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Apprenticeship for the Development of Design Thinking (ADDET)

Intellectual Output 1

Apprenticeship model for the acquisition of problem-solving competencies and design thinking mindset

O1/A4 Development of a model for apprenticeship

(project No. 2020-1-RO01-KA202-079926)

ADDET

Applicant organisation:

Colegiul Economic "Ion Ghica" Braila, Romania

Partners:

MAGENTA CONSULTORIA PROJECTS SL, Spain

AINTEK SYMVOULOI EPICHEIRISEON EFARMOGES YPSILIS TECHNOLOGIAS EKPAIDEFSI ANONYMI ETAIREIA, Greece

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CESIE, Italy

Content

Introduction

Nowadays, problem solving skills play an important role in coping with complexity and change in today's society (European commission, 2018). These skills can respond to the growing needs of individuals to develop personally and handle obstacles and change. Problem solving skills apply prior learning and life experiences, with the look for new opportunities to learn and develop.

The aim of ADDET is to develop the employability and problem-solving skills and competences of VET students. For that aim, the project will develop an apprenticeship model for students in upper secondary and higher VET schools, based on the design thinking methodology as well as problem-based learning.

The specific objectives of the project are:

- To develop problem solving competences and design thinking mindset for upper secondary and higher VET students through an apprenticeship model
- To develop problem-based learning through an apprenticeship model that will follow a design thinking methodology
- To support VET trainers by developing a trainers' guide addressed to trainers in VET schools and companies that will apply the apprenticeship model and will design, support and evaluate the apprenticeship programme.
- To create VET-company partnerships, experiment and validate the apprenticeship model
- To spread the idea of problem-based learning in apprenticeship by organizing seminars for trainers in VET schools and companies that are interested to apply the apprenticeship model

The current document represents the Model for Apprenticeship that is developed based on the results and work done during the previous three tasks as follow: IO1/A1 Identification of best practices, O1/A2 Organization of focus groups, O1/A3 Development of design thinking methodology.

The outcome is the below developed **model for apprenticeship** implementation oriented to the acquisition of **problem-solving skills and competences** which are based on the **design thinking methodology**.

The apprenticeship model consists of the development of a sustainable business solution, based on real problems provided by the company that host the apprenticeship. The apprenticeship uses problem-based learning methods to keep the students engaged.

The apprenticeship is based on open-end real problems that the company faces. With the support of trainers, the apprentice will formulate realistic and viable business solutions to address the problems. The apprenticeship will also use the processes of design thinking methodology in order to adopt solution focused strategies.

Students are taught on the **five stages of design thinking** (empathise, define, ideate, prototype and test). Each stage that the student will have to follow in order to accomplish the

problem set up at the beginning, will be designed in order to evolve different problem solving skills:

- ✓ empathise - communication/team building/active listening,
- ✓ define - decision making/research,
- ✓ ideate - creativity/evaluation/planning
- ✓ prototype - risk management/prioritising,
- ✓ test - adaptability/flexibility/analysis/ assessment

The apprenticeship model includes theoretical foundation and guiding principles for the **design**, **implementation** and **evaluation** of the apprenticeship programme for the development of problem-based skills based on the design thinking methodology.

Moreover, the work-based learning approach develops crucial awareness and connections with real life and allows learners to create a sense of reality, be tested by challenges and setbacks, take leaps and reap rewards, all in a dynamic, rapidly changing environment that is completely risk-free. The model is created on the basis of the national contexts of the partners' countries, however it is general enough to be applied in different contexts and countries in Europe.

The diversified profile of the partners' countries covers diverse needs and sectors and subsequently offering at the same time a 'one size' scheme with specific suggestion to shape it to different contexts, in order to ensure its wider transferability.

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The model defines:

- ✓ Objectives and target groups
- ✓ Involved parties and their responsibilities
- ✓ Methodology to apply problem-based learning
- ✓ Competence grid for problem solving skills and competences to be acquired during each stage of the design thinking methodology
- ✓ Methodology and practical tools for planning, implementing and monitoring of the apprenticeship model

Objectives and target groups

The main objective of the model is to

provide the overall guidance of how to develop and implement apprenticeship programs by involving students in the business process and develop their problem-solving skills by the Design thinking structured and holistic approach.

Target groups:

- ✓ companies and trainers of companies, who are involved in apprenticeship projects
- ✓ students in upper secondary and higher VET schools

The target groups are further defined within the context of the education systems on the partnership countries:

Germany:
The apprenticeship system in Germany is a dual system: apprentices get theoretical knowledges in professional schools and the rest of the time they get trained in companies from their professional economical sector. Ratio of the training time in a company to the learning time in the school is around 3:2.

Regular apprentices have to deal with the problems in the real working world actually every day. They work in the companies together with experienced experts. After a sufficient introduction they have to solve “every-day-problems” and tasks independently. So, the development of the problem-solving skills is actively enhanced during all apprenticeship time.

Greece:
In Greece, formal upper secondary vocational education and training is provided by private or public upper secondary schools (EPAL) and OAED, the national Manpower Employment Organization. OAED operates a total of 50 EPAS schools, apprenticeship schools for vocational training with two-year courses. Students that are eligible to attend the apprenticeship schools are between 16 to 23 who have completed at least one class of the upper secondary school. The paid apprenticeship is four or five days per week in private or public entities and any specifications are underlined in the contract between the entities and the trainees.

Turkey:
VET school system in Turkey is the most expensive system and it is an appropriate means of education for Turkey which gives importance to economy. Vocational and technical secondary education is the system that educate students in VET education and responsible education sector for apprenticeship system in Turkey. It is offered through public and private schools. The period of formal vocational and technical education is 4 years. Vocational open

education high schools have been established for meeting the needs of vocational education for the individuals who have left formal education or would like to acquire an alternative profession following the compulsory education age.

Bulgaria

The last changes and adaptation of the VET in Bulgaria has been made in 2018 with the Vocational Education and Training Act (in force since 2014 and its last amendments in 2018). The work-based learning can be organized by the vocational school based on a partnership between one or more employers. Furthermore, work-based learning is organized for students that have reached 16 years and are in the second stage of upper secondary education. Dual education and training is offered in vocational schools at upper secondary level for students above 16 years of age. The training leads to 2nd or 3rd level professional qualifications (EQF level 4). Upon completion, the diploma for the training gives access to tertiary education. Dual training is offered also in vocational training centers at post-secondary not tertiary level.

Romania

Apprenticeship can be defined as a period of training that alternates practical training on the job and training in a vocational training institution.

Apprenticeship at work is professional training based on an apprenticeship contract at work. Apprenticeships at work are organized for qualification levels 1, 2 and 3, established by the legislation in force. Apprenticeships at work are organized for the qualifications established by the legislation in force and for the occupations included in the Classification of occupations in Romania, for which there are standards of professional training, respectively occupational standards.

TO WHOM IS APPLICATION ADDRESSED AT THE WORKPLACE?

a) interested persons, over 16 years of age, who want to focus on learning starting from real, concrete professional situations, required by practicing an occupation directly at work;

b) employers who want to organize apprenticeship activities at work according to the fields of activity, for the jobs declared vacant.

Grant available for young people aged 16-24.

Italy

Apprenticeship in Italy is an open-ended employment contract aimed at training and employing young people. The framework of the apprenticeship is outlined in the Decree 81/2015. It is aimed at young people aged between 15 and 29. The main feature of this type of contract is its **training content**: during an apprenticeship, the young person works in the company, where he/she acquires the skills needed to achieve a specific professional qualification (**professional apprenticeship**) or to obtain a qualification (**1st and 3rd level apprenticeship**). It is divided into three types:

1. Apprenticeship for vocational qualification and diploma, upper secondary education diploma and certificate of higher technical specialisation, for young people aged between 15 and 25, with the aim of obtaining one of the above qualifications in the workplace. The employer must sign a protocol with the training institution in which the student is enrolled, which establishes the content and duration of the duration of the employer's training obligations, according to a scheme defined by decree of the Ministry of Labour;
2. Professional apprenticeship, for young people aged between 18 and 29, aimed at learning a trade or obtaining a professional qualification. The employer draws up a training plan which establishes the duration and methods of training for the acquisition of technical and specialised skills according to the professional profiles established in the personnel classification systems;
3. Apprenticeship for advanced training and research, for young people aged between 18 and 29, aimed at obtaining university and advanced training qualifications, including research doctorates, diplomas from higher technical institutes, for research activities and for apprenticeships for access to the professions. The employer must sign a protocol with the training institution in which the student is enrolled, which establishes the content and duration of the duration of the employer's training obligations, according to a scheme defined by decree of the Ministry of Labour.

The company where the apprenticeship take place must provide the training set out in the Training Plan attached to the contract, which defines the training content and skills that the apprentice will acquire at the end of the course. At the end of the apprenticeship, the intern will be hired by the company with an open-ended contract, and he/she will of course continue to work for the company.

The specific target groups of the model are: managers, owners and other key decision makers of companies including innovation managers and employees who work with apprentices, and students from upper secondary education and higher VET schools.

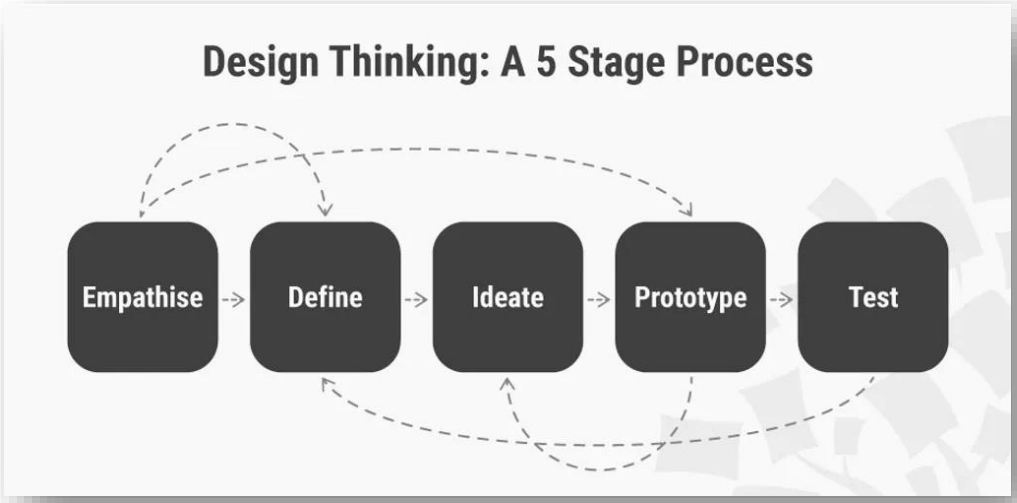
Design thinking as defined by IDEO is:

> *a human-centered approach to innovation—anchored in understanding customer's needs, rapid prototyping, and generating creative ideas—that will transform the way companies develop products, services, processes, and organizations.*

In the ADDET model we consider it a non-linear, iterative 5-stage process that provides a solution-based approach to solving problems in the work between companies and the intern/s. It's very useful in tackling complex problems that are broadly defined or unknown, by understanding the human needs involved, by re-framing the problem in human-centric ways, by creating many ideas in brainstorming sessions, and by adopting a hands-on

approach in prototyping and testing. (Source: Interaction design foundation, www.interaction-design.org)

The five-stage Design Thinking model proposed by the Hasso-Plattner Institute of Design at Stanford (d.school). d.school is the leading university when it comes to teaching Design Thinking. The five stages of Design Thinking, according to d.school, are as follows: Empathise, Define (the problem), Ideate, Prototype, and Test.



In this context, the participation of the managers who already apply and/or are willing to apply this approach is critical. Students need to be aware of the process and familiar with the background of the company. Some business concepts and background is also important.

It is a methodology for experiential learning and concrete results generated by the students who work on teams.

Involved parties and their responsibilities

The main parties involved in the program are:

- ✓ Business organization – SME, large companies, startups with their managers and employees
- ✓ VET schools – for upper secondary education and high schools with their students
- ✓ Teachers and trainers.

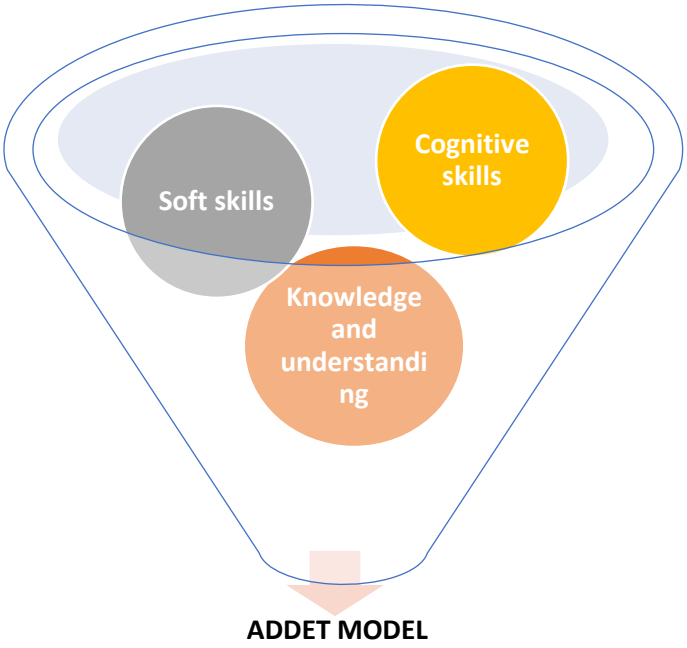
Team formation and roles

The following section details the process of team and role formation. It may be the case that participants have to carry out a psychometric evaluation, to identify the role that students are likely to take when working in a group.

In the apprenticeship model of ADDET we assume and take into consideration the possibility of students who are interns to work collaboratively either with other interns or employees.

Project-driven team learning

As described and elaborated in the IO1/A3 Methodology to incorporate design thinking methodology in WBL: the model leverages on the concept of project- and problem-based learning. The approach adopted here sought to enhance the role of project-driven learning. The innovation here is that besides the traditional individual project work, collaborative learning is introduced for students to tackle complex problems in groups rather than individually. Developments in innovation have shown that projects in the field are so complex that team work is essential.

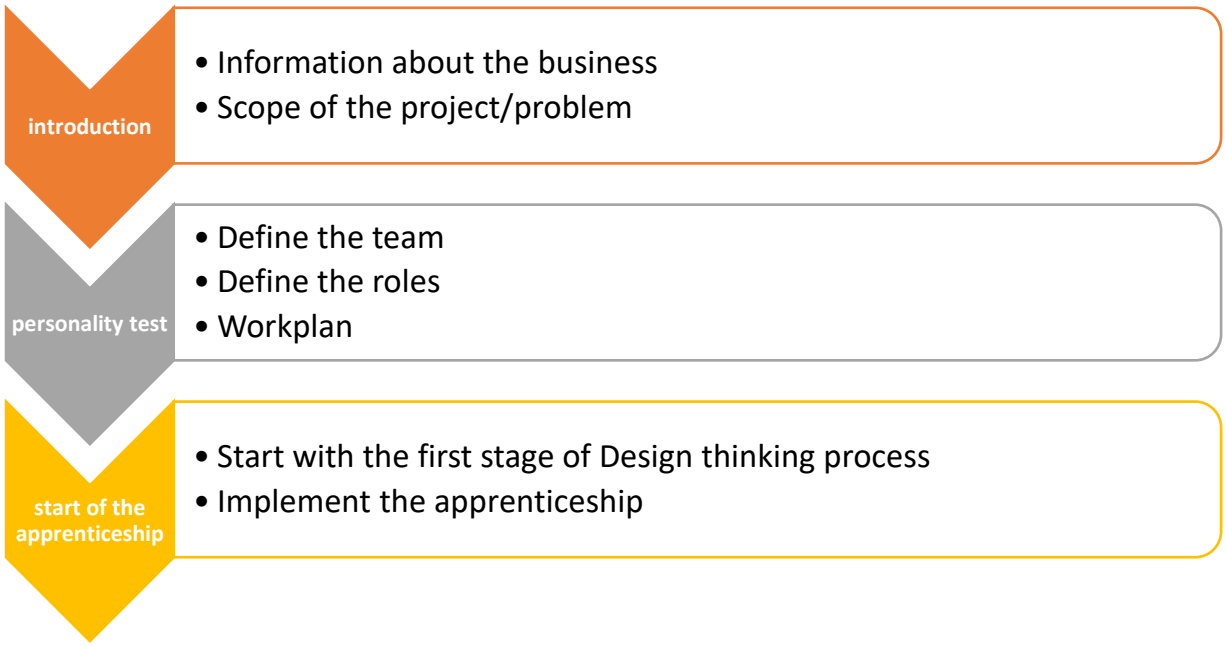


- **Cognitive skills**
- **Soft skills**
- **Knowledge and understanding**

The overall strategy is student-centered built around the needs of various businesses.

In order to be successful the apprenticeship should start with an introductory *Module* where more information about the background of the business is provided. It is also important to introduce the intern/s to the corporate culture, employees, managers.

The preparatory phase should follow the below three main steps:



It is highly recommended to start the preparation during the classes at school with the support of their teacher/tutor. A series of workshops provide students with a framework of theories, ideas, notions and concepts to build understanding. The students then interact with businesses to develop new ways of doing things within that business that are theoretically sound. In the process students are expected to question the veracity and value of the theories as they try to put them into practice.

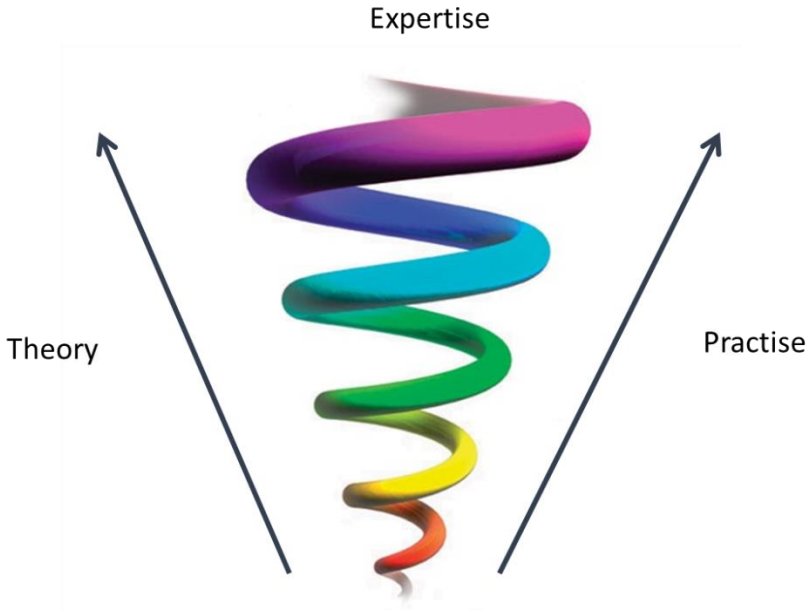


Figure Teaching and learning strategy

Personality tests

Psychometric tests are assessment tools used to objectively measure individual personality traits, aptitude, intelligence, abilities and behavioral style. Psychometric assessments are widely used in career guidance and employment to match the abilities and personality of a person to a suitable career or role. In our case, we conduct a test and/or game and exercise in order to define the scope of the work and the role of the intern/s in the process. It is even more important in the scope of the Design thinking process which starts with *Empathy* phase.

The founder of the Psychodynamic approach, Sigmund Freud, suggested that our personality was a lot more complexed than originally suggested and that our behavior, and personality, is driven by our innate drives and needs.

Carl Jung, proposed that there are only four human personality preferences: sensing, intuition, thinking and feeling, and that these influence our personality. The 1900's lead to an increased interest in personality testing, assessments, and typing, especially in the workplace.

Woolworth personal data sheet was the first modern personality test to be invented; it was used by the United States American army to detect which recruits would be susceptible to shell shock.

Many companies use psychometric, behavioural and personality tests to help them make decisions, develop employees and build high-performing teams. The benefits of introducing testing into the workplace (whether for recruitment, or for ongoing personal and team development) include:

- Providing an **external, objective view** of an individual, which is not biased by the perspective of an individual (such as a line manager) or by the organisational culture.
- Helping individuals to learn about themselves by presenting them in a new light. The provision of tailored information allows individuals to **manage their career progress** and set **targets based on their performance**.
- Analyzing fit between individuals and jobs, so that **appropriate skills and training needs** can be identified.
- **Building teams** of individuals who work harmoniously and productively together.

In the ADDET model we aim to form the teams for the apprenticeship and to introduce the intern/s to the work environment, the managers, employees, other interns.

It is also part of the learning process and the intern learns about this process and how to further do it.

This prior evaluation is very useful to create balanced groups of different personalities. As a general recommendation it can be indicated that: when working with more than one student it is recommended to create the teams composed of up to 5 students. Each team

needs an experienced mentor to support the work throughout the course. It is also recommended to apply personality test, introductory session as an “ice breaker” with games or another approach to form the team.

Myers–Briggs Type Indicator[1]

Myers–Briggs Type Indicator - The Myers–Briggs Type Indicator (MBTI) is an introspective self-report questionnaire with the purpose of indicating differing psychological preferences in how people perceive the world around them and make decisions. The MBTI was constructed by Katharine Cook Briggs and her daughter Isabel Briggs Myers. It is based on the conceptual theory proposed by Carl Jung who had speculated that humans experience the world using four principal psychological functions – sensation, intuition, feeling, and thinking – and that one of these four functions is dominant for a person most of the time.

The MBTI was constructed for normal populations and emphasizes the value of naturally occurring differences.

"The underlying assumption of the MBTI is that we all have specific preferences in the way we construe our experiences, and these preferences underlie our interests, needs, values, and motivation."

In the case of use of a. Myers–Briggs Type Indicator - to create balanced teams trainers should consider that some types are more common than others (ISFJ, ESFJ, ISTJ for example) and in one group there shouldn’t be too many individuals of any one style. Awareness of differences between types gives students a foundation for understanding the theory of personality and how their teammates may be different. The MBTI assessment is ideal for a wide range of applications, including:

- ✓ **Team development**: Helps ease communication among team members, identify team strengths and weaknesses
- ✓ **Leadership development**: Deepens leaders’ understanding of their personality type and the types of those they are leading to help them manage better, give more meaningful feedback, and improve individual and team performance
- ✓ **Conflict management**: Improves skills in identifying sources of conflict and intervening early to prevent underperformance, disruption, and disengagement
- ✓ **Stress management**: Builds resilience and increases productivity
- ✓ **Career planning**: Guides students on career choice and development

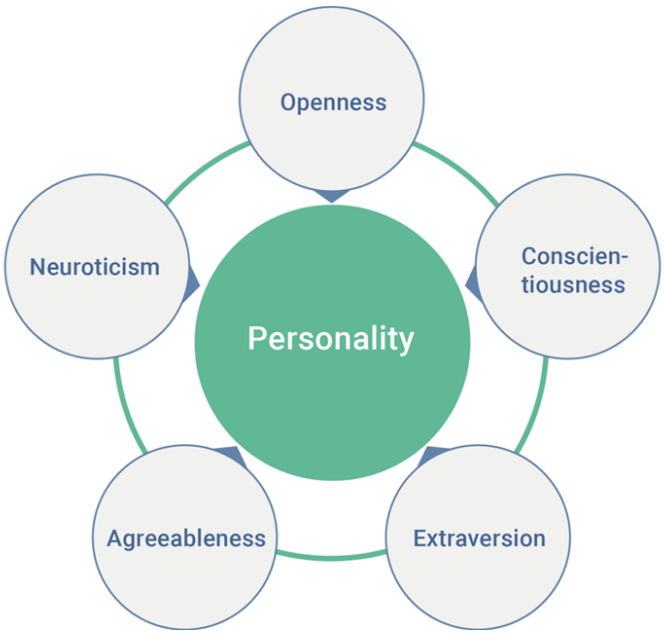
[1] www.myersbriggs.org

Mettl Personality Profiler[2]

The Mettl Personality Profiler measures an individual's strengths and growth opportunities based on underlying personality traits and workstyle preferences, and aid in understanding what behaviors a candidate is likely to engage in as a result of their preferences and predispositions. It can be used in combination with other tools to provide a more holistic understanding of the individual's pre-dispositions, as well as behavioral manifestations at the workplace.

Big Five personality traits[3]

The Big Five personality traits, also known as the five-factor model (FFM), is a taxonomy for personality traits. It is based on common language descriptors. When factor analysis (a statistical technique) is applied to personality survey data, some words used to describe aspects of personality are often applied to the same person.



Many contemporary personality psychologists believe that there are five basic dimensions of personality, often referred to as the "Big 5" personality traits.

The five broad personality traits described by the theory are extraversion (also often spelled extroversion), agreeableness, openness, conscientiousness, and neuroticism.

When people first come together in a group they go through a number of stages as they come together and work out what is required. These stages are known as Forming, Storming, Norming and Performing[4].

This is the first stage of the apprenticeship program where the content and the learning objectives are introduced to participants. More recent research shows that this process is

[2] https://mettl.com/
[3] https://www.testgorilla.com/
[4] Tuckman, B. W *(1965). "Developmental sequence in small groups". Psychological Bulletin. 63 (6): 384–399.*

not quite as linear as first thought and groups often move back and forth between the different stages.

Belbin Team roles[5]

A Belbin 'Team Role' is one of nine clusters of behavioural attributes identified by Dr Meredith Belbin's research at Henley as being effective in order to facilitate team progress. The nine Belbin Team Roles are: Resource Investigator, Teamworker and Co-ordinator (the Social roles), Plant, Monitor Evaluator and Specialist (the Thinking roles) and Shaper, Implementer and Completer Finisher (the Action or Task roles).

Belbin Team Roles are used to identify behavioural strengths and weaknesses in the workplace.

"The types of behaviour in which people engage are infinite. But the range of useful behaviours, which make an effective contribution to team performance, is finite. These behaviours are grouped into a set number of related clusters. to which the term 'Team Role' is applied."

Meredith Belbin

Belbin measures behaviour and does not have psychometric properties. There are a number of different factors which influence our behaviour – and personality is one of them. Others include: skills and abilities; values and motivations; experiences and external influences. Whilst personality may not be immediately apparent to others, behaviour is – it's the outward manifestation of all those factors, working together and acting on other people.

It allows enabling individuals to be able to project and talk about their behavioural strengths in a productive, safe and non-confrontational way.

ENNEAGRAM[6]

The Enneagram of Personality, or the Enneagram, is a model of the human psyche which is principally understood and taught as a typology of nine interconnected personality types. It defines nine personality types:

1 THE REFORMER

The Rational, Idealistic Type: Principled, Purposeful, Self-Controlled, and Perfectionistic

2 THE HELPER

The Caring, Interpersonal Type: Demonstrative, Generous, People-Pleasing, and Possessive

3 THE ACHIEVER

[5] https://www.belbin.com/about/belbin-team-roles

[6] https://www.integrative9.com/

The Success-Oriented, Pragmatic Type: Adaptive, Excelling, Driven, and Image-Conscious

4 THE INDIVIDUALIST

The Sensitive, Withdrawn Type: Expressive, Dramatic, Self-Absorbed, and Temperamental

5 THE INVESTIGATOR

The Intense, Cerebral Type: Perceptive, Innovative, Secretive, and Isolated

6 THE LOYALIST

The Committed, Security-Oriented Type: Engaging, Responsible, Anxious, and Suspicious

7 THE ENTHUSIAST

The Busy, Fun-Loving Type: Spontaneous, Versatile, Distractible, and Scattered

8 THE CHALLENGER

The Powerful, Dominating Type: Self-Confident, Decisive, Willful, and Confrontational

9 THE PEACEMAKER

The Easygoing, Self-Effacing Type: Receptive, Reassuring, Agreeable, and Complacent

HIGH5[7]

HIGH5 is the strengths test that helps people find out what they are naturally good at. If you have ever heard about the strengths finder, this is it. It is based on the principles of positive psychology, an emerging scientific field studying what makes humans flourish. The core premise is that fixing one's weaknesses can help to avoid failure, but to achieve success, happiness, and fulfillment - one needs to maximize their strengths. Therefore, HIGH5 is designed to identify what's strong in people rather than what's weak.

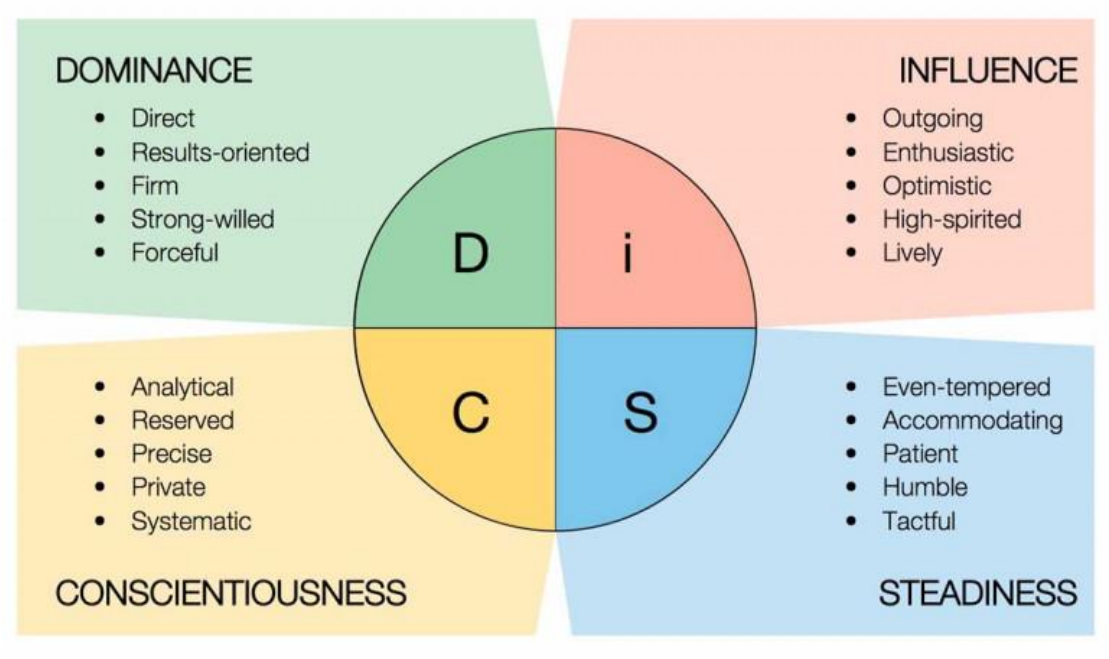
Unlike other assessments, HIGH5 does not assign you to a specific group or type. Instead, it identifies your unique strengths sequence, which is as unique as 1 in 1.86 million.

DISC Personality test[8]

DISC assessment measures the personality and work style. The DISC system was created by psychologist William Moulton Marston as a simple but powerful way to describe people's emotions and behavior. In his 1928 book, Emotions of Normal People, Marston described four basic personality types: Dominance, Inducement, Submission, and Compliance. Each of these types had its own way of managing emotions and behavior, especially interpersonal behavior.

[7] https://high5test.com/

[8] www.discprofile.com

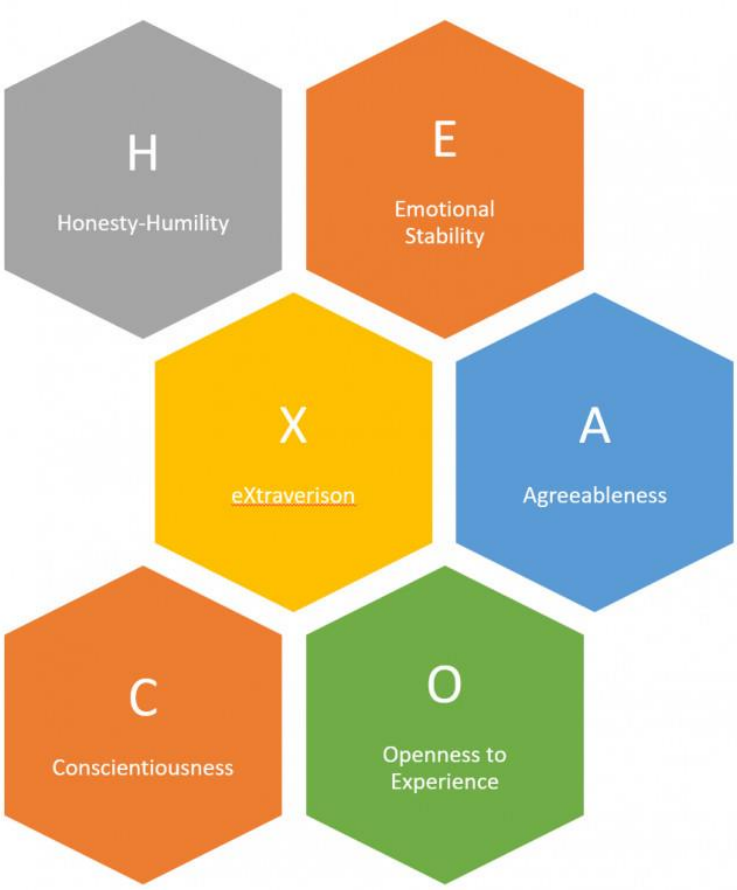


The DiSC assessment contains 28 questions, where the participant picks a word that is most like them, and a word that is least like them for each question. The DiSC assessment is designed to be easy to use, easy to administer and to be delivered by anyone.

HEXACO Model of Personality Structure Personality Inventory[9]

The HEXACO model was constructed in the year 2000 to assess some of the personality dimensions, and theoretical interpretations, that had been outlined in earlier studies. The model measures six major personality dimensions, namely: Honesty-Humility, emotionality, extraversion, agreeableness, conscientiousness, openness to experience. The inventory is comprised of 200 questions for the full-length assessment or 100 questions for the half-length assessment.

[9] www.hexaco.org



The Birkman Method[10]

Introduced by Roger Birkman, the Birkman method is an online assessment that measures personality, social perception and occupational interests. The assessment is designed to provide insight into what specifically drives a person's behaviors in an occupational setting and social context. The questionnaire has 32 scales altogether, 10 that describe occupational preferences, 11 that describe effective behaviors and 11 that describe interpersonal behaviours and environmental expectations. The assessment consists of 298 questions, 250 of which are true-false questions and 48 of which are multiple-choice.

Role of the trainer and the student/s

In the process of learning by doing a trainers' part is memorable to achieve progress in the process. Specifically, the trainer has a twofold role: the one of a **supervisor/evaluator** combined with the one of a guide:

Supervisor/evaluator: The trainer has to supervise VET students in order to provide them with feedback not only on their work but also on how they perform their gained knowledge and understanding of "Design Thinking" phases on their work.

Guide: This role is identic to a mentor in which the trainer gives VET students guidelines and advices, sets boundaries, gives opportunities for new ideas all while encouraging them to act independent and take risks so they can build their empirical knowledge and soft skills.

[10] www.birkman.com

Each intern/team should work under the guidance and facilitation from two main participants in the process: a tutor – teacher, trainers from the school and the trainer/mentor from the company.

Assessment plan

Assessment of this programme is formative and done according to the National rules in each country for WBL and apprenticeships. The company should provide the participants with a "Certificate of Participation" on completion of the programme besides the formal requirements. The assessment could be done as follow:

- By the teacher for in-class performance
- By the trainer for the achievements at the work place – this is based on the final results of the prototype and the practical/experiential elements of the work process following the final stages of Design thinking approach
- By the team/other interns and employees of the company which reflects the teamwork and such skills as: leadership, work under stress, meeting deadlines, communication, etc.
- Self-assessment of the intern

Specific formative assessments are built into the learning process of VET schools. There could be a final formative assessment which takes the form of a presentation to the business owner. All of the formative assessments can be adapted as summative assessments. It is also a good idea to assess the level of interest from trainers, mentors and business owners (managers) as they also play a significant role in the programme. This can be done by sending out a request for expression of interest, or approach local business owners to see if they are willing to participate.

Part of the process is also the collection of feedback in terms of organization, achievement, level of satisfaction, follow-up, results, new knowledge and skills.

Templates of the assessment are provided for use in this Model in Annex 2 Assessment Form.

Design thinking phases of ADDET apprenticeship model

Experimental learning theory and styles

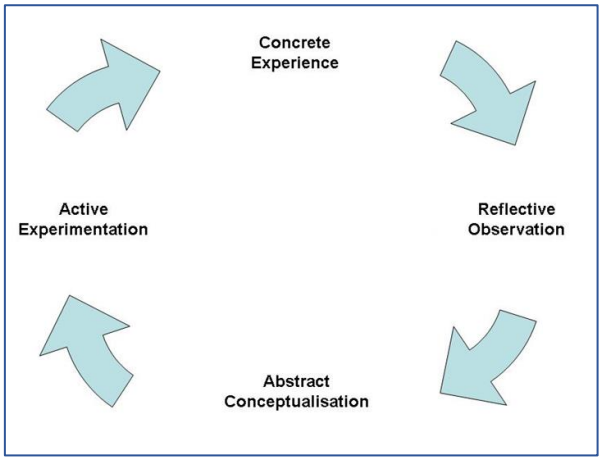
In its essence this Model provides a framework and approach for experiential learning with hands-on experience and interactions with business representatives and real-life problems.

The first theories of experiential learning arose in the mid-nineteenth century as attempts to move away from traditional formal education, where teachers simply presented students with abstract concepts, and toward an immersive method of instruction. The concept of experiential learning was first explored by John Dewey and Jean Piaget, among others, but it was made popular by education psychologist David A. Kolb. Kolb created Experimental Learning Theory (1974) to unify the contributions and insights of different scholars into an

explicit and coherent framework. Kolb's theory represents a four-stage learning cycle in which the learner touches all the bases:

- ✓ **Concrete Experiences**: Being involved in a new situation
- ✓ **Reflective Observing**: Analyzing the experience and thinking about the problem
- ✓ **Abstract Concept-Making**: Forming theories and new ideas
- ✓ **Active Experimenting**: Testing of theories by implementing them and verifying the results

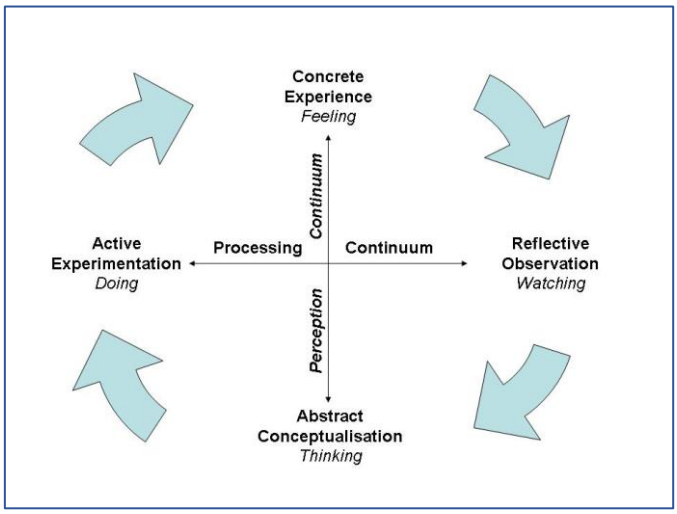
Experimental Learning Cycle



Source: Kolb, 1974

Based on this four-stage cycle Kolb's learning theory sets out four distinct learning styles, which are the combination of two "conflicting" axis (continuums) - Processing Continuum, how we approach a task, and Perception Continuum, our emotional response, or how we think or feel about it. According to Kolb, these activities are conflicting as we cannot perform both at the same time. Thus, when confronted with a new learning situation we internally decide whether we wish to do or watch, and at the same time we decide whether to think or feel. Various factors may influence a person's preferred style, such as social environment, educational experiences, or the basic cognitive structure of the individual. Whatever influences the learning style, the result is always a way of "grasping the experience", which defines our approach to it, and we choose a way to "transform the experience" into something meaningful and usable, which defines our emotional response to the experience.

Experimental Learning Cycle with axes



Source: Kolb, 1974

Definition of the project

The suggested selection criteria for the problem are:

- ✓ The degree of complexity needs to be at the level that the students are able to grasp
- ✓ The challenge/business problem needs to be culturally sensitive to the students' cultural aspirations
- ✓ It needs to be a real and genuine issue that is impacting on the viability and/or growth of the organisation presenting the challenge/business problem
- ✓ It should be related to development of innovations
- ✓ The company should not have already solved the challenge /business problem, although they may be working on a solution independently of the programme.

The information for the challenge needs to cover the following points:

- ✓ Overview of the organisation
- ✓ Overall vision for the future of the organisation
- ✓ Overview of the challenge/ business problem by asking a key question
- ✓ Consequences to the organisation of not finding a solution to the challenge/ business problem
- ✓ Details of any constraints/ limiting factors that might impact on ability to resolve the challenge/ business problem (e.g. Budget limitations/ access to finance/ skills gaps).

A template for a prospective challenge can be found at Annex 1. BUSINESS PROBLEM/DEFINITION OF THE COMPANY CHALLENGE.

After completing the programme feedback and recommendations from the company can be gathered though a simple questionnaire (Annex 3. FEEDBACK FORM)

After the intern/s have defined together with the business what the challenge or the problem is they need to work together so they can find solutions and test them following the DT process. The role of the trainer from the business side is to offer opportunities to the interns and observe them by providing necessary resources to the students that will help them

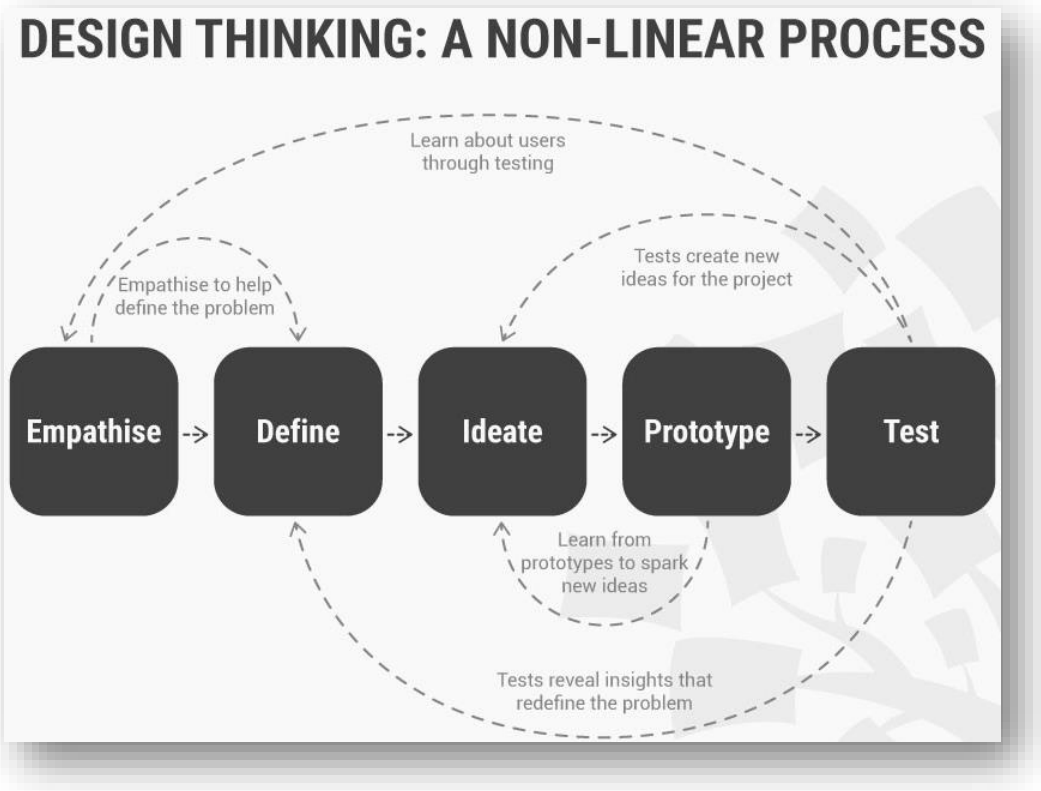
complete the challenge. It is crucial to "break down" each step of Design Thinking to understand how this method will work in a workplace.
As described in the Methodology of Design Thinking in IO1/A3 it is a problem-solving framework. The concept has been around for decades, but in the past five to ten years, IDEO, a design consultancy, has championed the process as an alternative to a purely analytical approach to problem-solving.

Tim Brown, IDEO's president and CEO, defines design thinking like this:

"The mission of design thinking is to translate observation into insights and insights into products and services that will improve lives."

Design thinking provides structure for working on problems starting from the very first stage – clear definition of the problem/challenge.

As a methodology for this Model we use the five-stage non-linear approach as presented below (according to Interaction design foundation)



Design Thinking is appropriate to solve a great variety of challenges and in the current model it is advised to be combined with support for the company to develop innovation.

Some examples of challenge areas are:

- ✓ Redefining value
- ✓ Human-centred innovation
- ✓ Quality of life
- ✓ Problems affecting diverse groups of people
- ✓ Involves multiple systems
- ✓ Shifting markets and behaviours
- ✓ Coping with rapid social or market changes
- ✓ Issues relating to corporate culture
- ✓ Issues relating to new technology
- ✓ Re-inventing business models
- ✓ Addressing rapid changes in society
- ✓ Complex unsolved societal challenges
- ✓ Scenarios involving multidisciplinary teams
- ✓ Entrepreneurial initiatives
- ✓ Educational advances
- ✓ Medical breakthroughs
- ✓ Inspiration is needed
- ✓ Problems that data can't solve

It allows solving problems across multiple spheres at the intersection of business and society, logic and emotion, rational and creative, human needs and economic demands and between systems and individuals. It provides a novel solution different from the traditional and typical problems. That's why the model involves definition of complex and cross-functional, interdisciplinary type of challenges provided by the company.

In this process the role of the teacher who has expertise in design thinking is critical. S/he can facilitate the formation of the challenge in close collaboration with the company manager/s.

As Bruce Mau, founder of the Massive Change Network, put it:

"It's not about the world of design, but the design of the world".
– Bruce Mau

The apprenticeship model based on design thinking aims to support the enhancement and development of the right mindset for innovation which is supported by the creativyt of the students who work with the company which is one of the key elements of innovation together with the team and the surrounding ecosystem and environment as it is shown on the image below":

Creating the right mindsets, selecting the appropriate team, and setting up environments which encourage innovation to take place are three of the essential aspects of fostering successful innovation within companies, organisations, and society at large.

Planning the Design thinking stages/phases:

- **Empathize: Understand Your Audience -** In design thinking, empathizing involves understanding the beliefs, values, and needs that make audience tick. It involves observation — watching, listening to, and understanding the audience — and engagement — interacting with the audience, users, or customers.
- **Define: Establish a Point of View -** in design thinking, this process is described as establishing a point of view (POV): a statement that sums up the insights learned about the audience and clarifies their needs. The solution(s) that students will eventually come up with will be informed by this POV.
- **Ideate: Focus on Possible Solutions -** the Ideation stage is a brain dump of ideas, and nothing is off limits. The point isn't to separate the good ideas from the bad or even find one "perfect" solution, but to come up with as many ideas as possible.
- **Prototype: Try Out Multiple Solutions -** Ideally, the Ideate stage should produce multiple solutions. At the Prototype stage, the goal is to put the best ones to the test. Stanford's d.school suggests that the prototype might be anything from a wall of post-it notes or a storyboard to a physical/digital item or an interactive activity. The process of building a prototype helps clarify the problem even more and offer new insights or new solutions. In preparing for the final testing stage, it's helpful if prototypes can be looked at or experienced by the audience or user for the purpose of requesting feedback.
- **Test: Find the Best Solution for Your Audience - t**esting helps students learn more about their possible solutions and more about the audience. Depending on how the testing is done, it may lead back to any of the four previous stages: they may discover that they didn't define the problem correctly or failed to understand the audience and need to go all the way back to square one. Or they might just need to refine the prototype a little. Most likely, testing will help develop improved and/or advanced prototypes.

Competence grid for problem-solving skills and competences

The design thinking methodology focuses on the development of problem-solving skills and competences which can be further divided into the following main groups concerning the process and project-based learning:

Knowledge and understanding:

- Theoretical perspectives, methods and techniques of design thinking
- Key features of success when developing novel solutions
- Business and technical aspects of the solution

Cognitive skills in being able to:

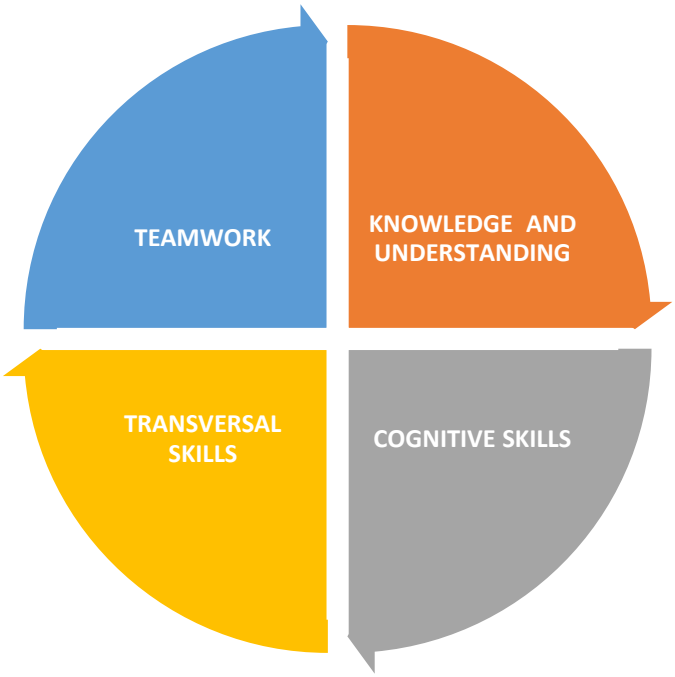
- Researching and developing an innovative solution to a problem
- Evaluate the relevant skills needed at a variety of levels
- Identify and evaluate elements of design thinking and innovation
- Analyse and synthesise information from multiple sources to reach justifiable conclusions
- Use conceptual skills to create and implement decisions

Transversal skills:

- Project management and critical components of the process
- Preparation of basic project management chart
- Leading a project that develops innovative solutions to problems
- Analytical skills

Team work:

- Leadership and communication
- Negotiation
- Conflict resolution in a team setting while under pressure.



These skills and competences could be further divided into the **five stages of the process**:

	KNOWLEDGE AND UNDERSTANDING	TRANSVERSAL SKILLS	COGNITIVE SKILLS	TEAMWORK
EMPATHIZE	How to create Personas? How to conduct interviews? How to create empathy map?	Empathy Active listening Initiative Intuition Analysis of results and information Generation of insights and conclusions	Research on the needs and behavior of the target groups Analysis of behavior and needs	Leadership role Team roles during the interview process Building rapport and relationship
DEFINE	Problem definition Open and close questions Decision tree Mindmap	Analytical skills Lateral thinking Decision making Definition of challenges and opportunities SWOT analysis Problem definition Devising alternatives	Collect and analyze information about trends and the business ecosystem Analysis of the business Technical analysis	Team roles during the problem definition
IDEATE	Creativity techniques Creativity and innovation	Creativity Analytical skills Evaluation of ideas	Analysis and evaluation of ideas	All students work together and the

		Lateral thinking Resilience to reassess ideas Tolerance to accept and reject ideas Accept rejection of ideas Evaluating alternatives	Development of solution concepts and plans	leadership role is limited Communication and interaction
PROTOTYPE	Technical aspects What is a prototype Business concepts	Development of prototype Accept failure Decision making Dealing with complexity	Influencing skills Identify and evaluate elements for prototyping Research and selection of prototype means and techniques Development of templates and mock-ups	Distribution of roles for the prototype
TEST	Ways for testing Phases of testing Participants in the testing Evaluation and feedback of the testing Business plan creation	Adaptability and flexibility Improvement and iteration Adaptability and flexibility Entrepreneurial skills Risk taking Decision making Implementing the most viable solutions	Conceptual skills Implementation and development of solutions	Distribution of roles for the testing including sub-teams and supporting technical roles

ANNEX 1. BUSINESS PROBLEM/DEFINITION OF THE COMPANY CHALLENGE

Name of organisation	Contact person	Contact details
Overview of the organisation (300 words)		
Overall vision for the organisation's development (200 words)		
Overview of the challenge/task/problem to be solved during the apprenticeship of the student/s (500 words)		
Consequences of not resolving this problem (200 words)		
Are there any specific restricting factors such as finance or skills that impact on this problem?		
General guidelines for the apprentices and the application of Design thinking methodology in the process:		

ANNEX 2. ASSESSMENT FORM

Name of the teacher, subject	Name of the company trainer/mentor	Contact person Contact details
Overview of the assessment provided on the skills: - **Cognitive skills** - **Soft skills** - **Knowledge and understanding** - **Design thinking process**		
Fulfilment of tasks and activities during the apprenticeship program		
Achievement of the goals, assessment of goal-setting		
Respect of the workplan and deadlines		
Achievement of the specific requirements and technical skills		
General comments and assessment of the application of Design thinking methodology in the process:		

ANNEX 3. FEEDBACK FORM FOR PILOT TESTING

1. How good was the methodology for working with students in the pilot?

	1	2	3	4	5	
week	○	○	○	○	○	excellent

If you have some, please write your recommendations on the previous question

Your answer

2. How do you evaluate the students participating in the solution of your challenge/case?

	1	2	3	4	5	
week	○	○	○	○	○	excellent

If you have some, please write your recommendations on the previous question

Your answer

3. How do you evaluate the benefits of the teamwork with the students?

	1	2	3	4	5	
week	○	○	○	○	○	excellent

If you have some, please write your recommendations on the previous question

Your answer

4. What was the level of support while working on the case by the mentors?

	1	2	3	4	5	
week	○	○	○	○	○	excellent

If you have some, please write your recommendations on the previous question

Your answer

5. **How do you evaluate the work of the students during:**	1	2	3	4	5
1. The meetings with managers and employees	○	○	○	○	○
2. The presentations and deliverables produced	○	○	○	○	○
3. The development of the work throughout the stages of Design thinking	○	○	○	○	○
4. The final presentation of the results after the five stages of design thinking	○	○	○	○	○

If you have some, please write your recommendations on the previous question

Your answer

6. What was most difficult for you during the pilot testing?

Your answer

7. **What you liked most/least during the testing of the course?**

Your answer