.
- **Societal challenges** – reflecting the priorities of the Europe 2020 strategy and addressing major concerns shared by citizens in Europe and elsewhere.

In addition, there are two specific objectives / horizontal programmes:

- **Spreading excellence and widening participation** – targeted at low-performing Member States in order to balance research and development performance with other EU countries.
- **Science with and for society** – aimed at cooperation between science and society to make science more attractive, increase awareness and open up new research and innovation activities.

And three smaller blocks:

- **European Institute of Innovation and Technology (EIT)** – created to enhance Europe's ability to innovate by integrating education and entrepreneurship with research and innovation at EU level. The main operational arm of the EIT is its Knowledge and Innovation Communities (KICs). Currently, there are 3 KICs (Climate, InnoEnergy, ICT Labs) and 5 new are to be launched from 2014 onwards (active ageing, raw materials, added-value manufacturing, Food4Future, urban mobility).

⁴⁴ <http://www.ec.europa.eu/horizon2020> „What is Horizon 2020?“ [accessed 02.05.2014]

- **Joint Research Centre (JRC)** – it is the Commission’s in-house science service and the only service responsible for direct research.
- **Euratom** – it is a complementary research programme for nuclear research and training.



FIGURE 7: Structure of Horizon 2020⁴⁵

SME Instrument

SME stands for **small and medium-sized enterprises** as defined in the EC recommendation.⁴⁶ To be counted as an SME, the enterprise must be engaged in an economic activity and must have:

- less than 250 employees, and
- an annual turnover not exceeding €50 million, and/or
- an annual balance sheet of no more than €43 million.

Within the SME category, a **small enterprise** is defined as an enterprise which:

- employs fewer than 50 persons, and
- whose annual turnover and/or annual balance sheet does not exceed €10 million.

⁴⁵ <http://cerneu.web.cern.ch/horizon2020> “Horizon 2020 Structure” [accessed 02.05.2014]

⁴⁶ Commission recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, notified under document number C(2003) 1422.

The SME Instrument has been designed for the first time in the new programming period specifically for single or groups of highly innovative for-profit SMEs with international ambitions, determined to turn strong, innovative business ideas into winners on the market. The aim of this instrument is to:⁴⁷

- Fill the gaps in funding for early-stage, high-risk research and innovation by SMEs, as well as stimulating breakthrough innovations;
- Target all types of innovative SMEs showing a strong ambition to develop, grow and internationalise;
- Provide support to all types of innovation, including non-technological, social and service innovations, given each activity has a clear European added-value.

Additionally, the SME Instrument reduces the entry barriers to SMEs for Horizon 2020 funding. It offers funding for highly innovative projects in the three phases, each of which will be open to all SMEs:^{48,49}

Phase I : *“Concept and feasibility assessment”* – This proof of concept includes the scientific or technical feasibility and commercial potential of new idea in order to develop an innovation project. The grant provided in this phase is a lump sum of €50 000 per project (70% of the notional eligible costs of €71 429) and if successful, the applicant may receive even higher support through applying for the second phase. It is possible to submit a feasibility study aimed at risk assessment, intellectual property management of a new product, innovation strategy development, market study, etc. The aim of such feasibility study is to verify technological, practical, as well as economic viability of an innovation idea.

Phase II : *“Innovation project”* – It includes the development of the business idea into a market-ready product, service or process which can be, but need not be developed through the phase I. Activities should focus on demonstration, testing, prototyping, piloting, scaling-up, designing, etc. in order to bring an innovation idea to the market. The received grant is usually in the order of €500 000 to 2.5 million covering up to 70% of eligible costs, or even 100% if the project has a strong research component or if it is specifically foreseen in the Work Programme.

Phase III : *“Commercialisation”* – Even though no grants are provided in this phase, it is possible to get additional EU support to enter the market with the innovations created within phase II. This includes investment readiness support, help with accessing risk finance and customers, and European Enterprise Network services.

In addition, to enhance the company’s innovation capacity, help align the project to strategic business needs, and foster the project’s long-term commercial sustainability, *coaching and mentoring* will be available throughout phases I and II to the successful beneficiaries. It will be provided via the Enterprise Europe Network (EEN) and delivered by qualified and experienced business coaches through consultations and signposting.

⁴⁷ <http://www.brusselsnetwork.be> „The new dedicated SME instrument under Horizon 2020“ [accessed 02.05.2014]

⁴⁸ <http://www.ec.europa.eu> „SME participation“ [accessed 02.05.2014]

⁴⁹ <http://www.ec.europa.eu> „H2020 Online Manual“ [accessed 02.05.2014]

How to write a successful project proposal

The whole project cycle consists of various steps from planning, setting the strategy, assessment of needs and self-assessment, identification of potential partners and first contact with them, establishment of an effective action plan and budget plan, and finally the negotiation, implementation and monitoring of the project. Therefore, writing a project proposal is only the first step in the project cycle. When successful, this step continues with various other actions which are crucial in achieving the objective we want to accomplish by the project. It is necessary to keep in mind that the project proposal is only an instrument, not a goal.

Planning

A quality project proposal considerably increases the chance of achieving the objectives of the organisation. It is necessary to plan and prepare for the proposal writing. Preparatory phase allows assessing if there is a realistic predisposition that the project will be successful. The organisation should start with its strategy in order **to assess the needs and existing opportunities**. The decision on whether to apply for funds through the project should be based on more factors. These may include:

- Possibility to link the project with the mission, vision and priorities of the organisation;
- Expectations from the project related to short-term and long-term results;
- Problems and challenges that could be solved by the project;
- Availability of human, material and financial resources – capacity and capability;
- Availability of necessary infrastructure;
- Know-how of the organisation;
- Level of own contribution;
- Overall benefits of the project.

Despite good strategy and planning, the application for project usually requires longer-term approach. It is often crucial to be a member of the most significant organisations, networks and platforms, to have well-established position (on the market in case of SMEs / in scientific environment in case of research organisations and institutions), to demonstrate excellence of the applicant through awards, certificates, past engagement in projects, etc. This is a long lasting process which, however, brings added value to the project.

Another important step in the preparatory phase is **to find a suitable call** which corresponds to what we want to achieve. Each call is specific and contains documents and guides that help to prepare the quality proposal. When considering EU projects (e.g. Horizon 2020, SME Instrument, etc.), the relevant documents can

be found in the European Commission's Research and Innovation **Participant Portal**. The participant portal is an 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. The understanding of the text of the call is one of the steps in succeeding in EU funding schemes.

If the applicants (in this case trainees) are familiar with EU research funding, it is possible to go directly to the Horizon 2020 calls at the Participant Portal under Funding opportunities and filter open calls according to the individual interest. On the other hand, if the potential applicants want to find topics that belong to open or upcoming calls, they can search through the key words on the Search Topics page.

The main information related to the particular call can be found on the **Call page** which contains the basic data and key documents to prepare a proposal. Calls are further sub-divided into **Topics**. The scope and expected impact of each topic is described on the **Topic page** which specifies the submission deadline and contains a link to the electronic submission system. The document where the information on the time schedule of the calls, as well as call conditions can be found is the **biannual work programme**.



Exercise. *In order to execute an exercise on how the trainees understand the text of the call the trainer may print the text of a call relevant to researchers or SMEs, respectively, depending on the target group of the training. It should contain the topic of the call, description, main framework conditions and eligibility criteria. After reading the text of the call, the trainees should be able to answer the following questions:*

- *What is the objective of the call?*
- *Why is there a need to reach the objective?*
- *How could it be reached?*
- *Is partnership required?*
- *What is the maximum EU contribution per project?*
- *What is the expected impact?*

If an organisation wants to participate in a project proposal, it is necessary **to create an account on the Participant Portal and to make an online registration with the Commission**. After the registration, the organisation will receive a 9-digit Participant Identification Code (PIC) which is the unique identifier used in any interactions with the Commission.

Partnerships

After self-assessment resulting in a statement that the organisation is eligible and ready to implement the project, there is a need **to find partners** that could form the consortium. Partnerships are desirable because they enhance the quality of the project by helping to move towards the objectives and the vision. When considering the proposals related to knowledge and technology transfer,

partnerships are an inevitable part of projects since the transfer require at least two parties: technology donor and technology user. Even when we take into account only one side of the technology transfer process, it is usually beneficial to work in partnerships, e.g. in the development of a technology. The important role of partnerships in technology transfer has already been described in chapter 2.

This section is dealing mostly with identification of the most relevant partners for the project, selection of partners and analysis of partner profiles in order to assess the value added they can bring to the project. Expertise of others is one of the best external resources in the project. Additionally, it is important to highlight that the key element is the **complementarity of partners and not the duplicity**.

The active searching for partners whose profile corresponds to a particular call can be done, e.g. on conferences, brokerage events, internet, and ideally the partners may be involved in the project based on previous bilateral cooperation. Key aspects that have to be taken into account when searching for the most relevant partners are the following:

- Type, size and internal characteristics of the potential partner;
- Similar focus of performed activities (research or business/commercial) in order to find common interests and objectives that could be fulfilled by the joint project;
- Similar expectations and ambitions;
- Complementary skills, facilities and know-how that could enrich the collaboration and accelerate the progress;
- Ability and willingness to dedicate human and financial resources in the joint project efforts;
- Ability to take risks and to cope with the pressure the project could bring.

In addition to the above mentioned channels of partner search, the potential partners may be found with the help of partner search services provided by National Contact Points and other entities. These include, e.g.:⁵⁰

- **CORDIS Partner Service** – one of the largest databases of self-registered partner profiles.
- **Enterprise Europe Network** – the cooperation opportunities database publishes an extensive number of profiles of international companies and research organisations which may help to find suitable partners for bilateral business, innovation and technology cooperation.
- **Other theme-driven networks and databases**, e.g. Idealist Partner Search (ICT), Fit for Health (health and life sciences), IMI Partner Search (pharmaceutical innovation), etc.

After the identification of the most relevant partners, **first contact** with them and **formal involvement in the partnership**, it is necessary to define the roles each partner will play in the project. The partners must be informed in advance what will be their responsibilities and tasks in order to avoid potential misunderstandings and

⁵⁰ <http://www.ec.europa.eu> „H2020 Online Manual“ [accessed 02.05.2014]

conflicts during the implementation of the project. The tasks must be assigned to partners according to their expertise in specific field in order to get the most benefits from their participation. Additional to the professional roles of the partners, it is good to create a project management structure which will determine the position of each partner in the decision-making bodies of the project. All these relationships and tasks should be clearly described in the project proposal.

In some cases, it is also possible to apply for funding through individual proposals. The opportunity to submit a research proposal as an individual researcher or organisation arises under the Horizon 2020 European Research Council grants and the Marie Skłodowska-Curie actions. Individual SMEs can apply to the Horizon 2020 SME Instrument.



Exercise. *In order to test the abilities of trainees to find the right partners, to negotiate with them and to work in partnerships, various exercises can be used, e.g.:*

- *Split up the participants into pairs, where one person will be interviewed by the other in order to find his/her main characteristics. Then, the roles will swap. Assessing the quality of obtained information may show what is the ability of trainees in finding the most important information about partners.*
- *Group exercises can help to test the team working skills. The trainer can pose a question to the whole group of participants. If the group is too large, the trainer can split it up into smaller groups. Each participant will think about the answer and afterwards, participants will discuss their answers with the whole group in order to find the consensus. This can help to find out if the trainees are able to cooperate and deal with different opinions of others.*
- *The trainer can think of other exercises in order to test whether the trainees are able to work in partnerships.*

Proposal writing

After finishing the preparatory phase and after finding the right partners for cooperation, proposal writing phase can begin. One of the most important things is to become familiar with the required structure of the proposal. This includes not only the content of the whole project proposal but also its length. This is usually determined by the type of the project, as well as by the requirements indicated in the particular guidelines. However, some common elements can be found in the architecture of various formats and application forms.

In order to leave a positive first impression, it is necessary to create a short and concise topic which will refer to a key result or objective of the project. It should give the evaluator and the reader an effective snapshot of what is the proposal addressing. Additionally, an eloquent acronym contributes to better memorability of the proposal. This, together with indication of particular funding scheme, name and contact details of the lead organisation and list of other partners (if any) is placed on the title page. It is followed by the list of contents, which is in many cases determined by the nature of the project. In order to provide an overview of the

whole content of the proposal, an abstract should be included. It is a short summary containing the problem statement, main objectives, information about partnership and activities.

When considering research projects submitted under Horizon 2020, the project proposal should contain detailed description and justification of the:

- Concept and background of the project;
- Progress beyond the state-of-the-art;
- Activities, work plan and timeline;
- Milestones, deliverables and other outcomes of the project;
- Human, material and financial resources required;
- Expected impacts of the project.

Concept Concept of the project contains the information about what ideas led the organisation to develop the particular proposal and to apply for funds. It usually incorporates a strong theoretical description of the main challenges and contains the literature review which demonstrates the rationale of the proposal. Concept describes the social, economic, political and cultural background from which the project is initiated.⁵¹ This part of the proposal should give the organisation an answer how the project fits to its mission and vision. Therefore, the concept and background explain the needs of the organisation and the problem it is trying to solve through the project. Where possible, the information provided in the concept and background should be supported by statistical data in order to picture the realistic overview of the situation and to enhance the arguments for the project.

Advancements Additionally, not only the background information is important to express the need to implement the project, but it is also necessary to describe the advancements that could be achieved by the project. Concept containing the literature review captures the state of the art in the particular field. It should be further explained what is the progress the organisation would like to achieve by the project.

Excellence of the project coordinator Moreover, the excellence of the project coordinator should be mentioned in this section of the proposal. It may include the history of the organisation, mostly with respect to achievements, expertise, past experience, results of previous activities, etc. Presenting the organisation in a successful way means to highlight the main strengths and capabilities related to the topic. Special attention should be paid to international position and recognition of the organisation. It may be expressed through past engagement in projects, membership in various organisations, etc.

Aim and Objectives One of the most important parts is to set the appropriate aim and objectives of the project. The most usual approach is to set one main aim which is then broken down into various objectives. The overall aim responds to the key problem the project is trying to solve. Specific objectives

⁵¹ Nebiu B. (2002). Developing skills of NGOs: Project Proposal Writing. The Regional Environmental Center for Central and Eastern Europe. ISBN: 963-9424-18-8.

contribute to the fulfilment of the main aim. Each project usually has multiple objectives which provide a more detailed breakdown of the main aim. Objectives should be measurable, achievable, verifiable, and formulated in a solution-neutral way. Quality objectives are related to the topics addressed in the call and are in line with the strategic goal of the call.

The rule regarding the objectives is represented by the word “SMART”, where:

- ✓ **S** specific, simple
- ✓ **M** measurable
- ✓ **A** acceptable
- ✓ **R** realistic
- ✓ **T** time-scheduled

Activities and Work plan

Methods and steps that lead to the achievement of specific objectives are represented by project activities. The activities are usually delivered through work packages which are broken down into tasks. This creates a work plan of the project which is important in the implementation phase of the project. It is important to provide clear description of the activities, as well as the time schedule of their implementation. The work plan consists of logically linked activities divided into interlinked work packages which are appointed to individual partners. The efficient work plan should be prepared by the project coordinator in cooperation with other project partners. It should be consulted with work package leaders and task leaders from the partnering organisations in order to agree on individual activities and responsibilities of each partner. The work plan should contain detailed work description including, e.g. rationale of each activity, objectives to be achieved by the respective activity, approach, leader of the activity and roles of other partners (if any).

Moreover, it is good to make a graphical presentation of the activities showing their interdependencies using simple pictures and schemes. For example, a PERT diagram is a valuable instrument in this regard (Fig. 8).

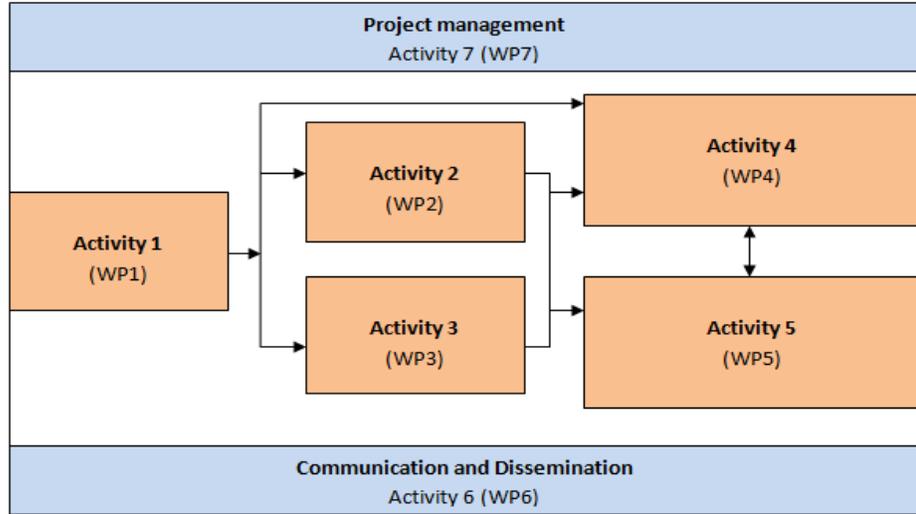


FIGURE 8: PERT diagram

Timing

Another important issue is the timing of activities / work packages and their components. The duration of each activity can be illustrated in a Gantt chart (Tab. 1) showing the beginning, the end of the activity and respective milestones (M). This graphical tool helps to better understand the planned activities and their time dependency since some activities may depend on the completion of the others. Gantt chart represents the easiest way to present the activities in a certain time frame. It is necessary to pay attention to the timing of activities because the time frame set in the proposal will have to be followed during the whole implementation of the project. In order to avoid delays in the implementation, the time schedule should be followed as closely as possible.

TABLE 1: Gantt chart

| | Month 1 | Month 2 | Month 3 | Month ... | Month n |
|------------------------------------|---------|---------|---------|-----------|---------|
| Activity 1 (Work Package 1) | | | | | |
| Task 1.1 | | M | | | |
| Task 1.2 | | | | | |
| Activity 2 (Work Package 2) | | | | | |
| Task 2.1 | M | | | | |
| Task 2.2 | | | | | |
| Task 2.3 | | | | M | |

Deliverables and Milestones Following this, the milestones and deliverables are important parts of the project work plan. These represent the results which are to be achieved through the realisation of individual activities. The results provide more detailed overview and description than the aim and objectives. The results should be measurable using various indicators. These provide a quantifiable basis which helps to assess the success in reaching the project's objectives.⁵² **Deliverables** can take different nature, such as: report, prototype, demonstrator, etc.; and various dissemination levels depending on the confidentiality of data. Some deliverables are available to public and others are restricted to the partnership, to a specific group of users, or to other programme participants. Deliverables are assigned to the activities and their delivery is planned for a certain month from the project start date. On the other hand, **milestones** represent actions to be taken during the project, such as workshops, conferences, strategy developments, i.e. key events providing an overview of the progress. It has to include information on how the milestone will be attained, i.e. means of verification.

Resources In order to express the capacity and capability of the consortium to implement the project, it is necessary to provide the description of available **human, material and financial resources**. The appropriateness of the allocation and justification of the staff, equipment and budget can be provided in the section related to resources to be committed which describes how the necessary resources will be mobilised and integrated in a coherent way.

- **Human resources** are related to the project personnel and to the roles each partner has in the project. In order to manage the human resources in an effective way, the project management structure is usually created. It should be designed to provide the control over the entire project in terms of time, activities and budget. It is the decision making mechanism responsible for all operative decisions concerning the project. Well-functioning management structure has to establish an effective system of internal and external communication in order to achieve successful results by increasing the synergy of the cooperation.

Additional to the management structure of the project, the proposal should contain brief description of quality and expertise of each individual participant. Short profile of the organisation including main tasks in the project and previous experience relevant to these tasks should be provided. Profile of all staff members who will undertake the work in the project should be also provided.

Quality and excellence of the consortium as a whole can show how do participants collectively constitute a team capable of mutual cooperation, how they are suited and committed and well-balanced in relation to project objectives. Complementarity between participants is an important element in achieving the aim and objectives and high quality of outcomes.

⁵² Nebiu B. (2002). op. cit.

- **Material resources** include necessary infrastructure to undertake the activities of the project. It may be related to, e.g. equipment, technical infrastructure, research infrastructure, etc.
- **Financial resources** indicate what amount will be required to undertake the project. This should be based on the plan of budget resources. The overall financial plan of the project must be adequate, indicating all major cost items. The composition of the budget is in the competence of the project coordinator in cooperation with consortium. However, certain limitations have to be taken into account. All the costs are usually classified into various budget categories. Key cost categories include personnel costs, travel and accommodation, meetings and events, consumables and in some cases also subcontracting. Firstly, the budget must reflect the effort invested by the partners to the activities and tasks of the project. The effort is usually expressed in person months allocated to each work package (activity). Based on the number of person months and the hourly rate for personnel in each country and/or organisation, the personnel costs are calculated. Travel and accommodation costs include participation in the events either related to partnership meetings or to conferences, brokerage events, etc. The category of meetings and events includes the costs of organisation, e.g. rent of premises and catering. Consumables are used to ensure that promotion and other materials are printed and disseminated. It may include flyers, booklets, brochures, etc. Finally, some activities such as translation services, printing and editing of project publications, independent evaluation may be subcontracted. However, transparency and rules for equal treatment have to be followed when selecting the subcontractor.

Additional to the requested EC contribution, the partners can highlight their success in obtaining national grants and other forms of financial support. This can show their ability to integrate and use the resources in a coherent way.

Risk analysis and contingency plans It is desirable that the consortium is well aware of the fact that the project could face difficulties during its implementation. Therefore, the project should contain risk assessment analysis and contingency plan in order to be able to face possible problems that may arise. The risks are usually attributed to individual activities / work packages, may be of different nature, and may be assigned various degree of importance.

Impacts One of the most important parts of the project is the impact. This section should describe not only the expected impacts at different levels (e.g. regional/national/transnational), but also steps needed to bring about these impacts. It may explain how account is taken of other national or international activities. Additionally, it is necessary to assume any external factors that may determine whether the impacts will be achieved. The impacts are considered also from the perspective of dissemination and exploitation of project results.

The whole project hierarchy based on the description of individual parts of the project is illustrated in the Figure 9 below.

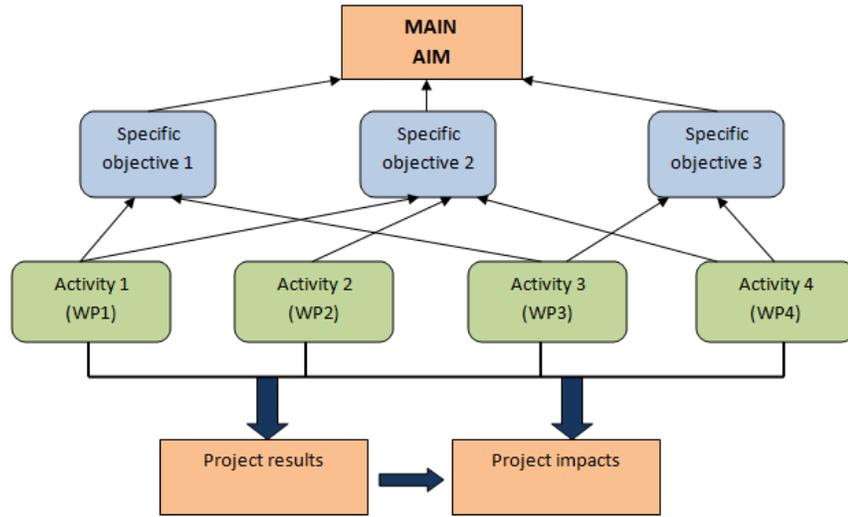
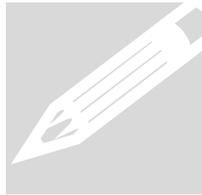


FIGURE 9: Project hierarchy



Tips in writing a project proposal:

- Prepare an easy-to-remember acronym;
- Follow the instructions given by the call;
- Set a clear, measurable and attainable objective;
- Write comprehensibly and simply;
- Develop a logical framework and create logical links;
- Anticipate future problems and prepare contingency plans;
- Focus on impacts and follow-ups;
- Leave a positive last impression.

Finally, when the project proposal is finalised, it is time to make the last step which is **submission**. The projects under EU research and innovation programme are submitted electronically through the Participant Portal. Once the project is submitted, the Commission **checks its admissibility** and **eligibility** and asks independent experts to **evaluate** it on the basis of the criteria “*excellence*”, “*impact*” and “*quality and efficiency of the implementation*”. To be considered for funding, a proposal must achieve a pre-defined qualifying score on each criterion, and an overall qualifying score. Grant preparations are opened for the highest-scoring proposals.

Conclusion

Human resources create the most important asset of each institution, regardless whether it is a research organisation or a private company. Their training and development is an essential tool that helps the institution to move forward, to be innovative and to keep stable position in the scientific or market environment. Therefore, the training is necessary for the growth of the individual, as well as the organisation as a whole.

In order to be able to deliver the training of a high quality, the ToT is necessary since it prepares those who will deliver the training and who will transfer the knowledge onto the target audience. The trainers must be able to prepare and deliver the training which is effective, efficient and engaging at the same time.

ToT is a complex process which aims to deliver the skills to carry out the training. It is composed of various steps that lead to the future successful implementation of training. The importance is stressed to the following parts:

- Preparation of training;
- Training delivery;
- Evaluation of training.

Each part is important and the success of the training depends on the quality of the above mentioned steps. Key aspects of the training lie in the preparedness of the trainer, proper method of training which encourages interactivity and active participation, selection of the most relevant themes and topics respecting the needs and expectations of trainees, and in the training assessment. All these factors lead to the fulfilment of the aim and objectives.

It is necessary to notice that the secret of competent and successful trainer is not measured by the number of handbooks and manuals s/he has read but by the knowledge transferred to the participants and their ability to apply it in real life.

This handbook highlights the importance of gathering and distributing information mostly with regard to knowledge and technology transfer and project proposal writing to the trainers so that they become able to facilitate the learning and to help the trainees to reach solutions.

The knowledge and technology transfer is defined in many different ways. However, all of the definitions lead to the same goal which is moving the idea from laboratory to a marketplace what helps to bridge the gap between research and business. It is a very broad topic since it is composed of various steps from R&D activities, prototyping, patenting, licensing, product development and marketing. The essence lies in the transformation of invention into the product or service that could be commercialised in the market and thus, bring benefits to all involved.

In order to support the idea of knowledge and technology transfer, case studies have been used. These bring practical insight into the topic and provide an overview of possibilities brought by the concept of knowledge and technology transfer from various countries and regions. Additionally, case study is one of the effective methods used in the training and thus, may be understood as a dissemination method supporting the training process.

Finally, this handbook captures the challenge of obtaining funds for research and innovative ideas of R&D organisations and SMEs. European Union research projects are one of the opportunities in this regard. These represent the option for stakeholders involved in the knowledge and technology transfer who would otherwise not be able to accomplish their goals without project funding. The main benefits of funding obtained through projects are in the fulfilment of goals and priorities of the applicant, better opportunity to solve problems, challenges and to find partners. Therefore, enhancing the skills to prepare and implement sophisticated projects brings value added in achieving the objectives of each organisation.

Glossary

After Action Review is a method for joint discussion of the event by its participants in order to draw conclusions.

Authors are persons whose creative work resulted in development of a product.

Best practice is the best way (method, solution) for achievement of a defined goal.

Commercialisation is aimed at making profit through the use of IPR objects in production, as well as from sale or transfer of rights to use these objects to other legal and natural persons.

Data is a fact, concept or instructions presented in a conditional form suitable for forwarding, interpretation and processing by a person or by automated means.

Explicit knowledge is that which can be recorded or encoded.

Forum is a web-application, which allows users to communicate with each other.

Groupware is a technology, allowing organizing a teamwork and efficient knowledge and information exchange inside of this team.

Industrial sample is a result of creative human activity in the field of industrial designs.

Information is a contextually related data.

Intellectual Property (IP) in a broad sense means the rights fixed by the law to the results of intellectual activity in the field of production, science, literature and art.

Invention is a result of intellectual human activity in any field of technology. Invention means establishment of new laws, properties and phenomena of material world.

Job rotation is a practice of transfer of organization's employees from one position to another for training and development of staff.

Knowledge is the information in conjunction with the rules, procedures and operations of its processing.

Knowledge management is the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation.

Knowledge map is a visual representation of knowledge of the organization.

License to use the object of intellectual property is a contract under which a person who has the exclusive right to authorize the use of OIPR (the licensor) grants to another

person (the licensee) a written permission giving the licensee the right to use this object in a certain limited field.

Objects of intellectual property right (OPIR) are results of intellectual and creative activity which correspond with legal requirements.

Open Space Technology is a way of organizing meetings, conferences, symposia, at which there should be a clear and convincing topic, interested and prepared group, and a leader. At the same time, this event starts without traditional formal program (agenda), materials and plans.

Patent is a technical and legal document issued to the applicant for an invention, utility model or industrial design which meets the conditions of patentability and confirms the authorship, priority and the right of ownership to mentioned objects.

Tacit knowledge is that which one can feel and understand, but which is practically impossible to express.

Technology is a systematic knowledge about manufacturing of products, application of process or rendering of service regardless whether this knowledge is reflected in the invention, industrial sample, useful model, new processing system, technical information, services or assistance provided by the specialists in design, installation, management of production or its activity.

Technology brokers are physical persons who can be private entrepreneurs providing services to participants of technology transfer for searching of business partners, investors, or for establishing contacts between individuals, groups or organisations for promotion of innovative ideas through creation of new or use of existing technologies for gaining profit or other benefit.

Technology transfer is a promotion of technology towards its practical use with gaining profit or other benefit in the long run.

Trade secret is technical, commercial, organizational and other information which can increase the efficiency of production or of any other socially expedient activity, or can ensure some other positive effect.

Trademark is a designation by which goods and services of one person differ from goods and services of others.

Wiki technology is a website which structure and content can be jointly changed by the users with the help of tools provided by the site itself.

World Café is a method of organizing workshops under which the atmosphere of cafe is created in the room. Participants discuss a problem or a question in small groups, sitting at the tables.

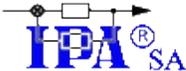
References

1. Bozeman B. (2000). Technology Transfer and Public Policy: A Review of Research and Theory. – *Research Policy*, 29, 627-655.
2. Carayannis E.G. – Alexander J. (1999). Technology-driven strategic alliances: tools for learning and knowledge exchange in a positive-sum world. – In Richard C. Dorf (ed.), *The Technology Management Handbook*, Boca Raton, FL: CRC Press.
3. COM(2010) 546 Innovation Union flagship initiative. [Electronic resource] - Access mode: http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf
4. Commission recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, notified under document number C(2003) 1422.
5. Conflict Resolution Network, PO Box 1016 Chatswood NSW 2057 Australia, <http://www.crnhq.org> „CR Kit“ [accessed 28.04.2014]
6. Dogra R. – Garg R. – Jatav P. (2013). Technology Transfer in Pharmaceutical Industry: Transfer of Process from Development to Commercialization. – *International Journal of Pharmaceutical Sciences and Research*, Vol. 4(5): 1692-1708.
7. EC (2004). Developing and delivering training on the Aarhus Convention for Civil Society: A Manual for Trainers. EU project: "Environmental Information, Education and Public Awareness, Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine" EuropeAid 02-0114. ISBN: 966-8026-51-9.
8. EC (2013). Joint Research Centre. Danube Innovation Partnership: A proposal
9. Fisher F. (2007). Průručka pre trénerov. – Finančný Manažment pre samosprávy/Financial Management for Local Government, Earthscan 2007. ISBN:978-7-84407-402-2.
10. Kirkpatrick D. (1995). *Evaluation Training Programs: The Four Levels*. - Beret-Koehler Publishers, San Francisco.
11. Krč K. (2012). Transfer technologií: Příležitost i nezbytnost pro české univerzity. – Mendelova Univerzita v Brně. ISBN: 978-80-7375-655-0.
12. Levin M. (1996). Technology Transfer in Organizational Development: An Investigation into the Relationship between Technology Transfer and Organizational Change. – *International Journal of Technology Management*, 2(3), 297-308.
13. Loeffler J. - Gohla R. – Hermann E. - Chiran D. (2011). Innovation in SMEs. Contract POSDRU/92/3.1/S/61289, Dezvoltarea competențelor manageriale și antreprenoriale în vederea creșterii competitivității și valorificarea oportunităților de afaceri. Proiect cofinanțat din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013 "Investește în oameni.

14. Loeffler J. – Chiran D. – Gohla R. – Hermann E. (2011). Transnational partnership for SMEs: Challenge and benefits. – Contract POSDRU/92/3.1/S/61289, Dezvoltarea competențelor manageriale și antreprenoriale în vederea creșterii competitivității și valorificarea oportunităților de afaceri. Proiect cofinanțat din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013 “Investește în oameni.
15. Milano M. – Ullius D. (1998). Designing powerful training: The sequential-iterative model. - San Francisco, CA: Jossey-Bass, 1998, p. 87.
16. Minieri J. (2007). Training for Trainers: A Guide to Designing Interactive Trainings Using Popular Education Techniques. – Research Centre for Leadership in Action, NYU Wagner.
17. Mittelman J.H. – Pasha M.K. (1997). Out from underdevelopment revisited: Changing global structures and the remaking of the Third World. New York: St. Martin’s Press.
18. Nebiu B. (2002). Developing skills of NGOs: Project Proposal Writing. The Regional Environmental Center for Central and Eastern Europe. ISBN: 963-9424-18-8.
19. OECD LEED Forum on Partnerships and Local Governance (2006). Successful Partnerships: A Guide. – Collective of authors.
<http://www.oecd.org/cfe/leed/forum/partnerships>
20. Philips R. (2002). Technology Business Incubators. How Effective Is Technology Transfer Mechanisms? – Technology in Society, 24(3), 299-316.
21. Shandler D. (1996). Reengineering the Training Function. - St. Lucie press, Florida.
22. Singh Y.P. (1999). Training of Trainers (ToT) Manual. – Haryana Community Forestry Project, Haryana Forest Department.
23. Solter C. – Minh Duc P.T. – Engelbrech S. (2007). Advanced Training of Trainers: Trainer’s Guide. – Pathfinder International, Watertown, MA.
24. Tuckman B. (1965). Development sequence in small groups. – Psychological Bulletin 63 (6): 384-399.
25. Williams F. – Gibson D.V. (1990). Technology Transfer: A Communication Perspective. – Sage: Beverly Hills, CA.
26. <http://www.ted.com>
27. <http://www.steinbeis-impact.com> „The Steinbeis Network – A brief overview“ [accessed 12.12.2013]
28. <http://www.steinbeis.de> „Technology.Transfer.Application.“ [accessed 12.12.2013]
29. http://en.wikipedia.org/wiki/Technology_transfer “Technology transfer” [accessed 30.01.2014]
30. <http://nptt.cvtisr.sk> “Národný portál pre transfer technológií” [accessed 05.02.2014]
31. <http://www.ec.europa.eu> „JRC launches the Danube Innovation Partnership“ [accessed 05.02.2014]

32. http://nitt.cvtisr.sk/uvodna-stranka/o-projekte.html?page_id=255 „Národná infraštruktúra pre podporu transferu technológií na Slovensku – NITT SK“ [accessed 10.02.2014]
33. <http://www.autm.net> „About Technology Transfer“ [accessed 11.02.2014]
34. <http://www.utrs.com> „Technology Transfer“ [accessed 11.02.2014]
35. <http://www.unh.edu> „Technology transfer“ [accessed 03.03.2014]
36. <http://smallbusiness.chron.com> „5 Conflict Management Strategies“ [accessed 28.04.2014]
37. <http://ww.businessballs.com> „Kirkpatrick’s learning and training evaluation theory“ [accessed 28.04.2014]
38. <http://www.ec.europa.eu/horizon2020> „What is Horizon 2020?“ [accessed 02.05.2014]
39. <http://cerneu.web.cern.ch/horizon2020> „Horizon 2020 Structure“ [accessed 02.05.2014]
40. <http://www.brusselsnetwork.be> „The new dedicated SME instrument under Horizon 2020“ [accessed 02.05.2014]
41. <http://www.ec.europa.eu> „SME participation“ [accessed 02.05.2014]
42. <http://www.ec.europa.eu> „H2020 Online Manual“ [accessed 02.05.2014]

NoGAP project partners:

| Beneficiary name | Logo | Country |
|--|--|----------|
| Steinbeis Innovation gGmbH, Steinbeis-Europa-Zentrum |  | Germany |
| Technical University of Cluj-Napoca |  | Romania |
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