



Bio-based Industries  
Consortium

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# *UrBIOfuture*

careers, education & research

Guide of best practices for cooperation between  
academia and industry based on success cases

## 10 Best Practices in Academy-Industry Cooperation to develop Circular Bioeconomy Education Programs

Corporación Tecnológica de Andalucía



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## 1. Executive Summary

REUNE project guidelines gather best practices for academia-private sector cooperation. REUNE Manual of good practices, is a book and an online site published by 'Corporación Tecnológica de Andalucía (CTA)' that compiles more than 60 recommendations of international success cases of University-Business cooperation.

Being REUNE an extensive guide of best practices for cooperation between academia and industry with a transversal approach, it is full of ideas, suggestions and lessons learnt that can contribute to the purpose of the "UrBIOfuture Experience". The objective of the present document "10 Best Practices in Academy-Industry Cooperation to develop Circular Bioeconomy Education Programs" is to select the ten more relevant REUNE's guidelines to reach the mentioned objective, and so be another tool enhancing the afterlife impact of the "UrBIOfuture Experience".

The approach followed to select REUNE's most suitable guidelines was to select just the ten of them more relevant to facilitate cooperation University & Industry in the process of designing together the next European generation of Circular Bio-based Economy education programs.

On the other hand, we highlight that a framework of innovative co-design of educational programs for circular bio-based economy, itself, could one of the best opportunities to build up University and Industry cooperation in Europe. UrBIOfuture project results provide a good start point for it, having needs of the industry, existing gaps in the European Education identified by a reputed consortium of a Horizon 2020 funded project.

The guidelines are presented in a very friendly visual and simple way, that lets anybody to play around and design easily tailormade Action Plans to work with key stakeholders, particularly University and Industries. On the base of the specific characteristics of each region (stakeholders involved, bio-based transition maturity, socio-economic momentum, innovation drivers available, timelines etc..) different relevant scenarios for the guideline applications will emerge and a first draft of a suitable action plan can be designed. Adaptation of the Action Plan depending of objectives, timelines or resources available can be addressed efficiently with reasonable efforts. Detailed Information about international success cases provided are a source of inspiration while visual valuation about implementation needs and stakeholders to involve facilitate optimization of the Action Plan.



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### 3. Acronyms and abbreviations

<b>CTA</b>	Corporación Tecnológica de Andalucía
<b>CBBEPP</b>	Circular-Bio-Based-Economy Education Programs
<b>ECBBEE</b>	European Circular-Bio-Based-Economy Education
<b>MIT</b>	Massachusetts Institute of Technology
<b>R&amp;D</b>	Research and Development
<b>RTO</b>	Research and Technology Organization
<b>USA</b>	United States of America



## 4. Introduction

One of the fundamental pillars of knowledge-based competitiveness is the relationship between Companies and Universities. At present, no single public or private entity alone can generate all the necessary knowledge to create products, or innovative goods and services, in a global market. Therefore, University-Industry collaboration is a necessary condition for innovation and active interaction between the two agents is essential for any region to achieve greater competitiveness.

CTA (Corporación Tecnológica de Andalucía, Technological Corporation of Andalusia) was born in 2005 as a regional instrument to facilitate and foster the collaboration between academia and industry, a key element of regional socio-economic growth and industrial competitiveness. All studies conducted in recent years on the Spanish System of Innovation indicate that one of its main weaknesses is the insufficient use by the industry of the scientific and technological potential existing in the country's public R&D system, particularly where the Universities are concerned. Although considerable efforts have been made by the two parties involved, the difficulties still remain. CTA is now a days considered an essential instrument to provide Companies, Universities and Public Administration, efficient tools to create stronger and more fruitful links with the University and other RTOs. With this aim CTA faced an ambitious project called REUNE, meaning "MEET" in English.

Based in CTA's REUNE project, a guide aiming at facilitating cooperation between academia and industry in the bio-based sector has been produced (see Annex 7).

According with the UrBIOfuture proposal, this guide would include brief description of easy-to-implement ideas and approaches that boost industry-academia partnership and that support proper knowledge transfer. Each practice-card indicates in a visual way the degree of impact, difficulty and costs, as well as the need for personnel, the estimated time to execute it and the beneficiaries. Practices such as laboratories shared by university researchers and companies, exchanges of managers and professors, the involvement of companies' top positions in their collaboration with the University or the loan/renting of equipment as demonstrators to the research groups can have a great impact in the medium and long term in the academia-business partnership to be built in Europe. On the other hand, one of the UrBIOfuture objectives was to build upon UrBIOfuture partners successful earlier activities. Technological Corporation of Andalusia (CTA) contributes to this objective by generating a Guide of best practices that will be built upon the one released by CTA (REUNE manual), selecting best practices to meet to UrBIOfuture Experience afterlife objectives

REUNE project, developed by CTA in collaboration with the School of Industrial Organization (EOI) and BICG consultants, has analyzed international success stories in the University - Industry relationship. This guideline of best practices studied sixteen geographical regions, selected for having similar socio-economic characteristics than Andalusia ten years ago. Having those regions achieved at present a high level of development and worldwide leadership in certain technological based areas, in just ten years, it was considered interesting to analyse their innovation ecosystems and, particularly, the characteristics and relationship models they put in place for University-



Industry cooperation. Sixteen of those regions were analysed in detail and six were visited to hold personal interviews with the protagonists of the most interesting success stories: Veneto (Italy), Nord Pas de Calais (France), Styria (Austria) and Karlsruhe (Germany). Two top worldwide innovations ecosystems - Massachusetts (USA) and Oxfordshire (United Kingdom)- where also visited as relevant references worldwide. In all cases, the issues that could be most useful for Andalusia were analysed, based on a previous analysis of the Andalusian innovation ecosystem situation, carried out through a survey to more than 120 CTA industrial members.

Finally, 63 recommendations were obtained and classified in trends, being then grouped in ten chapters:

#### REUNE MANUAL CHAPTERS

1. Fostering collaboration between Universities and Business
2. Knowledge transfer between Universities and Business
3. Production and commercialisation processes
4. Services, advice and consultancy
5. The management of intellectual property protection
6. Financing
7. Mechanisms for the management of University-Business relationships
8. resources policies
9. Networks, clusters and technology parks
10. Regional frameworks

Recommendations of good practices included in each chapter are briefly explained and recorded in cards showing international examples of specific success cases, where specific recommendation has been put in practice. Visual information was also included, showing expected impact of the recommendation on the enhancement of University & Industry Cooperation, difficulty of implementation, average costs, as well as personnel needed for its development and estimated time for executing each practice. Major beneficiary stakeholder needed for its implementation are also indicated. In this way easy access to companies, research groups and other innovation stakeholders is provided, offering a tool for potential tailored action plans to design efficient collaboration paths between the Industry and the scientific world.



Figure 1: The ten REUNE chapters including, 63 guidelines of best practices for University & Industry cooperation

Recommendations of good practices included in each chapter are briefly explain and record in cards showing examples of specific known cases where particular recommendation has been put in practice and also visual information about expected impact of the recommendation on the enhancement of University & Industry Cooperation, difficulty, costs, as well as personnel needs for its implementation and, estimated time for executing each practice. Agents necessary for its implementation are also indicated, in order provide easy access to companies, research groups and other innovation stakeholders a potential tailored action plan of implementation for designing a path of collaboration between the Industry and the scientific world.

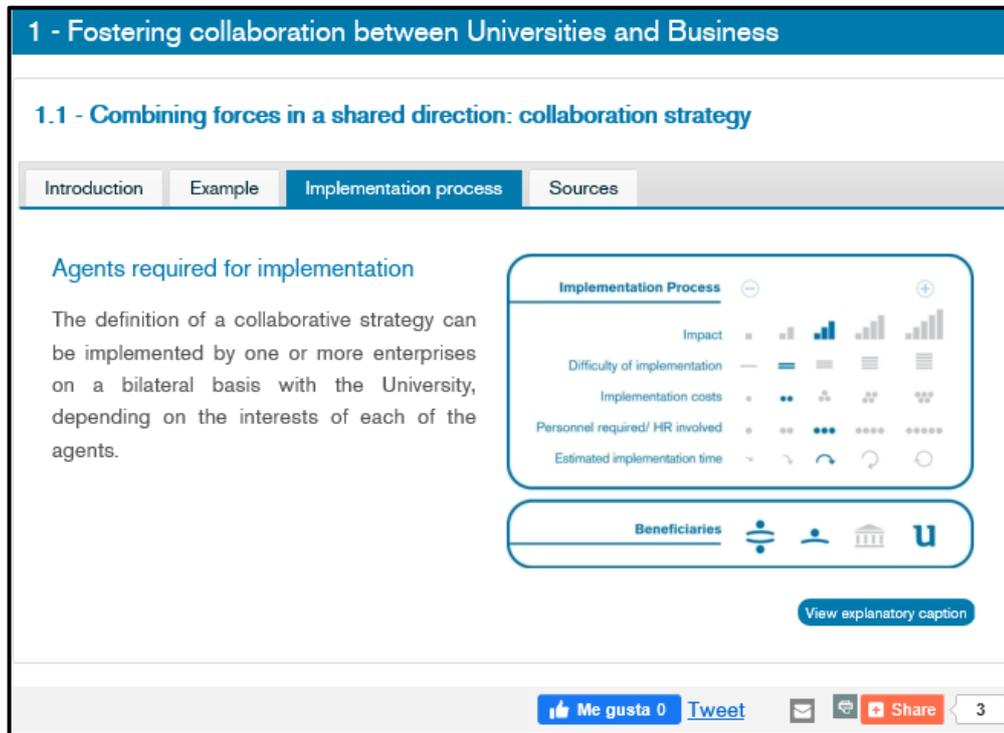


Figure 2. Example of REUNE card showing visual information about needs for the implantation of REUNE guideline to foster University & Industry Cooperation.

REUNE document (and REUNE online application) compiles the results of this comprehensive research study to identify good practices in terms of cooperation between Companies and Universities, both nationally and internationally. These results are expressed in the form of recommendations. The study has been both fascinating and challenging, aiming as it does, to address to some extent the needs for Innovation and Development of the region and the improvement of competitiveness in terms of Andalusian productivity.



Figure 3: REUNE Manual and web (on-line access included in Annex 1- Sources)

## 5. Methodology

REUNE project guidelines gather best practices for academia-private sector cooperation. Delivered REUNE Manual of good practices, is a book and an online site published by Corporación Tecnológica de Andalucía (CTA) that compiles more than 60 recommendations on international success cases of University-Business cooperation.

Being REUNE an extensive guide of best practices for cooperation between academia and industry with a global approach, it is full of ideas, suggestions and lessons learnt that can contribute to the purpose of the “UrBIOfuture Experience”. The objective of the present document “REUNE: ten best practices for Cooperation Academy & Industry to develop circular bio-based economy education programs” is to be one of the tools included in the so called “UrBIOfuture Experience” tool kit.

The approach followed to select REUNE’s most suitable guidelines to be used in the “UrBIOfuture Experience”, was focused in select just the ten of them more relevant to facilitate cooperation University & Industry in the process of designing together the next European generation of CBEEP.

Our vision is that a frame of innovative co-design of educational programs in bioeconomy itself could work as an opportunity to build up University and Industry cooperation, considering the advantage of having available UrBIOfuture project results, which provides a good start point (needs of the industry, existing gaps in the European Education systems both identified by a reputed consortium in a H2020 project).

Two criteria of REUNE guidelines selection were used:

1. REUNE'S guidelines included in chapter 1, should be prioritized. These recommendations are specifically dedicated to tackle the bases to "Foster collaboration between University and Industry". Seven out of the ten guidelines selected are from this chapter.
2. Identify REUNE's guidelines from other chapters including relevant recommendations to reinforce key areas of collaboration University & Industry that should be reinforced during the period of bio-based economy education programs co-design, specifically important to address in the mentioned education programs and/or useful to facilitate University and Industry commitment to this objective of education programs co-design. These key areas of collaboration relate clearly with the concept of efficient technology transfer and innovation (e.g. entrepreneurship, Living Labs and Lab Tours). Two guidelines of Chapter 3 "Production and commercialisation processes" and one guideline from Chapter 4 "Services, advice and consultancy" complete the ten guidelines selected as most relevant for REUNE's selection of guidelines to feed "UrBIOfuture Experience".

Major focused of REUNE's Chapter 1 -Fostering collaboration between Universities and Business" is dedicated to guidelines to facilitate collaboration challenges related to:

- Cultural differences caused by their differing goals: Universities generate and transmit knowledge created from basic research whereas Industry focuses on the application of knowledge to generate profit.
- Cultural impediments to collaboration (related to logistic issues, style of communication, cultural miss-understandings).
- Different timescales in the implementation and development of projects.
- Ignorance on both sides of the Open Innovation model.

REUNE's Chapter 3 - Production and commercialisation processes- focuses in empowerment of both parts (University and Industry) about a very important issue: the clear market orientation their relationship should have in order to perform, an effective research results exploitation. It is therefore essential for academic institutions to have an in-depth knowledge of the needs of the productive sector, so as to strengthen the innovation process together with the companies they work with. The endorsement of new Open Innovation models, with increasing involvement of end-users to accelerate the exploitation of R&D&i results is a key aspect in terms of attaining this goal.



REUNE's Chapter 4 - Services, advice and consultancy – addresses the support services needed to improve the Innovation process involved in University & Industry technology transfer and project development, showing there are still important aspects of the work between both public and private bodies (for example, training facilities for effective new business models development, R&D&I results alignment and profit and losses account, etc..). Cooperation also must be designed to allow effective connection between Business and Universities. The demand for services of this nature, from both companies and research groups, remains high, even though the supply has increased over recent years. This is mainly thanks to the public sector and agencies such as the Spanish Network of University-Enterprise Foundations (ReDFUE), the Office Network for the Transfer Research Results (OTRI Network), the Science and Technology Parks and the Technology Platforms. This can be inferred from the results obtained in the initial analysis of the REUNE project, which are outlined below, and reflect the interests of both parties in the development of short-term services.

Again, the approach followed to select REUNE's most suitable guidelines to be used in the "UrBIOfuture Experience", was to select just a few guidelines (10), the most relevant to facilitate cooperation University & Industry in the process of designing together the next European generation of CBBEEP.

## 6. Best practices selected for UrBIOfuture Experience

From a total of more than 60 recommendations included in REUNE's Manual of best practices for University & Business Cooperation (see Annex 1-Sources), 10 have been selected as the most relevant to facilitate academy & industry collaboration for co-designing together circular bioeconomy education programs.

The so called "REUNE best practices for UrBIOfuture Experience" consist on the following 10 guidelines.



### REUNE guidelines for UrBIOfuture Experience

- 01 Combining forces in the same direction: collaboration strategy
- 02 Designing a collaborative guide or manual
- 03 Promoting personal and sectorial interactions
- 04 Providing equipment as demonstrators
- 05 Consolidating long-term relationships with Universities
- 06 Promoting good practices based on the impact of University - Business relationships
- 07 Promoting dialogue between Universities and Companies in the field of knowledge transfer
- 08 Supporting the creation of technology-based spin-offs and start-ups
- 09 Generating Living- Labs or Real Time Laboratories
- 10 Organising permanent interactive forums: LabTours and IdeasLab

Figure 4. REUNE's guidelines for UrBIOfuture Experience



## 6.1 Guideline 01- Combining forces in the same direction: collaboration strategy

We can find numerous examples of relationships between Academy and Industry, having a variety of positive and negative results. However, in times of crisis or relevant socio-economic transitions, like seems to be the transition towards an European Bio-Based Circular Economy (EBBCE) and society, the relationship should certainly be retained, and ideally be strengthened to face the challenges posed by these socioeconomic circumstances. The major objective should to provide the right environment for effective collaboration in terms of effort and efficiency.

The first step for achieving this involves designing a well-defined road map which is accepted by all the agents involved and helps to lead the creation of solid long-term links. It is also important to clearly defined the expectations and interests of both parties, by specifying objectives and communication channels, as well as strategies for knowledge and technology transfer. Concerning collaboration to design next European generation of CBBEEP, the need to spot expectations and interests of both parts is also an important goal, as well as to define clear communication channels and involvement of exiting Circular Economy Strategy frameworks at regional or national level.

There are other vital aspects concerning the design of an efficient strategy which should not be overlooked, including the promotion of collaborative thinking and teamwork. One of the options which could help Universities and Companies to begin to define partnerships for EBBCEP design would be to encourage cross-participation of personnel in of their respective decision-making bodies to perform this co-creation exercises.

Before that, explore and define the expectations and hopes, with each party in order to gain insight, analysing collaboration and the communication processes and cultural styles, would be needed to be put in place. It is also important to promote transparency by making strategy clearly visible and accessible to everyone involve, by for instance, featuring its content on the website of the Companies or Universities.

It would be useful to seek outside help to develop all these processes and the final first draft of the EBBCEP design. With this aim, information should be provided about the different professional skills necessary for it to reach proper agreements and, as well as the channels and tools for maintaining fluid communication between team members. Policies for the effective process development for EBBCEP design should be also identified.

Finally, the collaboration strategy should include a section clarifying relevant concepts, people in charge, responsibilities and functions of project leaders, implementation of dynamic team workshops, etc...

## Examples

Nord-Pas de Calais (France). The involvement of University staff on the boards of directors of Companies or of Directors on the governing bodies of academic institutions is one of the practices employed in the region of Nord-Pas de Calais. Thanks to this working method the experience of both parties is invaluable in the design of a more consensual strategy which identifies mutual needs and developmental potential. On the other hand, one of the keys to the success of competitive clusters in this region is the implementation of a strategy for joint collaboration (see Sources in Annex 1).

## Stakeholders required and implementation needs

The definition of a collaborative strategy for EBCECEP design between University and Industry would require representatives of Universities and Industries from different knowledge areas and industrial sectors. Implementation timing will depend on the existing Bio-based Circular Economy regional or national strategies and its own level of implementation, (e.g consolidated bioeconomy clusters, number and type (sectors) of industries active in bioeconomy, research groups and institutes active in bio-based economy research and innovation, etc...). However, the Guideline 01 – Combining forces in the same direction: collaboration strategy aligning, is considered a medium impact task with relatively low difficulty of implementation and costs, that has a medium level of human resources dedication and has and needs an average time for its execution. Major beneficiaries would be large companies, SMEs and Universities.



Figure 5. Information regarding implementation and major beneficiaries of Guideline 01 – Combining forces in the same direction: collaboration strategy aligning

## 6.2 Guideline 02 - Designing a collaborative guide or manual

To remove the barriers caused by the cultural differences between Universities and Industry and get all the benefits of mutual understanding, it is recommended to create an



information guide which compiles the main principles for co-existence in a simple and accessible language so as to increase awareness and understanding between all agents. The main aims of such a document would be compiling details of experiences and different activities carried out by Universities and Industries involve concerning the establishment of good practices for University & Industry collaboration in general and in particular regarding previous education programs co-designs. The content of this guide or manual should provide comprehensive information including different forms of collaboration and guidelines for identifying potential partners and successful approaches used.

The compilation of such a collaborative guide would be extremely useful for the various agents for recovering valuable information but also for improving their professional and personal relationships, and so setting a good start point for future collaborative dynamics needed for an efficient EBCEP co-design. It would be also a good occasion to set collaboration guidelines for co-defined by both parties including terms such as “circular bioeconomy”, “sustainability” “responsible cooperation”, “bio-based technical specific skills”, “stem contents needed for bio-based economy”, “competences and skills to foster” “methodologies for active learning” or “continuous learning education”, “markets, business and legal competences”, “demand of education profiles in bioeconomy”, “key enable technologies for bio-based circular economy”, etc... The guide could be structured around themes or chapters such as: “Mutuality of interests”; “How to forge stable and strong relationships”; “Collaboration Strategies”; “Institutional aid in support of collaboration”; “ Staff requirements and training”; “ A first List of major areas to address in an EBCEP”, etc.

### **Examples**

Guiding principles for University-Industry endeavours. (NCURA, IRI). This document contains the guiding principles which should govern the relationship between the Universities and Business. It identifies the disparate natures of each agent, which – as the document itself emphasizes – is precisely where we can find their most valuable qualities. The document advocates the establishing of long-term relationships to implement effective and durable projects. It also provides a number of solutions to solve potential conflicts which may arise.

Responsible Partnering-Joining Forces in a World of Open Innovation: Guidelines for Collaborative Research and Knowledge Transfer between Science and Industry. EIRMA, EUA, EARTO, PRO TON. This manual is aimed at improving strategic collaboration and knowledge exchange between companies and research centres. It is conceived as an instrument to support the development of professional skills, finding effective assistance for the fulfilling of objectives, etc. (see Sources in Annex 1).

### **Stakeholders required and implementation needs**

The guide or manual for collaboration should be developed by groups of companies and research groups active in Bioeconomy and with extensive experience in the interaction

with Academy and Industry, highly motivated to find new ways of overcoming cultural barriers between both types of stakeholders. The availability of such companies and research groups and other factors could determine the implementation process of this Guideline 02 – Information regarding implementation and major beneficiaries of Guideline 02 – Designing a collaborative guide or manual. However, in average is considered a medium impact task with low difficulty of implementation and costs, relatively low level of human resources an implementation time needed for its execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.



Figure 6. Information regarding implementation and major beneficiaries of Guideline 02 - Designing a collaborative guide or manual

### 6.3 Guideline - 03 Promoting personal and sectorial interactions

The interviews conducted within the framework of the REUNE PROJECT reveal that non-specific events may be useful in terms of making informal contacts, but rarely lead to concrete collaborations. The most effective results come from the development of sectorial activities with clear thematic objectives and the involvement of the whole value chain of an industry. For this reason, to foster the Academy & Industry co-design of EBCEEP will be needed a type of event aimed to bring together clients, suppliers, entrepreneurs, potential investors and representatives from the academic world active in different sectors or knowledge areas regarding bio-based economy, so as to encourage effective interaction between them in order to reach and effective process of EBCEEP co-design.

These events also help research groups to identify the technology needs of the market, whilst promoting their skills and technological expertise, meeting future partners, and gathering information about financing opportunities in the private sector. Likewise, entrepreneurs can benefit from a physical framework which allows them to engage with



researchers or other investors who may be interested in a project. The main objective is to link all potential partners with the academic world, thereby reinforcing the idea that personal contacts are vital to more efficient results. One of the keys to the success of this recommendation would be to enlarge the bio-based community in the evolution and validation of the EBBECEP.

### **Examples**

This recommendation can be illustrated by two examples, both in the French region of Nord-Pas de Calais. The CIEL Innovation Center, established in 2004, organizes personal and sectorial meetings to review and strengthen the links between the different personnel in charge of Innovation Systems. It uses two formats to fulfil its role of monitoring the process and establishing contacts in a highly personalized manner: sectorial conferences and seminars on cutting-edge technology. The other example is the Nutrition, Health and Longevity business cluster which focuses part of its activity on the development of sectorial meetings between Companies and laboratories, some of which are held on a bilateral basis (see Sources in Annex 1).

### **Stakeholders required and implementation needs**

The promotion of personal interactions inside the bio-based economy community can be implemented by companies either individually or collectively, by Public Administrations and Universities and also by public-private partnerships but an inclusive approach of all type of stakeholders, sectors and value chain elements is always key. “Co-designing Next Generation of European Circular Bio-based Education Programs” is a good engagement subject itself for this kind of promotional events.

The availability of such bio-based economy community and other factors could determine the implementation process of this Guideline 03 – Information regarding implementation and major beneficiaries of Guideline 03 – Promoting personal and sectorial interactions. However, in average is considered a high impact task with medium difficulty of implementation, medium human resources need and medium costs, requiring relatively low period of time for its implementation and execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.



Figure 7. Information regarding implementation and major beneficiaries of Guideline 03 – Promoting personal and sectorial interaction

## 6.4 Guideline 04 - Providing equipment as demonstrators

The exchange of equipment between Companies and Universities is a major step forward in their collaboration process, with the aim of providing better infrastructure, establishing pilot programs and initiating a customer loyalty process. Mostly the customer would be the Industry although not always. This initial effort from the academic world is compensated by long-term benefits and improvements, since it facilitates training for educators, encourages students to acquire new technology skills and generates feedback from users of a specific type of technology. The tests carried out in the Universities and the feedback from students and teachers to Companies can also improve product quality orientation. This type of potential collaborations should be identified as they can have an enormous value to enhance active learning methodologies and train-the-trainers' schemes to be taking into account for the Academy & Industry co-design of CBEEP. This could provide important innovation update for traditional sectors and educational systems at local, national and international levels.

### Examples

The multinational company IBM provides Universities with a range of resources including free access to hardware, complete software packages, specialized courses, tools, books, etc. This offers Universities direct access to emerging technologies whilst the IT giant benefits through the involvement of its personnel as tutors, members of the Advisory Council, lecturers, etc. Additionally, the company has access to students, who play a valuable role in improving the corporation's internal educational systems, which are focused, amongst other things, on training future workers in specific areas in connection with the enhancement of creativity and the generation of new ideas. Although involving specific complexity due to specific characteristics of the bio-based economy sector and its industrial facilities, the IBM strategy of collaboration with Universities could be

applicable to Bio-Based Pilot Plants and potentially also regarding industrial bio-refineries.

### **Stakeholders required and implementation needs**

The exchange of equipment between Companies and Universities is a recommendation that can be implemented by a large company in collaboration with a University, or by a group of like-minded companies which apply the process in projects with academic centers. Industrial areas or poles implementing bio-based circular economy under industrial symbiosis schemes could be especially relevant. Although the diversity of particular situations can have very different dimension and road map, in average Guideline 04 – Providing equipment as demonstrators is considered a high impact task with relatively low difficulty of implementation, medium human resources needs, medium costs, requiring average period of time for its implementation and execution. Major beneficiaries would be large companies and Universities.



Figure 8. Information regarding implementation and major beneficiaries of Guideline 04 – Providing equipment as demonstrators.

## 6.5 Guideline 05 - Consolidating long-term relationships with Universities

Innovation and Research require a stable and enduring framework to achieve their efficiency and productivity objectives. Likewise, cooperative research projects developed between Universities and Companies provide their greater benefits when a stable and durable process of interaction is established. Therefore, and taking the specialized literature into consideration, one of the ultimate aims of this scenario should be to strengthen the university-industry relationship in terms of timescales. Personal relationships and mutual understanding are the keys to achieving this objective, and generally, although it is the larger companies which more often resort to these practices



and seek to form partnerships with leading Universities which excel in specific areas of interest, SMEs are obviously not excluded from this type of collaboration.

There are several ways to initiate a stable partnership. One is to reach a series of agreements to develop different projects by working with universities with which companies have already had successful previous experiences, and another is to develop a strategy of long-term collaboration with interactive teams. Thus, in order to establish a good long-term university-industry relationship it is necessary to be aware of the needs, objectives and concerns of the other party. In this sense it is important to increase informal contacts and dialogue whilst developing collaborative strategies. Interests of both parties must be aligned in order to reach an agreement on goals and achieve a common and innovative vision whilst defining an equal partnership strategy which promotes direct contact between participants and establishes open and transparent communication processes with a common language which permits mutual understanding. It is also of fundamental importance to recognize collaboration is a cross-disciplinary activity, where the skills of both parties can create useful synergies.

To take advantage of existing collaborations between University Research Groups and Industries collaborating consistently to develop bio-products or bio-process, to involve them in the co-design of next European generation of Circular Bio-based Economy Education Programs, could be extremely effective in order to tackle innovative approaches and guarantee success.

### **Examples**

**The Human Genome Project.** The Human Genome Project (HGP) was an international scientific research project aimed at determining the sequence of chemical base pairs which make up DNA whilst identifying and mapping the approximately 20,000-25,000 genes of the human genome from both a physical and functional perspective. It involved a collaborative strategy for long-term collaboration between dynamic teams from Companies and Universities. The \$90 billion project was founded in 1990 by the US Department of Energy and the National Institutes of Health, under the direction of James D. Watson, and was expected to be completed in 15 years. Thanks to broad international collaboration and the advances in genomics and computer technology, an initial draft of the genome was completed in 2000 (and was announced jointly by former President Bill Clinton and former British Prime Minister Tony Blair on June 26, 2000). The entire genome was finally presented in April 2003, two years earlier than expected.

The US multinational Hewlett Packard coordinates numerous collaborative research projects with scientists, entrepreneurs, governments and businesses throughout the world which allows them to maximize the impact of joint research results. The company has a global team which is fully interconnected through innovative programs such as the Technology Innovation Program, which offers Universities all around the world the opportunity to participate in joint research projects with leading scientists from HP Labs on a competitive basis, and the Scholarship Program, which provides students with a one-year internship in leading HP labs.

### Stakeholders required and implementation needs

The development of stable partnerships between University research groups and Companies to develop research, development and innovation projects for the bio-based circular can be implemented by a single Company or various Companies and by a single or various University research groups, and Universities can play an important role in ensuring that a more long-lasting relationship between both parties are developed. Although the diversity of particular situations can have very different dimension and contextual frameworks, in average Guideline 05 – Consolidating long-term relationships with Universities is considered to have medium to low impact and implementation costs, medium human resources needs and difficulty of implementation and relatively long periods of implementation and execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.



Figure 9. Information regarding implementation and major beneficiaries of Guideline 05 – Consolidating long-term relationships with Universities.

## 6.6 Guideline 06 - Promoting good practices based on the impact of University - Business relationships

The university-industry relationship is symbiotic. Companies need Universities in order to grow in the same way that Universities need Companies as channels for the transmission of their knowledge. For this reason, it is important to design a conceptual framework of mutual cooperation which emphasizes good practices as a driving force.

The purpose of this recommendation is to demonstrate the outcome of a research project developed at the MIT Sloan School of Management and its potential to impact any University – Business relationship, also those involving Circular Bio-based Economy Industries and Universities active in research areas bio-based economy related. In the same line that the previous recommendation, it should be taking into consideration to involve research groups and companies active in bio-based economy, working together

to develop conceptual frameworks based on good practices for mutual cooperation describe in next example (partially or totally), in the co-design of next European generation of CBBEE. The following seven recommendations included in the seminar held at MIT Legatum (USA), included in next paragraph, has also potential to feed several education competences areas.

## **Examples**

The following seven recommendations were part of a seminar held at MIT Legatum (USA) by John Chisholm, a widely recognized entrepreneurial mentor, aimed at improving University - Business collaboration and the impact of marketing. This list of good practices is based on the following premise: what matters is not the direct result of research or collaboration, but the impact that this information will have on the marketing of the company's products or services. These seven ideas are the result of a study conducted with 25 Companies which participated in some 100 projects with MIT.

- (1) Defining the strategic context of the project and the company as part of the selection process. It is absolutely essential to specifically adapt business strategies to the project. As such, the company's research portfolio is used to establish opportunities for collaboration, define specific collaboration goals and identify individuals in the company who can benefit from the findings.
- (2) (Selecting project managers who have a sound knowledge of the technology needs of the research project, good management and networking skills in the various departments and functions of the organizations involved and are able to identify opportunities and points of connection between research and applications for products.
- (3) Developing a shared vision with the University team of how the research project can help the company.
- (4) Investing in long-term relationships through multiyear collaboration projects. In this respect the aim should be to encourage personal interaction with key researchers in Universities, even at times when there are no projects programed.
- (5) Creating a strong communication link with the research team through meetings and interviews and establishing a communication mechanism as a form of maintaining contact and promoting the exchange of personnel. This enables researchers to leave Universities and join the company.
- (6) Guaranteeing the prioritization and effective dissemination of the project within the Company in such a way that links between the researchers and sections of the company are successful. These interactive contacts are important to ensure that the initiatives carried out by the research group are in line with the objectives of the Company.
- (7) Supporting the collaborative activities during and after the contract so as to ensure that the results of the research process are fully exploited. It is important that Companies are equipped with the necessary technical and management support mechanisms.

### Stakeholders required and implementation needs

The design of conceptual framework of mutual cooperation between University and Industry, with emphasis in good practices as a driving force, can be implemented by a single Company or various Companies although Universities can also play an important role in ensuring that a more long-lasting relationship between both parties are developed. Although the diversity of particular situations can have very different dimension and contextual frameworks, in average Guideline 06 – Promoting good practices based on the impact of University - Business relationships, is considered to have high impact, high difficulty of implementation and high costs, medium needs of human resources and long periods of implementation and execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.



Figure 10. Information regarding implementation and major beneficiaries of Guideline 06 – Promoting good practices based on the impact of University - Business relationships

## 6.7 Guideline 07 - Promoting dialogue between Universities and Companies in the field of knowledge transfer

In the Knowledge Society Universities play a central role in three keyways. Firstly, as producers of knowledge through R&D activities; secondly, as transmitters of knowledge, through training and publication of results; and finally, through the transfer of knowledge. The most advanced economies are those which have managed to build a stable relationship between scientific knowledge and its application to goods and services across industry as a whole. This scenario must however be accompanied by a strong commitment from all the stakeholders involved, including the Administration. Companies and Universities active in Bioeconomy developing stable relationships in the field of knowledge transfer should be taking into consideration for involving them in the co-design of next European generation of CBEEP. Promoting dialogue University & Academy in the field of knowledge transfer is also an opportunity to consolidate



collaborations while working on CBEEP co-design. The examples described in next paragraph have potential to support definition of some competence education areas.

### **Examples**

Karlsruhe (Germany). The work of German Universities is highly valued among Companies. Academic institutions are extremely receptive and flexible in their collaboration and this can be seen in the fact that they facilitate ease of access and contact with Companies. An interesting example of this is the idea of sharing a laboratory in exchange for returns generated by Intellectual Property. Some of the features which enable better University - Company collaboration (in the region of Karlsruhe) are: (1) A strong orientation towards licensing and the creation of spinoffs, (2) An innovation model which is clearly oriented towards product commercialization, (3) Creation of joint research groups.

Styria (Graz, Austria). In Austria the best example can be found in the region of Styria (Graz), where collaboration between the University and Business plays a pivotal role in regional economic development. The Government, the academic world and Companies all promote collaboration from various different perspectives. In terms of the administrative framework, there is the Universities Act of 1975, amended in 1987, which allows research centers to collaborate on business projects. In 2002, another law concerning Universities was passed which established new forms of intellectual property management. This law also promotes public financing opportunities such as grants to a broad range of projects, whilst encouraging the involvement of NGOs and public bodies as research partners. Factors which promote collaboration with Universities include the presence of specialized scientists and teachers who have previous experience in the private sector or resources to manage projects. These factors are reinforced by a well-established scientific-technological infrastructure and support services.

Lastly, there are a number of other factors in the region including: the high density of innovative businesses; the level of demand for R&D services; spatial proximity, which is enhanced by limited movement of students and professors; and the tendency to contract external R&D.

Furthermore, it is important to draw attention to the studies published by the Graz Technische Universität (TU) which includes various papers which are voluntarily provided by researchers from both private Companies and Universities. Amongst the former there is a notable willingness to embark on projects as rapidly as possible and to be able to collaborate with particularly gifted students. The university researchers meanwhile participate to the maximum in articles and frequently give their names to work which is being carried out or which has positive results for the research centre.

### **Stakeholders required and implementation needs**

Development of stable relationships University – Industry in the field of knowledge transfer require close collaboration between all three parties, companies, Universities and Public Administrations although some of the ideas could be implemented individually

by any of the actors. Although the diversity of particular situations can have very different dimension and contextual frameworks, in average Guideline 07 – Promoting dialogue between Universities and Companies in the field of knowledge transfer, is considered to have high impact, medium difficulty of implementation and medium costs, and relatively low needs of human resources and short periods of implementation and execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.



Figure 11. Information regarding implementation and major beneficiaries of Guideline 07 – Promoting dialogue between Universities and Companies in the field of knowledge transfer

## 6.8 Guideline 08 - Supporting the creation of technology-based spin-offs and start-ups

Innovation is a process which can take place at anytime and anywhere. For this reason, it is necessary that the parties involved perceive it as an ongoing activity rather than a simple knowledge transaction. The process requires a suitable ecosystem (business angels, venture capital, public policies for incentives, etc.) and above all, an entrepreneurial culture with values which focus on exploitation of knowledge coupled with a strong sense of cooperation. The role of Companies in supporting new technology-based business initiatives should be recognized as the cornerstone of the Innovation system.

In the same line, the entrepreneurial culture to achieve successfully the creation of future educational programs, must be promoted and reinforced throughout different instruments. One of them are consulting services provided by universities aimed to help teachers, researchers, students and / or employers to maximize the potential of knowledge through the creation, management and consolidation of spinoffs and start-ups. With this aim in mind, programs. Foster innovation and entrepreneurial culture as well as efficient consultancy profiles to support new bio-based economy universities and bio-based enterprises could be more connected and the needs that the future industry could have will be detected faster and implanted in future educational entrepreneurs



must be part of the next generation Circular Bio-based Economy Education Programmes, so as spin-offs and start-ups should be also involve in its co-design. The examples mentioned in the next paragraph could be a good source of ideas for bio-based educational programs regarding areas of innovation and entrepreneurship (further examples can be found in Sources – Annex 1).

### **Examples**

The innovation department of the Karlsruher Institut für Innovation Technologie (KIT) fulfils two main functions: firstly, it provides management support services to its researchers, covering issues such as the maintenance of patents, and research, marketing and technological surveillance contracts; secondly, it offers advice on business development, fostering the creation of spinoffs and making technological business incubators available to new entrepreneurs. The institution encourages its staff to set up new businesses by encouraging professors to combine their work in Companies and the University. It also supports the existence of Direct Labs, laboratories which work exclusively for one or various companies, hire research personnel, and create numerous spinoffs. The creation of these new companies is either driven by the university itself or by working in parallel with outside collaborators. In 2010, it created 20 spinoffs, the most important being Celitement, a cement company created together with Schwenk, who were responsible for developing the ideas and providing information on the market and commercial strategies. The KIT on the other hand was responsible for research and technology and provided space on campus to build an experimental pilot plant for the manufacturing of the new product. Once this phase has been completed another plant will be built offsite. It is important to note that the KIT is a shareholder of the new company. These types of agreements are long term and do not seek to generate immediate profits.

### **Stakeholders required and implementation needs**

Provide support to the creation of technology-based spin-offs and start-ups is a recommendation that can be implemented by a company or a business association in collaboration with the University. Alternatively, it can be adopted by the Public Administration to assist in the systematic support for the creation of new businesses. Although the diversity of particular situations can have very different dimension and contextual frameworks, in average Guideline 08 – Supporting the creation of technology-based spinoffs and start-ups is considered to have high impact, high difficulty and costs of implementation, high needs of human resources and long periods of implementation and execution. Major beneficiaries would be large companies, SMEs, Public Administrations and Universities.

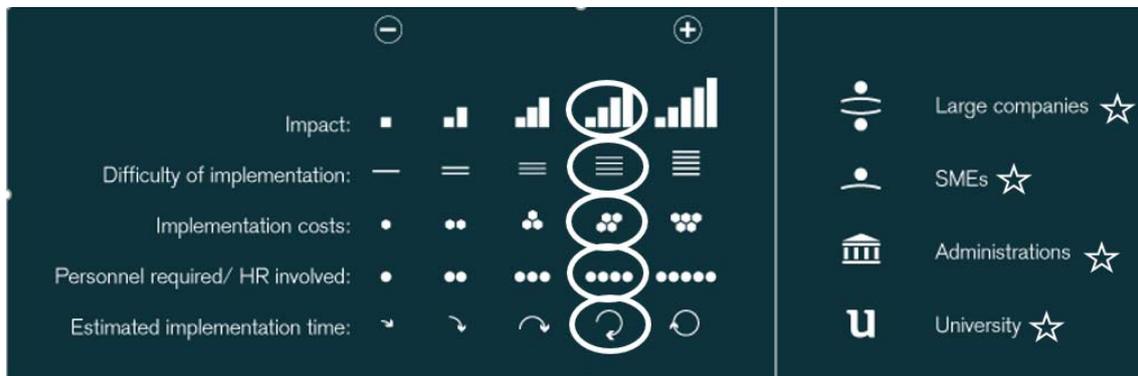


Figure 12. Information regarding implementation and major beneficiaries of Guideline 08 – Supporting the creation of technology-based spinoffs and start-ups

## 6.9 Guideline 09 - Generating Living- Labs or Real Time Laboratories

Sometimes developed technologies never see the day light, either due to lack of promotion or because they have failed to take into account the real needs of the market. To avoid this problem, to ensure technology developed respond to the requirements of the market and commercial success, Living Labs or real-time laboratories have been created. These laboratories could be defined as "experimental environments which allow disparate agents with common interests to collaborate within a scientific or technological domain in the development and use of innovative ideas to solve current problems in an integrated manner".

The objective of a Living Lab is to allow the involvement of the end-user in testing prototypes, thereby leading to the creation of an Open Innovation community to achieve the commercialization of technology and the valorisation of know-how. This means that R&D teams (especially in technological development) need to be part of the laboratory, so that in the case of a prototype being developed, the degree of maturity of the "demonstrated" technology is much greater.

The idea is to design spaces where the end user acquires an active role by explaining their needs, concerns and questions, whilst allowing open activities for university staff, companies, entrepreneurs, investors and society as a whole to make contact and test newly created technologies, or those in a process of development, so as to improve them or bring them into line with the real needs of the user. This concept applied to circular bio-based products and processes development, particular bio-plastics and other bio-materials and/or circular co-design can effectively contribute to address market demand and consumers specifications, supporting effectively bio-based entrepreneurship.

## Examples

Orschungszentrum Informatik (Karlsruhe, Germany). The aim of the FZI is to support businesses and public entities in the process of IT-based innovation through market analysis, technological needs and methods for developing new industrial prototypes. The center has four different research divisions: software engineering; information process engineering; production engineering and smart systems; and engineering of sensors and embedded systems. Its research teams are mostly made up of academics, the majority of whom come from the KIT (Karlsruher Institut für Technologie). Details about other examples like the FZI Living Lab for Ambient Assisted Living (AAL), the FZI Living Lab mobileIT/SatNav or the Media Lab of Massachusetts Institute of Technology (EE.UU.) can be found in Annex 1 (Sources)

## Stakeholders required and implementation needs

Provide support to technology-based spin-offs and start-ups by having appropriate Living Labs or Real Time Laboratories is a recommendation that should be implemented by a group of companies with similar interests who wish to set up a virtual Living Lab whereby the end user is implicated in the process of R&D&i. Although the diversity of particular situations can have very different dimension and contextual frameworks, in average Guideline 09 – Generating Living- Labs or Real Time Laboratories is considered to have high impact, low difficulty of implementation, but high implementation costs and long periods are required for their implementation, although having medium needs of human resources Major beneficiaries would be large companies, SME and Universities.



Figure 13. Information regarding implementation and major beneficiaries of Guideline 09 – Generating Living- Labs or Real Time Laboratories



## 6.10 Guideline 10 Organising permanent interactive forums: LabTours and IdeasLab

There are two key problems which limit the amount of collaboration between companies and Universities. Firstly, the difficulty of finding a research group which meets the company's requirements (in terms of both skills and knowledge as well as infrastructure and R&D facilities), and secondly, the obstacles to creating mutual trust in order to establish permanent interaction. In order to solve these problems, we propose the organization of stable interactive initiatives between business and researchers which permit more personal contact like the so called LabTour and IdeasLab (see next paragraph and Sources in Annex 1). These interactive forums for effective University & Industry collaborations could be a source of inspiration for new schemes and approaches for technology transfer and R&D&I projects development in Circular Bio-based Economy.

### **Examples**

Below are two examples of initiatives to link businesses and researchers which offer advice on the process of seeking out a suitable research team (with the necessary capabilities and resources) and the unification of interests: LabTour and IdeasLab. Labtour focuses on companies making regular visits to University facilities. During these tours' companies can check a laboratory's capacity or level of resources whilst starting to discuss various aspects of possible projects with researchers. In the same way, in a situation when a company has facilities which are of interest to a university it would be the research team who carry out visits to check on issues such as the capacity of the company's infrastructures. Depending on the situation, LabTours could bring together a variety of agents from the fields of Business or Research, whereas others are attended only by representatives from the academic world or by a number of different companies with similar or complementary interests. In general, it is preferable that the LabTour event is not overly restrictive and takes place in a relatively informal atmosphere so that the various participants from the different fields can interact in as natural a manner as possible.

IdeasLab-Once the initial contact is made through the Labtour, if the researchers and companies are compatible, the next step is to organize a more formal meeting to establish the foundations and more concrete aims of the joint project. As such, IdeasLab, complementing Labtour, has already been implemented by universities such as ETH Zurich, and adopted by organizations such as the World Economic Forum. This forum is based on organizing workshops in order to discuss ideas concerning pre-established subjects, from fairly broad based general sectorial topics to those of a much more specific nature. The objective is to bring together groups of businesses representatives and scientists with the aim of developing new ideas for specific projects and encouraging the two parties to work together in collaboration. The companies would then select a project and research group (a tailor-made team) in order to begin working together immediately. In this way, as well as establishing the basis for carrying out new projects, working networks with common interests often emerge which lead to long-term professional

relationships (e.g. The agreement between ETH and Siemens for the next five years, through the creation of a university chair in Sustainable Building Technologies).

### **Stakeholders required and implementation needs**

Organization of permanent interactive forums like LabTours and IdeasLab to foster University & Industry collaborations in project development is a recommendation that could be implemented by a single company or a group of companies which decide to participate in this type of activity. Equally, companies, organized in sectorial groups, could suggest this recommendation to universities, so as to encourage can have very different dimension and contextual frameworks, in average Guideline 10 - Organizing permanent interactive forums: LabTours and IdeasLab is considered to have high impact, low difficulty of implementation and low period of time needed for implementation, very low implementation costs and medium needs of human resources Major beneficiaries would be SME and Universities.



Figure 14. Information regarding implementation and major beneficiaries of Guideline 10 – Organising permanent interactive forums: LabTours and IdeasLab

## 7. Conclusions

The so called REUNE best practices for UrBIOfuture Experience indicates the best 10 guidelines to follow to foster Academy & Industry Cooperation to write together the next generation of circular Bioeconomy Education Programs. These guidelines can be an interesting tool for clusters and other innovation organizations, RTOs, Universities and Industries to define a first Action Plan to build up the confidence and mutual understanding needed between University and Industry to do the job. Our vision is that a frame of innovative co-design of educational programs in circular Bioeconomy, itself, could work as an opportunity to build up University and Industry cooperation. UrBIOfuture project results provide a good start point for it, having needs of the industry,



existing gaps in the European Education identified by a reputed consortium of a Horizon 2020 funded project. The guidelines are presented in a very friendly visual and simple way that lets anybody to play around and design easily a first Action plan to start working with key stakeholders, particularly University and Industries, to facilitate the work needed. On the base of the specific characteristics of each region (stakeholders involved, maturity of the bio-based transition, momentum of different innovation drivers in the time where the action plan will be initiated like funding, human resources available, socio-economic strategies, success cases, etc...) different relevant scenarios for the guidelines applications will emerge and different objectives and time lines will need to be addressed.

The information about expected implementation needs and beneficiaries can help to draw a first approach for university-industry collaboration Actions Plans in order to promote the bio-based economy-education of the future in an efficient way. Also, to show different actions plans, because different expected scenarios can be used as a tool for co-creation exercises, visualized the best approaches and academy & industry alignment during the process of engagement, planning and actualization of collaboration actions to deliver the European circular bio-based economy education programs of the future. On the other hand, an interesting integrated Action Plan can arise by grouping first the different guidelines just considering the time they need to be implemented short-medium-long and then organizing each group of guidelines taking into account other criteria, for example human resources available in the short term, large companies as major beneficiary and big impact of the action needed, and this for each phase of the action.

“UrBIOfuture Experience” is a pivotal tool for attracting talent and providing professional orientation and to provide the bio-based industry and sector with a basis for promoting careers in the bio-based sector, to address the education and training gaps identified during the project and to promote all the opportunities emerging in the bio-based sector. This “experience” is composed by educational and communication materials and a group of actions towards society (e.g. events). Special attention is paid then to its impact after the project particularly to foster entrepreneurship competence, and creative thinking, especially among young people and good practices for the cooperation Academy & Industry in the design of new active learning approaches and next European generation of Circular Bio-based Economy Education Programs.

UrBIOfuture experience will include a website to open a constant active communication between industry, research and academia. A set of open-access events targeting students (including primary education, high schools and university), graduated students (e.g. PhDs and post-docs), professionals and unemployed where opportunities in the Bioeconomy field will be presented. And also, materials to be used by education organizations, academia and private sector in order to promote bio-based careers and train professionals: brochure, poster and video.

One of these materials will also be a draft of contents for future educational programs identifying the needed skills and competences at each career stage from the results obtained in UrBIOfuture project, an assessment report on how pilot infrastructures could be integrate in the educational system offering an open space for knowledge transfer will be conducted through a real pilot case study and a Guide of best practices for academia-

industry cooperation based on a successful projects developed previously by CTA about this issue best practices guide will be built upon the one released by CTA (REUNE manual), adapting it to UrBIOfuture Experience objectives. All this elements or “tools” will be gathered in the outline of the UrBIOfuture Experience program aimed to boost this cooperation between RTOs, academia and industry.

One of the UrBIOfuture objectives was to build upon UrBIOfuture partners successful earlier activities. Technological Corporation of Andalusia (CTA) contributes to this objective by generating a Guide of best practices that will be built upon the one released by CTA (REUNE manual), particularizing it to UrBIOfuture Experience afterlife objectives.

## 8. Annexes

### Annex 1. Sources

REUNE Manual of Good Practices:

- <http://www.reune.corporaciontecnologica.com/es/index.html>)

### Annex 2. List of figures

- Figure 1: The ten REUNE guidelines of best practices for University & Industry cooperation
- Figure 2. Example of REUNE card showing visual information about needs for the implantation of REUNE guideline to foster University & Industry Cooperation
- Figure 3: REUNE Manual and web (online access included in Annex 1- Sources)
- Figure 4. REUNE’s guidelines for UrBIOfuture Experience
- Figure 5. Information regarding implementation and major beneficiaries of Guideline 01 – Combining forces in the same direction: collaboration strategy aligning
- Figure 6. Information regarding implementation and major beneficiaries (of Guideline 02 - Designing a collaborative guide or manual
- Figure 7. Information regarding implementation and major beneficiaries of Guideline 03 – Promoting personal and sectorial interaction
- Figure 8. Information regarding implementation and major beneficiaries of Guideline 04 – Providing equipment as demonstrators.
- Figure 9. Information regarding implementation and major beneficiaries of Guideline 05 – Consolidating long-term relationships with Universities.
- Figure 10. Information regarding implementation and major beneficiaries of Guideline 06 – Promoting good practices based on the impact of University - Business relationships



- Figure 11. Information regarding implementation and major beneficiaries of Guideline 07 – Promoting dialogue between Universities and Companies in the field of knowledge transfer
- Figure 12. Information regarding implementation and major beneficiaries of Guideline 08 – Supporting the creation of technology-based spinoffs and start-ups
- Figure 13. Information regarding implementation and major beneficiaries of Guideline 09 – Generating Living- Labs or Real Time Laboratories
- Figure 14. Information regarding implementation and major beneficiaries of Guideline 10 – Organising permanent interactive forums: LabTours and IdeasLab