ANGEL

ERASMUS+ CBHE

R1.3 ANGEL Guide of Best Practices: University-led Entrepreneurship and Innovation

WP1. Customization and training

Project Information

Project Acronym:	ANGEL
Project Full Title:	ASEAN Network for Green Entrepreneurship and Leadership
Project No:	619421-EPP-1-2020-MY-EPPKA2-CBHE-JP
Funding Scheme:	Erasmus+ KA2 Capacity Building in the field of Higher Education
Coordinator:	UTM
Project Website:	https://angel-project.eu

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Date	May 2023
Status:	Completed
Dissemination Level:	Public

Reviewed by UTHM and EUC

Table of Content

Contents

Executive Summary

The selection of the best practices was made using the following criteria:

- Success over time (in operation for more than a decade). No new initiatives were selected. Only historically successful cases were selected as a guide with more guarantees of successful implementation in another University. New initiatives can be considered as ideas or experiments and not as good practices. The goal is to increase **feasibility** of implementation of the new model.

- Variety of approaches. An effort was made to select best practices that accommodate a variety of approaches. This criterion was selected to increase the focus and perspective of the innovative model to provide **flexibility** to the model.

- Different size of the University. The ANGEL Universities have quite different size (professors / students, resources, etc.), strategy and goals. The criterion was selected to increase **adaptability** of the model to the specific needs of the University and its stakeholders.

- The final criterion is cross-multi culturalism. In a globalized world with significant turbulence in economic, social, and geopolitical levels cross-multi culturalism is important because it provides the wealth of variety to the model and ensures **stability (durability)** of the model after its initial implementation by the University.

Finally, the number of best practices has been limited to fifteen (15) to enhance the discussion by having a number high enough to capture the variety needed and small enough not to be confusing. This balanced approach to the number of best practices is important for the ANGEL Innovative model due to the fact that the model is based on these best practices but it's not a copy or selection of one of them but rather a combination / reengineering all of them to a more flexible model.

1. Basic Framework

There are five (5) steps – stages (see Figure 1) to complete the task to create an innovation and entrepreneurship initiative within or with a University. Before even starting the process of completing the five stages the University has to assess the needs of the stakeholders that is willing to serve, and they are willing to participate - cooperate in the effort of creating this center. A stakeholder approach is a necessary factor for the initiative to be successful. Not all stakeholders have the same needs, or they are willing to cooperate in all manners or to engage their resources in this effort. So, the mix has to be balanced, complementarities and synergies have to be should be explored.

Approach - Dilemma - Principles

Strategy

Inspiration

Resources

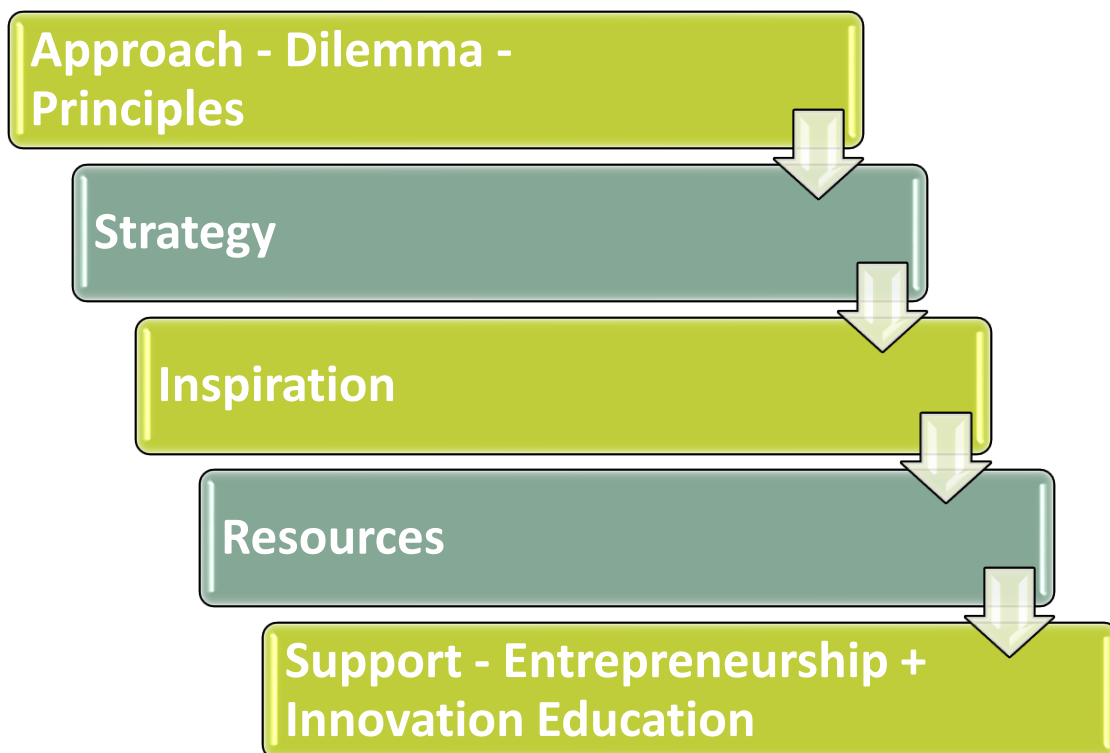**Support - Entrepreneurship + Innovation Education**

Figure 1. The basic framework

This proactive approach will facilitate the establishment of an environment of cooperation and convergence with stakeholders. In turn convergence will contribute to the evolution of all stakeholders and especially the University to evolve to an

organization that actively participates in the events of the society and the economy that has its basis, but also beyond it.

1.1 Approach – Dilemma - Principles

The **first stage** is to select the Approach – Dilemma - Principles of the center. There are two basic approaches: the agency and the stakeholder approach. Using the agency approach, the University will play the role of the agent and a dominant stakeholder will play the role of the principal. The University (agent) will provide specific services on behalf and to the principal and the University will be supervised by the principal. This role is myopic because it doesn't consider the effects that other stakeholders may have and the economic and social environment in the long term and minimizes the impact of the initiative. There is a heterogeneity that has to be considered. Thus, the stakeholder approach, which is more inclusive, is better suited for the new role that the University will play in the design and function of an innovation and entrepreneurial center.

One the most important issues is the emphasis that the initiative will have. There are two major options: the first one is to give emphasis on socioeconomic dimension of innovation and entrepreneurship, while and the other is the emphasize the technological and economical dimensions. The first option is holistic and the second one is more focused.

The approach has to be compatible with the generic goals, mission and vision of the University and its stakeholders. The idea is to re-engineer, re-design the mission and vision of the University in order to encompass the new role that the evolved University has to play in an innovation ecosystem. On the other hand, principles are the guidelines needed for and from all stakeholders to establish a stable synergistic (not parasitic) ecosystem. All stakeholders have to have consensus on the issue of the basic principles which are:

- Sustainability,

- Openness,

- Authenticity,

- User involved innovation,

- Spontaneity.

Marginalized groups can be more easily incorporated and participate in an initiative that uses a stakeholder approach because their perspective and goals could be encompassed to the initiative's goals and their perspective could be evaluated and considered. In a diverse world where the wealth of ideas and perspectives is in high demand, the open system of the stakeholder approach can provide more alternatives – options and hence a more rational decision could be made. So, it's a win-win convergence of marginalized and main stream groups.

The selection of stakeholders involved in this effort has to be based on the:

- Willingness to participate,

- Alignment of their goals – mission and vision with the common mission – vision,

- The capability to create synergies and complementarities

- And last but not least, on the convergence of their principles – values

Finally, there is the dilemma of the stakeholder relations. The relation amongst of all stakeholders has been based on a new foundation. The University doesn't have to be the leader of this initiative because the leadership role may be a role for every stakeholder. Instead of a hierarchical structure of relations where the University is the leader, a more balanced relation is more appropriate and better suited to handle the challenges of today and future challenges as well. A distributed system of leadership is a better choice for creating more empowered (efficient and effective) teams.

This approach combined with the Complexity Leadership Theory[1] can create a framework for establishing relations that are not hierarchical but resemble more a network of equals. Every node (stakeholder) of the network can complement, contribute, enhance, support each other.

1.2 Strategy

The **second stage** is to formulate a common strategy. The alignment – convergence of strategic goals of all stakeholders is by its own a difficult task to do. To achieve it there has to be stablished an ecosystem that has at its core a common culture and values. Culture and values are the springboard to:

- Endorsement (alignment of mission and vision), convergence of goals.

- Partnerships

- Interface with government agencies – industries

- Create support structures (i.e. start-ups, joint ventures, business incubators, etc.)

- Relations that can be a catalyst to boost the impact that the initiative may have.

The University's role is to provide leadership skills, resources and a culture evolvement process. The University may be at the epicenter of the business and economical – social transformation and thus at the epicenter of the effort to shape the future. Consensus on the goals of the group – team is necessary condition but not sufficient. There has to a consensus on:

- Incentives,

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[1] Complexity Leadership Theory is a framework for leadership that enables the learning, creative, and adaptive capacity of complex adaptive systems (CAS) in knowledge-producing organizations or organizational units.

- Resources,

- Instruments – structures,

- Time horizon of every goal.

1.3 Inspiration

The **third stage** to inspire. Having in mind the heterogeneity of stakeholders, the variety of goals they have, and their needs. The initiative has to create a bias for action. The external environment is evolving with an accelerating rhythm. Analyzing and designing are necessary, but the impactful outcomes derive from action. Innovation and entrepreneurial centers are not think tanks, at least not only think tanks, they are an instrument to facilitate action of stakeholders to achieve common goals and projects.

On all previous stages there is a possibility of conflict amongst stakeholders and conflict due to changes in culture and social norms. Conflict management is an integral part of the model because conflicts are unavoidable, but they can have a positive impact if they are managed appropriately.

1.4 Resources

Two (2) different type of main resources needed for an initiative like this: human and financial resources. Universities can provide a significant amount of human resources (both professors and students) but it is more likely to lack in financial resources. The cooperation with other stakeholders can complement this and thus create a more complete structure. This synergistic relation amongst stakeholders and Universities is mutually beneficial. The other stakeholders acquire access to human resources and knowledge that didn't have before their participation and Universities get access to financial resources, equipment and analyses of the external and internal environment or corporations and organizations.

1.5 Support - Entrepreneurship and Innovation Education

The **fifth stage** is the identification and commitment of support resources to create structures and institutions as vehicles of innovation and business cultural change. Structures that facilitate:

- Coordination,

- Education,

- Start-Up,

- Spin-Offs,

- Incubators,

- Laboratories,

- Finance

Can be served by a variety of institutions. There is a variety of formal and informal institutions. Informal institutions are not legally formed, and they are based on cooperative schemes, they may have managerial independence and structures, budget, etc. These institutions can be easily formed, stakeholders do not have to fully commit to them, and they can evolve with more flexibility. The disadvantage is that they lack the capability to implement a full range of supportive structures.

Instead, formal-legal institutions are not so flexible, but they bind stakeholders to fully commit to the common goals and commit resources. Also, formal institutions are easier to be recognized by others and easier to establish connections and co-operations with stakeholders' others than the ones that are already part of the initiative.

2. Pedagogical approach

One the main contributions of a University to an innovation and entrepreneurial center is their main activity which is education. Through education not only knowledge is passed from the professor to the student, but skills, social norms and culture can be altered to adapt or to create wider changes to the socioeconomic fabric.

The typical outputs of a University are:

- Students

- Research

- Educational tools

The current turbulent economic and social environment creates a situation where the possibility to fully analyze and understand the phenomena and the problems is quite high. Businesses and organizations expect graduate students to conceive, develop and implement real solutions to ill-defined problems.

2.1 From Taylorism to contemporary approaches

Taylorism (specialization) has shaped the business world during the 20th century. The end of the 20th century has been marked up by significant changes, both technological and socioeconomical. These changes created the turbulent status of the business external environment. Today's problems need to have whole teams from different disciplines in order to develop solutions to current problems. Hence, specialization of a scientist – graduate is not anymore, the critical factor. A specialist will address only a portion of the problem and probably will not solve the problem.

Universities all around the world have identified the paradigm shift since the 1970's and they have introduced innovative pedagogical approaches. The most common elements of the new pedagogical approach are:

- Focus on teams not the individual,

- Design thinking – problem solving orientation,

- T-type or π-type students – personalities,

- Multi-intra disciplinary curriculums,

- Curriculum flexibility.

Focus on teams and not the individual has been seen as an inescapable option due to the complexity of modern problems. Introducing teams to problem solving also introduces the problem of team management and team relationships. Working in teams is a skill and a cultural element at the same time. Universities are training students in working in teams and handling the relevant issues (communication, conflicts, etc.).

Another need-driven shift is the one from systemic thinking to design thinking. Design thinking is focused on solving a problem. It uses a different perspective and it is more compatible with the current status of the environment. Teams can change and formulate according to the needs of a specific problem and interface with other teams if necessary.

Even these changes are not adequate to address the issues and problems contemporary businesses and organizations face. There is the problem of team members. What kind of team members should be used? This question has three answers:

- Specialists

- T-type

- π-type personalities

The option to use specialists as team members is the traditional one. Theoretically, if all specialists cover the disciplines needed to solve the problem, the team should work well. Each discipline has a specific perspective to the solution and different hierarchy of priorities. That may lead to conflict, to resource waste and may lead to project failure. As problems become more complex and diverse this traditional mix of specialists is getting inefficient.

To solve the issue, University have developed the two alternatives. Students and professors should be familiarized with more than one discipline in order to mitigate the issue of team management and project efficiency. The first alternative is to "create" a t-type personality[2]. This alternative mitigates the problem because it provides to the professor and students (through the broad generic background) a better understanding of their role in the team and reduces the possibility of conflict or project failure. This option is an evolution of the specialist approach (Taylorism) and not a radical different approach.

The third option is to adopt a π-type[3]. This option is a radical approach to the issue. A π-type student – professor masters multiple disciplines to gain a more holistic knowledge and experience, thus becoming an expert – specialist in multiple disciplines. Thus, the team can be more homogeneous and due to common experiences and expertise they can communicate, coordinate and cooperate more efficiently and effectively.

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[2] T-type student – professor: broad generic background and deep knowledge of a specific discipline.
[3] a π-type student – professor: multiple disciplines – expertise.

2.2 Schools, Curriculums, Programs and Seminars

The traditional organizational structure for a University is a hierarchy (see Figure 2). Schools are the segmentation of each generic science and each department serves a more specific field of science or discipline. Within each department or school, a sector or laboratory can be established to accommodate more specific projects and cooperation with other departments of the University or stakeholders.
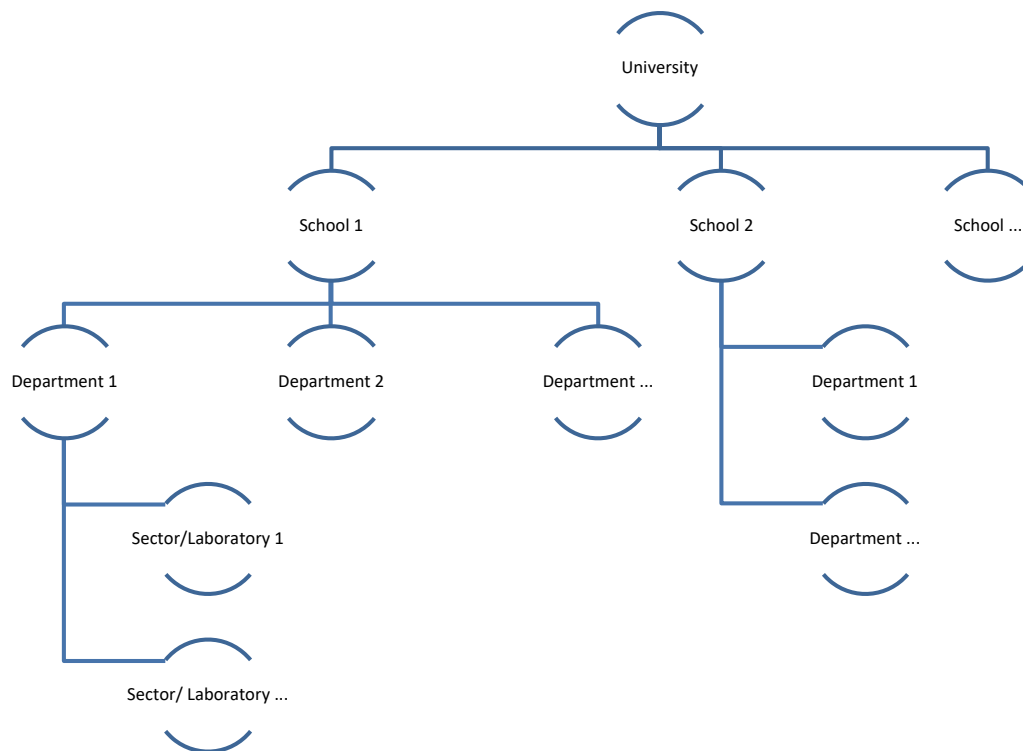
Figure 2. Traditional organizational structure of a University

This traditional organizational structure of a University has been seen as an impediment for the development of initiatives like innovation and entrepreneurial centers. Some Universities have introduced a variety of alternatives to address this issue. Some of them have altered their organizational structure and others have made minor alterations – amendments to the traditional structure by introducing new structures placed along schools or departments or introduced structures outside / in parallel their organizational structure.

Each alternative has advantages and disadvantages and creates a very different University governance model. Although there are a number of alternatives the most significant ones are the following:

- School only level, no department level (degree).

- No school or department, no curriculum (no degree), only programs – seminaries.

- Institutions (no degree).

- School level programs (no degree).

- Flexible curriculums where students may choose courses and programs that they are more interested in to fulfill the credits they need to obtain a degree.

3. Best Practices

Using the criteria presented on the 1st section of the current document, fifteen best practices have been selected to be analyzed. A short description of every best practice is provided in following sections. A structured analysis is provided at the Appendix section.

3.1 Tongji University (China – Finland)

Tongji University is a medium to large (about 36.000 full time students) University based in Shanghai. It founded the College of Design and Innovation in 2009, separating the design school from the College of Architecture and Urban Planning. Tongji University has established the Mission D program, an interdisciplinary "design-driven" innovation and entrepreneurship education to students. The Sino-Finnish Centre and the College of Design and Innovation at Tongji University collaborate to run the Mission D Program.

The goal is to provide an alternative educational opportunity for those who choose to use "design thinking" to incorporate and apply information and skills to solve problems in various contexts. These two capabilities, along with broad, organizational, and disciplinary expertise and skills in a particular professional domain, are the foundational elements of the so-called "T-shaped personalities". T-shaped people are "deep problem solvers in their home discipline but also capable of collaborating with and recognizing experts from a broad variety of disciplines and functional areas," according to Mission D.

The program not only promotes collaboration among students from various disciplines such as architecture, design, business management, linguistics, psychology, engineering, and biology, but it also has a strong link to current social and economic issues. Tongji needs an interdisciplinary structure at the university level in order to expand design from "design doing" to "design thinking," which can have a greater effect on the economy and society.

The following goals are highlighted in Mission D:

- Design Thinking to combine the knowledge of creation, industry, and engineering.

- International marketing, operations, planning, financing, logistics, and other core business skills.

- Approaches to international product/service design and prototyping/piloting.

- Leadership, networking, and boundary-spanning in cross-cultural teams.

- Negotiation, teamwork, public speaking, and pitching proposals are all useful skills.

- Working in cross-cultural teams to develop a plan for commercializing a new product/service for an existing organization or a new venture in China, Europe, and internationally.

3.2 Business Succession Schools (Finland)

The Lahti University of Applied Sciences and FINPIN established the Business Succession School (BSS) in 2005. The Rectors Association initiated the formation of FINPIN in 2002. FINPIN's objectives are to develop interesting teaching opportunities horizontally among Finnish universities of applied sciences, as well as to raise awareness of the importance of entrepreneurship education and its effect on the Finnish economy, particularly in terms of business succession. The FINPIN initiative has 26 out of 28 universities of applied sciences as partners.

The BSS provides training for company successors and supports retiring businesses with the transition phase. The first BSS was founded at the Lahti University of Applied Sciences after a one-year research period on the role of universities of applied sciences (UAS) in the business succession process. From October 2005 to April 2008, a pilot program was implemented. BSS programs have been incorporated into curricula since then. On the request of the Ministry of Labour and Economics, an assessment of the program was carried out for the period 2006-2009.

Educating business successors (project work, business succession plan as thesis project), practical experience (working in companies, entry/take-over strategy), and assistance with business succession (ownership transfer process, competence transfer process, management transfer process) are the three themes that the activities are organized around.

Keywords: Cooperation, π-type, multi discipline, Incubators

3.3 The Paris d. school (France)

The ENSAVT, ESIEE, UPEM, EIVP, and ENPC are part of the Paris d.school consortium, which encompasses fields ranging from architecture and urban planning to all forms of engineering, as well as business and finance. The project for a French d.school (a mimic of the original d.school of Stanford) was developed between 2007 and 2011.

ME310 Design Innovation was created at ENPC between 2009 and 2012 in partnership with Stanford and its international network, SUGAR (which includes the Aalto Design Factory and HPI). Design thinking provided a lot of motivation for developing high-level competences in the practice of engineering with a big effect in the real world.

Via the trans-discipline of design thinking, the aim of the Paris d.school is to become a demonstrator of prospective pedagogies in creativity. The proposal for the establishment of a French d.school was established in two stages, the first with multidisciplinary programs at the national level, and the second with multidisciplinary multi-cultural programs at the international level.

Students are mostly Masters-level graduates from Paris d.school academic partners. Students may enroll in such courses by applying to the d.school for full-time programs or by taking courses from the current curriculum; they come from a variety of disciplines, including telecommunications, computer science, mechanical engineering, industrial engineering, and telecommunications, to name a few. Students are offered three kinds of courses: initiation workshops, intermediate courses and expert programs.

The consortium is quite large in size dur to the size of the participating Universities. The resources committed are significant and this corresponds to the spectrum of the impact it targets.

Keywords: Cooperation, π-type, multi discipline

3.4 Entrepreneurial University of Wismar (Germany)

The University of Wismar launched the "Entrepreneurial University" in 2009, building on a 2000 initiative and backed by a 2007 strategic change. Its key goals are to centralize all entrepreneurship programs on campus and to promote an entrepreneurial mentality in all faculties. The basic activities provided are:

- Entrepreneurship curriculum should be integrated into both study programs and current courses.

- Mentoring and coaching

- Start-Up Night) in the "Idea Camp" scenario.

- Assisting in the formation of R&D teams and organizing scouting activities

- Investing in gender-specific entrepreneurial ventures

The focus is on Economic, Technical issues and although it's a small comparatively initiative provides support in the form of Start-ups.

Keywords: π-type, Multi discipline, Start-ups, Mentoring and coaching, Economic-Technical

3.5 University of Berlin (Germany)

"Gründungsservice" began in 2004 as the Technical University of Berlin's Entrepreneurship Center (TUB). The main partners include the TUB Alumni, Business Angels, VC, TUB Faculties and university institutes active involved in business start-ups, external business support organisations, Berlin networks, the Technologie Coaching Centre, colleagues in the rest of Germany and abroad, and organisations fostering women's entrepreneurship. "Gründungsservice" is a one-stop shop on campus that caters to teachers, research assistants, postgraduates, and professors from all faculties. The aim is to bring existing entrepreneurship support activities

together and expand them, as well as to improve opportunity awareness and the entrepreneurship rate in the Berlin-Brandenburg economy.

The basic activities provided are:

- Workshops and seminars on "soft skills," "entrepreneurial inspiration" and "opportunity identification" (for both men and women), "technology scouting" for researchers, and "business plan writing" (with the Institute of Innovation and Technology).

- The Entrepreneurship Academy is a non-profit organization dedicated to (1 week)

- Individual assistance with drafting a business plan and obtaining government funding

- Team-building and team-coaching facilitation.

- Incubation (pre-seed) facilities have a 12-month period.

- Scholarships for professors with expertise in the scientific and natural sciences, as well as public relations campaigns to promote women's entrepreneurship.

- Self-assessment method for determining one's own entrepreneurial profile.

Keywords: π-type, Multi discipline, multi support structures, Economic-Technical

3.6 Neudeli: The Bauhaus University's entrepreneurship center (Germany)

Neudeli started in 2001. The Friedrich-Schiller-Universität in Jena, Microsoft Deutschland GmbH, Hochschule für Film und Fernsehen Konrad Wolf Potsdam/ Babelsberg, the City of Weimar, and other regional companies are among the main partners. Students, graduates, and personnel from the faculties of architecture, civil

engineering, media, and design who are interested in entrepreneurship are eligible for financial assistance.

Neudeli is a one-stop shop that assists with public awareness (entrepreneurship education, concept scouting, consultancy, competition and event organization, and so on), training/skills creation (ongoing coaching, seminars, entrepreneurship academy, and so on), and growth (matching with investors, trade, and so on).

Activities of the initiative:

- Multidisciplinary student teams (design, media, industry, computer science, and others) "prototype" entrepreneurship education by working on actual case studies from partner businesses, entrepreneurs, and university projects/patents.

- Space and infrastructure for concept development: Neudeli will include office space and free use of infrastructure, as well as assistance from the Neudeli team.

- Competitions and idea scouting

- Services provide product creation and business concept counseling, as well as ongoing coaching for students, university employees, and alumni.

- Matchmaking and exchange: Daily formal and informal gatherings of students, entrepreneurs, and company founders from various backgrounds/Matching events with investors.

Keywords: Cooperation, π-type, multi discipline, multi support structures, Economic-Technical

3.7 Beuth University of Applied Sciences Berlin (Germany)

In 2002, the Beuth-Hochschule founded the Gründerwerkstatt. The initiative's key goals are to provide close proximity business incubation to the university and to aid team building. The Gründerwerkstatt can accommodate up to 20 individual founders or teams for up to 18 months.

Every six months, a sophisticated two-step screening process is held, in which individual would-be entrepreneurs and teams are evaluated on the nature of their business ideas and market potentials. Seminars and in-house one-on-one coaching sessions are held for incubatees. They are referred to external business service providers if necessary. Financial assistance is required for participants.

3.8 Alta Scuola Politecnica (Italy)

The Politecnico di Milano and the Politecnico di Torino founded Alta Scuola Politecnica in 2004. It selects 150 talented students each year from among the applicants to the Master of Science in Engineering, Architecture, and Design programs at the two universities solely on the basis of merit. ASP's goal is to produce high-profile graduates who combine in-depth disciplinary expertise with interdisciplinary, horizontal skills required for working in a genuinely multidisciplinary setting.

The current courses are:

- Innovation and Society,

- Design Methods,

- Management of Innovation,

- Complex Decision Making in the Public and the Private Sphere,

- Global Change and Sustainability,

- The Dynamics of Creativity.

Altogether, Politecnico di Milano and Politecnico di Torino award each year about 25 % of the engineering and 40 % of the architecture and design Bachelor titles in Italy. ASP benefits from the merging of these three cultures (engineering, architecture, and design): systemic innovation, which is produced by ASP projects, typically results from the strong technological background of the engineering students, from the awareness of the context framework of the architecture students, and from the attention to user needs of the design students.

Based on our experience, projects can be clustered into two groups:

- Technology- & research-driven

- Design-driven (demand pull! starting from a complex problem and trying to find solutions).

Keywords: Cooperation, π-type, multi discipline, Education

3.9 University of Gdansk (Poland)

The Gdask University of Technology has been supporting entrepreneurs since 1993. The Faculty of Management and Economics was a driving force behind the promotion of this area of study. The Faculty of Management and Economics, the Pomerania Development Agency Co., and local governments are funding the project.

3.10 University of Tokyo (Japan)

The Office of Innovation and Entrepreneurship of the Division of University Corporate Relations (DUCR) seeks to achieve creative university-industry collaborations to implement the University's research outcomes into society and attain high-impact innovation.

One of the missions of the Office is to create specific joint research projects that harness the comprehensive skills and capabilities of the University of Tokyo. To this end the Office of Innovation and Entrepreneurship is engaged in the promotion of various programs including Proprius21 Plus, a collaborative research development scheme; Global Proprius21, a project to create international university-industry collaborations; as well as the Science and Technology Exchange Forum & Salon and the UCR Consortia. The Office also delivers the UCR Proposal to industry on university researchers who wish to form an industry-academia partnership.

Another mission of the Office of Innovation and Entrepreneurship is to provide support to startup companies founded upon the research and technology developed by researchers and students at the University of Tokyo. The University of Tokyo Entrepreneur Plaza, a major startup incubation facility on Hongo Campus, was opened in 2007 to support these venture companies by responding to their diverse research and business needs. Many venture companies have gotten their start from the Entrepreneur Plaza.

The Office of Innovation and Entrepreneurship is also focused on entrepreneurship education. In collaboration with the University of Tokyo Edge Capital Co., Ltd.(UTEC), TODAI TLO, Ltd., and the University of Tokyo Innovation Platform Co., Ltd., the Office operates a program for entrepreneurship education known as "The University of Tokyo Entrepreneur DOJO", which will start its fourteenth term of operation from this coming April. The Office also offers other type of action-based entrepreneurship education programs to students including the EDGE NEXT (a global entrepreneurship program for researchers such as PhDs and Postdocs) and the Hongo Tech Garage (a Makerspace). The Office will continue to cooperate with all Faculties and Graduate Schools of the University while making concentrated efforts in entrepreneurial education.

Keywords: π-type, Multi discipline, multi support structures, Economic-Technical

3.11 University of Brighton (UK)

The Design Futures initiative has been developed at Brighton University. Design Futures is a collaborative space within the School of Art, Design, and Media that was created as a conceptual model for an outward-looking and adaptive design education with the aim of driving creativity in design science and pedagogy.

The focus is on developing novel approaches to investigating the relationships between pictures, spaces, objects, and humans in order to interrogate and comprehend the information they share. The model also aims to investigate how these insights can be applied to promote the production of compelling ideas and concrete innovation activities through research and synthesis processes. The vital value of this school-and-college-wide design context in terms of pedagogy is to include a questioning climate that will draw on the distinctive and integrative strengths of design education to create new information formations and ways of learning and researching. Students benefit from a wider variety of disciplinary and technical standards thanks to the importance and coherence of interdisciplinary participation, as well as the incorporation of initiatives with industry and community partners.

Keywords: Cooperation, π-type, multi discipline, Incubators

3.12 Korea Advanced Institute of Science and Technology (South Korea)

Korea Advanced Institute of Science and Technology (KAIST) is the first and top science and technology university in Korea. It was founded in 1971 and currently has more than 10.500 students. It is comprised of 5 Colleges, 7 Schools, 13 Graduate Schools, 27 Departments. KAIST has been the gateway to advanced science and technology, innovation, and entrepreneurship, and our graduates have been key players behind

Korea' innovations. KAIST will continue to pursue advances in science and technology as well as the economic development of Korea and beyond.

KAIST educates, researches, and takes the lead in innovations to serve the happiness and prosperity of humanity. KAIST fosters talents who exhibit creativity, embrace challenges, and possess caring minds in creating knowledge and translating it into transformative innovation.

KAIST's main campus is located in Daejeon, 160 km south of Seoul, the capital city of Korea where its College of Business is located. Daejeon, with a population of approximately 1.5 million, serves as a hub of science and innovation. More than 200 research institutes, including the R&D facilities from the public and private sectors are located in Daedeok Science Town in Daejeon, which is referred to as Daedeok Innopolis.

Keywords: π-type, Multi discipline, multi support structures, Economic-Technical

4. Teaching entrepreneurship

Under the new business and academic both faculty and students should adopt a quite different approach to teaching and learning. Innovative teaching methods (i.e. through games) can be employed in order to harness the creativity both of the faculty and students. It's the faculty's member responsibility to create an environment that encourages student to be more engaging in the learning process and to be unleash their minds form the shackles of conformity to the present status quo.

To do that faculty members should use dynamic and methods of teaching and avoid the classical lecture. But this is not enough. Until now each faculty member was/is specialized in a field of science. That is not enough. Collaboration with other professors is a prerequisite of success. So, each faculty member should be ready to

design multi discipline courses based on problem solving and especially on value creation for stakeholders. Finally, faculty should participate on the process to create flexible syllabuses and offer students the freedom of selection (even the freedom to switch their focus to a different discipline / school).

Students should escape form the notion-will of a well-structured course and adapt to the new approach. Participation is the key factor. Each student should recognize hers/his interests and pursue them by designing a syllabus structured to hers/needs and wants. The expectation of having specific measures of student performance can be an impediment of change.

Project based learning – problem solving learning provides an innovative approach to all participants. It removes all dogma, well established roles and entrenchment of all participants and focuses on creating value by solving the problem. No certain or given methodology is obligatory. Methodology is incorporated in the solution itself. So, the same team / stakeholders can use different methodologies for solving different problems.

In all best practices presented in the current report teaching innovation consist in creating a teaching environment that enables all participants to contribute to the learning process. A semi-structured process is used to create the course fitted to the needs of the participants (students, faculty members and other stakeholders). Stakeholders can provide the framework and enhance the value of the teaching process by giving information about the prerequisites / restrictions and expectations of the external environment. This is a critical success factor for the creation of the supporting environment.

5. Creating supportive environment for students and faculty

The collaboration of faculty members and students is under the new approach a critical factor. Current roles (professor / student) are restricting innovation and creativity. Problem solving teaching methodology is based on new roles and responsibilities for each participant. So, the teacher is a facilitator / leader and motivator for creativity and the student is the creator.

Supporting structures for this teaching methodology are:

- Flexible syllabuses

- Multi – discipline approach. Students should be encouraged to take different courses from other schools / departments.

- Motivate participation of students and faculty members from other schools / disciplines.

- Create a different work / teach area structure.

- Universities that lead innovation rather than just teaching what is innovation (do rather than teach).

- Create networks of Universities / laboratories to bridge the gap of any weakness that a stand-alone University may have. Networks can facilitate the exchange of knowledge and experience; they can provide different perspectives of the same problem (holistic view) and they can distribute the burden of the project management and especially the resources' of the University. Finally, networks can help to globalize the solutions and multiply the value created by the project.

- Coaching new start-ups

- Mentoring new start-ups

The mix of the ANGEL project (European countries, ASEAN peers in Lao PDR, Vietnam, Indonesia, Malaysia and Campodia provides a unique opportunity to take advantage of the diversity (European, ASEAN) mix and the local similarities in order to address the issues of global complexity and localized problems of disadvantage groups (people with disabilities, minorities (women, ex refugees), poor income groups, etc.).

6. Reaching the marketplace

Whatever happens within the University environment has no value if external stakeholders are not engaged in the process of learning / designing a strategy / designing a product or service. External stakeholders are the providers of funding / perspective / framework of social and economic needs and finally the ones that they have the problem that needs to be solved.

In almost all best practices presented in the current report external stakeholders are invited to participate and they are given multiple roles in the entrepreneurial process. Some of them are "clients" for the product or services designed, some are producers and others are regulators / financiers. All types of stakeholders are useful and in each project the mix of which stakeholders and how heavily they will be engaged in the process depends on the nature of the problem - project.

7. Common – Uncommon elements of the models

The analysis of best practices reveals that there are a number of common and un-common elements of the model that each University uses to create an innovation and entrepreneurial center. The consensus on a number of elements to so numerous Universities is a very strong indication that these elements have been tested and found that work better than any other alternatives. On the other hand, there are equally numerous uncommon elements. Each University made a different decision to

formulate a model adapted to their needs. Hence, these elements are the ones on which the differences of models are based.

7.1 Common elements of the models

One common element on all the above alternatives is that curriculums, programs or seminars provided are multi-intra disciplinary, focused on design thinking. Design thinking may be seen as shortsighted, but this is not true. Design thinking is another perspective in understanding the external environment. Instead of understanding the entirety of the environment the research only focuses on an issue – problem. Through the understanding of the elements – dimensions of the problem the solver can gain a better understanding of the whole environment. Through experience and learning more aspects of the environment is illuminated and understood.

Curricula, programs and seminars can transform real - life experience to educational material and drive students and trainees to amalgamize experience to knowledge. Programs may vary in time length (from 2-hour programs to 2 month) and can be offered not only to students but to executives and professionals as well. This option enriches the mix of students and provides a richer real-life experience to these programs.

Specified programs can be designed to focus on executives only to provide educational opportunities to early mid-career professionals. The time horizon may vary from one-year program (fellowship) to 3–5-day programs (leadership accelerator programs) according to the scope – goal of the training and the needs of the participating professionals and corporations.

Furthermore, these alternatives can provide innovation project education to primary and secondary education schools. Both pupils and teachers learn how to participate in innovation teams, learn to use design thinking. Teachers are also taught to create curricula and implement techniques.

So, Universities implement curricula, programs, seminars to all levels of education for different reasons. Initiatives that focus on primary and secondary education schools have the goal to prepare pupils for their life as university students and to pass on values, social norms, concepts, etc. These pupils will better and quicker adapted to the new way of thinking, working, creating, solving problems.

University student's curricula, programs, seminars focus on providing to them knowledge, skills, values and real – life experiences that will help them as researchers, executives or professionals. Finally, curricula, programs, seminars that focus on professionals and executives can help professional to adapt to the current and future needs and to accelerate their educational experience to their colleagues. It is not uncommon a mix of pupils-teachers, students-professors and professionals-executives to be involved in a common project or program.

Another common element is the stakeholder approach. Universities, corporations and other stakeholders understand through their common experience that a Nash equilibrium can be reached, and all can benefit. A stakeholder approach is compatible with the idea that individual pursuit of value has a smaller probability of success. No dominant strategy exists, and the dominated strategies produce lesser that expected results. Thus, the stakeholder approach is a better framework for the current socioeconomic environment and for Universities in particular.

A final common element is the adopted culture and the acceptance of diversity as fundamental elements of the model. Culture, both as an environmental dimension and as tool, is significant. No university, curricula, institution or other support structure can achieve success without the compatibility of the culture that is designed for. Diversity (previously seen as an obstacle) is today seen as a multiplier of the impact that the imitative or model has.

7.2 Uncommon elements of the models

The uncommon elements are:

- Structure

- Focus

- Pedagogical approach

- Support structures

7.2.1 Structure

Universities according to their historical path of development have decided to create their innovation and entrepreneurial centers using a variety of organizational vehicles:

- Initiatives - Laboratories

- School level curriculum

- Institutes - Laboratories

- Cooperation with other Universities.

Initiative are the most flexible organizational schemes – vehicles. In essence initiatives are informal groups or projects on a department/school/university level. Initiatives can easily form and dissolve without significant entry and/or exit costs.

The second option is to create a specialized school. This option has some prerequisites to be functional:

- The University has to establish the school, decide whether the school will have students that will be able to get a diploma/bachelor's degree, master or Ph.D. degree.

- Significant resources (teaching personnel, buildings, equipment, etc.) have to be allocated to the school.

- The administration costs are higher than the ones of an initiative.

- Curriculums have to designed for periods expanding to 4-6 years and may be stable for that period.

Initiatives – laboratories can be a good first initial cautious step in introducing to the University the concept of an innovation and entrepreneurial center that evolves with the University at its core.

The school option has fewer degrees of flexibility than an initiative or a laboratory, because it is part of the University's organizational hierarchy. The fact that there are no academic departments is no accidental. The level of a school and not department was selected because a school can have multiple disciplines covered (a factor-element that is important for success as it has been shown earlier). On the other hand, has some advantages. The most important ones are the commitment of resources and the inflexibility of the curriculums. Usually, this option due to its disadvantages, is mostly found in large Universities that have the resources and the wide spectrum of disciplines they serve to facilitate an option like that.

One formal and legally well based option is the establishment of an institute or laboratory. The institute is a parallel organizational vehicle and can be an efficiency multiplier for the projects that operate within the institute. The flexibility of the institute is substantial due to the fact that it is not part of the official organizational hierarchy of a University, but it is a special purpose organizational vehicle used by the University to interface the University with its external environment and to create a stable relationship with stakeholders without the impediments of the strict organizational hierarchy of a University.

The final option for structure observed is the cooperation with other Universities. Innovation and entrepreneurial centers need a lot of resources (human, technological, etc.) and some projects are so complex and big that one University cannot fully cover the needs of the project. This organizational construct has a lot of dimensions and may take o lot of time to establish and to balance the roles of each and every University, the resources that every University will contribute to the common endeavor. Cooperation of Universities is not a "one size fits all" solution. It has a lot of flexibility. Universities can cooperate in an initiative, an institution or to establish common curriculum at a school level. This option works best when Universities have complementarities, common values and a culture of cooperation. A unique advantage is that through cooperation the wealth of ideas, creativity and learning can be increased and be mutually beneficial to all members of the cooperative.

7.2.2 Focus

Universities focus on specific inputs or types of collaboration with the other stakeholders whatever the structure selected and the support structures created (see next sections):

- Education

- Mentoring

- Synergies

The main contribution which is catholically used by all Universities is the formal education. Universities main purpose is to educate, so they do the same within the framework of an innovation and entrepreneurial center. Although education is what Universities do best, this contribution to the common effort is extremely important to success. Universities serve as a conduit of knowledge, skill, values and culture to other stakeholders and to the society as a whole. Education is the tool to pass them to the other stakeholders.

Mentoring is a mechanism for the informal sharing of information, social capital, and psychosocial help that the recipient perceives as important to employment, career, or professional development; mentoring requires informal contact, normally face-to-face and over time, between an individual who is perceived to have greater relevant knowledge, wisdom, or experience (the mentee) and a person who is perceived to have less relevant knowledge, wisdom, or experience (the mentee).Mentoring can be used interchangeably with formal education but it needs special skills and resources to be successful.

Finally, synergies are a full package where the research branch of the University is also employed (education and mentoring are the other two). Synergy of stakeholders that complement one with the other on the level of resources, ideas, structures, support structures can be a quite powerful tool of the intervention of the University to its external environment. Synergies are not monolithic. They can evolve through time and be enriched as the relationships of stakeholders get stronger through time. The commitment of resources is substantial and hence Universities show restrain for using synergies. That is why it is common on initiatives that are active for more than twenty years or when the University has a size that can ameliorates the issue of resources needed.

7.2.3 Pedagogical approach

The pedagogical approach has been analyzed on section 3 of the current document. There are two specified pedagogical approaches:

- T-type

- π-type

A major concern is that the adoption of either one will result to a need to make changes to curriculums and more importantly to the organizational structure of the University. So, the shift to a different pedagogical approach isn't a simple change, but

fundamentally changes the University. Of course, this change can be transformational or gradual. The type of change (transformational or gradual) is depended on the structure that the University will select (see section 5.2.1). An initiative can introduce a new type of student – professor working on an informal structure of the University or the University may gradually allow students and professors to gain knowledge and expertise from other disciplines.

7.2.4 Support structures

There are numerous support structures that can be created and function within the innovation and entrepreneurial center of the University. Some of the support structures that have high frequency of use in the best practices studied are:

- Education

- Coordination – mentoring[4] and coaching[5] services

- Business incubators[6]

- Start-Ups[7]

- Spin-Offs[8]

- Research and technology parks[9]

- Financial support.

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[4] A business mentor is someone who has more entrepreneurial business experience than the trainee and who acts as a reliable confidante over a long period of time.

[5] Coaching is a teaching approach in which a more experienced or professional person offers advice and instruction to a trainee with the goal of improving the employee's abilities, efficiency, and career.

[6] A business incubator is an organization or organizational unit that provides services such as management training and office space to help new and startup businesses develop.

[7] Startup is an independent organization, younger than five years and is aimed at creating, improving and expanding a scalable, innovative, technology-enabled product with high and rapid growth.

[8] A spinoff is an independent company through the creation of new business using an idea-concept that derived by a research lab or a parent company.

[9] A research and technology park is a property-based development that accommodates and fosters the growth of tenant firms and is associated with a university (or a government and private research bodies) based on proximity, ownership, and/or governance.

Using it's significant and well-trained personnel a University can provide educational, mentoring and coaching services. Educational services may vary on the time horizon, scope, tools, trainees, focus, etc. using the competitive advantage of a university in the area of knowledge and experience management the University may introduce specialized mentoring and coaching services. Mentors and coachers can be complemented by other members of the network of stakeholders that are part of the initiative.

A more robust support structure is the business incubator. The University has to commit more resources than the previous support structures to implement it successfully. The same can be said for start-ups and spin-offs, although these forms of support structures provide a more holistic cover of the needs of young businesses.

The final two support structures are different from the previous ones. A research and technology park are even more University centric than the other support structures. This support structure can be justified when the University produces intellectual capital that needs to be protected and its connection with the industry is very strong.

Financial support is rare. Only a few Universities or University centric initiatives are involved in the financial operation and funding processes of the projects – businesses – start-ups – spin -offs that hosts.

8. Decision to be made

From the moment a University acknowledges the need to create an initiative due to the need to intervene to its economic and social environment, it has to make some important decision in order to formulate the initiative. These decisions involve the following issues:

- Stakeholders to be involved

- Time horizon

- Spectrum of support structures

- Pedagogical approach

- Structure

A University may adopt an evolving (conservative or cautionary) approach to formulate its own initiative. The first decision to make is the number and type of stakeholders needed to be invited to participate in the initiative. A high number of stakeholders contributes to the complexity and difficulty (to achieve consensus or at least tolerance) of the initiative and increases the possibility of failure. Large networks of stakeholders need better incentive schemes, stronger relations, better established norms and rules, prioritization of goals, conflict management skills, etc. An initial small number of stakeholders will create a core that will help the initiative to be established on solid foundations and evolve having a point of reference for the next wave of stakeholders. **So, think different.**

The time horizon selected is equally important. Short term initiatives or strategies may not be compatible with the long-term statements like the mission and vision of the stakeholders. Some stakeholders may need short term support and it's important to be provided with it. The initiative per se must have a long-time horizon. The architecture of its approaches, structures, processes have to be compatible with the time horizon. Many structures, pedagogical approaches, etc. need time to mature and to be fruitful. **So, think big and long-term.**

The final three decisions (Spectrum of support structures, Pedagogical approach organizational Structure) are focused on the organizational structure and the support structure that the University's initiative has to select. The cultural and historical path of the University has to be considered. The magnitude of the initiative should not be an impediment. It's better to think before you act, but act, nevertheless because

opportunities may turn to threats and strengths to weaknesses in the passing of time. **So, act.**

Conclusion

Each University should consider its own environment. A PEST analysis is quite useful in identifying all dimensions and factors that will affect the establishment, operations and success of an innovation and entrepreneurial center. The intervention of the University to its environment may not be a radical one, to impose change but more to facilitate change, when change is acknowledged as a necessity. To do that the University has to:

- Make decisions and formulate the Key Work Standards for Success

- Decide the Role of the University on its environment

- Formulate the University's Strategy to achieve its goals

- Select the model of University Governance to be implemented.

The innovation of the proposal is the creation of an "engine" of model creation. A University can design a model that corresponds to its needs and goals. Best practices provide the structural elements of the engine and the University should select the direction and speed to create the Angel Innovation Model.

Imagine ... think big
Innovate ... think different
Implement ... act

Appendix

Glossary

Stakeholder: a stakeholder is a member of "groups without whose support the organization would cease to exist (Moutchnik, 2013)

Strategy: a pattern in a stream of decisions to contrast with a view of strategy as planning (Mintzberg, 1978).

Incentives: systems that dictate the incentives needed for an agent to achieve a desired outcome (Neilson, 2007)

Conflict management: Conflict management is the process of limiting the negative aspects of conflict while increasing the positive aspects of conflict. The aim of conflict management is to enhance learning and group outcomes, including effectiveness or performance in an organizational setting. Properly managed conflict can improve group outcomes (Alper; Tjosvold; Law, 2000Leadership

Start-Up: startup or start-up is a company or project undertaken by an entrepreneur to seek, develop, and validate a scalable business model (Robehmed, 2013).

Spin-Offs: Spin-offs are divisions of companies or organizations that then become independent businesses with assets, employees, intellectual property, technology, or existing products that are taken from the parent company (Zahra, 1996).

Incubators: is an organization that helps startup companies and individual entrepreneurs to develop their businesses by providing a fullscale range of services starting with management training and office space and ending with venture capital financing (Rubin; Aas; Stead, 2015).

Taylorism: is a theory of management that analyzes and synthesizes workflows. Its main objective is improving economic efficiency, especially labor productivity. It was one of the earliest attempts to apply science to the engineering of processes to management (Mitcham, 2005)

Design thinking: a set of cognitive, strategic and practical processes by which design concepts (proposals for products, buildings, machines, communications, etc.) are developed (Tim, 2008).

Mentoring: Mentoring is to support and encourage people to manage their own learning in order that they may maximise their potential, develop their skills, improve their performance and become the person they want to be (https://www.reading.ac.uk/engageinmentoring/what-is-mentoring/eim-definitions.aspx)

Coaching: Coaching aims to produce optimal performance and improvement at work. It focuses on specific skills and goals, although it may also have an impact on an individual's personal attributes such as social interaction or confidence. The process typically lasts for a defined period of time or forms the basis of an on-going management style.

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University	Country	Rate	Period	Approach	Perspective	Emphasis	Components	Structure
Tongji	China	Moderate	10	Stakeholder, Modality	Design thinking	Socioeconomic	Culture, Diversity	Single
Business Succession Schools	Finland	Moderate	15	Stakeholder	Design thinking	Socioeconomic	Culture, Diversity	Single
The Paris d. school	France	Moderate	14	Stakeholder	Design thinking	Socioeconomic	Culture, Diversity	Modular
Entrepreneurial University of Wismar	Germany	Moderate	10	Stakeholder, Modality	Design thinking	Economic, Technical	Culture, Diversity	Single

University	Country	Rate	Period	Approach	Perspective	Emphasis	Components	Structure
University of Berlin	Germany	Moderate	15	Stakeholder, Modality	Design thinking	Economic, Technical	Culture, Diversity	Single
Neudeli : The Bauhaus University's entrepreneurship centre	Germany	Moderate	20	Stakeholder, Modality	Design thinking	Economic, Technical	Culture, Diversity	Modular
Beuth University of Applied Sciences Berlin	Germany	Moderate	19	Stakeholder	Design thinking	Socioeconomic	Culture, Diversity	Single

University	Country	Rate	Period	Approach	Perspective	Emphasis	Components	Structure
Alta Scuola Politecnica	Italy	Moderate	16	Stakeholder	Design thinking	Economic, Technical	Culture, Diversity	Single
University of Gdansk	Poland	Moderate	27	Stakeholder, Modality	Design thinking	Socioeconomic	Culture, Diversity	Single
University of Tokyo	Japan	Excellent	>30	Stakeholder	Design thinking	Economic, Technical	Culture, Diversity	Modular
University of Brighton	UK	Excellent	>30	Stakeholder	Design thinking	Socioeconomic	Culture, Diversity	Modular

University	Country	Rate	Period	Approach	Perspective	Emphasis	Components	Structure
Korea Advanced Institute of Science and technology	South Korea	Excellent	>30	Stakeholder	Design thinking	Economic, Technical	Culture, Diversity	Modular
Harvard	USA	Excellent	>30	Stakeholder, Modality	Design thinking	Socioeconomic	Culture, Diversity	Modular
Stanford	USA	Excellent	>30	Stakeholder, Modality	Design thinking	Socioeconomic	Culture, Diversity	Modular
M.I.T.	USA	Excellent	>30	Stakeholder, Modality	Design thinking	Economic, Technical	Culture, Diversity	Modular