Training Pack D-EMIND

Digital Entrepreneurial Mindset

A guide to Innovative, Digital and Entrepreneurial Learning Processes

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Content

Chapter 1. Introduction of the D-EMIND project

1. What is the D-EMIND project about?

According to UNESCO (2017), in the framework of the **Sustainable Development Goals (SDG),** quality education (promoting the development of skills and knowledges to find solutions to economic, social, and environmental problems) is the cornerstone of all the other SDG. The COVID-19 pandemic has evicted and accelerated the need for our educational systems to address the **digital transformation** promoting, among other aspects, the use of digital tools among students and teachers, creating more attractive and innovative learning and teaching approaches, and finding a way of how to work transnationally without traveling to stay in tune with surrounding societal changes.

Additionally, building **entrepreneurial competence** is a key EU policy. It is a feature of the Strategic Framework for Education and Training and an element of many recent policy documents. The Council Recommendation on Key Competences (EC, 2018), states the importance of "promoting entrepreneurial mindsets" and encourages Member States to think about "nurturing entrepreneurship competence, creativity and the sense of initiative especially among young people".

An excellent approach not just to develop creativity and entrepreneurial competences, but also to answer current societal challenges (e.g., UN SDG) is **challenge-based learning (CBL)**. It is an innovative learning methodology, based on experiential learning and focused on applying students' knowledge (acquired during their regular courses at university) to solve real-world challenges. It combines self-direct learning, interdisciplinary and cross-national teamwork with an intensive use of technology.

Based on the developments of previous projects focused on on-site Entrepreneurship Education and considering the need to promote online or digital co-creation and entrepreneurial systems and dynamics, the main aim of D-EMIND is to **design, develop and test a digital challenge-based learning methodology, strategies, and tools for promoting entrepreneurial mindset in Higher Education.**

The specific **aims** of the D- EMIND project are:

- developing and promoting the use of a trans-European platform for challenge-based learning, innovation and peer-to-peer learning among students and teachers.
- facilitating real world challenges where students, as part of their formal education, cooperate with external organizations to help them solve challenges.
- merging challenge-based learning and entrepreneurship teaching and hence
- taking both to the next level.
- preparing students for a work life that physically and digitally transgresses.
- borders reinforcing the link among higher education institutions and external institutions and organizations - including companies, public administration and NGOs in order to co-create projects to foster entrepreneurship.

The four major **intellectual outputs** within our project are:

- **D-EMIND Methodology and Self-assessment tool for entrepreneurship**

In the methodology you can find the basics of the atom model, a model we created to promote entrepreneurial competences within Higher education. It also contains a detailed description of all activities which can be used through the elements of the Atom model.

In addition, we have developed a self-evaluation tool, which can help assess students' self-confidence in their own entrepreneurial skills. The questionnaire will be sent out to all students at the beginning and end of the course.

- **D-EMIND Digital Toolbox and Platform**

For promoting the use of a trans-European platform for CBL, innovation and peer to peer learning amongst students and teachers we created a platform. The Platform includes the digital toolbox and it focuses on promoting an entrepreneurial mindset partly by building a digital repository with free resources and tools and partly by building/creating an intranet to facilitate collaboration between students, teachers and mentors. One function is connecting students, teachers, mentors and external public and private organizations. Another function is establishing transnational learning- and innovation hubs of students and a third function is establishing a knowledge-sharing forum for teachers.

- **D-EMIND Training Pack**

The training pack will give teachers, students and mentors the necessary tools to implement challenge-based learning using the D-EMIND methodology in the (digital) classroom. After explaining the why and what of CBL you can find practical information on how to implement CBL in your classroom, using the social and learning sphere and the activities of the ATOM model, all in a digital context.

- **D-EMIND MOOC**

The MOOC will provide you with all the necessary videos and presentations to work with challenge-based learning, whether it is in a digital or live classroom, or on an individual basis.

The aim of these 4 intellectual outputs is to be an asset to educators involved in developing and delivering entrepreneurial education in the four partner countries and beyond. All the instruments provided (methodology, self-assessment tool, digital toolbox, platform, training pack and MOOC) are focused on implementing challenge-based learning especially in a digital world, all to enhance the development of students' future skills, develop creativity and entrepreneurial competences.

2. Entrepreneurial education

> "**Entrepreneurship** is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social".

Over recent decades, rapid and deep-seated social, technological, and environmental changes have prompted policymakers and educators to reflect upon the purposes and content of education, as part of the need to adapt and keep pace with such changes. There is a growing consensus that this goes beyond transmitting knowledge, towards preparing students for life: towards fulfilling their potential both as active citizens and within the world of work.

All students, not only those who want to become entrepreneurs, have to be provided with skills and qualities essential in their future careers. What makes entrepreneurial education distinctive is its focus on generating ideas that have value for others. While this might suggest a narrow economic or commercial purpose, this value also takes cultural and social forms. The potential of entrepreneurial education goes far beyond training for students in tertiary colleges on how to start up a business.

Educators recognize that fostering an entrepreneurial mindset is not only a question of preparing students for the future within the complex economic environment. It is also a means of fostering personal and social development so that students:

• gain skills in getting on with others
• express their creativity in suggesting solutions to problems
• learn to reflect on their own particular strengths, interests and aspirations
• adopt a can-do attitude and drive to turn ideas into action
• show resilience in handling setbacks
• apply their financial literacy and numeracy skills in real-world contexts
• communicate their ideas to a wide range of audience
• contribute to the community as active, responsible citizens.

Entrepreneurial education contributes to a more relevant curriculum, improved student motivation and opportunities to engage with the community and to be better prepared to match the needs of the business world.

Over recent years, the importance of entrepreneurial education has attracted considerable attention among the world's policy makers. The European Commission, views entrepreneurial activity as relevant to all levels of education and calls upon member states to ensure that 'All young people should benefit from at least one practical entrepreneurial experience before leaving education.'
It is worth noting that entrepreneurial education has several characteristics, which many teachers may already be using but have not recognized as being associated with Entrepreneurial education. These characteristics include:

• Experiential – learning through first-hand experience
• Value creating - creating something or service of value to others in real-life contexts.
• Collaborative - sharing and developing ideas with others to achieve a common goal
• Multidisciplinary - drawing on the knowledge and skills of those who work in different disciplines

New innovative and enhanced educational/learning methodologies are undeniably key in developing highly skilled and competent students, better prepared for the professional world.

3. Challenge based learning

Challenge Based Learning is a collaborative learning experience, an engaging, multidisciplinary approach in which teachers and students work together to learn about compelling issues, propose solutions to real problems, and take action. CBL is collaborative and hands on, asking students to work with other students, their teachers, and experts in their communities and around the world to develop deeper knowledge of the subject they are studying, to identify and solve challenges.

Challenge Based Learning mirrors the 21st century workplace. Students work in collaborative groups and use technology to tackle real-world issues. For teachers, the task is to work with students to give them structure, support, checkpoints, and the right tools to get their work done successfully, while allowing them enough freedom to be self-directed, creative, and inspired.

3.1 Why Challenged based learning?

Nowadays we are surrounded by challenges on all levels and how we respond to these challenges will determine our future. We have to learn - when faced with a challenge – to consider different perspectives and create sustainable solutions. In order to learn how to address challenges, challenge-based learning can be implemented in the curricula to address local and global challenges and in the meantime build on the 21st century skills of students. Especially entrepreneurial competencies are in increasingly high demand in a dynamic and globalized society.

From our perspective, practice-oriented teaching is essential for developing students' entrepreneurial mindsets and action competencies while encouraging the application of theoretical perspectives and reflection. Practice-oriented teaching does not conflict with theory comprehension.
In Bloom's taxonomy, a high level is achieved not only by understanding and applying a theory but also by being able to apply it in both simple and complex contexts. Partnership members believe that students must be trained to understand that 'real-world' often differs from the technical theories and academic criteria of higher education.

Knowing the why and the advantages of CBL, our mission is to bring CBL to the students, teachers and mentors so we can create an entrepreneurial mindset in every HEI in the world.
This training pack is meant for students, teachers & mentors interested in stimulating an entrepreneurial mindset by working with CBL. We will guide you through digital CBL using the Atom model and prepare you to get started with CBL.

3.2 Why CBL in a digital way?

The Atom Model that we developed within the ForEMLink project is a way of fostering an **entrepreneurial mindset in Higher Educatio**n on a **local, national, European and global scale**. The aim is to promote entrepreneurial competencies in higher education students through learning processes that teachers can facilitate with creative, innovative and entrepreneurial activities.
The Atom Model suggests a process and activities that teachers can use to facilitate the development of entrepreneurship for students. It is based on a partnership perspective on how one may integrate entrepreneurship as a natural element in Higher Education courses.

However, due to the challenges evidenced by the **COVID-19 pandemic** we felt the need to alter the ATOM model and make it more suitable to apply in an online or digital co-creation context. That is why we created within the D-EMIND project a model - based on the ATOM model – to apply challenge-based learning in a digital context.

The fact that CBL is applied in an online context has quite some consequences on the surrounding spheres of the atom model – the social and the mental sphere. The accompanying activities must be altered to the new digital setting. The physical sphere will completely disappear and make room for digital tools to be used in solving challenges going through the different steps of the ATOM model.

As stated above, CBL is an approach to teaching and learning where students collaborate in teams and select, define, and work with authentic, locally, or globally relevant challenges which have more than one solution or none at all. Inherent to CBL is the fact that no one has the solution to the challenge in advance, not even the teacher. Students take ownership of the challenge by being given the autonomy to work in self-directed teams. In fact, applying CBL in a classroom setting - especially a digital one - prepares students for the 21st century workplace. Students collaborate in teams and use technology to tackle real-life challenges.

4. Changing role of the teacher

As a teacher you are responsible for facilitating the challenge-based learning environment. This is something completely different than a traditional teacher role where a curriculum must be written, learning goals have to be determined, content has to be researched and aligned and assessments have to be developed. When using Challenge Based Learning in a classroom – live or digital, it is very important to 'step away' from the process and allow space for **self-directed, creative, and inspired learning** by the students themselves. Resist the temptation to get too involved in the process or discussion and to come up with solutions yourself.

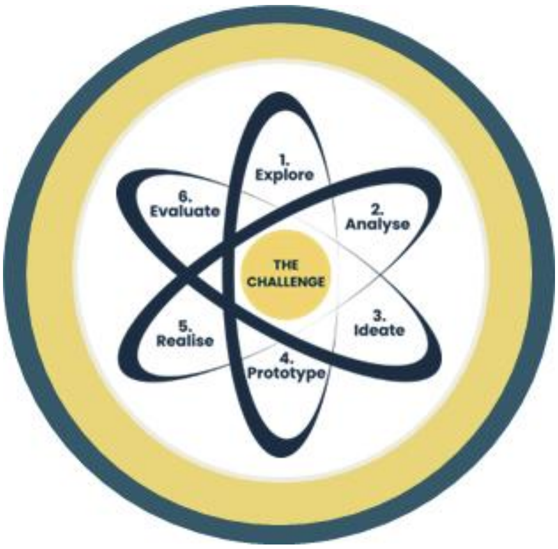
The main task of the teacher is to create an inspiring learning environment, to give in that way a boost to their creativity, to provide structure and support, to implement checkpoints and the right tools to get work done. So, we shift from a teacher–centered approach to a **student-centered approach**.

To support student teams who co-create solutions, **mentors** can be involved in the process. Mentors could be teachers from different disciplines, but also external stakeholders from outside the higher education institution can prove valuable partners. They can be valuable sources of knowledge, can actively collaborate with the students, function as evaluators of the outcome or even provide new challenges to be solved.

5. The Atom Model and the theoretical foundations

The Atom Model suggests a process and activities that teachers can use to facilitate the development of entrepreneurial education for students. It is based on a partnership perspective on how one may integrate entrepreneurial education as a natural element in Higher Education courses.

The model consists of 6 'elements' or stages in solving the challenge, which forms the core of the atom. The Learning Spheres circulates around the 6 elements in the atom. The spheres are social and mental; they influence the atom and its elements. To work on the different elements a variety of activities are suggested in the methodology and further on in this training pack.



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The process starts and ends with a challenge at the core of the Atom Model to which neither the teacher nor the students have the solution. Throughout the six elements of the model, the students and teacher discover that dealing with challenges using various approaches and activities produces different solutions. Part of the process is to step into uncharted territory in terms of knowledge, risk taking, making mistakes, learning and trying again. Initially, the path to a suitable solution is unknown and it may take students several attempts to find it. It is therefore essential to be open to new solutions and not to assume that the solution to a challenge is known beforehand. Students may suggest excellent solutions of their own, allowing them to develop their skills and become more knowledgeable in a specific area.

The Atom Model is designed in a way that makes it possible to use all its elements. However, one may also select activities from specific elements that seem most meaningful for the educational courses that the teacher is preparing. Similarly, one may select activities related to the subject and curriculum criteria of an existing course. With this flexibility, entrepreneurial activities can be adjusted to the subject area with the specific didactics employed within the timescale that the teacher has at his/her disposal.

With the six elements of the Atom Model, one will discover that the focus constantly changes. For example, it can shift from concrete field observations and an understanding of real challenges to intense idea generation. Subsequently, it switches to a process through which the ideas with the greatest value are selected. These processes promote an entrepreneurial mindset, increased motivation, creativity and the generation of new solutions.

The element of unpredictability reflects reality - the immensely complex reality in which Higher Education graduates all over Europe are immersed once they start their careers. Thus, this form of training develops entrepreneurial competencies and prepares students to handle real and difficult, but solvable, challenges developing competencies that are in high demand among employers.

To dig deeper and understand the meaning of each phase of the Atom Model, reading “The Atom Model: Breakdown and Meaning of its phases from a theoretical perspective” is crucial. It provides information for comprehending its purpose and application, allowing us to leverage this approach fully and achieve meaningful outcomes in challenge-based learning. More information on the theoretical background can be found in annex 1.

Chapter 2: Training pack of the digital Atom Model

1. Overview of the modules

In this chapter you will find a short overview of all the modules presented in this training pack. Apart from module 0 which is about setting the stage and presenting the challenge, each module is dedicated to one element of the Atom Model. The estimated time is an indication of time needed, the real timing depends on the activity the user (teacher, student, or mentor) selects to work on the element. For example, developing a prototype can be done in 30 minutes, but it might also take days or weeks.

We have prepared six modules – one for each element – to put the Atom model into practice.

1.1. Structure of the modules

Module	***Content***

Module 0	- Setting the stage:
	  - Planning of the CBL
	  - Finding a challenge
	  - Setting up the teams
	- Learning spheres (social & mental)
	- Present the challenge

Module 1	Explore the challenge
Module 2	Analyse
Module 3	Ideation
Module 4	Prototype
Module 5	Realize
Module 6	Evaluate

1.2 What are the modules about?

<u>Module 0 : the challenge and the learning spheres</u>

The core of the model is the **challenge**. This is where the students and teachers start and finish the whole process of working with 'real life projects' – this is why it has a central place in the model. Challenges originate from 'the field', and can be problems, potential development trails and hacks to future change. They are phenomena that can be observed on all systemic levels in society, organizations, and companies/enterprises.

Around the atom model two learning spheres circulate. The spheres are **mental and social,** and they influence the atom and elements within it.

When the students go through an innovative process, the facilitating teacher must deal with the essential task of creating a learning sphere in the initial stage. It is the lecturer who must set the framework for the social and mental learning sphere. It is recommended that it is introduced at the beginning of the innovative learning process, considering that the active creation of the learning environment is an essential prerequisite for the successful lesson on innovation. It is necessary for the teacher to facilitate those complex and demanding innovative learning processes to encourage the creative, innovative and enterprising mindset in the students. A part of this facilitation is to create a learning sphere, which inspires and motivates students to become active throughout the six elements.

The learning spheres are important for the atmosphere that fosters the 6 elements of innovation.

The social learning Sphere is primarily perceived as the social relation and the collaboration between students. In the core of the Atom Model students work with solutions for real world challenges and for them to dare to present creative solutions it is our experience that through working on this social learning spheres, the essential feeling of security and mutual trust among group members are stimulated.

The mental sphere, in our perspective, encourages the development of an entrepreneurial mindset to help the students complete the 6 elements of innovation. The entrepreneurial mindset must, to some degree, be present during the innovative learning process for the students to be able to work with the 6 elements of innovation and at the end of the process to create a solution for the challenge in the core of the model.

Module 1 : Explore

An exploration in the field of investigation takes place in order to sense and be able to properly identify the challenges of the field, if possible, through physical presence and/or virtual conditions. Inspiration can be drawn from research methodology, social technologies, and social engineering. The purpose is to gather a broad range of data that will enable the participants to experience the challenge from an inside perspective. The aim is to achieve a sufficiently deep understanding of the challenge itself and of the field surrounding the challenge. You want to look for the 'not-obvious', or the unknown, which is a fruitful path to innovation.

All activities in this section will inspire you on how to explore the challenge.

Module 2 : Analyze

An **analysis** is conducted using the collected data. Theoretical perspectives can be added in order to develop a deeper understanding of the challenge - its origin and its components. The analysis is a gateway to a clarification of the underlying question of the challenge. This question serves both as a driving force and as the project core and must take the form of an open-ended question. The aim is to identify patterns and to achieve an in-depth understanding of the challenge. It is imperative to undertake a careful analysis in order to avoid quick fixes and obvious answers to the challenge.

All activities in this element will focus on how to analyze the data that was collected in the Explore element.

Module 3 : Ideate

Ideate is about creating innovative solutions to the challenge. The aim is to unleash creativity in the participants and to generate new ideas drawing on a broad field of knowledge and approaches. After the generating of ideas, a sorting of ideas takes place. The different ideas are discussed and chosen in the light of the themes and specifications and the particular ideas that the students wish to continue with. Activities in this element will focus on either how to ideate innovative solutions to the challenge or to select the idea to focus on.

Module 4 : Prototype

When **prototyping**, the chosen ideas are given a form and are substantiated, or 'materialized'. It is imperative to visualize the ideas in order for both participants and 'clients' to share, understand, test and validate them. Complexities and opportunities are explored collectively. The knowledge necessary to qualify the prototype is gathered. If possible, the prototype is communicated to and/or tested in the field in order to attain feedback. The aim is to conceptualize the ideas and solutions generated in the ideation stage. You are working towards being able to bridge the gap between idea and action. For this to happen, the ideas must be given a manifested visual expression others can understand and relate to.

Module 5: realize

Realize means that steps are designed for implementation of the prototype. The next step is the realization of the prototype, if possible, within the given frames. The guiding principle in this process is matching the prototype to the possible. Questions such as who, where, and how many are answered. This takes place in a dialogue between the external stakeholders and the participants.

Module 6 : Evaluate

Lastly, in the 6 elements of innovation is the **evaluation**. This evaluation is composed of two parts:

1) An external part where the idea and the action or action plans are evaluated by the external partners in the project. This is an end point of the students working with solving the challenge.
2) An internal evaluation with the teachers and the other students of the innovative learning process.

Per module we provide an overview of activities to choose from in order to work on this element in a digital environment. You can also find these activities on the D-EMIND website – just click on an element to get the complete list of activities. Click on a specific activity to get a full description and step by step guide about how to implement this activity.

As stated above, it is not obliged to use all the modules in a linear way – as teachers/mentors get more and more familiar with using challenge-based learning based on the atom model some modules can be skipped or executed in another order. Sometimes it might also be necessary to go back to a former module, e.g., when in the prototyping phase it turns out that the idea is not feasible, it might be necessary to go back into ideation.

Keep in mind that if you spread the process of challenge-based learning using the atom model over several days or even weeks, you have to start the new element of the cycle with a warming up activity of the social and/or mental sphere to 'set the stage' again.

We recommend measuring entrepreneurial and innovative skills at the beginning of the challenge-based learning experience. The partners in D-EMIND have developed a user-friendly digital tool that teachers and students can use on their own. The same test is repeated at the end of the innovation cycle, in the evaluation phase, the evolution in skills through using challenge-based learning can become clear.

For more tips about the facilitation in an online environment, we refer to the methodology.

2. Complete list of activities per module

Module	Activities	Estimated time	Student group
Module 0 Setting the stage: Mental sphere	1. Party time 2. Alternative presentation 3. Giving presents 4.Backwords Focus 5. When are you creative 6.The paperclip 7. The 30 circles 8. Complete the Incomplete Figure Test 9. Backwards Focus 10. Yes. I've Made a Mistake 11.One minute paper	10-20min 5-10min 20-30min 5-10 min 10-15 min 10-12min 10-12min 20-30min 5-10min 5-10min 5-10min	16 2-40 16 16 16 15 15 15 16 16 16
Module 0 Setting the stage: Social sphere	1. Code of Collaboration 2. Check-in 3. What is Your Childhood Dream? 4.If I were a... 5.Anecdote – the story 6.The object box 7. Yes, But vs Yes, And 8. Keep talking behind my back 9. From 16 down to 1 10.Know their role	1-2 hours 20-30min 20-30 min 5-10 min 30min-1hour 20-30 min 5-10 min 20-30 min 90-120 min 90-120min	16 2-40 2-40 5-30 5-10 5-6 2-40 5-6
Module 0 Setting the stage: The challenge	1. The 5 Why's 2. Formulation of a challenge 3. Find your challenge 4. Where to find a challenge 5. The challenge and group formation	10-20min 10-20min 10-20min 2hours-2days 2-3hours	2-5 5-30 2-30 Class or groups groups
Module 1 Explore	1. Target group interview 2. What? How? Why? 3. Station to station 4. My ever changing mood	30-60 min 2-3 hours 20min 20min	2-40 15 15 15

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	5. What do I even know?	60min	
Module 2 Analyze	1. The 5 Why's 2. The 5W's	10-30min 10-20 min	Even number 2-5
Module 3 Ideate	1.Adapt a role 2. User journey map 3. Conceptual blending 4. Reverse brainstorm 5. Sticky dots 6. Pressure cooker 7. Use the word 8. The idol 9. Picture Boost 10. Countless obstacles 11. Pass it on 12. Idea minimization 13.Gyro Gearless 14. Idea ABC 15.Blooming ideas 16. Extreme measures 17. In my (un)biased opinion	30-60 min 60min 20-30 min 20-30min 5-10min 30-60min 10-20min 5-10min 10-20min 30-60min 10-20min 30-60min 10-20min 20-30min 60min 60min 60min	5-10 5-10 2-5 2-5 2-10 9-30 2-40 5-40 2-40 2-40 2-40 2-35 2-30 2-40 Project groups Project groups Project groups
Module 4 Prototype	1.Get real 2. One MVP builder based on group instructions 3. Build your own MVP	1day 1day	5-10 Project groups
Module 5 realize	1.The elevator pitch 2. The network map 3. Marketing 4. Stepping stones 5. Step-in 6. Pitching game	20-30min 30-60 min 5-10min 1day 1day 30-60 min	Project groups 15 Project groups
Module 6 Evaluate	1.Feedback and evaluation from the external partners 2. Feedback panel 3. Self-assessment 4.Get-a-grip 5. One minute paper	30-60min 20-30min 3-4 hours 3-4 hours 30min	2-40 2-40 2 groups 5-30 Project group

3. Teaching materials for the modules

In the next unit you can find the templates with a detailed overview per module, containing the following information:

1. Aim of the module
2. Learning outcome
3. Competences
4. Activities
5. Timing
6. Assessment
7. Tips & recommendations
8. Further reading

Module 0:	**Setting the stage: (1) learning sphere (social & mental) and (2) The challenge**
Aim of the module	**(1) The Learning Sphere** circulates around the 6 elements in the atom. It contains the social and mental sphere and influences the atom and the elements within it. This learning sphere is mainly important for the atmosphere that fosters the 6 elements of innovation, it is important to take time to work on this before starting the innovation cycle. The learning sphere aims to create an atmosphere where students: • feel at ease in their digital environment • get to know each other and their own team members **(2) The challenge** The challenge is the core of the based learning experience where we aim at students to be able to solve complex, real-life cases. A challenge can be delivered by a company or other stakeholder, or students can come up with a challenge themselves.
Learning outcome	• Feeling at ease in their team which will help them to work and think more constructively and creative throughout the process that follows • Understanding the goal of the challenge and they will feel involved and stimulated to work on a solution for the challenge presented
Competences	• Works together and co-operate with others to develop idea and turn them into action • Takes up challenges • Identifies and assesses their individual- and group strengths and weaknesses • Identifies needs and challenges that need to be met
Activities	To start with this module, the following activities of the D-EMIND methodology guide are suggested: • A8 Complete the Incomplete Figure Test 20'-30' (mental sphere) • B8 Keep talking behind my back 30' (social sphere) • 0.5 Where to find a challenge 60' (Challenge) Depending on the size of the group and the time you have, you can choose one or more activities of the mental- and the social sphere. Check our methodology for more activities.
Timing	• Introducing CBL + what are we going to do 15' • Application of the activities A8, B8, 0.5 90' • Closing of the session and intro of what is coming next 10'
Assessment	• Before setting the stage:

	Students can take the self-assessment test to measure their level of entrepreneurial skills. That way you have a base measurement by which you can evaluate the progress students are making by using challenged based learning. https://www.demind.eu/self-assessment-tool/ • At the end of the activity: check if everyone understood the challenge.
Tips & recommendations	• Take some time to announce the teams and for the students to get to know their team members. They feeling good in their team is decisive for the teamwork and the outcome of the whole innovation process. • When preparing the teams try to work with multidisciplinary or even international teams, mix students with different backgrounds as much as possible. • When choosing a challenge it is important that it is broad enough, in the sense that it can be looked at from a multidisciplinary angle. Also, it has to be a 'real-life' problem, connecting to something that is happening in the world today and which is somehow relevant to the students, close enough to 'their' world. This will add to the experience of feeling that they can make a difference within their community. • If the challenge is provided by an external stakeholder, it is preferred that he or she presents the challenge directly to the teams. In that way extra information can be given and the students can ask questions directly. If not possible 'live', the challenge can also be presented in a video message to the students. The challenge owner should also be included in the evaluation process when the students present their solutions. Make sure there is enough time for the students to ask questions so that the challenge is very clear to everyone. • You as a teacher have to plan the whole challenge-based learning experience from a to z beforehand: choose a challenge, prepare a timetable for executing every module, divide the students into teams.
Further reading	D-EMIND (2023). *Methodology D-EMIND. Digital Entrepreneurial Mindset. A guide to Innovative, Digital and Entrepreneurial Learning Processes*. Available at: https://ddd.uab.cat/pub/llibres/2023/273330/demindguide_a2023.pdf

Module 1:	Explore
Aim of the module	• To understand the main concepts related to the exploration phase • To achieve a sufficient deep understanding of the challenge itself and of the field surrounding the challenge. • To look for the 'not-obvious' or the unknown, which is a fruitful path to innovation. • To assess the process of the exploration competences acquired
Learning outcome	• Having a deeper knowledge to understand what the challenge is about. • Gathering extra information about the why, how and what of the challenge, which is the start for the innovation journey.
Competences	• Explore the social, cultural and economic landscape surrounding the challenge • Explore and experiment with innovative approaches • Reflect and learn with others • Find and manage the material, non-material and digital resources needed to turn ideas into action
Activities	All activities in this section will inspire students on how to explore the challenge. • 1.4 What do I even know 60’ Keep in mind that when you start the exploration phase on a new day, you have to start with a warming up activity from the mental and/or social sphere to set the stage again.
Timing	• Introducing the explore phase 10’ • Application of activity 1.4 60’ • Closing of the session 5’
Assessment	• During the exploration phase: Check with all students if the activities have been understood and everyone collaborates in their team. • At the end of the module After they have gathered all information and have a deep understanding of the challenge, try to challenge them with critical questions to see if they have a good understanding of the essence of the challenge.
Tips & recommendations	• Let students look for information using different sources • Don’t let them be satisfied too quickly, encourage them to dig deeper into the exploration phase. • Learn them to be critical with the information they have gathered • Let them try to summarize the challenge to know if they have a deep understanding of the challenge

	• If possible, ask feedback from the challenge owner. Each team can get the chance to get in contact with the challenge owner and can check if their understanding of the challenge is correct. • Students start by gaining an empathetic understanding of the problem, they have to set aside their own assumptions to better understand the problem, the needs of customers and users, …
Further reading	Fox, L., Dan, O., Elber-Dorozko, L., & Loewenstein, Y. (2020). Exploration: from machines to humans. *Current Opinion in Behavioral Sciences, 35,* 104–111. https://doi.org/10.1016/j.cobeha.2020.08.004 Wojtowicz, Z. & Loewenstein, G. (2023) Cognition: A Study in Mental Economy. *Cognitive Science, 47*(2), 1-10. https://doi.org/10.1111/cogs.13252 Wojtowicz, Z., & Loewenstein, G. (2020). Curiosity and the economics of attention. *Current Opinion in Behavioral Sciences, 35,* 135–140. https://doi.org/10.1016/j.cobeha.2020.09.002

Module 2:	Analyse
Aim of the module	• To analyse all collected data from the exploration phase and identify patterns in order to gain a deeper understanding of the challenge • To identify all underlying problems and question all surrounding fields of the challenge
Learning outcome	• Understanding - in-dept - of the challenge • Identifying patterns in the fields surrounding the challenge
Competences	• Establishes new connections and bring together scattered elements for the landscape of the challenge • Combines knowledge and resources • Thinks in an ethical and sustainable way and makes sure the goals are met accordingly
Activities	• 2.2 the 5W's Who? What? When? Why? Where? 20' Keep in mind that when you start the analyze phase on a new day, start with a warming up activity from the mental and/or social sphere to set the stage again.
Timing	• 15' Introduction to the analyze phase • 10' Warm up activity A3 Digital Storytelling • 20' Application of activity 2.2 • 5' Closing the session
Assessment	During the analyze phase: • have all the students understood the activity and is everyone contributing in a motivated way At the end of the analysis: • After analyzing all the information in the surrounding fields, try to challenge the students with critical questions. Do they have all the information they need before starting to gather ideas in the ideation phase?
Tips & recommendations	• It is imperative to undertake a careful analysis in order to avoid quick fixes and obvious answers to the challenge • Sometimes it is wise to combine several activities for this element of analysis to gain a thorough understanding of the challenge
Further reading	Bloom, B. S., & Krathwohl, D. R. (2020). *Taxonomy of educational objectives: The classification of educational goals. Handbook 1, Cognitive domain*. Longmans Cottrell, S. (2023) *Critical Thinking Skills: Effective Analysis, Argument and Reflection.* Bloomsbury Publishing Nazarova, G. (2022) Will be on the basis of modern economic education. Principles of pedagogical development of analytical thinking in economists. *European Multidisciplinary Journal of Modern Science, 6,* 627–632. https://emjms.academicjournal.io/index.php/emjms/article/view/470

Module:	Ideate
Aim of the module	• To understand the main concepts related to the ideation phase of the atom model. • To apply strategies to promote creativity and generate, classify, discuss, and select ideas. • To assess the process of acquisition of ideation competence.
Learning outcome	• Explaining the main concepts related to the ideation phase of the atom model. • Applying strategies to facilitate student creativity and generation, classification, discussion, and selection of ideas. • Developing creative tools to assess the process of ideation competence acquisition.
Competences [1]	1. Spots opportunities to respond to challenges and create value. 2. It develops several ideas and opportunities to create value, including better solutions to existing and new challenges. 3. Recognizes and judges the potential of an idea for creating value (in social, cultural, and economic terms) and identifies suitable ways of making the most out of it. 4. Assess the consequences and impact of ideas, opportunities, and actions on the target community, market, society, and environment.
Activities	To develop the planned objectives, the following activities of D-EMIND Methodology Guide will be implemented: • A3 Digital Storytelling– 10’ • 3.4. Reverse Brainstorm – 20-30’ • 3.11. Pass it on – 10-20’ • 3.13. Gyro Gearloose – 10-20’ • 3.18. Idea Minimization 30 – 45’
Timing	25’ Introduction to the Ideation phase of the Atom Module 10’ Warm up activity A3 Digital Storytelling 60’ Application of the activities 3.4, 3.11, 3.13 and 3.18 5’ Closing the session
Assessment	Process: • During the implementation of the activities, the trainer should check with all the groups that the activities have been understood. End of the activities: • The teacher asks the students the following questions to get some feedback: o What have you learnt in this session? o Have you faced any obstacles or any problem? o Have you been able to generate and select some ideas to solve the challenge? o Which activities have been more useful?

	• Teachers can propose a peer assessment process where students review and provide feedback about other groups' results.
Tips & recommendations	• Students should go deeper into the ideation process, avoiding getting too fast to the solution. • During the peer assessment, students must be critical of helping their colleagues. • If it is possible, teachers could try to invite external agents to assess the pertinence and relevance of the ideas created.
Further reading	Barbot, B. (2018). The Dynamics of Creative Ideation: Introducing a new Assessment Paradigm. *Frontiers in Psychology 9*, 1-9 https://doi.org/10.3389/fpsyg.2018.02529 Csikszentmihalyi, M. (2020) *Finding Flow: The psychology of engagement with everyday life.* Hachette UH Editorial Song, M., Yang, S. & Park, J. (2021). Asking for good ideas can hurt creativity. The effects of two-step instruction method on quantity and quality of ideas. *Creative and Cognition 47*, 1-4. https://doi.org/10.1145/3450741.3466631

Module:	**Prototype**
Aim of the module	• To understand the main content of the prototype phase • To design the outcome of the ideation phase • To relate to all requirements for the best solution • To assess the process of the prototype phase competences acquisition
Learning outcome	• Articulating the results of the ideation phase • Combining theory and practice • Incorporating unexpected problems into their solution in a structured way
Competences	• Learns through experience • Combines knowledge (ideation phase) and resources (prototype) to achieve valuable effects • Applies practical working methods such as CAD-software and reflects and learns from both success and failure. • Knows about the difficulties in the real job world with the work including peers and mentors. • Uses creativity to prototype and visualize with simple tools (Lego, sketches, etc.)

Activities	• 4.4.3. Build your own MPV (Build your own and share) 90' - 180'- 240'- 1 day
	    ○ Discuss ideation phase and final idea
	    ○ Discuss must-haves and nice-to-haves
	    ○ Visualize it on a whiteboard, CAD-software etc. (get to know the tools)

Timing	• Introduction to the Prototype Phase 10' • Application of the activity 'Build your own MPV' 90'-160'.
Assessment	During this module • Check if students understood how to implement requirements in a real environment using acquired knowledge and resources. At the end • Students evaluate solution and methods(activities) and can give critical comments; try and failure • self-evaluation (see also the D-Emind self-evaluation tool: https://forms.office.com/Pages/ResponsePage.aspx?id=l4kz1kohkk-6dQOX8QqEzCwwec24nPZDoDOviqFzIKVUQVBIREJTWDNDWDNQTlpXU1NFN0JLSTZKRy4u)
Tips & recommendations	• Present (pre)prototype to the stakeholders for early feedback • In order to save materials, it is a recommendation to start with a CAD model before building the prototype. • Make an estimation of the time students will need to make a prototype

Further reading	Coutts, E., Wodehouse, A., & Robertson, J. (2019). A Comparison of Contemporary Prototyping Methods. Proceedings of the Design Society: International Conference on Engineering Design, 1(1), 1313-1322. https://doi.org/10.1017/dsi.2019.137 Ijadi Maghsoodi, A., Kavian, A., Khalilzadeh, M. & Brauers, W. (2018) CLUS-MCDA: A novel framework based on cluster analysis and multiple criteria decision theory in a supplier selection problem. Computers & Industrial Engineering, 118, 409-422, https://doi.org/10.1016/j.cie.2018.03.011 Lauff C., Knight, D., Kotys-Schwartz, D., & Rentschler, M. (2020) The role of prototypes in communication between stakeholders. Design Studies 66, 1-34. https://doi.org/10.1016/j.destud.2019.11.007

Module:	Realize
Aim of the module	• To produce and realise the prototype to the best possible way, • To make the solution or prototype come into action, • To understand the main concept related to the realisation phase • To assess the process during the realisation phase regarding the acquisition of competences.
Learning outcome	• Synthetising and structurizing of the previous modules • Organising and designing the plan to implement the prototype • Communicating the process and pitching the plan to the challenge owner • Reconstructing and revising the necessary parts of the prototype
Competences	• Reacts directly to the target groups' needs • Manages and resolves confrontations in a constructive manner • Communicates persuasively and convincingly
Activities	• Warm up activity – 10' • 5.1. The Elevator Pitch - 20'-30' • 5.6. Pitching Game – 30' – 60' • 5.7. Presentation Participation – 20' – 30'
Timing	• Introducing the realization phase 10' • Application of the activities Warming up, 5.1,5.6,5.7 120'
Assessment	During the realization phase: • active dialogue to discuss constructive improvement ideas. After the phase: • critical questions to challenge the students (by the teacher + the challenge owner) • peer evaluation
Tips & recommendations	• Students can be tired and bored after a long preparation phase, therefore encouragement and motivation during the realization phase plays a significant role. Compliments and praise for their achievements are needed to keep them motivated. • During the realization phase it may turn out that there are many mistakes and misunderstandings. The teachers should emphasize that mistakes are OK! • Students can understand that some business ideas work and others don't. Even if their idea does not work they have learnt something

	new, they should not give up but work further on the solution and find new ways.
Further reading	What Is Learning by Doing And Why Is It Effective? (written by Leon Ho) https://www.lifehack.org/898427/learning-by-doing • Additional help on pitching can be found at https://www.presencing.org/resource/tools • Erichsen, J., Sjöman, H., Steinert, M., & Welo, T. (2020) 'Protobooth: gathering and analyzing data on prototyping in early-stage engineering design projects by digitally capturing physical prototypes. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 35*(1), 65-80. http://doi.org/10.1017/S0890060420000414 • Kent, L., Snider, C., & Hicks, B. (2021). Mixed reality prototyping: Synchronicity and its impact on a design workflow. *Proceedings of the Design Society, 1*, 2117-2126 https://doi.org/10.1017/pds.2021.473

<table>
<tr><td>Module:</td><td>Evaluate</td></tr>
<tr><td>Aim of the module</td><td>To evaluate the innovative solutions (material or non-material) produced by the students
To receive feedback on the solutions produced, from the challenge-owner and/or end-user of the solution
To evaluate the process of CBL using the 6 phases of the atom model
To receive feedback on the innovation journey the students experienced, from the teacher and from the team members</td></tr>
<tr><td>Learning outcome</td><td>Reflecting and taking control of one’s own learning process
Starting a new innovation cycle in case a new challenge was discovered while evaluating the solution
Developing new creative, innovative and entrepreneurial competences</td></tr>
<tr><td>Competences</td><td>use co-creation as a model in a digital environment
actively reflects upon one's own learning
takes and gives effective and efficient feedback in a digital environment</td></tr>
<tr><td>Activities</td><td>To evaluate the product - the innovative solution the teams produced, the following activities can be implemented:
4.61. Feedback and evaluation from the external partner(s) - 30’-60'
4.1.6. Evaluate the opposition 60’-90’
To evaluate the process - the innovation journey of the students and the learning environment, taking another D-EMIND self-assessment test is advised to measure the evaluation in entrepreneurial skills before & after going through the innovation process. 15’</td></tr>
<tr><td>Timing</td><td>Introducing the evaluation phase 10’
Implementing the activities: 145’
Evaluating of the process: 15’</td></tr>
<tr><td>Assessment</td><td>To assess non-cognitive entrepreneurial skills a self-evaluation by the student is recommended. E.g., the D-EMIND tool https://forms.office.com/Pages/ResponsePage.aspx?id=l4kz1kohkk-6dQOX8QqEzCwwec24nPZDoDOviqFzIKVUQVBIREJTWDNDWDNQTlpXU1NFN0JLSTZKRy4u.
The students take the self-assessment test to measure their level of entrepreneurial skills before they start the process and again at the end.
To assess the solution pitched by the students an evaluation sheet (annex 2) can be used, where the members of the jury give a score to pre-defined criteria the solution should give an answer to.</td></tr>
<tr><td>Tips & recommendations</td><td>One perspective here could be to make the evaluation look more to the future, making it look forward rather than backwards.</td></tr>
</table>

	The external panel should be comprised of members that have knowledge of the ‘solution’. The feedback criteria could be widened to include considerations relating to time and the resources needed for the solution to be produced. Use online tools such as Padlet, virtual whiteboard and breakout rooms in Teams/Zoom.
Further reading	The Innovation Circle: https://books.google.dk/books/about/The_Innovation_Circle.html?id=nPkuzgEACAAJ&redir_esc=y Bortolini, R., Nogueira, M., Danilevicz, A. & Ghezzi, A. (2021), Lean Startup: a comprehensive historical review. *Management Decision, 59*(8), 1765-1783. https://doi.org/10.1108/MD-07-2017-0663 Cook, D., Bikkani, A. & Poterucha, M.J., (2023) Evaluating education innovations rapidly with build-measure-learn: Applying lean startup to health professions education. *Medical Teacher, 45*(2), 167-178, https://doi.org/10.1080/0142159X.2022.2118038 Nandal, N., Kataria, A. & Dhingra, M. (2020) Measuring Innovation: Challenges and Best Practices. *International Journal of Advanced Science and Technology, 29*(5), 1275-1285. http://sersc.org/journals/index.php/IJAST/article/view/8157

ANNEXES

Annex 1 : The Atom Model: Breakdown and Meaning of its phases from a theoretical

1. Explore: Exploration as a tool

Exploration is a powerful tool for problem-solving and can open up a world of possibilities. It can help discover new approaches and uncover hidden knowledge that can be applied in any situation. In this section, the importance of exploration is considered and how it can help solve problems. In addition, it examines different methods of exploration and some examples of effective exploration. Finally, it discusses the importance of curiosity in exploration and provides tips for successful exploration.

Introduction to exploration

Think about a nature photographer who has just arrived in a jungle and has never been to. She could spend all of her time in the first hideout she discovered while looking for a suitable location for wildlife photography, gradually learning which animals frequented that area. She could also consider other places, which might be better, but also worse. She misses the chance to learn more about the advantages of her first hideout because to find these better locations, she must abandon it and venture further into the forest. How should she explore the forest? How does she explore it? The most important idea is that a wildlife photographer should explore the forest to learn more about the qualities of their first hideout.

Exploration is the process of searching for knowledge and understanding. It involves looking at a problem from different angles, trying out new ideas, and discovering new solutions. It is an essential tool for any problem-solver, allowing to uncover hidden insights and uncover new approaches (Fox et al., 2020). Besides, it can take many forms, from experimentation to observation and from exploration of the physical environment to the exploration of minds. People can explore through conversations, reading, travel, research, and experimentation. The possibilities are endless, and the best part is that exploration can be performed anywhere and at any time.

For this reason, the importance of exploration is related to unlocking creativity and finding new solutions to problems because creative thinking and searching for less obvious answers can be beneficial. In reaction to an unsolved riddle, specific curiosity drives exploration out of the desire to eliminate uncertainty and develop a sense of mastery (Litman, 2019), helping to identify strengths and weaknesses and to use the strengths to advantage. This allows us to obtain information about the world and to better understand people's capabilities. It also allows building on existing knowledge and developing new ideas. In addition, it is important because it can develop new skills, discover new paths, stay motivated, and focus on goals. This is due to the particular curiosity motivating intrapersonal cognitive exploration that fosters the generation of creative ideas through a novel idea-linking mechanism (Hagtvedt et al., 2019).

Some benefits of exploration are that it can help to build on existing knowledge, uncover hidden insights, gain a better understanding of our environment, develop new strategies, think more critically, and come up with innovative solutions, because individuals are motivated by a particular curiosity to look for information beyond what is necessary to understand the puzzle that sparks the search (Grossnickle & Hidi, 2019; Wojtowicz & Loewenstein, 2020).

How exploration helps to solve problems

Exploration can help solve problems in many ways because it allows one to gain new perspectives, uncover hidden insights, and come up with innovative solutions. It can also help develop new skills and explore new possibilities. For example, cognitive science has greatly benefitted from an economic

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knowledge of the mind and that this should continue in the future. In fact, putting cognitive science and economics on an equal conceptual footing opens the door for greater cooperation between the two fields by conceptualizing cognition as the productive application of mental resources. This will improve our knowledge of the contemporary economy, which is increasingly driven by mental rather than physical production (Wojtowicz & Loewenstein, 2023), and will also allow cognitive scientists to more easily adapt economic concepts and analytical tools for the study of mental phenomena.

Another example, exploration can also be used to explore new technologies and tools. New technologies and tools can be a great way to explore and to gain insights into a problem. Although those who experience curiosity have a notion of the kind of solution they desire, the way there and most definitely the end goal itself is unclear. This may lead people down various avenues as they work to answer the puzzle, exposing them to concepts that are only tangentially related to the puzzle and to one another. As a result, it is expected that exploration will benefit the idea generation stage of the creative process, because this stage implies the curiosity to discover new mental paths to develop original ideas (Hagtvedt et al., 2019).

Tips for successful exploration

Exploration can be a powerful tool for problem solving, but it is important to approach it in the right way. Here are some tips for successful exploration:

1. Take your time: Exploration should be a slow and thoughtful process. Take your time to explore and uncover new insights.
2. Ask questions: Asking questions is a great way to explore and to uncover new knowledge.
3. Experiment: Experimentation can be a great way to explore and to uncover new solutions.
4. Stay curious: Stay curious and keep exploring new ideas and approaches.
5. Try new things: Exploration is all about trying new things and exploring new possibilities.
6. Take risks: Exploration can be risky, but it can also be rewarding. Taking risks can help us to discover new solutions.

Conclusion

Exploration is a powerful problem-solving tool that can open a world of possibilities. It can help uncover hidden insights and uncover hidden insights. It can also help develop new skills and thinking outside the box. Besides that, it is an essential tool for any troubleshooter and can help gain a better understanding of the environment. It can also help to maintain motivation and focus on goals. In addition, it can help gain new perspectives and find creative solutions because by unlocking the power of exploration, it is possible to solve any problem. So, are you ready to explore? Start with small steps and keep exploring new possibilities. With exploration, anything is possible.

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2. Analyse: What Does It Mean to Analyse?

When people talk about analysis, it can be interpreted in a variety of ways. Depending on the context, it can be used to refer to a method of problem solving, a process of gathering data, or a type of analysis. But what does it actually mean to analyse? In this section, it will break down the definition of analysis and explore all the different types of analysis, the process of analysis, the benefits of analysis, the necessary skills for effective analysis, analytical thinking, and the role of technology in analysis. So let's get started!

Introduction: What Does It Mean to Analyse?

Analysis is the process of breaking down an issue, problem, concept, or idea into its component parts to gain a better understanding of it. It involves evaluating each part of the subject matter and examining the relationships between them (Bloom, 1956; Bloom & Krathwohl, 2020). Analysis can be used to identify patterns in data, uncover trends, and develop strategies. It is a powerful tool for making decisions and discovering solutions to complex problems (Lester et al., 2020).
At its core, analysis is a way of thinking that requires you to look deeply into a situation or problem to gain a better understanding of it. This can be done through a variety of methods and techniques, such as gathering and analyzing data, developing models and theories, and making predictions (Gibbs, 2018).

Types of Analysis

Analysis can be divided into two main types: qualitative and quantitative (Creswell & Creswell, 2018). Qualitative analysis involves gathering data through interviews, surveys, focus groups, and observation. This type of analysis is used to identify patterns and trends in data and to draw conclusions about the underlying causes of an issue or problem (Flick, 2018).
Quantitative analysis, on the other hand, involves gathering data through experiments and surveys. This type of analysis is used to identify correlations between variables and to make predictions about the future (Gibbs, 2018). Both qualitative and quantitative analysis are important for understanding complex problems and making informed decisions.

The Process of Analysis

The process of analysis involves a few key steps (Furber, 2010). First, you must identify the problem or concept you want to analyze. You must then gather data related to the problem or concept. Next, you must develop models and theories to explain the data. Finally, you must make predictions about the future based on your analysis.
Once you have identified the problem or concept, you must gather data related to it. This can be done through experiments, surveys, interviews, focus groups, or observation. Once you have gathered the data, you must analyze it to identify patterns, trends, and relationships. This can involve using

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statistical methods, data mining, or machine learning. Finally, you must make predictions about the future based on your analysis.
Some of the benefits of the analysis are that it is a powerful tool for problem solving and decision-making. This allows one to gain a better understanding of a problem or concept. This can help develop strategies tailored to specific needs. It can also assist in identifying the patterns and root causes of problems or issues. In addition, it can help identify inefficiencies and develop solutions to address them.
To make this possible, a few key skills are needed. First, you must have a deep understanding of the problem or concept that you are analyzing. This requires in-depth knowledge of the subject matter and the ability to identify patterns in data. Additionally, you must be able to think critically (Cottrell, 2023) and draw conclusions based on the analysis. In fact, analysis is one of the six core critical thinking abilities after interpretation, evaluation, inference, explanation, and self-regulation (Liu & Pásztor, 2022). You must also be able to interpret the data accurately and develop models and theories to explain it. Finally, one must be able to make predictions about the future based on the analysis. These skills are essential for effectively analyzing data and identifying trends.
Another important skill is analytical thinking, because it is a type of problem solving that requires you to break down an issue or concept into its component parts to gain a better understanding of it (Nazarova, 2022). This involves evaluating each part of the problem or concept and examining the relationships between them. This helps in identifying patterns in the data, drawing conclusions, and making decisions. Analytical thinking involves gathering data, developing models and theories, and making accurate predictions. It is a powerful tool for problem-solving and decision-making. Analytical thinking requires you to look deeply into an issue or concept to gain a better understanding of it.
Finally, the role of technology in analysis is crucial because it has revolutionized the way we analyze data, and it will continue to play an important role in the process of analysis. With the rise of big data and artificial intelligence, analysis has become easier and more efficient. Technology has enabled us to gather and analyze more quickly and accurately. Technology has also enabled the development of more sophisticated models and theories to explain data.
In conclusion, analysis is an effective instrument for making decisions and solving problems. To better comprehend a problem or concept, it entails disassembling it into its constituent parts. We trust that this article has given you a clearer grasp of what analysis is. There are a lot of resources accessible to you in the D-EMIND Methodology (2023) if you want to improve your analytical abilities and use them when making decisions and solving problems.

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3. Ideate: A comprehensive definition of the concept of Ideation

Ideation is a creative process that involves generating and exploring ideas to find solutions to problems. It is a crucial part of the creative process and can be used to solve a variety of challenges. This document will provide a comprehensive definition of ideation and explore the process and how to facilitate it. Finally, the conclusions are presented as a synthesis.

What is Ideate?

The term "Ideate" or "Ideation" refers to the action of creating an idea or concept. This point is founded on Passaro et al.'s definition of the ideation and intention stages (2016). It is a mental process that implies the generation of an original and unique thought that can be used to solve a problem, improve a process or develop something new. In other words, Ideation is part of the creative process involving generating and exploring original ideas to solve problems (Fink & Benedek, 2014). The term "generation of ideas" was coined for the first time by the American psychologist Edward de Bono (1970, 1994) as one of the phases of the creative process, for this reason, it is essential to explain what creativity is and how it is related to the "Ideation" phase.

Ideating is not just about generating ideas but also the process of nurturing and developing those ideas into tangible solutions. Therefore, it is the ability to create original ideas or solutions, and for this, creativity is required. According to Guilford (1950, 1957), creativity comprises two essential elements: fluidity and originality. Fluency refers to the number of ideas a person can produce in a given period of time. Originality, for its part, refers to the novelty and value of the ideas generated. Furthermore, this author argues that creativity is a complex cognitive process that involves the interaction of various factors, including motivation, ability, personality, culture, and environment. In this sense, creativity is not a fixed skill but can be developed and improved through learning and practice (Guilford, 1950, 1957).

Ideation aims to find innovative solutions to problems, helping to generate new products, services, or strategies that can be used to solve problems in various ways. By fostering collaboration and open-mindedness, ideation can help create an environment where new ideas can be explored and developed. For this reason, it is now widely used in business because it can be used to solve a variety of challenges. It involves a lot of brainstorming, collaboration, research, and analysis.

The ideation processes

Ideation is a process that involves generating, exploring, and developing ideas. It starts with identifying a problem or challenge and then brainstorming possible solutions. This implies investigating the issue, gathering information, exchanging ideas, and exploring different possibilities (Barbot, 2018). Once potential solutions have been identified, they can be further developed. This means researching possible solutions, analyzing the pros and cons of each, and refining the solutions. After this, the answers can be tested and refined until a final solution is reached.

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However, where do the ideas come from? According to Guilford (1950, 1957), divergent thinking is a type of ideation involving generating many ideas and then exploring them. It is a great way to find innovative solutions to problems and can help you explore different options. De Bono (1970, 1994) expresses that lateral thinking is a type of ideation that involves exploring different perspectives and questioning assumptions. It is a great way to find creative solutions to problems and can help you explore other possibilities.

Koestler (2020), who developed the theory of bisociation, considers that ideas arise when two or more different concepts combine in an unexpected way to create something new, thus generating an act of creation. Osborn and Harrington (1953 in Song et al., 2021) were the ones who coined the "brainstorming" method, which is used in most cases to generate many ideas through the stimulation of people's minds. The Hungarian psychologist Mihaly Csikszentmihalyi (2020) has studied the creative process and has identified certain factors that contribute to the generation of ideas, including motivation, concentration, and flow.

In the words of Fink & Benedek (2014), the main sources are the neural networks within the human brain that trigger unique thoughts; the cultural context and existing knowledge of the people who participate; interaction with people of diverse backgrounds and experiences; the open and inquisitive mindset and the willingness to explore beyond the comfort zone; the time set aside for generating and incubating ideas; and, an environment that is tolerant of experimentation or risk-taking, accepting that not all ideas will succeed.

How to facilitate the ideation processes

To facilitate the ideation processes, creating an environment where ideas can be freely explored is important. This involves creating an open and welcoming space where people feel comfortable sharing their ideas. It is also essential to foster collaboration, encouraging people to collaborate to generate new ideas and explore different possibilities. Furthermore, it is also necessary to foster open-mindedness, encouraging people to be open to new ideas and consider different perspectives. Finally, it is vital to provide a structure, giving guidelines, processes, and tools to help facilitate the ideation process (Barbot, 2018).

This structure could start by first identifying the goal of the ideation process. This involves clearly defining the problem and the desired outcome and can help focus the ideation process. Second, it is essential to keep an open mind. This involves being open to new ideas and perspectives and can help generate more creative solutions. Third, it is important to explore different possibilities. This consists in researching possible solutions and exploring other options which can help find more innovative solutions. Fourth, it is essential to get feedback. This involves sharing ideas with others and receiving feedback, which can help refine and improve solutions (Selva & Dominguez, 2018).

Conclusion

Ideation is a creative process that involves generating and exploring ideas to solve problems. It is an integral part of the creative process and can be used to solve a variety of challenges. Ideation can also help foster collaboration and open-mindedness. Encouraging people to brainstorm and explore different possibilities helps create an environment where people can work together to find innovative solutions. By understanding the role ideation plays in the creative process and taking steps to facilitate it, organizations can develop innovative solutions to problems and create new products, services, or strategies.

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4. Prototype: Understanding the Prototype Definition

Creating prototypes is a popular practice in product design and development. It is a great way to quickly test and improve a product before investing a lot of time and money in it. Prototyping helps to identify potential problems and mistakes early, which can save a lot of time and money in the long run. In this article, it will be exploring the prototype definition, types and examples of prototyping, the prototyping process and much more.

What is a Prototype?

A prototype is a model or representation of a product or idea. It is usually created to test the feasibility of a product or idea, and it is designed to provide feedback and help refine the product or idea. Prototypes can also be used to demonstrate the product or idea to potential customers and investors. It can be defined in different ways: “a first or preliminary version of a device or vehicle from which other forms are developed” (Oxford Dictionary, 2023) or “an individual that exhibits the essential features of a later type” and “a first full-scale and usually functional form of a new type or design of a construction” (Merriam-Webster Dictionary, 2023). Definitely, a prototype is a tangible or digital representation of an essential design feature that can be used at any stage of the design process (Lauff et al., 2020). In fact, one of the key phases of the design process is prototyping for any product, including electronic devices, vehicles, tools, and techniques (Herriott, 2013).
The choice of the best prototype design is a challenging issue that requires careful decision-making. For these issues, multiple criteria decision-making techniques are quite helpful. (Ijadi Maghsoodi et al., 2018). Prototypes are usually created using different materials and methods, such as paper, foam, clay, wood, metal, or plastic. They can also be created digitally, using 3D printing, digital sculpting, computer-aided design (CAD), or other software (Ijadi Maghsoodi et al., 2019).
Due to the complexity and dynamic nature of prototypes, there is still a lack of understanding regarding their basic makeup (Lim et al, 2008). The process of the prototype is essential because people are enabled to reframe failure as a learning opportunity, support a sense of forward progress, and reinforce beliefs about creative ability, according to the psychological experience of participating in it (Gerber & Carroll, 2012). Also, Jensen et al. (2017) described the process of using prototypes helps to uncover unknown unknowns in business initiatives.
In this sense, prototyping forces people to learn tacit knowledge about materials, methods, decision-making, and other technical elements because tangible objects are essential to the design process. To

plan, construct, test, and iterate prototypes, this knowledge materializes over time. It can be challenging to replicate this knowledge using more conventional learning techniques like reading or lectures (Lauff et al., 2018).

Types and Examples of Prototyping

Several different types of prototypes can be used in product design and development. For example, *concept prototypes* are used to test the basic concept of a product or an idea. They are usually simple and low-fidelity and are used to help refine the concept. Another example is *functional prototypes*, which are used to test the functionality of a product or idea. They are usually more complex and have higher fidelity and are used to ensure that the product or idea works as intended. Other examples include *visual* and *product prototypes*. The first are used to test the visual design of a product, and the second are used to test the overall design of a product or idea.
Prototyping can be used in a variety of different fields, such as product design, software development, industrial design, and architecture (Coutts et al., 2019). Here are some examples of prototyping:

- Product design: Prototypes can be used to create physical products, such as automobiles, furniture, electronics, appliances, and more.
- Software development: Prototypes can be used to create software applications, such as mobile apps, web apps, and desktop applications.
- Industrial design: Prototypes can be used to create industrial products, such as industrial machinery, tools, and parts.
- Architecture: Prototypes can be used to create buildings, structures, and urban spaces.
-

The Prototyping Process

The prototyping process typically involves several steps. The first step in the prototyping process is to *define the problem* to be solved. This involves understanding the needs of the customer, the goals of the project, and the constraints of the project. The second step is *to generate ideas* for solutions to the problem. This involves brainstorming, researching, and exploring different ideas and solutions. The next step is *to develop a prototype* of the solution, creating a detailed model or representation of the solution. The next step is *to test the prototype* and evaluate the results, because testing the prototype with customers and other stakeholders, and gathering feedback and data will help in the final step, which is *to refine the prototype* making changes to the prototype based on the feedback and data (Coutts et al., 2019).
As it is possible to appreciate that prototype and evaluate phases have elements in common, because testing the prototype can be done in several ways, such as usability testing, user interviews, surveys, focus groups, and more. This can help identify potential problems and mistakes early, which can save a lot of time and money in the long run.

Conclusion

Prototyping has several key benefits. Firstly, prototypes can be quickly created and tested, which allows for rapid iteration and refinement of a product or idea. This process can be used to quickly identify potential problems and mistakes. Secondly, prototypes can help reduce the risk of investing a lot of time and money in a product or idea that may not work. By creating prototypes and testing them, potential problems can be identified and addressed before investing a lot of resources. Thirdly, it can help improve communication between stakeholders, such as product owners, designers, and developers. They can help ensure that everyone is on the same page, and that everyone understands the product or idea (Lauff et al., 2020).

If you are looking to create a prototype for your product or idea, this comprehensive guide should help you understand the prototype definition and the process of creating one. With the right tools and knowledge, you can create a successful prototype that will save you time and money in the long term.

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5. Realise: Bringing Ideas to Reality

Ideas can be powerful but bringing them to life can be a challenge. With the help of prototyping, you can take your ideas from concept to reality. The realisation of the prototype requires careful planning, research, and testing. This section will discuss the steps you need to take in order to turn your ideas into a tangible product or service. We will also look at the use cases for different types of prototypes and how they can help you in bringing your ideas to life.
The realise phase is crucial for putting the design to the test, identifying any potential problems, and getting user input (Barbieri et al., 2013). Paper prototypes, interactive prototypes, and functional prototypes are a few examples of the various kinds of prototypes. Each type has a distinct function and ought to be applied at various phases of the development process.

Understanding the realisation of prototype
The realisation of the prototype involves the process of converting a concept into a physical or digital model (Barbieri et al., 2013). It is an essential stage for bringing ideas to reality because it allows for better communication between external stakeholders and participants to quickly test the ideas. The

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realization of the prototype is an iterative process, which means that the prototype will be tested, refined, and improved until it meets the desired outcome (Camburn et al., 2017).
Prototyping is the process of building a product model, which is used to help participants test, validate, and refine their ideas before committing to full-scale production (Barbieri et al., 2013). This is a crucial step in the product design process, as it allows for the exploration of various design possibilities and helps identify the best approach for a particular project. It can take many forms, ranging from physical models to virtual simulations (Kent et al., 2021). They can also be used for various purposes, such as testing the usability of a product, understanding the challenge, or verifying the technical feasibility of a design (Coutts et al., 2019). Furthermore, it is a stage for persuading the audience to buy, invest or collaborate in your challenge.

Strategies for successful prototype realisation

When it comes to prototyping, it's important to identify the right approach for a particular project (Camburn et al., 2017). Depending on the scope of the project, different types of prototypes may be needed. For example, if the project is focused on testing the form and function of a product, then a physical prototype may be the best approach. If the goal is to understand the customer experience, then a high-fidelity prototype may be the best approach. It's also important to consider the cost and time associated with prototyping. For example, if a project needs to be completed quickly, then a rapid prototype may be the best approach. If the project has a limited budget, then a low-fidelity prototype may be the best approach (Kent et al., 2021).
As recommended by Coutts et al. (2019), once you've identified the right approach for your project, there are a few strategies you can use to ensure a successful prototype realisation. First, it's important to set clear goals and objectives. This will help to ensure that the prototype is focused on the right things and can help to identify any potential problems or issues early on in the process. Second, it's important to involve all stakeholders in the process. This will help to ensure that everyone is on the same page and that the prototype meets the needs of all involved. Third, it's important to establish a timeline for the project. This will help to ensure that the prototype is completed on time and within budget. Finally, it's important to test the prototype. This is an essential step in the process and will help to ensure that the design meets the needs of the user.
While prototype realisation offers a number of benefits, there are also a few challenges associated with the process. According to Erichsen et al., (2020) these include:

- Finding the right approach: It's important to identify the right approach for a particular project, as different types of prototypes may be needed.
- Time constraints: Prototyping can be a time-consuming process, so it's important to establish a timeline for the project to ensure it is completed on time.
- Cost: Prototyping can be expensive, so it's important to factor in the cost when planning a project.
- Complexity: Prototypes can be complex, so it's important to have a clear understanding of the project before beginning the process.

Hence, to ensure a successful prototype realisation, it's important to follow a few best practices. Firstly, the participants should involve the target audience in the prototyping process and gather feedback from them regularly. Secondly, they should collaborate with other team members to ensure that the prototype meets the needs of all stakeholders. Thirdly, they should focus on creating prototypes that are user-centered and solve real problems. Fourthly, they should be willing to iterate and refine the prototype based on feedback and testing results (Donati, 2015).

Conclusion

Bringing ideas to reality is a complex process, but prototyping can help to simplify it. By exploring various design possibilities, testing the usability of a product, and understanding the customer experience, designers, engineers, and product managers can quickly iterate their ideas and identify the best approach for a particular project. By following the strategies and best practices outlined in this article, you can ensure a successful prototype realisation and bring your ideas to life.

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6. Evaluate: Designing an Effective Evaluation Process for Innovative Ideas

It's no secret that innovation is the key to success in today's rapidly changing world. To stay ahead of the curve, students need to come up with new strategies and ideas that will give them an edge in the marketplace. But coming up with these new ideas is only half the battle. To ensure that these ideas are successful, students need to have an effective evaluation process in place (Dziallas & Blind, 2019).

What is an Evaluation Process?

An evaluation process is a systematic way of assessing the merit of an idea, strategy, or product. It can range from a simple checklist to a complex system of metrics. It is important for students to have an effective evaluation process in place to ensure that their ideas are feasible and will have a positive impact on their bottom line.

Evaluation is important because it helps determine which ideas are worth pursuing and which ones should be discarded. It also helps them assess the potential risks and rewards associated with each idea. By evaluating each idea objectively, businesses can make informed decisions about which ideas are worth investing in and which ones should be avoided (Barbieri et al., 2013).

What are the steps of an effective evaluation process?

The steps of an effective evaluation process can vary depending on the type of idea being evaluated. Generally, an effective evaluation process is a critical aspect of measuring performance and progress towards achieving goals. The evaluation process should be carefully designed and implemented to ensure that it provides accurate and useful feedback to stakeholders.

The first step in creating an effective evaluation process is to clearly define the goals and objectives of the evaluation. This includes identifying the purpose of the evaluation, the stakeholders involved, and the specific outcomes that are being measured. Defining the goals and indicators will help ensure that the evaluation process is focused and relevant to the organization's needs (Dziallas & Blind, 2019).

An indicator or a Key Performance Indicator (KPI) is a measure used to assess the quality or potential of an idea in relation to a specific objective or criteria. It can be qualitative or quantitative and can vary depending on the context and the objectives of the idea evaluation process (Domínguez, et al., 2019). For example, indicators to assess the financial viability of an idea might include revenue potential, expected costs, and projected profitability.

Once the goals and indicators are defined, the next step is to develop a plan for data collection and analysis. This includes identifying the data sources and methods for collecting data, as well as the tools and techniques for analyzing and interpreting the data. It is important to ensure that the data collected is reliable, valid, and relevant to the evaluation goals (Bortolini et al., 2021).

In addition to data collection and analysis, an effective evaluation process should also involve stakeholder engagement and feedback. This includes soliciting input from stakeholders on the evaluation process, as well as providing feedback to stakeholders on the results of the evaluation. Engaging stakeholders in the evaluation process helps to ensure that the evaluation is relevant and useful to the organization (Cook et al., 2023).

Another key aspect of creating an effective evaluation process is to establish clear and consistent communication channels. This includes establishing a timeline for the evaluation process, as well as regular updates and reports on the progress and results of the evaluation. Clear and consistent communication helps to ensure that stakeholders are informed and engaged throughout the evaluation process.

Finally, an effective evaluation process should also include a plan for implementing the results of the evaluation. This includes identifying specific actions and strategies based on the evaluation findings, as well as a plan for monitoring and evaluating the effectiveness of these actions over time.

For the evaluation process to be successful, it is important for people to carry out a series of good practices (Nandal et al., 2020). First, spend some time carefully analyzing the facts. To ensure they make wise decisions, students should take the time to thoroughly analyze the data. Second, engage the process's participants. To make sure that everyone is on the same page and that the best ideas are pursued, stakeholders should be engaged in the process. Third, it's important to promote comments. To make sure that their concepts are well received, students should encourage stakeholder feedback. Fourth, success needs to be monitored. Businesses must monitor the development of their concepts to make sure they are on the right road and it is important to take the time to assess the outcomes after the idea has been implemented in order to determine its success.

There are numerous examples of successful evaluation processes. One of the most successful evaluation processes is the Lean Startup methodology (Bortolini et al., 2021; Cook et al., 2023), which is used by many successful startups. This methodology emphasizes the importance of testing ideas quickly and iterating based on feedback. Another successful evaluation process is the Design Thinking methodology (McLaughlin et al., 2019) which is used by many successful companies. This methodology emphasizes the importance of understanding the customer and designing solutions that are tailored to their needs.

Conclusion

In conclusion, an effective evaluation process is critical for organizations to assess the effectiveness of their innovation process. The process should be systematic, objective, and based on specific evaluation criteria. By following these steps, organizations can identify strengths and weaknesses of their innovation process, develop recommendations for improvement, and implement those recommendations to enhance the innovation process.

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Annex 2: Example of an evaluation sheet for final pitches

Date:
Case:

Jury member	
Group number	

		Min				Max	Comments
Creativity	Is the solution presented innovative?	1	2	3	4	5	
Feasibility	Does the idea answer the challenges or questions in the case?	1	2	3	4	5	
	Is the solution presented realistic? Justification by sources, arguments?	1	2	3	4	5	
Sustainability	Is it a strong, stable & long term solution?	1	2	3	4	5	
Presentation	Clear structure (can you follow the story?)	1	2	3	4	5	
	Presentation skills (non-verbal, material, use of voice, …)	1	2	3	4	5	

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