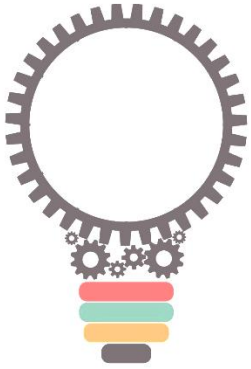

eDea

Ψηφιακές υπηρεσίες για ιδεασμό, συνεργασία & σύνθεση στη σχεδιαστική σκέψη

Deliverable 6

Evaluation report of the eDea digital intervention with user groups

Ελλάδα 2.0

Με τη χρηματοδότηση της Ευρωπαϊκής Ένωσης
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Contents

Introduction

The eDea research project takes a holistic approach to promoting innovation in industry and higher education, leveraging design thinking processes. This method is profoundly anthropocentric and allows the development of sustainable and creative solutions to the complex challenges of entrepreneurship and social entrepreneurship.

The project aims to create digital innovation services and activities, supporting interdisciplinary design teams in formulating, developing and implementing solutions that positively impact society and the economy. The proposed digital collaboration services are addressed to students, designers and trainers, integrating formal and informal problem-based learning processes. The main objective is to prepare young people for an active role in society by cultivating skills critical to meet the challenges of the 21st century through innovation. At the same time, eDea supports design teams seeking to improve their innovation practices and enhance the process of developing new products, services and strategies.

In addition, eDea promotes the adoption of the proposed digital learning and design intervention by students, higher education teachers and design teams through specially designed supporting content and targeted dissemination actions.

The technical report reflects the pilot use results and the evaluation of the research project results in academia and industry. It describes the evaluation methodology based on focus groups and user interviews or questionnaires.

These processes collected qualitative and quantitative data on the user groups involved in pilot use, implemented activities, and evaluation results.

The data analysis highlighted the added value of the eDea digital solution for innovation, contributing significantly to the investigation processes, problem definition, ideation, evaluation of possible solutions, and prototyping.

The results confirm that eDea is an effective tool for enhancing innovative thinking and creativity. It offers a digital learning and collaboration environment that actively supports design thinking in educational and business contexts.

1. Objectives and results of the eDea project

The eDea project aims to design and implement an innovative digital platform that supports design thinking processes for developing innovative solutions in entrepreneurship and social entrepreneurship. The platform empowers design teams, helping them discover innovative intersections between the desired outcome and what is technologically and economically feasible.

1.1 Objectives and users of the eDea digital solution

The eDea digital intervention for innovation supports collaboration at all stages of the design thinking process, namely:

- Investigate a problem.
- Define a problem in a way that introduces broad solutions.
- Ideation and brainstorming towards solution synthesis.
- Evaluate ideas and select one for prototyping.
- Prototype design.

The project is addressed to:

- Design teams and entrepreneurs seeking to improve their practices and promote innovation.
- Pupils, students and trainers in the context of formal and informal problem-based learning processes. Through this approach, young people acquire the necessary skills to become active citizens, able to face the complex challenges of the 21st century through innovation.

1.2 Key results

The eDea project has developed:

- **Methodological learning framework** for developing design thinking skills based on experiential learning and learning by action.
- **Digital activities** (case studies) inspired by real life, enhancing design thinking and entrepreneurship skills.
- **Digital collaboration platform** supporting design thinking and the creation of innovative solutions.
- **Supporting content** to help integrate design thinking into planning processes and business strategy.

- **Feasibility analysis**, which explores the possibilities of diffusion and promotion of the digital platform in educational and business ecosystems.

eDea aims to systematically enhance innovation through design thinking, providing digital tools and educational approaches that enhance entrepreneurial creativity and collaboration between different user groups.

2. Target groups of the eDea project and analysis of their needs

The target groups of the eDea project are:

2.1 Pupils and students

Pupils and students are tomorrow's problem solvers. They are the ones who will be called upon to introduce sustainable and innovative solutions to the challenges of entrepreneurship and social entrepreneurship in the 21st century. Cultivating design thinking and innovation skills is crucial for preparing young people for contemporary social and economic demands (Brown, 2009; Razzouk & Shute, 2012).

To respond effectively to these challenges, they need to develop:

- Innovation skills, such as:
    - Analytical and critical thinking are key to problem-solving ability (Facione, 2011).
    - **Creativity**, which promotes the production of original and workable solutions (Runco & Jaeger, 2012).
    - **Ability to collaborate in teams**, essential in a modern, interdisciplinary environment (Dillenbourg, 1999).
    - **Investigation and evaluation of sources are** critical for developing information literacy and informed decisions (Kuhlthau, Maniotes, & Caspari, 2015).
    - **Design and prototype evaluation**, a key phase of design thinking that facilitates rapid testing and updating of solutions (Brown, 2009).
- Familiarization with good human-centred design practices, to be able to apply in-practice principles such as:
    - **Adaptability**, allowing students to respond to changing circumstances and uncertain challenges (Bransford, Brown, & Cocking, 2000).
    - **Resilience**, enabling students to manage failure as an element of learning and improvement (Dweck, 2006).
    - **Flexibility**, facilitating the integration of new data and technologies into design processes (Schön, 1983).
- **Knowledge, experience and practical skills**, enabling them to put design thinking and innovation into practice, covering the entire spectrum of the process:

- **Problem analysis** (Jonassen, 2011)
- **Conception and development of ideas** (Osborn, 1953)
- **Implementation and testing** of solutions (Beckman & Barry, 2007)

Pupils and students can benefit from the eDea digital innovation learning intervention, which promotes innovation through collaborative processes. Through a digital learning environment, eDea enhances team collaboration, encouraging the creation of sustainable and entrepreneurially applicable solutions to entrepreneurship and social entrepreneurship challenges. Research results show that experiential learning and structured design thinking approaches improve problem-solving ability and promote creative thinking (Kolb, 1984; Liedtka, 2015).

2.2 Trainers and training organisations

Trainers and educational organisations are key in developing design thought process coordination skills in their pupils and students. To respond effectively to this challenge, they need:

- **Support structuring and monitoring design activities** in the classroom to promote creative problem-solving through collaboration, critical thinking, and the search for innovative solutions. Modern pedagogical approaches encourage students' active participation, interaction with real problems, and the application of design thinking in the learning process (Brown, 2009; Scheer et al., 2012).
- **Continuous and lifelong renewal of trainers**' skills, allowing them to adapt learning objectives, pedagogical approaches and educational content according to technological, social and labour market developments. According to Mishra & Koehler (2006), educators need a strong theoretical background that combines technological, pedagogical and cognitive knowledge (TPACK) to respond to modern educational needs.
- **Continuous renewal of curricula, teaching approaches and learning methodologies** to meet industry and society's current and future demands. Continuous modernisation of educational content is critical to enhance the attractiveness and effectiveness of educational programs (Binkley et al., 2012). At the same time, the adoption of modern learning approaches, such as project-based learning learning) Moreover, challenge-based learning, has been shown to improve student performance and engagement (Barron & Darling-Hammond, 2010).

- **Enhance synergies between academia and industry** through strategic partnerships that bridge the gap between theory and practice. Research shows that linking education to the labour market and cooperation between universities and businesses improves graduates' employability and innovation (European Commission, 2017; Etzkowitz & Leydesdorff, 2000).

The eDea digital intervention for innovation offers a modern, flexible, and adaptable training environment, enabling the development of content and learning programs based on a problem-centric approach. According to Jonassen (2011), problem-based learning enhances the development of critical thinking and problem-solving abilities while promoting students' active participation in the learning process. Thus, digital education through eDea can help improve teaching practices and strengthen the link between education and the needs of the knowledge society.

2.3 Designers and design teams

As design and product development professionals, designers and design team members are called upon to respond to an ever-evolving world where technological advances and user needs shape new requirements. To respond effectively to these challenges, they need:

- Familiarity with modern product design and development processes, which include:
    - **Understanding the basic principles of design thinking** underpinning user-oriented solutions (Brown, 2009; Liedtka, 2015).
    - **Analyzing customer and user needs** allows the development of products that solve real problems (Norman, 2013).
    - **Interactive communication with customers and users** is essential for creating functional, flexible and pleasant solutions (Sanders & Stappers, 2008).
    - **Understanding technological capabilities**, allowing designers to incorporate innovation and new technologies into their solutions (Verganti, 2009).
- **Develop project organisation and management skills** that enable planners to manage their time, resources, and teams effectively. Acquiring these skills is key to completing projects and delivering high-quality solutions within deadlines (Kerzner, 2017).
- Apply design principles to create products that are:

- **Ergonomic**, adapted to users' physical and psychological needs (Pheasant & Haslegrave, 2006).
- **Functional**, driven by optimal usability and performance (Norman, 2013).
- **Aesthetically improved**, according to the principles of good design, contributing to the product's pleasant user experience and commercial success (Lidwell, Holden, & Butler, 2010).

The eDea digital learning intervention for innovation provides a collaborative environment supporting design teams, fostering collaborative synthesis and developing new solutions. Through the platform, participants can explore, analyse, and develop products that effectively meet the needs of end users, promoting innovation in product and service design.

2.4 Enterprises

Working with executives who have strong critical thinking, entrepreneurial thinking, and problem-solving skills can offer significant strategic advantages for enterprises. In a rapidly evolving business environment, organisations that invest in developing such skills in their workforce can enhance their sustainability, innovation, and competitiveness (Drucker, 1985; Grant, 1996).

Benefits of working with highly qualified professionals:

- **Innovation and solution creation** as professionals with high critical thinking and problem-solving skills can contribute decisively to creating innovative ideas and solutions for the company. Their ability to:
  - **Recognize challenges** and understand multilevel problems (Facione, 2011).
  - **Analyze data** and make informed decisions (Kahneman, 2011).
  - **Proposing creative solutions** and utilising analytical and creative skills can be instrumental in maintaining a company**'s competitive advantage** (Amabile, 1998; Sternberg, 1999).
- **Identify business opportunities**, as business-minded professionals can contribute to the company's strategic development by identifying new market opportunities. This is achieved through:
  - **Market and competition analysis** to identify gaps and opportunities (Porter, 1985).

- **Identifying customer needs** and aiming to create products and services that meet their requirements (Osterwalder & Pigneur, 2010).
- **Anticipating industry trends allows** the company to adapt to evolving conditions (Christensen, 1997).

The eDea digital learning intervention for innovation supports utilising executives' knowledge and skills in collective design processes to create sustainable and applicable solutions for industry and society. Through collaboration and a systematic approach to design thinking, the eDea digital intervention for innovation facilitates the synthesis and development of innovative strategies that respond to market and societal challenges.

3. Evaluation objectives

The eDea evaluation aims to measure the benefits of the proposed digital learning intervention, which supports innovation processes in education and industry. The assessment is based on the use of design thinking emerging active skills development methodologies, such as:

- **Experiential learning**, which enhances student engagement through hands-on experiences (Kolb, 1984).
- **Problem-based learning**, **which** focuses on solving real-world problems as a means of learning (Barrows, 1986).
- **Gamification**, which increases user engagement and motivation levels (Deterding et al., 2011).

The evaluation of eDea focuses on multiple levels to ensure the effectiveness and sustainability of the platform. Its main objectives are to assess:

- **The relevance** of eDea methodologies and tools in both education and industry.
- **The acceptance** of eDea methodologies by students, teachers, and enterprises, as well as exploring factors such as utility perception and usage intent (Davis, 1989).
- **The quality of the project results**, considering parameters such as academic effectiveness and relevance to market needs (Biggs, 1996).
- **The effectiveness** of eDea in developing **problem-solving skills** by applying inquiry-based learning approaches (Jonassen, 2011).
- **User interaction** with eDea tools and methodologies, examining ease of use and user adaptation to learning environments (Nielsen, 1993).

In addition, usability is a critical success factor for digital design thinking tools, as it directly affects user acceptance, effectiveness, and experience (Norman, 2013). Therefore, the evaluation of eDea includes usability research features and focuses on:

- **Ease of use**, i.e. intuitive navigation and a low learning curve (Nielsen, 1993).
- **The comprehensibility of the interface** to support natural interaction and quick user familiarisation (Shneiderman et al., 2016).
- **The effectiveness of collaboration functions**, as co-creation and exchange of ideas are key objectives of eDea (Resnick et al., 2005).

- **The overall user experience**, considering factors such as user interaction, satisfaction and engagement on the platform (Hassenzahl &; Tractinsky, 2006).

The **evaluation results** and **user feedback** contribute to **improving the functionality** of the eDea platform and eliminating **errors** that affect the user experience. The assessment shall be based on widely accepted measurement methods adapted to the platform's nature and users' needs. This is followed by analysing these methods and their implementation within the eDea framework.

4. Assessment approaches: formative and summative

The eDea evaluation strategy is organised into two high-level activities:

- Create feedback from users through formative assessment.
- Creation of good practice guidelines through summative assessment.

Evaluation is critical in developing innovative digital services, as it allows for continuous improvement of the tools and methodologies provided (Scriven, 1967; Black & Wiliam, 1998).

4.1 Formative assessment

Formative approaches aim to generate continuous feedback to inform the design and implementation of the service during project development. This approach is based on the basic principle of iterative development, where results are modified and improved based on data collected at each stage (Sadler, 1989; Nicol & Macfarlane-Dick, 2006).

Formative assessment is applied iteratively and aims to enrich project results through user testing, research interviews, and data analyses (Shute, 2008). In each evaluation cycle, qualitative and quantitative feedback is generated, which helps optimise the results.

The formative assessment can start early in the project implementation period and focus on:

- The design of the proposed methodologies for the development of innovation skills.
- The evaluation of early versions of results by external users.
- Identifying areas of improvement, ensuring that the final product meets user needs and best practices (Brown, 2009).

Formative assessment is applied to both qualitative and quantitative models, including:

- **Qualitative methods**, such as focus groups and interviews (Patton, 2002).
- **Quantitative methods**, such as usage data analyses and evaluation questionnaires (Nielsen, 1993).

4.2 Cumulative assessment

Cumulative approaches are applied after an activity is completed and aim to assess the degree of achievement of objectives (Scriven, 1991). This method allows for systematically evaluating the effectiveness of the tools and methodologies used.

Under eDea, the cumulative assessment will be applied in the second half of the project implementation period in order to:

- **Record good practice guidelines** based on participants' experiences (Wiliam, 2011).
- **Assess the use of eDea**'s framework, platform, games and learning resources.
- Analyze factors that affect the effectiveness of the intervention, such as:
    - Number of participants.
    - Group composition.
    - Duration of use of the platform.
    - Learning phases and ways of utilising the tools.

Summative assessment provides evidence-based data for evaluating eDea's educational and design tools and will contribute to the future development of services that promote higher-order thinking skills (Bloom, 1956).

Like formative assessment, summative assessment applies to both qualitative and quantitative models. The data collected will guide the further development of eDea, enhancing its adaptability to the needs of the educational community and industry.

5. Evaluation models: qualitative and quantitative

The evaluation of learning interventions can be based on either qualitative or quantitative models, depending on the nature of the data to be collected and analysed. In the context of eDea, combining these two approaches will lead to complementary, complete, objective, and rich information, allowing evidence-based conclusions to be drawn about the effectiveness of digital learning intervention (Patton, 2002; Creswell & Plano Clark, 2017).

5.1 Qualitative evaluation models

Qualitative evaluation models are appropriate when responses to evaluation activities are to be documented descriptively and narratively instead of numerical data. The results can be recorded as opinions, attitudes, perceptions and experiences through texts, interviews and narratives (Denzin & Lincoln, 2011). A key advantage of qualitative methods is that they incorporate human interaction and interpretation, allowing a better understanding of participants' subjective experiences (Merriam & Tisdell, 2015).

eDea evaluation objectives, which include relevance, acceptance, quality and effectiveness of project results, can benefit from qualitative approaches, as these are more suitable for recording perceptions and attitudes (Maxwell, 2012).

Indicator	**Documentation method**
Relevance	Levels of commitment to pilot activities
Acceptance of eDea methodologies and tools	Feedback from participants and willingness to use
Perceived effectiveness of tools	Perception of added value by users
Usability	User feedback on pilot activities
Ease of integration into design and innovation processes	Interest in integrating the platform into their practices

Table 1. Qualitative evaluation indicators.

Qualitative methods include semi-structured interviews, focus groups, and content analysis from participant feedback (Guba & Lincoln, 1989; Kvale, 2007).

5.2 Quantitative evaluation models

Quantitative models are used when results can be measured numerically or statistically. This approach is practical when there is a need for objective, comparable, and replicable data (Cohen, Manion, & Morrison, 2018).

In quantitative evaluation, the same activities should produce consistent and repeatable results, facilitating statistical analysis and generalisable conclusions (Bryman, 2016).

In the context of eDea, the quantitative assessment will aim to measure participants' engagement, utilising real numbers achieved in the learning experiments.

Indicator	**Documentation method**
Number of organised learning experiments	Recording of activities per evaluation phase
Number of students participating	Analyse attendance data
Number of teachers involved	Statistical processing of registration and usage data
Number of design team members	Analyse platform usage data

Table 2. Quantitative evaluation indicators.

Quantitative data can be collected through questionnaires, platform usage reports, and user behaviour analysis (Field, 2018).

5.3 Combining qualitative and quantitative models

The combination of qualitative and quantitative methods offers a holistic picture of the impact of eDea. This approach, known as mixed methods evaluation, allows an understanding of numerical results and user experiences (Creswell & Plano Clark, 2017).

The use of combinatorial methods ensures:

- **Data completeness**. Numbers capture general trends, while narratives offer a depth of understanding.
- **Objectivity and validity**. Quantitative analysis reduces the risk of subjectivity, while qualitative analysis provides an interpretive framework.
- **Better planning and policy**. The information collected supports better decisions to improve eDea.

6. Evaluation activities

The evaluation under the eDea project focuses on the pilot use of all results of the research project, including:

- The methodology of producing innovation through design thinking.
- The **digital platform and** design thinking actions.
- The **supporting content** and user manual.

The evaluation is carried out with representative groups of the target group to produce helpful feedback that will be incorporated into the final versions of the project to meet users' needs (Scriven, 1991; Wiliam, 2011).

6.1 Evaluation activities

Evaluation activities will be organised through:

- Learning experiments.
- Reviews.
- Observations.

6.1.1 Learning experiments: a systematic approach

The concept of learning experiment is a term found in educational research literature that describes the direct involvement of participants in realistic educational activities (Kolb, 1984; Barab & Squire, 2004).

The use of learning experiments in eDea aims to:

- The comparative evaluation of the project results in actual conditions.
- **Generating feedback** from their development in educational contexts.
- Ensuring relevant and objective feedback (Cohen, Manion, & Morrison, 2018).

6.2 Trial participants

During the learning experiments, participants will:

- Be informed about the eDea project, its objectives and activities.
- Use the eDea digital intervention for innovation.
- Share their experiences and suggest improvements in reflection sessions (Kolb & Kolb, 2005).

The external user groups that will participate in the evaluation include:

Participants	Role in evaluation
70 students of the University of Thessaly	Evaluation of the learning application from the perspective of the software engineer.
70 students of the University of the Aegean	Assessment of the learning application from the perspective of the product and systems design engineer.
Clients of Design4Future & Butlair	Analysis of the platform's usability in real business environments.

Table 3. Participants in the pilot use and evaluation of eDea.

6.3 Continuous feedback and increments

Feedback is collected from the initial stages of design, including:

- **The design of the learning scenarios** integrated into the digital platform.
- **The basic functionality of the platform**.

External user groups will pilot the initial version of the application as part of the design processes. Feedback will be incorporated into subsequent versions of the platform, thus ensuring an incremental and iterative development approach (Nielsen, 1993; Norman, 2013).

This process is repeated throughout implementation, allowing continuous improvement of the digital application's functionality and efficiency (Shneiderman et al., 2016).

6.4 Internal reviews and partner cooperation

In addition to testing with external users, internal review activities will occur between the project partners. During these project meetings, the partners will provide feedback on the results produced, contributing to the improvement and strategic adaptation of the project to the needs of users and the market (Patton, 2002).

7. Assessment tools

In the evaluation of eDea, various assessment tools will be used to collect qualitative and quantitative data and assess the effectiveness, acceptability, and relevance of the proposed learning intervention. The selection of tools is based on internationally recognised assessment methodologies in educational research and design thinking (Patton, 2002; Creswell & Plano Clark, 2017).

The evaluation tools that will be used are:

- **Focus groups**. Focus groups are a qualitative data collection method, including group interviews that explore participants' attitudes, perceptions, and experiences (Krueger & Casey, 2015). This method is beneficial for understanding how users experience the eDea digital learning intervention.

In eDea, focus groups will collect feedback on the proposed approach's advantages and apply gamification and problem-based learning (PBL) to develop 21st-century skills (Deterding et al., 2011; Barrows, 1986).

- **Interviews or questionnaires**. Interviews or questionnaires are fundamental tools for collecting both qualitative and quantitative data. Interviews allow in-depth analysis of user experiences, while questionnaires can provide structured feedback and be used for statistical data analysis (Cohen, Manion, & Morrison, 2018). The questionnaires will assess various dimensions of the learning experience, such as perceived usefulness (Davis, 1989), perceived ease of use (Venkatesh & Davis, 2000), and satisfaction with the learning experience (Wiliam, 2011).
- **Remark**. Observation is an important data collection technique in evaluating user experience (UX), as it allows researchers to record participants' physical reactions and behaviours in real time (Nielsen, 1993).

In eDea, the "Fly on the Wall" method will be applied – an approach in which researchers observe users in their natural environment, recording interactions, problems and emotional reactions when using the platform (Brown, 2009; Shneiderman et al., 2016).

The observation will help identify potential usability barriers and incorporate the findings into the final eDea deliverables, improving the effectiveness of the learning intervention.

The exact combination of tools to be used in the assessment will be tailored to the needs of each assessment site. The aim will be to:

- Support existing skills development practices.
- It provides the desired feedback without disrupting the actions of participants.
- Ensure the validity and reliability of results (Guba & Lincoln, 1989).

8. Formative quality assessment process and results

For each partner where evaluation activities were carried out, a report was produced describing the groups involved, the evaluation tasks performed, and the results obtained.

The individual evaluation reports shall include information on the evaluation framework, participants, activities carried out, and qualitative and quantitative feedback.

This section presents the results of the qualitative and quantitative evaluation of all project partners, namely the University of Thessaly, the University of the Aegean, Butlair, and Design4Future. Both in the university partners and in the companies involved in the implementation of the project, the objective of the evaluation was to produce real-world user feedback in innovation production environments, as well as both learning and design environments in companies. The evaluation was formative, i.e., the results were integrated into the implementation and results of the project gradually and in real-time to better address the needs of users active in innovation projects.

The evaluation was carried out in 2 phases, particularly in universities:

- The first phase occurred in the spring semester of 2023 – 2024.
- The second phase occurred in the winter semester of 2024 – 2025.

Evaluation activities and results are presented below:

- The qualitative evaluation of each partner.
- Quantitative evaluation through questionnaires.

At the end of the module, the results of the cumulative evaluation at the end of the project implementation are presented.

8.1 University of Thessaly

The University is the only higher education institution in central Greece, specifically in the Thessaly area. It emerged from the merger of three other institutions and became the third-largest university in the country. The University has 37 departments geographically distributed in Volos, Larissa, Karditsa, Trikala, and Lamia. It enrolls 40,000 students.

The main assessment area will be the Department of Electrical and Computer Engineering. The department organically belongs to the School of Engineering. It enrols 1,000 students and employs 25 lecturers. The department aims to encourage

students' innovation to be active professionals and citizens in the future, contributing to growth, addressing the challenges of industry and society, and contributing to social cohesion.

The evaluation activities were carried out within the framework of the official courses of the department's undergraduate and postgraduate studies program. The participants were summarised as follows:

- In phase 1, which took place in the spring semester of 2023 – 2024, 150 students participated in the courses Architecture and Game Development and Serious Games.
- In phase 2, which took place in the winter semester of 2024 – 2025, 200 students participated in the courses Education Technologies, Design Thinking, and Advanced Software Design Topics.

After completing the work, the participants completed a questionnaire to evaluate the platform quantitatively and qualitatively.

Below is a description of the courses, the participants, the evaluation activities with student participation, and the feedback.

8.1.1 Game Architecture and Development

8.1.1.1 Course description

The course is taught in the 4th year of undergraduate studies of the Department of Electrical and Computer Engineering of the University of Thessaly. It concerns the design, implementation, and evaluation processes of digital games and serious digital games, i.e., games developed as learning tools. The course deals with the following topics:

- Play and structured games.
- Game design.
- Implementation of games.
- Research topics.

The course analyses the theory and practices necessary to understand, analyse, design, develop, and evaluate serious digital games.

Upon completion of the course, participants can:

- Understand concepts and methods of designing and implementing digital and learning digital games.

- Apply methods and procedures related to the conception, design, implementation, and evaluation of a digital or learning digital game.
- Use digital game development environments.
- Understand research issues in designing, implementing, and learning digital games.

8.1.1.2 Description of participants

The evaluation in the course Game Design and Development took place in the spring semester of the academic year 2023 – 2024. A total of 140 students attended. The students' participation occurred in the context of mandatory projects for designing and implementing digital games that contribute to the final grade.

8.1.1.3 Description of activities and use of the eDea solution

The students used the digital platform eDea in the context of compulsory assignments related to the design and technical implementation through the programming of learning digital games. Students worked in groups of up to 7 people. 27 teams were formed.

For the course's collaboration needs, an activity on the eDea digital platform guided students in designing and developing the learning digital game using design thinking processes that contribute to the exchange and building of ideas in teams. The structure of the activity through the digital platform enabled more significant interaction using multimedia presentations and the exchange of ideas. The structure of the activity is shown below:

Step 1. Presentation of the problem

The students had access to written instructions that presented the challenge of the task, i.e., designing and developing a digital game for learning. In addition, they had the opportunity to watch videos that presented the advantages of digital games for learning or fun. The students accessed the videos through the digital platform eDea, which allows presentations with text and images, videos, and layouts.

Step 2. User needs analysis

The students analysed users' needs. They answered questions about the desired audience that will receive their digital game, age, inclusion, user characteristics, actions and challenges of interest to users, and specific characteristics that make them different from other groups.

Step 3. Game world design

The students collaborated on the design of the world of digital gaming. This included the physical dimension, including dimensions and rules of physics. The time dimension, i.e. whether the passage of time in digital gaming affects the user experience. The environmental dimension, i.e. the space of the imaginary world, includes values and beliefs, professions, aesthetics, style, and mood. The emotional dimension, i.e. the emotions that the game seeks to stimulate. Moreover, the moral dimension is the rules of behaviour in the game world.

Step 4. Story design

The students designed the story of the digital game, which helps maintain user interest and a sense of progress. They were based on the hero's journey model presented by Vogler and Campbell and used in many stories of the modern and ancient world. The students were asked to decide whether the story is linear or branched, how many possible endings it will have, how it will evolve, and whether to use elements of digital storytelling, such as text, dialogue, video, and more.

Step 5. Character design

The students designed the game's characters. These included the main protagonist (avatar) that the player uses to interact with the game world and other characters with whom the user interacts within the game's story.

Step 6. Design gamification mechanisms

The students designed the game's mechanisms. This included the rules of game physics, the economy, i.e., the rules for importing, exchanging, and removing resources from the world of gambling, progress through levels, chapters, history, and more, and socialisation, i.e., communication with other players if this is provided for in the gaming world.

Step 7. Classroom presentation

The students presented their work results in class for the benefit of their fellow students and received feedback.

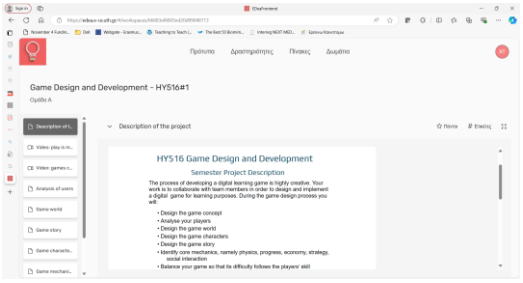
Examples of games developed as part of the pilot use of the eDea digital platform include:

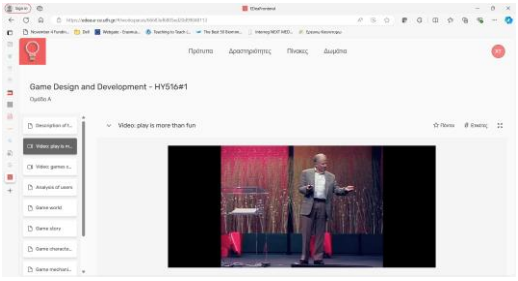
- Development of geography knowledge.
- Raising awareness about healthy eating.
- Strategy games.
- Adventure games.
- Competitive games.

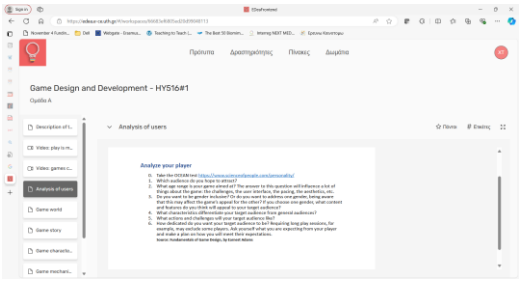
- Explore three-dimensional worlds through adventure and role-playing.
- Explore mysteries and detective games.
- Memory development and retention.
- Challenges of observation and orientation.
- Space exploration.
- Action games combined with knowledge development.
- Development of knowledge of electronic circuits.
- And more.

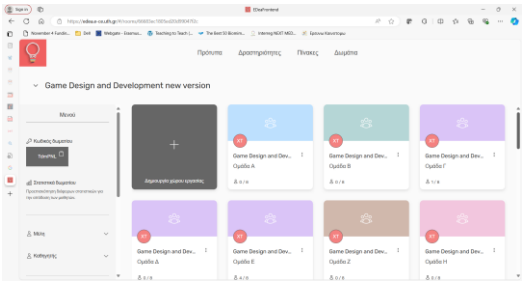
The activity structure within the eDea digital platform is shown below, along with excerpts and images from the students' digital collaboration spaces where they present their ideas for the digital game they designed and photos from the students' presentations in class.

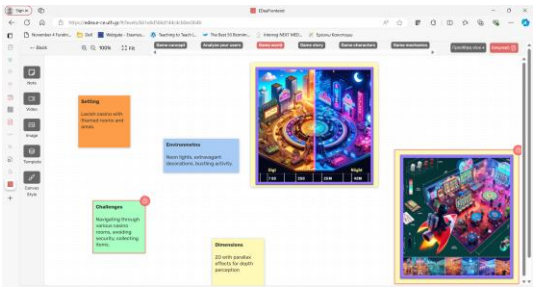
Finally, the students answered questionnaires about the functionality and usability of the eDea digital platform. Answers are detailed at the end of this technical report.

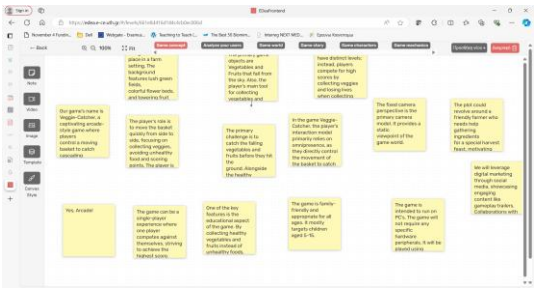












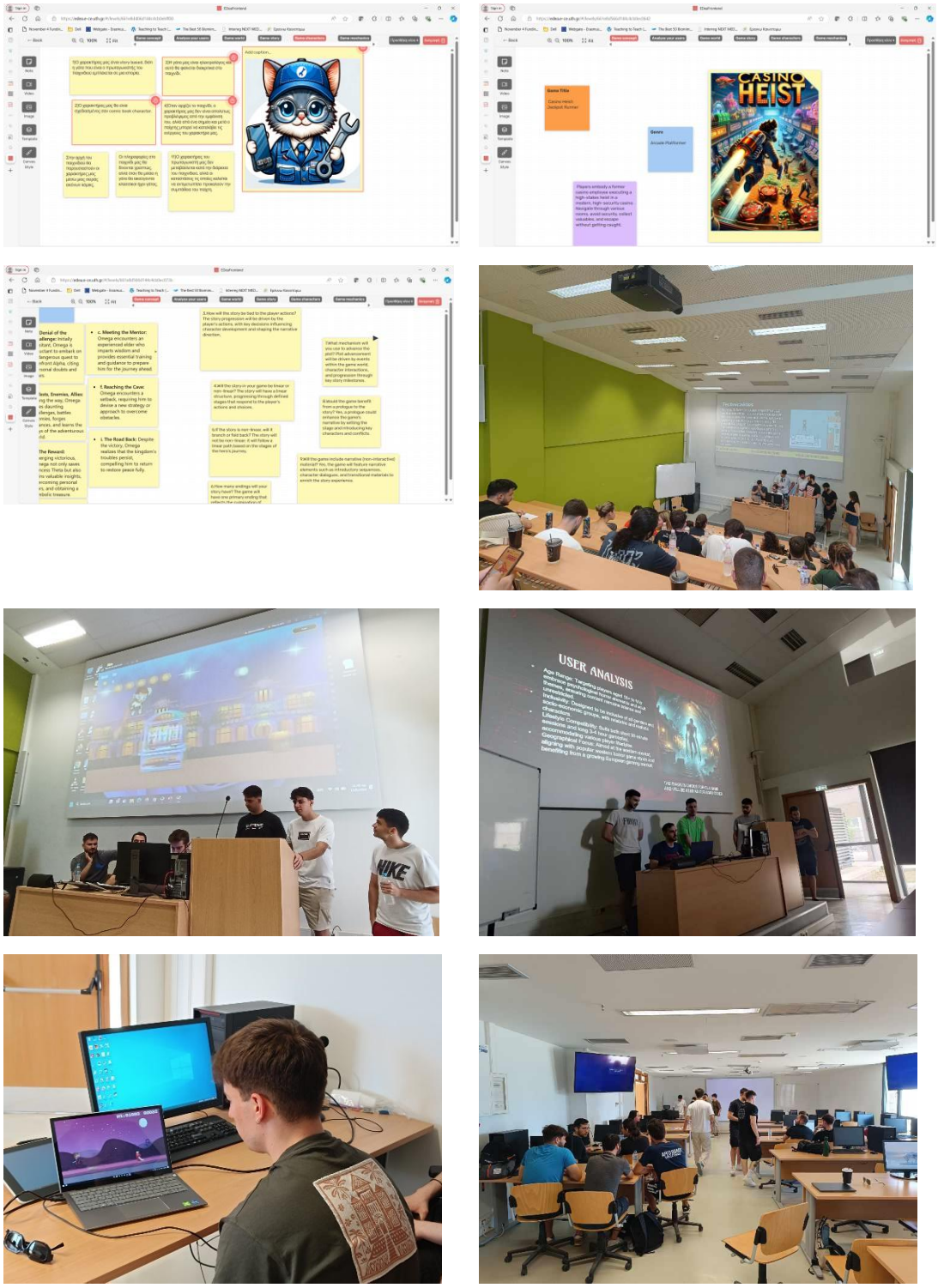


Figure 1. Pilot use of the eDea digital platform in the course Game Design and Development, University of Thessaly. Structure of the activity within the digital platform, images from the students' digital collaboration spaces, and photos from the final presentations.

8.1.2 Serious Games

8.1.2.1 Description of the course

The course is taught in the postgraduate program Applied Informatics of the Department of Electrical and Computer Engineering of the University of Thessaly. The course describes concepts and methods to understand, design, implement, and apply learning and digital learning games to learning processes. Specifically, it includes an introduction to digital games, emerging methodologies of active learning and learning through experience, emerging methodologies of exploratory and problem-based learning, serious games, game design, gamification, game elements, game mechanics, applications of learning games in broader learning processes, and games for specific purposes.

Upon completion of the course, participants can:

- Understand concepts related to learning games and digital learning games as well as broader gamification processes and their benefits in learning processes.
- Understand learning methodologies related to active and exploratory learning, learning through experience, and learning through learning games.
- Apply learning and digital learning games as tools in broad learning processes to meet learning needs.
- Apply practical methods and procedures for the conception, design, and implementation of learning and digital learning games.

8.1.2.2 Description of participants

The assessment in the course Serious Games took place in the spring semester of the academic year 2023 – 2024. 11 students participated. The students' participation took place in the context of mandatory design and implementation of learning digital games that contributed to forming the final grade.

8.1.2.3 Description of activities and use of the eDea solution

The projects developed by the students concerned the design and technical implementation through digital or physical prototypes of learning digital games. The students used the eDea digital platform and collaborated in 3 groups of up to 4 people. The design activity used in the course was the same as described above for the course Architecture and Game Development, consisting of 7 steps that included problem investigation, user needs analysis, world design, story design, character design, gamification mechanism design, and prototype design (see section *10.1.1 Game Architecture and Development*).

The assignments developed by the students included serious games for:

- Preparing for earthquakes.
- Development of skills for safe internet browsing.
- Exploration of lost Atlantis.

Below is the activity structure within the eDea digital platform, along with excerpts and images from the students' digital collaboration spaces, where they present their ideas for the digital game they design.

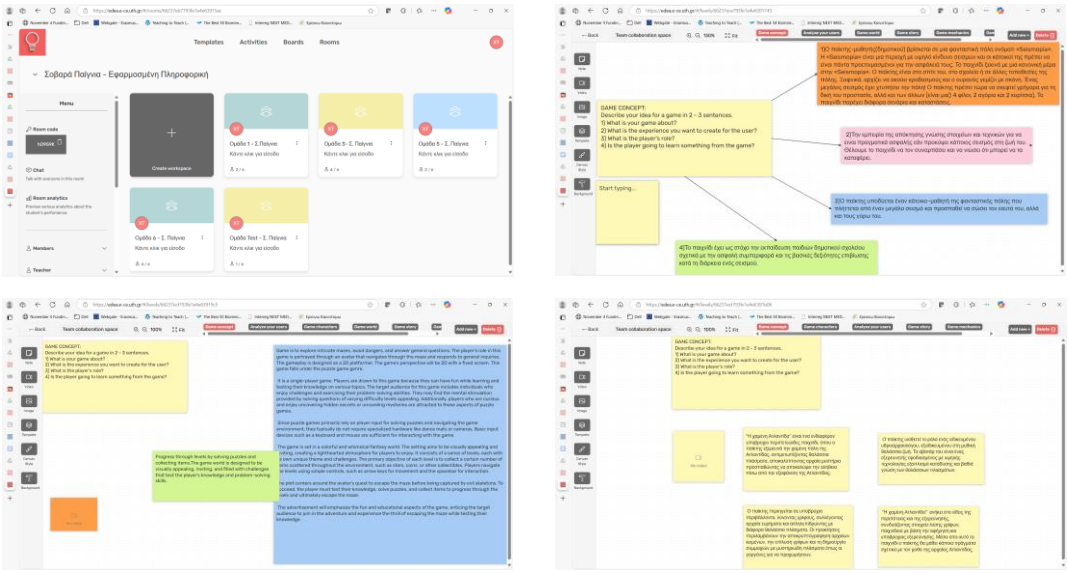


Figure 2. Pilot use of the eDea digital platform in the course Serious Games, University of Thessaly. Activity structure within the digital platform and images from the students' digital collaboration spaces.

Finally, the students answered questionnaires about the functionality and usability of the eDea digital platform. Answers are detailed at the end of this technical report.

8.1.3 Design Thinking

8.1.3.1 Course description

The course is taught in the 5th year of undergraduate studies at the Department of Electrical and Computer Engineering of the University of Thessaly. It focuses on design thinking as a problem-solving approach based on understanding users' real needs and developing innovative solutions. It examines how design thinking can be applied to the design of products, services, and processes and its importance for entrepreneurship and social entrepreneurship.

The course deals with the following topics:

- Basic concepts of design thinking.
- Troubleshooting design through design thinking.

- Benefits of design thinking in entrepreneurship and society.
- Problem investigation and empathy processes.
- Procedures for defining problems based on real needs.
- Ideation and production of solutions.
- Prototyping design and solution evaluation.
- Applications of design thinking to real problems.

The course combines theoretical knowledge and practical applications, focusing on designing people-centred solutions to create innovative and sustainable interventions that bring about positive changes in industry and society.

Upon completion of the course, participants can:

- Understand the meaning and importance of design thinking.
- Understand the benefits of design thinking for entrepreneurship and the development of products, services and processes.
- Know and apply the basic steps of design thinking: empathy, problem statement, ideation, prototype design, and evaluation.
- To develop innovative solutions that meet user needs through human-centred methodologies.
- Apply design thinking principles to real problems, proposing solutions that can lead to positive changes in the business and social sectors.

8.1.3.2 Description of participants

The assessment in the Design Thinking course took place in the winter semester of the academic year 2024 – 2025, and approximately 100 students participated. Student participation was based on compulsory assignments that included ideation, prototyping, and solution evaluation activities, which contributed to the final grade.

8.1.3.3 Description of activities and use of the eDea solution

The papers developed by the students concerned the design of solutions through technology to address the challenges of the 21st century, and specifically the 17 UN Sustainability Goals (2024).

The students collaborated in groups of up to 6 people using the eDea digital platform. 19 teams were formed.

The students' work was based on a learning activity developed within the eDea platform for the course. The structure of the activity is shown below:

Step 1. Creativity

The students carried out exercises to encourage creativity and create a sense of teamwork.

Step 2. Investigate a problem

Students explored the topic of sustainability by searching for photos, videos, scientific articles, media articles, and more.

Step 3. Interviews

The students designed and conducted interviews with typical users to highlight and analyse their needs. During the interview planning, they developed questions to create a sense of trust in the interviewee, promote discussion, and delve into points of interest. The students conducted two interviews and presented the results through a "user persona," i.e., a needs mapping. The user persona is not a real person. On the contrary, he is an imaginary person who gathers the characteristics of the average user.

Step 4: Define a problem

The students redefined the problem and chose to focus on using a phrase of the form: “How could we design a solution that ... be useful to the user group ...”.

Step 5. Ideation

The students carried out a series of ideation exercises to compose an innovative solution to the problem of their choice. They introduced ideas with high cost, low cost, and the use of "magic" (code for technology). They looked for ideas in existing solutions. They engaged in reverse ideation, pondering what would make the problem worse. They looked for correlations between different ideas. They tried to think of how a particular person of their choice, such as a parent, teacher, or scientist, would solve the problem.

Step 6. Evaluation

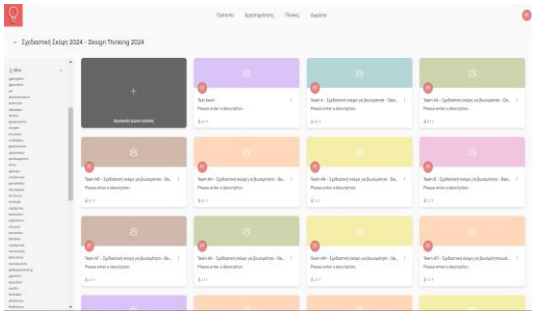
The students evaluated their ideas using a 2-dimensional table to correlate the innovation and feasibility of each possible solution. They chose an innovative but feasible solution with today's technology to turn it into a prototype.

Step 7. Prototyping

The students designed prototypes for the proposed solution, which they presented to the class. For the design of prototypes, they applied techniques such as describing their idea on posters, storyboards, or physical prototypes.

Examples of projects developed:

- Dealing with fast fashion.
- Protection of biodiversity at sea.
- Clean energy.
- Dealing with pesticides.
- Development of green infrastructure.
- Tackling plastic pollution.
- Collection of plastics from the sea.
- Promotion of biodegradable materials.
- Reduction of household overconsumption.
- Tackling air pollution.
- Addressing challenges for people with disabilities.
- Dealing with electronic waste.
- Pollution of the aquatic environment.



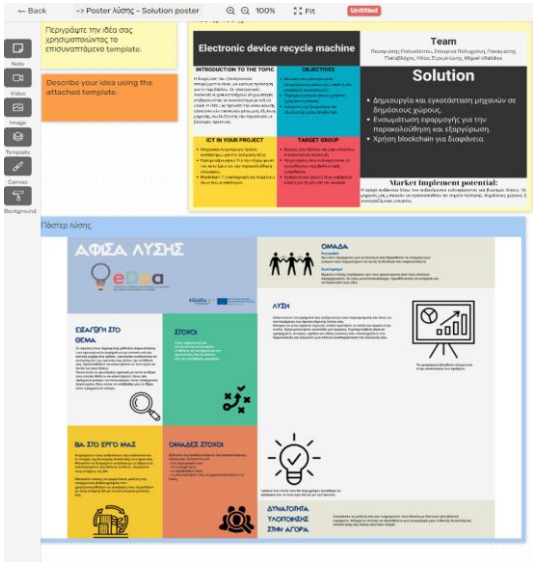


Figure 3. Pilot use of the eDea digital platform in the course Design Thinking, University of Thessaly. Structure of the activity within the digital platform, images from the students' digital collaboration spaces, and photos from the final presentations.

8.1.4 Education Technologies

8.1.4.1 Course description

The course is taught in the 3rd year of undergraduate studies of the Department of Electrical and Computer Engineering of the University of Thessaly. The course focuses on the use of technology as an educational tool in lifelong learning processes addressed to broad target groups, including preschool students, primary school students, high school students, high school students, vocational training students and adults including professionals. The course deals with the following topics:

- Learning methodologies, such as active, problem-centered, collaborative, and game-based learning.
- Presentation of learning applications and services.
- Technology and learning support for vulnerable groups.
- Development of transversal skills through technology and pedagogical theories.
- Design of digital learning applications and services.

- Research activities and good practices.

Overall, the course combines theoretical approaches with practical applications, examining how technology can enhance the learning process for different groups and contexts.

Upon completion of the course, participants can:

- Apply learning needs analysis of specific groups in specific learning contexts.
- Know and understand concepts related to transversal skills such as analytical thinking, critical thinking, entrepreneurial thinking, problem-solving ability, ability to work in teams, and ability to work in an international environment.
- Know, understand and be able to apply learning assessment processes based on learning objectives.
- Understand trends and new fields of research in education technologies, such as gamification and learning analytics.
- To develop and present to an audience comprehensive proposals for positive interventions through computer technology towards addressing specific learning needs and meeting specific goals.

8.1.4.2 Description of participants

The assessment in the course Education Technologies took place in the winter semester of the academic year 2024 – 2025, and approximately 100 students participated. Students' participation occurred in the context of mandatory digital learning intervention projects that contributed to forming the final grade.

8.1.4.3 Description of activities and use of the eDea solution

The work focused on designing innovative digital solutions, including applications and services, that can enrich the learning experiences of different user groups.

The students collaborated in groups of up to 6 people using the eDea digital platform. A total of 16 teams were formed.

The students' work was based on a learning activity developed within the eDea platform for the course. The structure of the activity is shown below:

Step 1. Team logo design

To encourage team spirit, the students decided on a team name and designed a logo. This action contributes to the members' sense of identity.

Step 2. Problem definition

The students redefined the problem they chose to focus on using a phrase: "how could we ... design a solution that ... be useful to the user group ...'.

Step 3. User needs analysis

The students analysed users' wishes by recording at least 10 different needs.

Step 4. Analysis of other existing relevant digital solutions

The students searched online and described other existing digital-related solutions with images and text.

Step 5. Description of the proposed solution

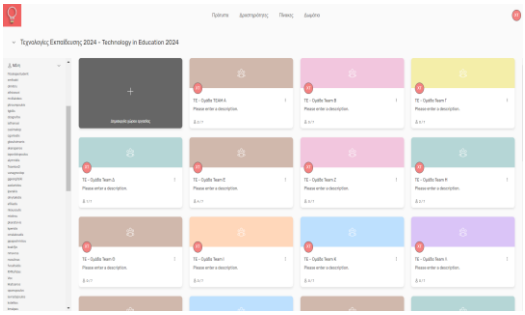
The students described the basic features of the proposed solution with text, diagrams, and images.

Step 6. Comparative effect of the proposed digital solution

The students described the comparative advantage of the proposed solution over other existing ones. They presented their solution to the class.

Examples of projects developed:

- Digital services that help pupils and students choose programmes of study.
- Digital application for the psychological support of students.
- Digital applications for personalized learning.
- Digital application for learning geography.
- Digital laboratories for science.
- Digital application for the development of problem-solving skills.
- Digital application for exploring different professional roles.
- Smart digital app for notes.
- Assistive digital technologies for language learning.
- Digital application for deepening knowledge.



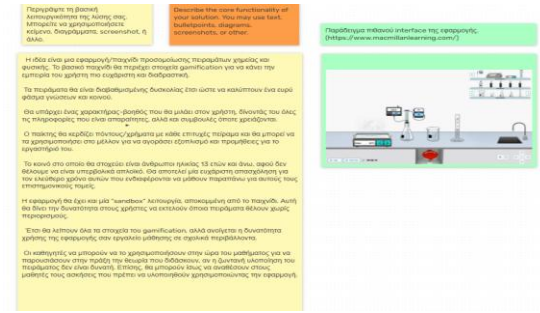


Figure 4. Pilot use of the eDea digital platform in the course Education Technologies, University of Thessaly. Structure of the activity within the digital platform, images from the students' digital collaboration spaces, and photos from the final presentations.

8.1.5 Advanced Software Design Topics

8.1.5.1 Course description

The course is taught in the postgraduate program Science and Technology of Electrical and Computer Engineering of the Department of Electrical and Computer Engineering of the University of Thessaly. It focuses on advanced software design topics and offers students the necessary knowledge to develop complex and reliable software systems.

The course deals with the following topics:

- Software development methods.
- Agile design.
- Software project management.
- Systems modeling.
- Systems architecture.
- Software design with components.

- Design for reuse.

Students have the opportunity to participate in team projects, gaining practical experience in the technical and administrative issues of software development and familiarising themselves with modern software development and management tools.

Upon completion of the course, participants can:

- Identify the target groups of a software system and analyse their needs.
- Export and record specifications for software systems.
- Effectively manage implementation time and resources.
- Implement software systems.
- Understand basic design concepts for critical systems and reuse.
- Design and develop systems systems.

8.1.5.2 Description of participants

The evaluation in the Advanced Topics in Software Design course took place in the winter semester of the academic year 2024 – 2025, and 7 students participated. The assessment is based on group projects and exams, where students are asked to apply their knowledge to real software development scenarios, focusing on technical excellence and system security.

8.1.5.3 Description of activities and use of the eDea solution

Students worked on designing and implementing software systems that promote quality of life. They worked in groups of up to 3 people. Three groups were formed.

The students' work was based on a learning activity developed within the eDea platform for the course. The structure of the activity is shown below:

Step 1. Group name and logo

To encourage team spirit, the students decided on a team name and designed a logo. This action contributes to the members' sense of identity.

Step 2. Purpose of software

The students defined the problem they chose to focus on using the phrase, "how could we design a solution that ... be useful to the user group?"

Step 3. Analysis of other existing relevant digital solutions

The students searched online and described other existing digital-related solutions with images and text.

Step 4. Interviews

The students designed and conducted interviews with real users to record and analyse needs. The design included questions for building trust with the interviewee, deepening, progressing, and reflecting.

Step 5. User needs analysis

The students used the results of the interviews to record and analyse user needs.

Step 6. Basic functionality of the proposed digital solution

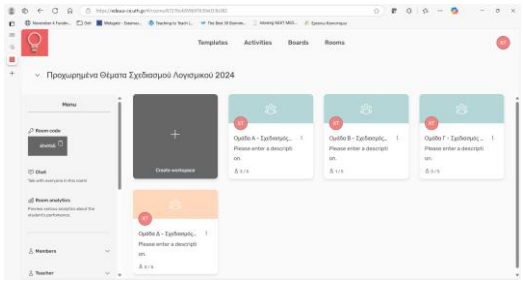
The students described the basic features of the proposed solution with text, diagrams, and images.

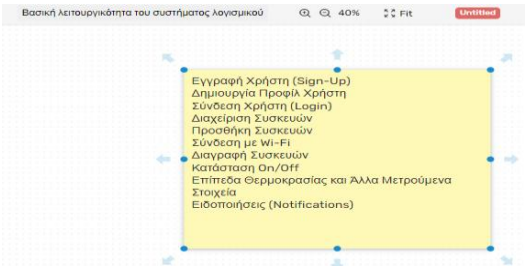
Step 7. Comparative advantage of the proposed digital solution

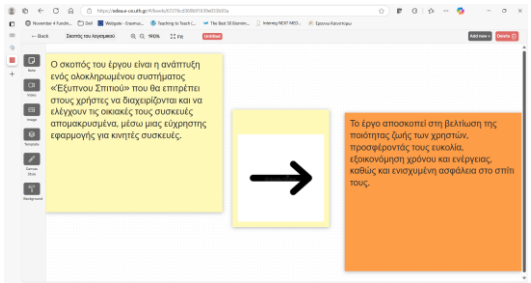
The students described the comparative advantage of the proposed solution over other existing ones. They presented their solution to the class.

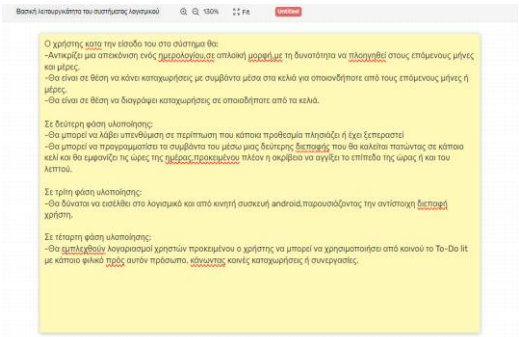
Examples of tasks developed:

- Smart home.
- Digital calendar.
- Production management platform, from raw materials to the shelf.









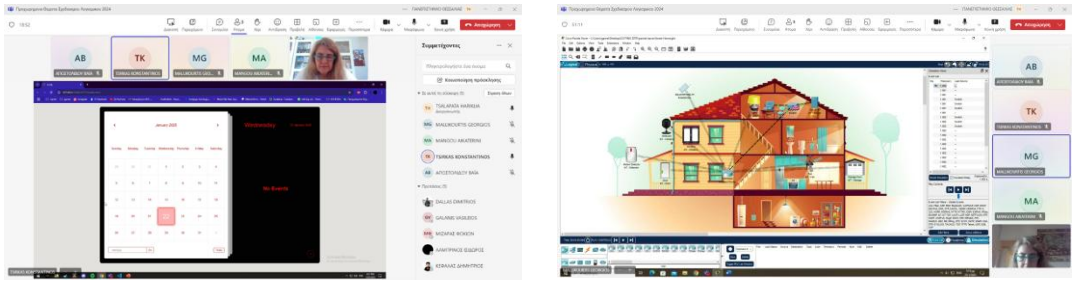


Figure 5. Pilot use of the eDea digital platform in the course Advanced Topics in Software Design, University of Thessaly. Structure of the activity within the digital platform, images from the students' digital collaboration spaces, and photos from the final presentations.

8.1.6 Qualitative evaluation analysis at the University of Thessaly

The qualitative evaluation at the University of Thessaly involved more than 350 students of the Department of Electrical and Computer Engineering. The participants worked in teams applying the eDea digital intervention to generate innovation in actual learning conditions in the context of formal curriculum courses. The qualitative assessment applied user observation during the use of the eDea solution and generated feedback summarised below:

- Participants successfully used the eDea digital solution to collaborate in groups inside and outside the classroom. The eDea digital platform has enabled collaboration on innovation actions anywhere, anytime. This capability is important as innovation and ideas contributed by team members can be generated at any time.
- The digital platform provides a collaboration interface that allows users to see other team members' contributions synchronously in real-time, i.e., when all team members use the platform simultaneously and asynchronously, i.e., in their own timely time. It uses a hybrid model that combines synchronous and asynchronous innovation, offering flexibility and continuous access. The students found the platform to be handy and contribute to collaboration.
- The platform offers rich functionality to express creativity through text, images, and videos to enhance the creative process and share ideas and knowledge in a vivid way.
- The innovation of the digital solution consists of collective intelligence mechanisms based on design thinking (Brown, 2009). Unlike traditional static platforms for exchanging ideas, eDea adopts a fluid, participatory and interactive system, where innovation is not developed individually but

collectively (Liedtka, 2015) and is based on principles of innovation crowdsourcing (Chesbrough, 2003).

- In addition, the digital platform offers the possibility of organising design thinking workshops. It supports the implementation of guided learning based on frameworks such as Double Diamond (Design Council, 2005) and the Stanford d.school model (Plattner et al., 2009) (eDea Output 1, Design Thinking Methodological Framework, 2023). It helps teams follow specific stages and methodologies without requiring prior expertise.
- Gamification functionality, such as likes, contributes to increasing user engagement (Deterding et al., 2011), as shown by their involvement throughout the semester in implementing innovative projects that students presented in class for the benefit of the whole.
- Suggestions for future improvements to the digital platform include minor additions to the user interface such as undo, user instructions, and accessibility across devices (see how they were integrated into the implementation in section *10. Integrating formative assessment feedback into implementation*).

8.2 University of the Aegean

The University of the Aegean is a public university founded in 1984 and based in Mytilene on Lesvos. It has 18 departments distributed geographically in six islands: Lesvos, Limnos, Rhodes, Samos, Syros, and Chios, and in two administrative regions: the North Aegean and South Aegean.

The evaluation will occur at the Department of Product and Systems Design Engineering of the School of Engineering, based in Hermoupolis, Syros. The department has about 600 active undergraduate students and offers a distance-learning postgraduate program.

The evaluation activities were carried out primarily in the context of formal courses in the form of studios in the undergraduate curriculum. During their studies, students are required to attend a set of Studio-type courses. They are courses in which students are trained in applying prerequisites and specialised knowledge to design a "product". Through this process, students acquire applied skills and become familiar with theoretical, methodological, and technological tools necessary for a modern product and systems design engineer. Secondarily, additional participating postgraduate students and PhD candidates of the department will be sought, if needed. The design of the experiments foresees that they will be completed within the spring semester of 2023 - 2024, but if, for any reason, it is not possible to have a sufficient number of participants, the experiments will continue in the winter semester of 2024-2025.

Below is a description of the courses from which students will be drawn to participate in evaluating the foreseen activities.

The evaluation of the platform also involved usability research and was carried out with the participation of students from the Department of Product and Systems Design Engineering. In total, 78 students participated:

- Phase 1, which took place in the spring semester of 2023 – 2024, involved 28 students in Studio 4 and Studio 6.
- Phase 2, which took place in the winter semester of 2024 – 2025, involved 50 students in Studio 3 and Studio 7c.

The participants were less familiar with design thinking, as reflected in their answers to the relevant questionnaire. Demographic data on the participant's age, gender, year of study, and previous work experience were collected to investigate possible correlations with their perceptions of the platform.

During the evaluation, participants were asked to use the eDea platform to perform specific design tasks based on the training scenarios developed within the eDea project. After completing the work, the participants completed a questionnaire for the quantitative and qualitative evaluation of the platform. Participants were given a printed questionnaire for greater freedom and development in open-ended answers without digital data restrictions. The results are described at the end of the University of the Aegean evaluation module.

8.2.1 Studio 4 - Concept Design

8.2.1.1 Course description

The main objective of the Studio 4 course is to introduce methodological, collaborative design in the laboratory (Studio-Based Learning for Design) through implementing a design project (Project-Based Learning for Design). The course focuses on producing design knowledge required in the early stages of the design process, mainly in the conceptualisation phase. The course aims to integrate parts of design theory (design methodologies: theoretical tools and methods) into the practical use of traditional and new media for training in creating design products.

Emphasis is placed on learning conceptual tools for capturing design ideas (concept design and development) and techniques for capturing them through 3D design using analogue and digital media (clay/paper modelling, maquette development - 3D modelling, texturing and lighting, rendering tools and methods, rapid prototyping). Specific objectives of the course are: Methodological design with emphasis on the implementation of design objectives, Introduction to design through the understanding of user needs and requirements, Introduction to conceptual design

with emphasis on functionality, usability, aesthetic quality, and technical excellence, Mapping of design ideas in three dimensions with traditional and new media. Evaluation of design ideas.

Students are introduced to an understanding of more complex issues related to solving design problems, which is based on the understanding and experience they have gained in older design problems in their early years of study while supported by advanced-level scientific textbooks. Also, the teaching includes views arising from modern developments in methodological problem-solving related to the design of products, systems and services at the conceptual design stage.

Upon completion of the course, students can:

- Understand the stage of conceptual design using creative and methodological tools.
- Organise collaborative design in teams.
- Adequately handle tools and methods for developing and designing products, systems, and services.
- Realise the role of multiple functions in creating a new product, system, and service.
- Delve into the knowledge produced by other course groups.
- Present and defend their design ideas.
- Work in interdisciplinary environments.
- Autonomously manage knowledge and adapt to complex and not clearly defined design problems.

8.2.1.2 Description of participants

Studio 4—Concept Design assessment took place in the spring semester of the academic year 2023 – 2024. It was the first evaluation phase at the University of the Aegean. Two student groups and 4 studio participants, for a total of 10 participants, participated in the evaluation on a trial basis. The students' participation took place in the context of mandatory design and analysis projects that contribute to the final grade. In contrast, participation in the final evaluation gave a grading bonus to the participating students.

8.2.1.3 Description of activities and use of the eDea solution

The students used the digital platform eDea in the context of compulsory assignments related to conceptual design and analysis of products for the home, with free choice

of topic. The students worked in groups of 5-6 people, creating 10 teams in total, 3 of which participated in the pilot use of the eDea platform.

For collaboration needs within the course, an activity on the eDea digital platform guided students through conceptual design, using design thinking processes that contribute to the exchange and building of ideas in teams. The structure of the activity through the digital platform allowed for greater interaction in presentations and the exchange of ideas. The structure of the activity is shown below:

Step 1. Presentation of the problem

Students had access to written instructions that presented the challenge of the task, i.e. the conceptual design and analysis of a product for the home. In addition, they had the opportunity to watch videos presenting examples of product design and analysis for the home.

Step 2. User needs analysis

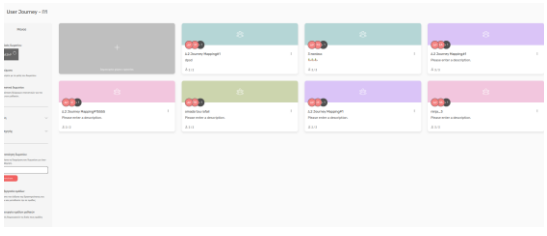
Students analysed user needs. They answered questions about the desired audience that will receive the product, age, inclusion, characteristics of users, actions and challenges that interest users, and special characteristics that make them different from other groups.

Step 3. Product design

The students collaborated on each team's product design, which included prototyping in a circular/feedback process of design thinking. In this phase, ideation, brainstorming, idea evaluation, and prototyping took place, considering the design's functional, conceptual, aesthetic, and ethical dimensions.

Step 4. Classroom presentation

The students presented their work results in class for the benefit of their fellow students and received feedback.



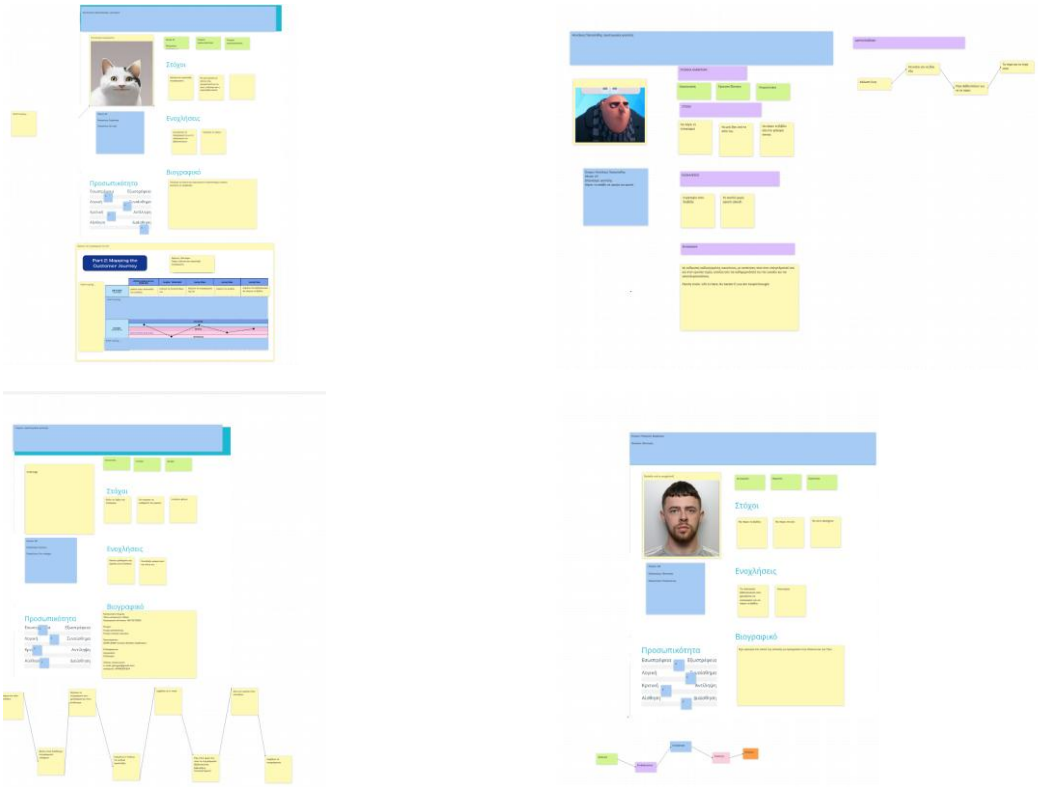


Figure 6. Pilot use of the eDea digital platform in Studio 4. Personaand user journey implementation.

8.2.2 Studio 6 - Product Design II

8.2.2.1 Course description

Industrial product design laboratories are the place where students work interdisciplinary, and applying theoretical and practical knowledge and skills they have acquired, conceive, analyze, and develop innovative and sustainable industrial products and systems.

In Studio VI – Product Design II the degree of difficulty of the design project increases as the objects to be designed have complex functionality and are technologically and constructionally more complex compared to Product Design I. At the same time, greater autonomy is required as the teams undertake to adapt the process to the requirements of their own design project, while greater freedom is given to the formation of the design direction.

The topics of the work concern technology platform products, where, given the technology, an attempt is made to redesign or redefine a cutting-edge product or system. To this end, design teams are invited to research and position themselves on current issues, looking for new user groups, new contexts of use and new needs for everyday technological products that may also include services apart from interaction.

At the same time, the interaction design between the user and the product is part of the integrated design process.

Upon completion of the course, students can:

- Adapt the integrated product design process according to the requirements of a design project.
- Identify new user groups and contexts for developing cutting-edge technological products.
- Prepare a project description to design an innovative product or system (brief).
- Apply reverse engineering techniques.
- Draw up design specifications for products and systems of complex structure and functionality.
- Design and apply techniques of activity observation and field research according to the requirements of the design project.
- Design and implement a physical and digital prototyping program depending on the requirements of the different stages of the process.
- They apply rapid prototyping techniques.
- Apply principles and knowledge of Cognitive Science
- They apply principles and knowledge of Computer Aided Design and Analysis to create high-detail digital assembly models.
- Design product user interaction as part of integrated product design.

8.2.2.2 Description of participants

The assessment in Studio 6—Product Design II took place in the spring semester of the academic year 2023 – 2024. The evaluation involved 3 of the groups participating in Studio 6, with a total of 18 participants. Students' participation was voluntary, but it was done in the context of preparing mandatory design and analysis projects that contribute to the final grade. Participation gave a scoring bonus to the people in the group.

8.2.2.3 Description of activities and use of the eDea solution

The students used the digital platform eDea in the context of compulsory projects related to the conceptual design and analysis of industrial products with user interaction and the use of electronic components, emphasizing industrial design with CAD.

For the course's collaboration needs, each group created its personal canvas on the digital platform eDea, using design thinking processes that contribute to the exchange and building of ideas in groups. The structure of the activity is shown below:

Step 1. Presentation of the problem

Students had access to written instructions describing the task's challenge: conceptualizing and analyzing an industrial product with user interaction and using electronic components. In addition, they had the opportunity to watch videos presenting examples of product design and analysis, emphasising industrial design and CAD.

Step 2. User needs analysis

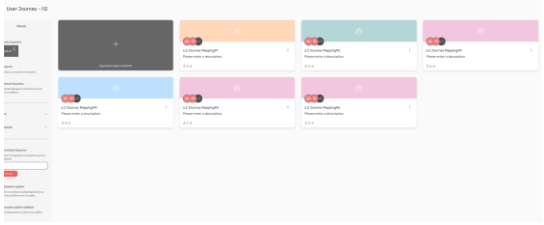
Students analysed user needs. They answered questions about the desired audience that will receive the product, age, inclusion, characteristics of users, actions and challenges that interest users, and special characteristics that make them different from other groups.

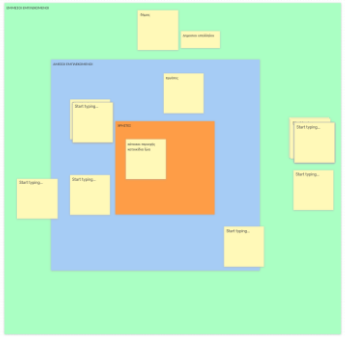
Step 3. Product design

The students collaborated on the design of the product world. This included the functional dimension, including functions and rules of use, the physical dimension, i.e. dimensions, construction materials and ergonomics, and the aesthetic dimension, i.e. the style, colors, and mood of the product.

Step 4. Classroom presentation

The students presented the results of their work to the class receiving feedback from the lecturers.





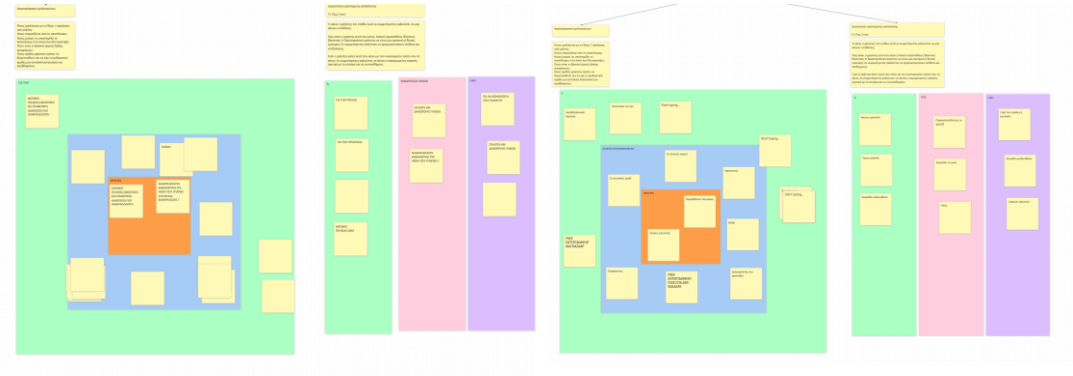


Figure 7. Pilot use of the eDea digital platform in Studio 6. Stakeholder mapping and "what, how, why".

8.2.3 Studio 3 – Ideation

8.2.3.1 Description of the course

The aim of the course is to train students in basic design concepts through the collaborative design process. During the ideation stage, the emphasis is on creative and methodologically documented design, which captures ideas in two-dimensional and three-dimensional space with analogue and digital tools.

The course's primary objectives are to strengthen cognitive processes and exercise technical and aesthetic judgment. This is achieved by educating students in the basic concepts of composing design specifications and drawings to imprint design goals. Design processes are explored as creative and analytical methods and as streamlined practices for investigating the structure and form of the artefact, the process of constructing compositions, the importance of the dynamics of standard morphology, and the handling of materials.

The course's main objective is also to develop skills in representing ideas in two-dimensional and three-dimensional space with the selective use of essential conceptual tools. The capture of ideas will be carried out through analogue and digital tools, which will be presented and explored through exercises in the laboratory (analogue and digital on PC). The design process requires practice in different media (traditional and new) to capture ideas. The topics are explored through drawing, modelling, three-dimensional computer programs, animation, photography, and different design techniques.

Students are introduced to an understanding of issues related to solving design problems, which is not based on their general secondary education but is supported by advanced-level scientific textbooks. The teaching also includes views arising from modern developments in methodological problem-solving related to product and system design.

Upon completion of the course, students can:

- They use the way of thinking, the knowledge about design and the understanding they have acquired in a way corresponding to their professional field while developing critical and design skills that are usually proven by developing and supporting design arguments and solving problems in the context of solving design problems.
- Through the methodological approach to design problems, they acquire the ability to collect and interpret elements that are part of human-centred design to develop and then shape a range of possible options to address the design issues they face.
- They organise information and present multiple ideas and solutions to design problems to specialised and non-specialized audiences.
- Apply design skills and knowledge necessary to tackle complex design problems
- They have gained design autonomy.

8.2.3.2 Description of participants

The assessment in Studio 3—Ideation took place in the winter semester of the academic year 2024 – 2025. A total of 40 students of the Department of Product and Systems Design Engineering participated. The students' participation took place in the context of compulsory group work. Participation in the platform's final evaluation involved a grading bonus for participating students.

8.2.3.3 Description of activities and use of the eDea solution

The students used the digital platform eDea in the context of compulsory assignments related to the production of alternative design proposals (ideation) on several topics related to the life of students at university. The students worked in groups of 5-6 people, creating 10 teams. Of those, 8 teams used the eDea digital platform.

For the needs of collaboration in the course context, the functionality of the digital platform eDea was utilised, encouraging the ideation process and brainstorming with specific techniques that we will analyse below.

Step 1. Presentation of the problem

The students chose one of the following topics, which were the starting point for the creative process:

- The ideal day at university: How students' daily routines could be redesigned to make it more productive and enjoyable.

- University stakeholder ecosystem: Who are all those involved in the university, for example, students, faculty, administrative staff, and others, and how do they interact? How can cooperation and communication between these groups be improved?
- Solutions for student housing: Creating innovative solutions to the student housing problem, considering factors such as cost, comfort, safety and socialisation.
- Redesigning the university library: How could the library become a more modern and attractive space for students to learn and research?
- Coffee break: Design a better coffee/snack experience at university, considering factors such as quality, variety, price, and atmosphere.

Step 2. Collection and organisation of information

The students then used the functions of the eDea platform to organise their information, ideas and observations on their chosen topic. The platform helped to

- Mapping of the basic needs of users (e.g., students). The students interviewed fellow students and recorded their needs on the platform, creating personas.
- Record problems related to the issue. Through the platform, students gathered data on the problems students face in these areas (for example, problems finding housing, difficulties studying in the library, and others).
- Developing alternative ideas for possible solutions using brainstorming techniques. For example, students used the platform's ideation tool to write down all their ideas without limitations, creating many possible solutions.

Step 3. Composition and analysis

Along the way, they further utilised eDea's tools (tables, presentations, task lists) to compose a complete innovation proposal, considering the following principles:

- To meet the needs of a specific group of users, for example, students with disabilities, international students, and others. Students used the experience map tool to better understand specific groups' needs.
- Incorporate elements of sustainability and be environmentally friendly. The platform allowed students to explore alternatives that reduce the environmental footprint of their design proposals.
- Be realistic and applicable in the context of the university. Through the platform, students analysed the university's limitations and possibilities, ensuring that their proposals were realistic and feasible.

Step 4. Presentation and feedback

Finally, the students presented their proposals to the class and received feedback from their fellow students. Thanks to the platform's ease of use, students could present their proposals clearly and receive helpful feedback from their fellow students.

Figure 8. Pilot use of the eDea digital platform in Studio 3. Snapshots from the implementation of Brainstorming.

In summary, the eDea platform facilitated teamwork, information organisation, and the synthesis of innovative ideas. Its use encouraged creativity and allowed students to develop and present their proposals effectively and in an organised manner.

8.2.4 Studio 7c - Service Design

8.2.4.1 Description of the course

The Studio 7c course is one of three parts of the 7x Studios series focused on the direction of Service Design. It is a practical educational process that completes the knowledge and skills students have already acquired in core courses, especially in the 3rd direction (Service Design).

The course's main objective is the practical application of service design methods through designing a specific service related to real-world issues but adapted to a specific studio-type educational process context.

This practical application also deals with issues of user experience and service branding. A key educational step of the process is selecting the topic, which takes place in the context of creative collaboration between trainees and trainers and considers a wide range of limitations and requirements.

Key learning parts of the course are:

- The use of methods and tools to identify the problem space and the different participants in the design problem.
- The creation of "value propositions" based on value in use. The identification of the appropriate design tools for the project.
- The user experience design.
- Branding.
- The use of the generalized iterative process of design, modelling and evaluation based on the well-known participatory action research methodology.

Upon completion of the course, students can:

- They apply design methods to create innovative services.
- Creatively apply service standardization.
- They evaluate prototypes with a focus on the user community.
- They develop business models around value generation in use.

8.2.4.2 Description of participants

The assessment in Studio 7c - Service Design took place in the winter semester of the academic year 2024 – 2025. The evaluation involved 2 teams consisting of 10 students who attended this studio. The students' participation occurred in the context of compulsory design and analysis projects contributing to the final grade.

8.2.4.3 Description of activities and use of the eDea solution

The students used the digital platform eDea in the context of mandatory projects related to the design of services that promote sustainable futures on the island of Syros, with an emphasis on primary production.

For the teams that used the eDea platform, it served as a central repository for research, ideas, and tools, allowing students to:

- Store and share links to articles, studies, and other sources of information about primary production in Syros.
- They analyse the needs and challenges of local producers (farmers, ranchers, fishermen) by creating personas and empathy maps.
- They design various innovative services, utilising brainstorming and SWOT analysis techniques to develop sustainable and realistic solutions.
- Evaluate and prioritise their ideas based on criteria such as feasibility, sustainability, social acceptance, and financial sustainability.

In addition, the eDea platform was used to present and evaluate their proposals, with the members of each team contributing:

Step 1. Needs assessment

The students started by exploring the needs and challenges faced by the actors active in the primary production sector in Syros (farmers, livestock breeders, fishermen) and the possible need to improve the sustainability of their activities. They used eDea tools such as tables and notes to record and organise their collected information.

Step 2. Identification of opportunities

They then used the eDea platform to identify opportunities to create new services that could support the sustainable development of the primary sector on the island. Emphasis was placed on harnessing local resources, promoting social cohesion, and creating new economic opportunities for local communities.

Step 3. Design of services

Based on the findings from the research and analysis, the students designed a series of innovative services, which included but were not limited to:

- Crop monitoring systems using sensors and drones to optimise production and reduce water and fertiliser use.
- Platforms for connecting local producers with tourism businesses and restaurants to promote local products and reduce transport distances.

- Training programs for farmers on sustainable farming practices and new technologies.

Step 4. Evaluation and presentation

Finally, the students presented their ideas and evaluated each proposal's potential success and viability, using the platform's functionality to organise the presentation and collect feedback. The presentation took place both in class and through a poster at an event open to the public.

Figure 9. Pilot use of the eDea digital platform in Studio 7c. Photos from the presentation of poster projects.

8.2.5 Qualitative evaluation analysis at the University of the Aegean

A qualitative evaluation was carried out with open-ended questions, which aimed to highlight the positive points of the digital solution as well as possibilities for improvement and integration of additional functionality. The feedback is analysed below:

- The operation of the digital platform's canvas and the ability to collaborate in real-time emerged as the most interesting and enjoyable elements. Participants particularly appreciated the canvas's flexibility for ideation and organisation of ideas, as well as the sense of collaboration and teamwork offered by the platform.
- The aesthetics of the user interface were pleasant, especially the colours and minimalist design.
- Improvements to the digital platform's user interface include drag and drop functionality on the canvas and tooltips on the user interface for button functionality.
- Regarding additional desired functionality, add more options for shapes, colours, and font styles, as well as the ability to import templates, undo, and draw tools such as freehand drawing, lines, and arrows. In addition, some

participants suggested adding communication functions within the platform (chat, comments) and task management functions (Pomodoro timer).

8.3 Design4Future and Butlair

Butlair is active in the field of user experience design (UX). The company applies design thinking to collaborative co-creation processes with Butlair's customers to develop digital products such as apps, services, and more, emphasising usability. Butlair develops digital services for corporate clients active in fitness, wellness, and health. In particular, digital services and applications contribute to effectively managing exercise programs, customers, and bookings.

Design4Future is active in service design using participatory methods (co-design). Utilising the design thinking methodology, Design4Future applies it to projects to collaborate with companies and organisations to design the services they provide to customers - citizens and the internal processes that support the provision of each service to improve the user experience for both customers and staff. Among Design4Future's clients are large multinational companies such as Deutsche Telekom® and Vodafone®, public organisations such as OKANA, the International University of Thessaloniki, Expertise France, and NGOs such as the international organisation Ashoka®, Organization Earth, etc.

The evaluation activities were carried out with clients and partners of Butlair and Design4Future. Projects requiring interdisciplinary collaboration between project team members were selected. Qualitative methods, including semi-structured interviews, focus groups, and content analysis from participant feedback, were used for evaluation with companies and professionals (Guba & Lincoln, 1989; Kvale, 2007). During the evaluation process with professionals, the following phases were followed:

- Phase 1 asked company representatives to interact with the eDea solution based on scenarios related to their work. A discussion through a semi-structured interview followed this. Specifically, participants are invited to complete specific actions through the platform, such as, for example, simulating the sequence of actions they would do in a project in collaboration with the team or in order to interact and become familiar with the functions offered by the platform. As the user interacts with the platform, the researcher monitors and records his impressions. Then, there is a discussion around the experience of interacting with the platform based on the objectives of the qualitative evaluation presented above.
- In phase 2, the activities focused on adopting the eDea solution in the companies' projects. Specifically, for the companies that continued to use the

eDea solution in their projects, and after the end of the first evaluation cycle, a meeting was held with the companies of the eDea consortium in order to collect more information and better understand the nature of the project in which they used the platform and ways to support the project team, through guidance and consulting interventions by Butlair and Design4Future. At the end of the projects, a discussion took place in focus groups on the overall assessment of the experience.

8.3.1 Participants

To ensure the confidentiality of personal data and data related to their projects, the professionals who participated in the platform's evaluation are not referred to by their names. However, each professional is provided with a brief description of his role in the company, the type of projects in which he participates, and the name of the company in which he works.

8.3.1.1 Criteria for selecting participants

The teams of Design4Future and Butlair developed a list of criteria for selecting the appropriate participants to participate in the evaluation actions of the eDea platform. These criteria are analysed below:

- **Number of participants**. According to the literature and good practices considered when selecting participants, the 5-participant trial reveals about 80% of the problems and needs of the target audience (Nielsen, 2000; Alroobaea & Mayhew, 2014). Adding 1 or 2 more participants can further validate the findings. The evaluation involved 10 professionals and organizations to ensure a thorough evaluation of the system with a satisfactory sample of Greek companies.
- **Degree of familiarity with design thinking**. The assessment involved professionals from different disciplines with varying degrees of familiarity with design thinking. On a scale from 1 (not at all familiar) to 10 (very familiar), participants were asked to determine their degree of familiarity with design thinking. Professionals who rated themselves a score of 1 to 6 are categorised as non-expert users. Similarly, those who rate themselves a score of 7 to 10 are categorised as expert users.
- **Balanced representation between men and women**. The balanced gender representation of men and women has social and moral value and offers significant advantages in the effectiveness and quality of the project's final results. Women and men may have different approaches to different issues, such as communication, decision-making, and problem-solving. Hence, the

variety of these approaches offers a more global and innovative approach to evaluating the eDea platform. Specifically, 3 men and 3 women participated in the evaluation.

- **Balanced representation at different ages**. The aim is to cover a wide range of ages, as according to bibliographic references, age is directly related to the degree of familiarity with technology. The study by Venkatesh, V., & Bala, H. (Venkatesh & Bala, 2008) examines how age groups influence the acceptance and adoption of new technologies in the workplace. The results conclude that younger adults adapt faster to new technologies than older age groups. At the same time, research shows that age also influences learning preferences and concludes that younger people usually choose self-learning through online platforms. In comparison, older people prefer more traditional forms of education, such as seminars or structured educational programs (Eraut, 2007). Considering the data of the above studies and the fact that the eDea platform is an educational, technological product, it was considered important for professionals of different age groups to evaluate the platform.
- **Representation of private, public sector, and NGOs**. The group set its primary objective to ensure pluralism in the representation of different sectors to ensure that the results of the eDea platform evaluation reflect each sector's needs and perspectives. Initially, the group considered following the sectoral breakdown, but this approach could not ensure adequate representation, as the list of sectors was too extensive and complex to manage. So, the research team proceeded to categorise organisations into three main sectors: public, private and third sector (NGOs), which proved more efficient and strategically relevant. This categorisation provides a complete picture of how organisations in these sectors approach project management, implementing strategies, and the needs of their teams. Public organisations, for example, typically act in a more structured and regulatory framework, having constraints related to funding and the ability to experiment with innovative approaches. Instead, private companies focus more on performance and efficiency, leveraging more agile and creative methods to achieve their goals. Finally, NGOs often work with limited resources and are oriented towards social efficiency and influence in communities and societies. This categorisation ensures the team collects data from different perspectives, allowing for a more comprehensive and representative assessment of organisations' needs.

8.3.1.2 Description of participants

To ensure the confidentiality and protection of participants' data, this section provides summary information for each professional who participated in the media platform evaluation actions. Specifically, the following information is provided for each participant:

- **Company/organisation**. The company or organisation in which the professional work is presented. From now on, the term company will refer to the private sector, while the term organisation will refer to the public sector and NGOs.
- **Age.**
- **Role and brief description of projects in which he participates**. The role of each professional is presented, and a brief description of the projects in which he participates is made.
- **Degree of familiarity with design thinking**. Participants assessed their degree of familiarity with design thinking methodology during initial communication, and the grading given by each was provided.

8.3.1.3 Description of participants

This section describes the participants in the pilot actions of Design4Future and Butlair. In order to ensure the confidentiality of participants' data, each professional is referred to with a unique code, which will be used from now on whenever an individual participant is mentioned. The encoding follows this model: It starts with the letter "S", representing the term "participant", followed by a number 01 - 10. Professionals and companies participated in random order in the assessment, determined mainly by availability. Finally, the initial "E" is added for expert users and "NE" for non-expert users. The term "participant" or "professional" is used in its general sense and does not represent a specific gender.

Participant 1 - Code S 01_NE

- **Company**: NVLOC is a small and medium-sized enterprise in Greece that helps businesses adapt their products or services to different countries and cultures. In this context, it provides business process reengineering services so that companies can successfully adapt their products and services to different countries.
- **Age**: 44 years old.
- **Role and brief description of projects in which he participates**. The professional collaborates with NVLOC and the director-CEO, specialising in

business process re-engineering. He is currently involved in a project to reorganise an international publishing client's sales and marketing department and how the sales and marketing department interacts with the company's production departments.

- **Degree of familiarity with design thinking**. 5/10 (category: non-specialized user). It leverages specific tools such as User Journey that help redesign internal processes. He is more familiar with the initial phases of design thinking and specifically with the research stage to analyse needs and capabilities based on current systems and processes of each customer, as well as with the ideation stage for the redesign of systems and processes.

Participant 2 - Code S 02_E

- **Company:** GRNET. GRNET provides design, development, and implementation services, infrastructure, and cloud computing for digital products and services. Its customers are bodies of the broader public and private sectors.
- **Age:** 37 years old.
- **Role and brief description of projects in which he participates**. The professional specialises in user interface design (UI/UX design). In this context, he deals with the design of user experience (UX) and the design of user interfaces (UI) in digital products and services developed by GRNET for its customers. Finally, in many projects, he participates in the analysis of business needs (business analysis). He is currently involved in a project to design a digital platform in the health field.
- **Degree of familiarity with design thinking:** 9/10. **Category**: Specialized user. It utilises various design thinking tools, depending on the project phase, such as interviews, persona, user journey, and various techniques for ideation, prototyping, and evaluation with users.

Participant 3 - Code S 03_E

- **Freelancer**. His projects include collaborations with companies and organisations such as Coca-Cola® Hellenic Group, Unilever®, the European Medicines Agency, the International University of Thessaloniki, and more.
- **Age:** 31 years old.
- **Role and brief description of projects in which he participates**. He deals with the field of informatics and data analytics. He has participated in many projects for the development of websites and information systems, as well as in projects for the development of digital games for use in marketing processes. These digital games

are used as a product promotion tool to promote companies' products to different audiences by providing an interactive experience.

- **Degree of familiarity with design thinking**. 7/10. **Category**: Specialized user. It utilises various design thinking tools and methods, such as interviews with users and partners to understand their needs regarding the project, ideation, storyboards to communicate the flow of the game to the team and receive feedback, and more.

Participant 4 - Code S 04_NE

- **Organization: Ministry of** Culture and Sports.
- **Age:** 53 years old.
- **Role and brief description of projects in which he participates**. The professional is a digital policy analyst in the Department of Innovative Services and Simplification of Procedures. Specifically, he is responsible for shaping the Ministry's digital strategy regarding the application of artificial intelligence in the sector and cultural institutions. In this context, he designs, shapes, and supervises specific digital projects and actions of the ministry. For the needs of the projects, collaborates horizontally with colleagues from other Departments and/or Directorates of the Ministry and with contractor companies that implement the projects it has designed.
- **Degree of familiarity with design thinking**: 4/10. **Category**: Non-specialized user. He has completed a design thinking training program and applied the methodology to a project related to designing a new public digital service. It utilises the initial phases of design thinking, such as research, to record needs and ideation for formulating the projects designed.

Participant 5 - Code S 05_NE

- **Agency: Ministry of** Justice.
- **Age:** 46 years old.
- **Role and brief description of projects in which he participates**. The professional works as a business analyst (business analyst) in the Department of ICT Project Design and Development. His role includes the initial analysis of the operational requirements for new projects, the ministry's digital actions, and the formulation of the project notice and technical specifications. In addition, in many cases, after the project is assigned to a contractor, it supervises its implementation, ensuring that predefined specifications are met.

- **Degree of familiarity with design thinking**: 4/10. **Category**: Non-specialized user. She has completed a design thinking training program. So far, he has applied only individual design thinking tools piecemeal in various phases of the projects in which he participates. It has not managed to implement a project utilising the design thinking methodology.

Participant 6 - Code S 06_E

- **Organization:** Among. The NGO Among is active in participatory planning, involving local community members in redesigning strategy, communication, and programs and services provided by institutions and businesses.
- **Age**: 35 years old.
- **Role and brief description of projects in which he participates**. The professional specialises in social innovation by designing participatory planning workshops and strategic planning of programs and actions with social impact.
- **Degree of familiarity with design thinking**: 8/10. **Category**: specialised user. It utilises various design thinking tools depending on the nature and needs of the project, such as persona, user journey, ideation, prototyping, and more.

Participant 7 - Code S07_X

- **Organization:** Harbor Lab.
- **Age:** 24 years old.
- **Role and brief description of projects in which he/she participates:** The participant works as a product manager at the maritime tech company Harbor Lab. He is responsible for the management and strategic planning of SaaS products addressed to shipping companies, improving the efficiency of their processes. He collaborates with software development teams, user experience designers (UX/UI analysts), and business analysts to formulate innovative solutions.
- **Degree of familiarity with design thinking**: 8/10. **Category**: Specialized user. He has integrated design thinking into his daily tasks and uses it to align user needs with business requirements. He conducts design thinking workshops at his company and leads teams in developing products based on user experience (user-centred design).

Participant 8 - Code S 08_NE

- **Agency**: Freelancer.
- **Age**: 40 years old.

- **Role and brief description of projects in which he participates:** The participant works as a freelance front-end developer and has collaborated with startups, design companies, and large companies to develop web applications and responsive user interfaces. He specialises in technologies such as React®, Vue.js, and Tailwind CSS. At the same time, he collaborates with user experience designers (UX/UI designers) and product development teams to deliver functional and aesthetically appealing user experiences.
- **Degree of familiarity with design thinking**: 4/10. **Category**: Non-specialized user. He has basic knowledge of design thinking and has participated in some workshops. He uses some tools of the method, such as user analysis and prototyping, but does not apply it systematically to all his projects.

Participant 9 - Code S 09_NE

- **Agency:** Sphynx.
- **Age:** 38 years old.
- **Role and brief description of projects in which he participates:** The participant works as a backend developer at Sphynx specialising in cybersecurity and data analysis. He is involved in developing and optimising backend systems, database management, and implementing APIs for cybersecurity business solutions. Collaborate with software engineers, data scientists, and security experts for the development of reliable and secure applications.
- **Degree of familiarity with design thinking**: 1/10. **Category**: Expert user. He is unfamiliar with design thinking and has not actively used it in his works. However, he recognises its importance in product development and is interested in learning more.

Participant 10 - Code S 10_E

- **Organization**: Prosperty.
- **Age**: 36 years old.
- **Role and a brief description of projects in which he/she participates:** The participant works as a product manager at Prosperty, a company specialising in the digitisation of processes for the purchase and management of real estate. He is responsible for designing the user experience (UX) and user interfaces (UI) for digital property management platforms, ensuring that the solutions developed meet users' needs. He works closely with Product managers, developers, and business stakeholders to create innovative digital products.

- **Degree of familiarity with design thinking:** 10/10. **Category**: Specialized user. He applies design thinking daily to product design by applying tools such as user analysis, persona design, prototyping, and usability testing. He has trained teams in design thinking techniques, and his approach is inextricably linked to human-centred design principles.

8.3.2 Projects of companies benefiting from the eDea platform

Below is a description of projects in which companies that participated in the initial presentation and evaluation of the platform, using specific scenarios related to their work, then used the platform in projects they implemented. The aim was to enhance collaboration between team members through design thinking tools, thus facilitating the collaboration of team members and the planning and problem-solving process. Each project's purpose is described, as well as how the eDea platform was used. Data on the number of companies involved in the project is also provided.

8.3.2.1 Collection of requirements for the design of an intra-company discussion channel

Participant S03_E implemented the project. Below is a brief description of the project, tools, and how to use the eDea platform to design an intra-company discussion channel (forum).

- **Number of companies involved in the project**. Two companies participated: the participant S03_E, founder of a sole proprietorship, and the client company of the project.
- **Project description**. The project concerns the design of an in-house discussion channel. The discussion channel aims to act as a central platform where employees can be informed about company news and actions and collaborate on joint programs and initiatives to enhance the company's innovation culture. S03_E undertook the design and implementation of the discussion channel. The successful implementation of the project was based on close cooperation with the client in order for S03_E to understand in depth his needs in order to define the basic requirements of the project, as well as the main sections and functions of the discussion channel, ensuring that it will meet the needs of users (employees of the client company). The implementation of the discussion channel will utilise the Discourse® platform, an open-source tool that provides broad customisation, thus reducing the time and resources required for the development.
- **Use of the eDea platform to support the project team in designing an in-house discussion channel.** Based on the project's needs, it was decided to use

the idea mapping template (mind map) and the ideation method to co-shape the functions that the discussion channel will include with the client. Specifically, idea mapping is a visual tool used to organise and structure information in a creative and non-linear way. It starts from a central idea, around which related concepts, categories, and subcategories develop through branches forming a map of thoughts. It helps teams analyse ideas, find connections between topics, and organise content more naturally and flexibly. The tools were used in **a co-design workshop** organised for the project's needs. The workshop was attended by professional S03_E and members of the project team on the client side and lasted 1.5 hours.

During the co-design workshop, the purpose of the workshop was initially introduced. The participants were then presented with the eDea platform, the essential functions of the eDea platform that would be useful for the workshop participants, such as creating a collaboration canvas, creating notes, changing the colour of notes, uploading images and videos, and the tools that will be used. Throughout the workshop, written instructions were provided to the Participants through the table. The team then started producing and discussing ideas for user needs and chat room features. After recording the initial ideas, the team worked on them collaboratively, utilising idea mapping. The goal was to categorise ideas to shape the essential functions the discussion channel would provide. Through this process, participants were able to organise their ideas, identify common themes, and form a clear structure for the content and capabilities of the discussion channel, considering user needs.

Three **different note colours were used to match the hierarchy of function and section of the** chat room**.** For example, to reach the green section, the user must go through the blue section. This created the initial architecture of the chat room. Finally, yellow notes are ideas for further investigation and do not necessarily correspond to specific functions of the chat room.

In order to ensure confidentiality, after the workshop was completed, terms and words directly related to the client, such as the customer's name and ideas or suggestions of project team members directly related to the company's internal organization processes, were removed from the collaboration canvas.

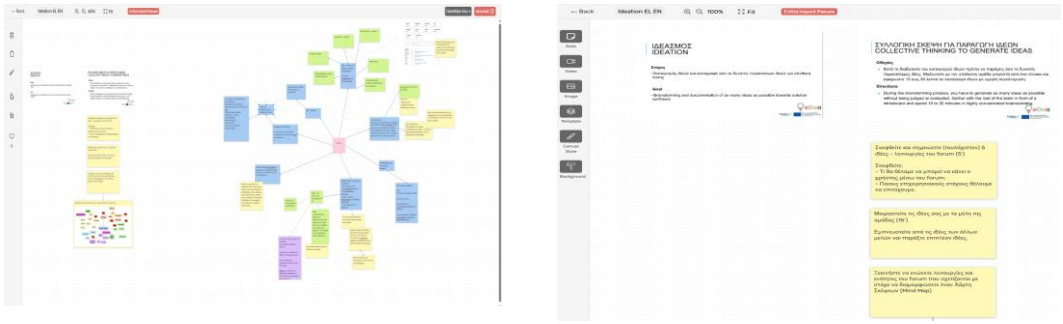


Figure 8. Overall overview of the canvas created and used during the workshop to collect ideas and requirements for the design of the discussion channel.

8.3.2.2 Creation of a digital service prototype for co-configuration of digital platform specifications

The project manager was the participant S05_NE. Below is a brief description of the project, the tools, and how the eDea platform was utilized.

- **Number of companies involved in the project**. The project involved a public body with participants from 2 different departments of the Digital Governance Directorate.
- **Project description**. The project is concerned with designing and implementing a new digital platform to monitor cases to resolve small claims between consumers and businesses. Participant S05_NE was responsible for the formulation of the operational and technical specifications of the new digital service. The participant had already completed a significant part of the analysis for the project specifications and then wanted to share the initial draft of the document with colleagues to collect comments and suggestions for changes and improvements. However, he said he had previously had difficulty getting feedback as his colleagues managed their projects and often found it challenging to take the time to read and evaluate long, multi-page documents such as project requirements analysis documents.

  Based on the challenges mentioned by participant S05_NE, an alternative approach to collect feedback from colleagues was proposed and exploited. In particular, an initial prototype of the digital service was designed based on the technical and operational specifications of the document to facilitate feedback. The prototype did not include functionality or interaction. The main objective was to act as a tool for visualising the specification study to facilitate collaboration and discussion with colleagues. This approach transformed the complex and extensive information in the document into a more understandable and readily accessible format, allowing colleagues to understand key requirements and offer meaningful feedback quickly.

Then, a workshop was organised for the presentation of the prototypes and the feedback from colleagues on specific screens of the platform. In collaboration with S05_NE, the workshop's agenda was formulated, which lasted 2 hours. The meeting was attended by other operational analysts from management, who contributed their knowledge and experience to co-formulating the project specifications. This way, the specification evaluation process became more efficient and interactive, enhancing colleagues' involvement. At the same time, the participant S05_NE, as project manager, immediately received substantial feedback that would help him improve the project specifications.

The workshop utilised the **ideation** and idea evaluation templates from the eDea platform. The participants' notes were coloured differently. Yellow notes correspond to comments and observations, and pink notes correspond to ideas.

The agenda of the workshop was structured as follows:

- Welcome and purpose of the meeting (5').
- Short presentation of the eDea platform that will be used to facilitate cooperation and exchange of ideas and views (5').
- Brief presentation of the project's purpose and what has been done so far (5').
- Presentation of prototype (15').
- Introduction to the method of ideation (5').
- Ideation of participants and discussion, exchange of ideas (45').
- Introduction to the method of evaluating ideas (5').
- Evaluation and prioritisation of ideas based on feasibility (20').
- Complete an appointment and next steps.

After the workshop was completed, some of the prototype screens that present individual functions that will be included in the first version of the platform were removed from the canvas to ensure confidentiality.

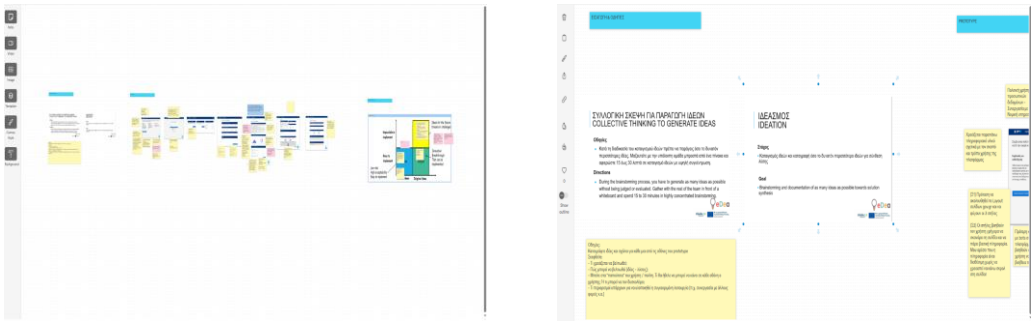


Figure 10. Overall overview of the project canvas.

8.3.4.3 Capturing the user journey to understand user needs

The project manager was the participant S02_E. Below is a brief description of the project, the tools, and how the eDea platform was used.

- **Number of companies involved in the project:** Two organisations participated in the project: the company responsible for implementing the project and the client organization.
- **Project description:** The project concerns redesigning the information system used by a public organisation to manage citizens' affairs. Participant S02_E, as a key project team member, was responsible for initially recording user needs and designing the user experience in the new system. The aim was for the system to meet the needs of employees, be user-friendly, and facilitate the performance of their tasks so that they could serve the public efficiently and without delay.

  The eDea consortium initially supported the project team in collecting user needs. In collaboration with participant S02_E, a focus group was organised with employees of the organisation in order to record the existing process of serving citizens and managing their cases through the existing information system. To capture user experience, the **standard user journey was utilised**, which allowed the detailed mapping of the stages followed by employees, from the initial registration of a case to its final processing. After recording the current process, a structured discussion was held with the focus group participants in order for the project team to identify problems, needs and requirements that should be considered in the system redesign. The needs and user requirements were recorded directly in a project table, providing the team with a direct and comprehensive display of the information collected.

The focus group included 6 employees from the client organization, participant S02_E, and 2 colleagues. The action lasted 2 hours and 1 quarter, with a short break in between.

The agenda and structure of the action were formulated in collaboration with participant S02_E and are presented below.

- Welcome, purpose of meeting and acquaintance of participants (10').
- Short presentation of the eDea platform that will be used to facilitate cooperation and exchange of ideas and views (5').
- Introduction to the user journey tool (5').
- Recording existing processes using the user's journey tool (60').
- Break (10').
- Discuss problems, challenges, and initial ideas regarding the redesign of the information system (45').
- Integration.

After the workshop, the table removed terms and information indicating the project's client to ensure confidentiality.

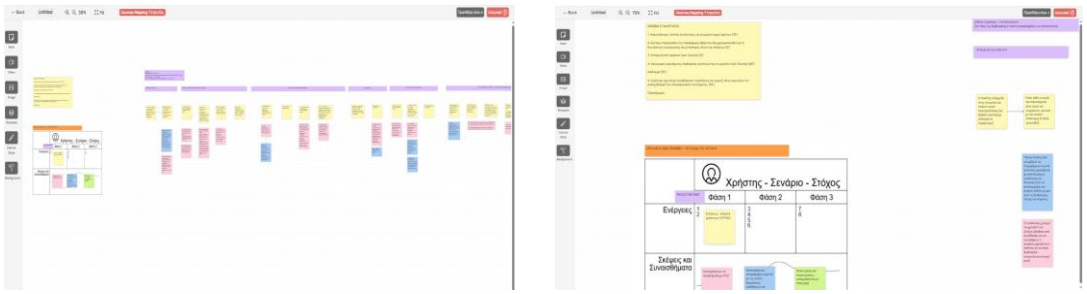


Figure 12. Part of the user's journey, along with the initial tool-filling instructions.

8.3.3 Quality evaluation analysis at Butlair and Design4Future

This section presents the overall evaluation findings from Butlair and Design4Future. Since many of the findings were common or complementary, they are presented as a whole, offering a coherent picture of the key conclusions of the evaluation to practitioners and companies.

The qualitative evaluation involved 12 companies and organisations from the public, private sector, and NGOs. The professional participants used the eDea platform in project conditions and simulated scenarios. The qualitative assessment applied user

observation during the use of the eDea platform and generated feedback through semi-structured interviews, summarised below:

- Participants successfully used the eDea solution in projects and specific scenarios, confirming that the provided functions substantially support professionals with different levels of familiarity with design thinking. Through the platform, they got to know it, practice the standards and use them in their projects, enhancing collaboration in teams and innovation in their companies.
- Although the eDea platform was initially designed with the main aim of meeting the needs of design teams, findings from the evaluation with professionals from different disciplines, who have different degrees of familiarity with design thinking, showed that its usefulness extends to professionals from the fields of technology, entrepreneurship, project organisation and management, and others. In this way, the cross-sectoral usefulness of the platform is highlighted, being a valuable tool for those who, regardless of speciality and industry, apply or seek to incorporate tools and stages of design thinking in their projects. This finding highlights a significant opportunity at the business model level of the eDea platform as it significantly expands the target audience, increasing the project's return on investment.
- The need for training and educational features, such as Standards, was expressed by professionals familiar with design thinking and unfamiliar users. This is explained by the fact that the design thinking tools for each phase are numerous, making it difficult for even a familiar user to know them all. Through the templates and user guide provided, the eDea solution enhances its impact by supporting professionals in continuously developing skills and knowledge from the moment they come into contact with design thinking and are interested in learning more until they develop into skilled users.
- All professionals found it particularly useful that the template and instructions for use are provided in combination with the canvas. This allows them to start using the tool immediately while being able to view and follow the instructions, saving time and avoiding unnecessary clicks. As they mentioned, one of the main problems on other similar platforms is that the tool and instructions are not provided on the same screen, making the process difficult. In addition, they noted that similar solutions, such as Miro® and Mural®, do not even include instructions for using the tools.
- The combination of training elements and functions, along with their direct application to projects through the operation of the Dashboard, adds significant added value to the eDea platform, expanding its use cases.

Therefore, the eDea solution responds even more comprehensively and effectively to the needs of professionals.

- Quick and easy template search is vital for professionals. Labels to classify patterns based on the design thinking phase are handy tools, as this is the first and essential criterion they would use to identify a specific pattern for the phase of design thinking in which it is applied.
- Participants expressed a positive view of incorporating a scheduling function into the eDea solution, stating that they find it helpful and would use it in their work and within their team for different purposes, such as recording and planning the phases of a project, breaking it down into more miniature stages and sub-activities, and assigning them to team members. Users emphasised that the scheduling function of the platform will substantially support them in managing their tasks, making it easier to coordinate and monitor the progress of a project based on the phases of design thinking methodology. They also noted that the user experience reminded them of Trello®, a popular and easy-to-use project management tool that provides a familiar interface.
- Participants stressed that they find it particularly optimistic that the interface on the canvas is simple and functional. In particular, advanced users reported that platforms such as Miro® or Mural® are often challenging for people who are not very familiar with technology. The complexity of the features these platforms provide can become a deterrent and hurt team collaboration or cause frustration to users who do not have the required experience to leverage it. On the contrary, the simple and functional environment of Canvas helps all users, regardless of their level of experience with technology, to focus on the real needs of their project without being distracted by complex functions.
- All participants were very impressed by the fact that the Board provides a collaboration space that can be customised according to the needs of the team and the project. In this context, many noted that a meeting does not need to use many tools, such as different presentations of team members, images, and more, as everything can be uploaded to the canvas and made available in advance to everyone, enhancing collaboration and efficiency.
- Gamification functionality, such as likes, helps increase user engagement (Deterding et al., 2011), as shown during the use of the platform. Specifically, professionals used this functionality to vote as a team for the best ideas or to highlight the most important needs and challenges of users, which each project team must solve.

- Professionals consider it particularly important that this platform has been implemented by prestigious bodies, such as the University of Thessaly and the University of the Aegean, and with the participation of companies specialising in design thinking, which is the main subject of the eDea platform. This fact gives significant prestige to the whole project and enhances the reliability and value of the platform in the eyes of users.
- Professionals consider significant added value, compared to competing platforms, because the platform is also provided in Greek. This paves the way for the eDea solution to be adopted by public sector bodies, where the use of the Greek language is required. Using the platform in the native language of users enhances accessibility and usability, making it more accessible and acceptable for organisations and professionals operating in the Greek environment.
- The eDea solution promotes effective and creative collaboration between different disciplines in multidisciplinary project teams. The tools it offers can be used in various projects, regardless of sector. Indicatively, it can support the development of digital products and services, the reengineering of internal processes of companies and organisations, and strategic projects, such as designing an organisation's strategy or developing new products and services. In addition, the platform can be used in collaborative workshops, enhancing inclusivity and innovation.
- Suggestions for future improvements to the digital platform include small additions such as providing each template with "pro tips", i.e. practical tips and user instructions for advanced users.

9. Quantitative evaluation

The results of the quantitative questions are presented separately per cycle/phase of the evaluation to reflect the platform's development and improvement over time and towards the end of the project.

The first phase of the eDea platform evaluation took place in the spring semester of 2023 - 2024. The questionnaire aimed to collect feedback from users on the platform's functionality. A total of 114 users participated in the eDea evaluation questionnaire.

The second phase of the eDea platform evaluation took place in the winter semester of 2024 - 2025. The questionnaire aimed to collect feedback from users on the platform's functionality. A total of 224 users participated in the eDea evaluation questionnaire.

9.1 How familiar are you with design thinking?

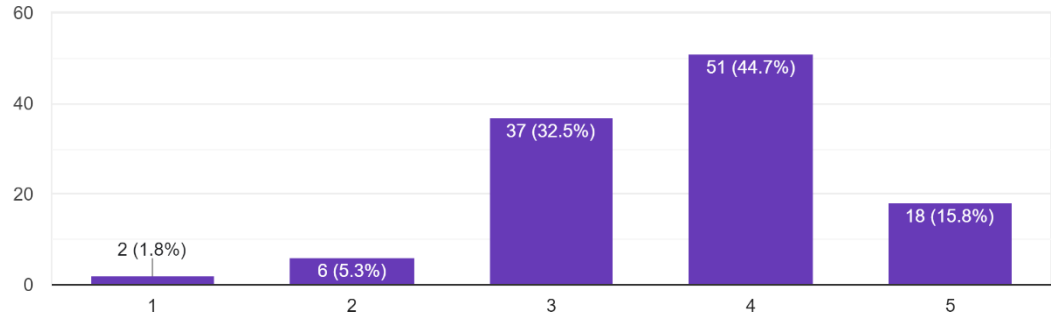


Figure 16. Phase 1 - How familiar are you with design thinking?

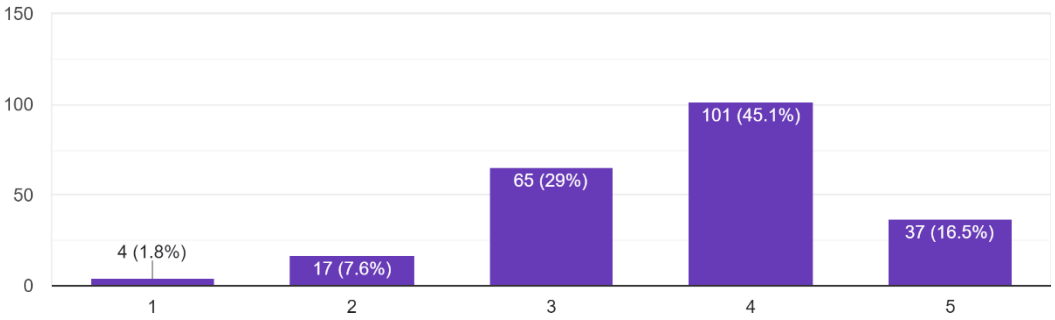


Figure 17. Phase 2 - How familiar are you with design thinking?

The graphs indicate that the majority of participants in both phases of the survey report are moderately to highly familiar with the term "design thinking."

9.2 What skills are important for innovation?

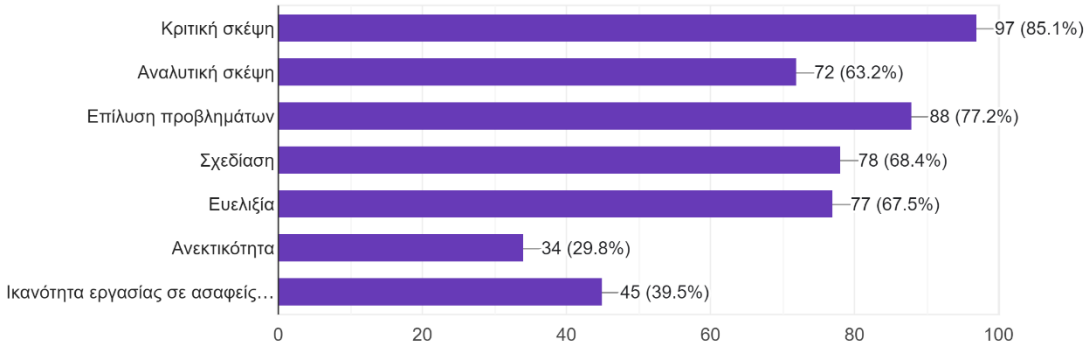


Figure 18. Phase 1 – What skills are important for innovation?

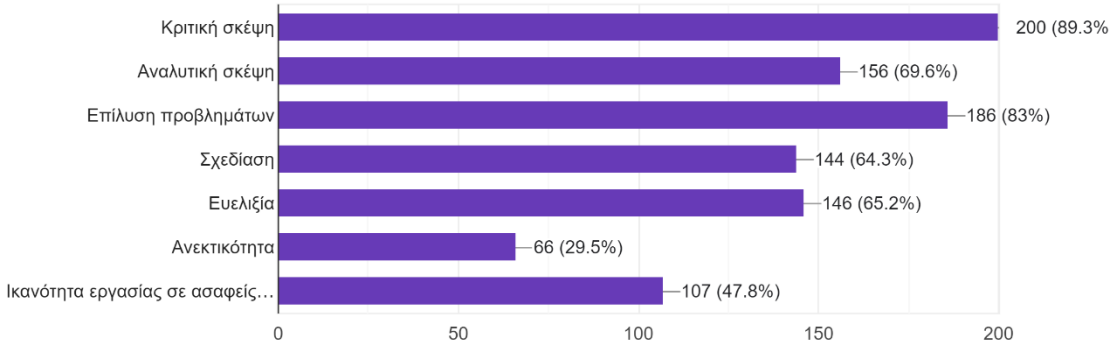


Figure 19. Phase 2 – What skills are important for innovation?

In both phases, "Critical Thinking", "Problem Solving", "Analytical Thinking", "Design", and "Flexibility" gather a high percentage of preference. We are seeing a notable increase in the percentage of students who consider the "Ability to work in unclear conditions" important in Phase 2, possibly indicating a growing recognition of the importance of this skill in the context of design thinking. "Tolerance" is the least popular answer.

9.3 The eDea digital platform contributes to the development of innovation skills

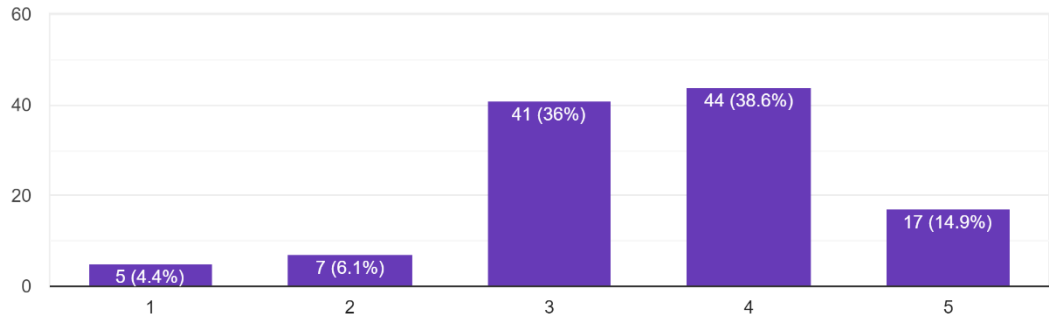


Figure 20. Phase 1 – The eDea digital platform helps develop innovation skills

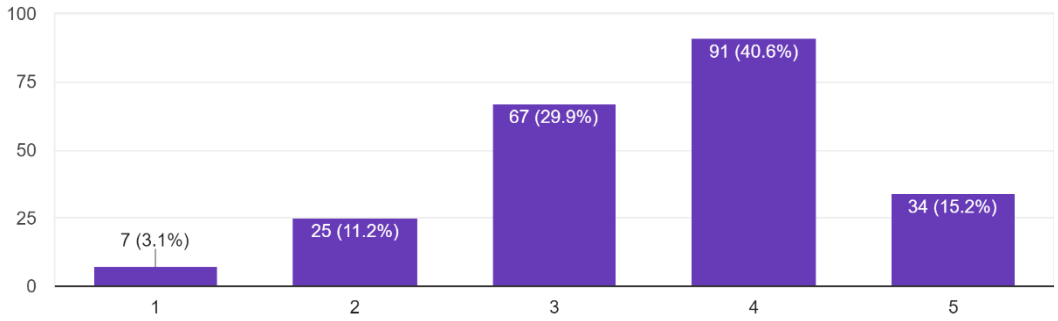


Figure 21. Phase 2 – The eDea digital platform helps develop innovation skills

The results, illustrated in Figures 20 and 21, show that the majority of respondents believe that the eDea digital platform contributes greatly to the development of innovation skills. This indicates that a significant part of respondents recognise the potential of the eDea platform to contribute to this development.

9.4 The eDea digital platform is easy to use

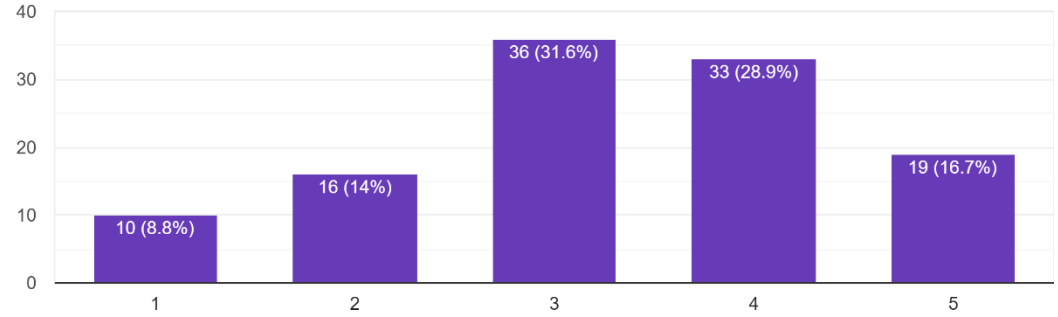


Figure 22. Phase 1 – The eDea digital platform is easy to use

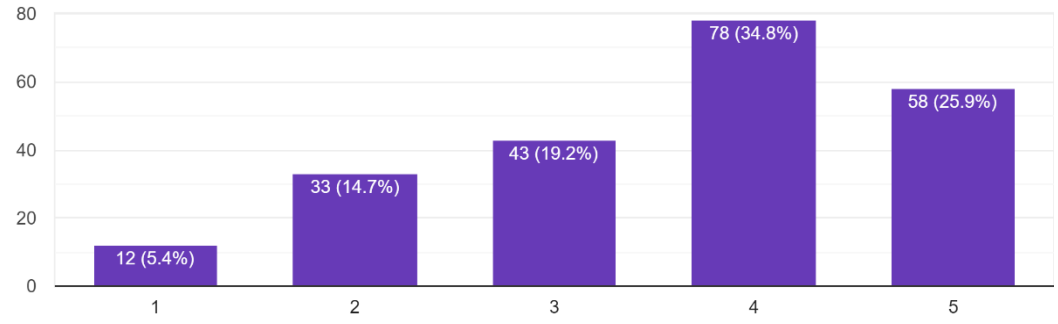


Figure 23. Phase 2 – The eDea digital platform is easy to use

The graphs for ease of use reveal a modest picture in both phases, mainly following a normal distribution around the mean value of "3". In Phase 2, perceived ease of use is a clear improvement.

9.5 The user interface of the eDea digital platform is understandable

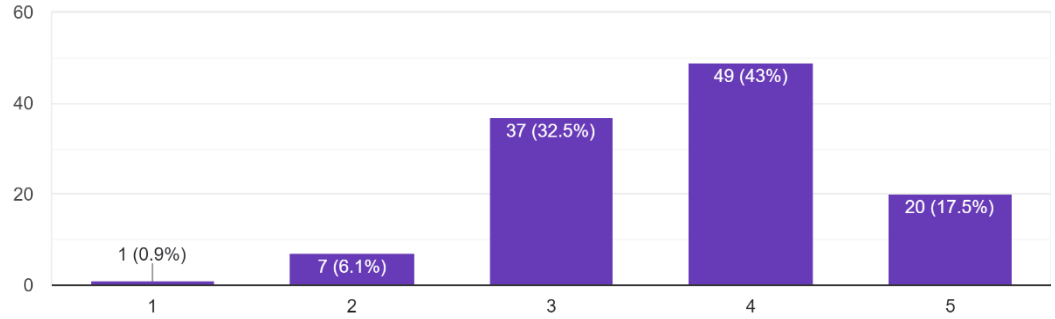


Figure 24. Phase 1 – The interface of the eDea digital platform is easy to understand

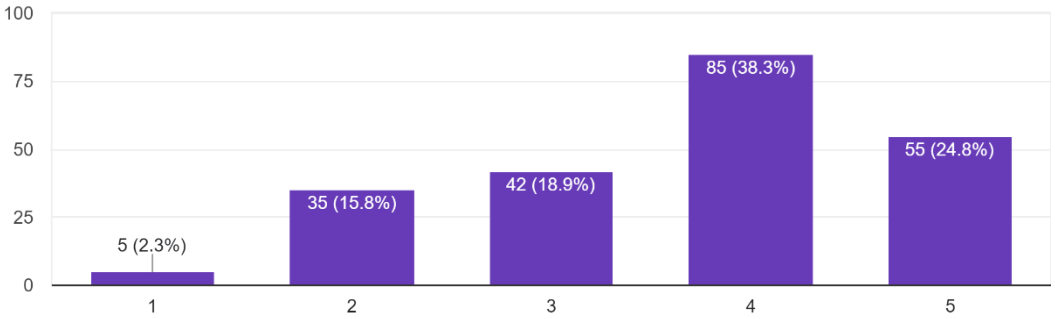


Figure 25. Phase 2 – The interface of the eDea digital platform is easy to understand

In terms of understandability of the user interface, the graphs show a similar picture with ease of use. This indicates that the user interface of the platform is clear and direct for all users,

9.6 I would use the eDea digital platform again

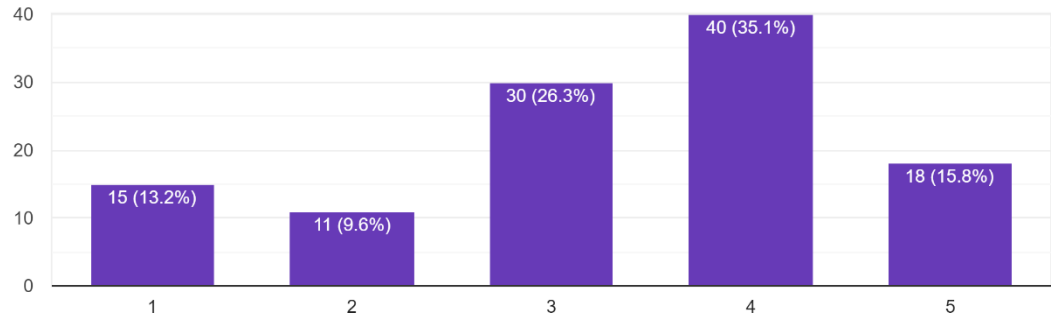


Figure 26. Phase 1 – I would use the eDea digital platform again

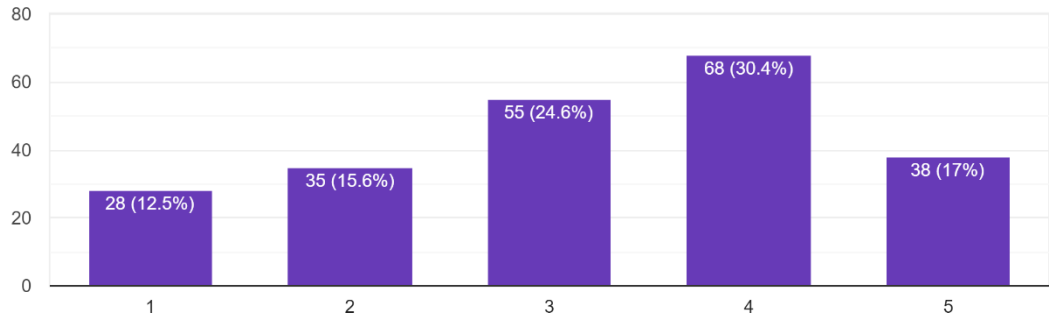


Figure 27. Phase 2 – I would use the eDea digital platform again

The intention to reuse the eDea platform shows a generally positive attitude from participants in both phases.

9.7 The functionality of the platform is comprehensive

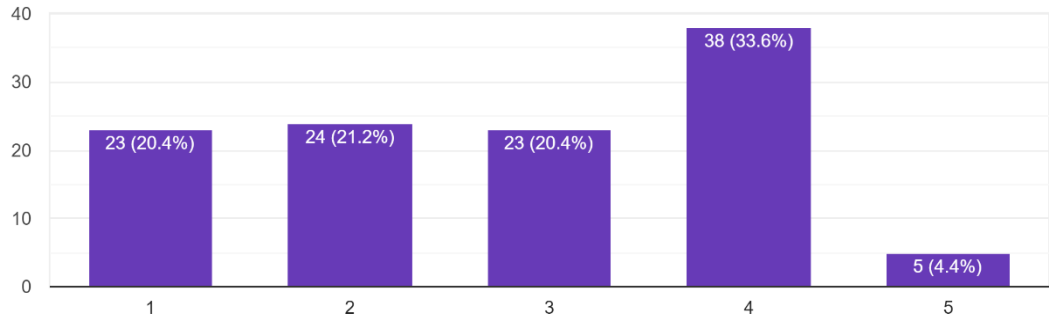


Figure 28. Phase 1 – The functionality of the platform is complete

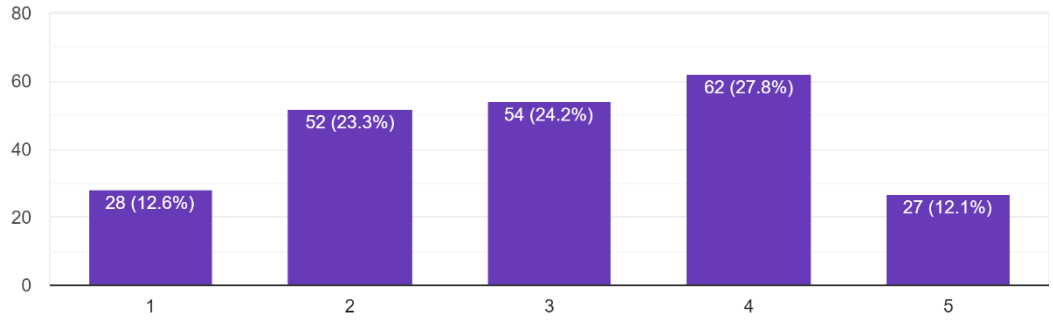


Figure 29. Phase 2 – The functionality of the platform is complete

Graphs for integrated functionality demonstrate that in Phase 2, the user perceptions significantly improved.

9.8 Design activities are interesting and meaningful

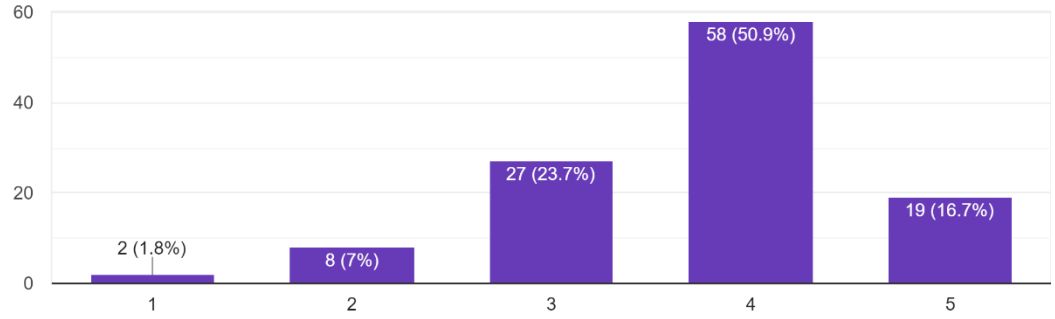


Figure 30. Phase 1 – Design activities are interesting and meaningful

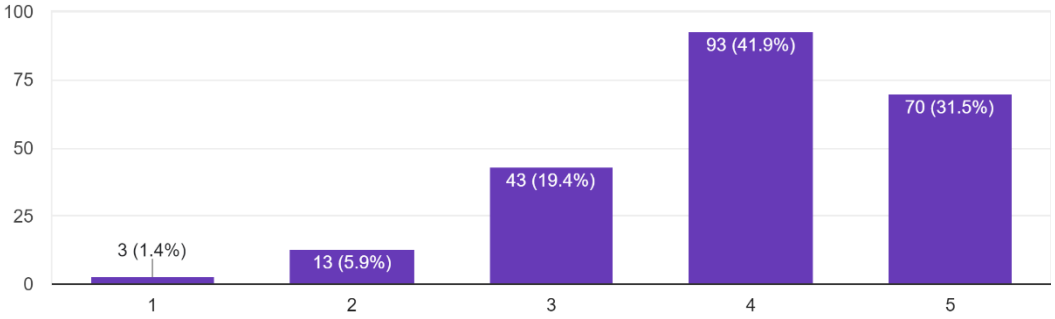


Figure 31. Phase 2 – Design activities are engaging and meaningful

Graphs on the interest and meaning of design activities show a positive picture in both phases. In Phase 1, tier "3" has the highest percentage, but significant participation is in the higher tiers. In Phase 2, there is a slight trend towards the higher rungs. This suggests that the participants considered the design activities interesting and relevant and that the research was meaningful.

9.9 Additional comments

Finally, respondents were asked to provide additional comments on the eDea platform. The comments provided provide a comprehensive picture of the platform's use, revealing its positive and negative elements.

During Phase 1, users appreciated the creativity and personal discovery offered by the design activities, stressing that the platform is "extremely useful" for their needs. However, there is a clear need to improve the UI, with suggestions for a more intuitive interface to make use more understandable and enjoyable. At the same time, they referred to some technical problems, such as the malfunction of the "delete" command, the lack of shortcuts and the erratic behaviour of the cursor, which affected the user experience. While these issues reduced the platform's usability, the overall

collaboration experience remained positive, indicating that users see significant value in its functionality despite the improvements required.

During Phase 2, students highly appreciated the eDea platform's contribution to collaboration, creativity and team organisation. Many found it easy and straightforward to use and reported that it offers a convenient learning environment with a nice graphical interface (GUI). It was pointed out that the platform helps with teamwork and allows for the structured exchange of ideas, facilitating learning. Some students called it a formidable platform, while others described it as extremely useful for educational purposes. Their experience with eDea was positive, and they recognised its potential and educational benefit.

10. Integrate formative assessment feedback into the implementation

The qualitative and quantitative formative evaluation results were incorporated into the implementation of the digital platform, improving usability, functionality, and overall user experience. In particular, the resulting improvements contributed to access, usability, collaboration and organisation of activities as follows:

- Improved accessibility and compatibility with multiple devices.
    - **Support mobile devices and tablets**, allowing the platform to be used on different operating systems and screen sizes.
    - **Automatic adaptation of the interface** (responsive design) for easy navigation on small screens, improving the user experience in mobile environments.
    - **Maintain functionality** across all platforms (desktop, tablet, mobile), ensuring continuous and seamless user collaboration.
- Enhanced user and group support.
    - **Creation of a detailed user manual**, which provides step-by-step guidance, good practices and support for effective team collaboration.
- Upgraded design and interactivity tools.
    - **Drawing tools that simulate pencil use**, providing users with an intuitive handwriting and freehand drawing experience.
    - **Support for** widgets such as stickers, shapes, and notes that allow users to express and organise ideas more flexibly.
    - **Real-time co-editing capability**, where multiple team members can design and customise content simultaneously.
- Improved structure and organisation of ideas through visual mapping.
    - **Ability to connect ideas with dynamic arrows**, allowing complex interconnections between concepts and data.
    - **Support drawing in a pencil-like way** for further flexibility in expressing ideas.
    - **Enhance comprehension by color-differentiating** memos on the collaboration canvas to highlight categories of ideas, stages of design thinking, and priority levels. In addition, using colours allows the categorization of information through visual differentiation.

- Integration of standard activities and design thinking structures.
    - **Publication through the digital platform of standard exercises, steps, and integrated design thinking actions** contributes to the easier structuring of design thinking actions by teachers or coordinators with less experience.
    - **Ability to create and save custom templates** for teams to reuse specific workflows or design scenarios.
- Support organisation and project tracking by supporting agile and iterative design methods.

In conclusion, integrating qualitative and quantitative data collected during the formative assessment improved the functionality, usability, and collaboration within the eDea platform.

11. Summative assessment and conclusions

The eDea digital intervention to promote innovation in teams was evaluated in actual conditions by external user groups of students and professionals. The conclusions of the cumulative assessment are summarised below:

The eDea digital platform is innovative as it redefines how teams work together to solve problems, develop innovative solutions, and learn by action.

It supports collaboration with dynamic sharing and the building of ideas in groups in a staggered ideation process that contributes to the collective creation of knowledge through design thinking. The eDea digital intervention adopts a fluid, participatory and interactive system, where innovation is not developed individually but collectively, based on innovation crowdsourcing principles.

The digital solution supports structuring innovation activities by creating an interactive idea lab, with teams designing and managing specially designed innovation sprints and design thinking workshops through the platform. The flexible digital platform supports different design thinking methodologies, such as Double Diamond (Design Council, 2005) and the Stanford D.school model. Structuring design thinking processes through the digital platform makes it accessible, measurable, and guided by helping teams follow specific stages and methodologies without requiring prior expertise.

The synchronous and asynchronous collaboration allows participants to contribute at different times and locations. The digital platform uses a hybrid model that combines synchronous and asynchronous innovation, offering flexibility and continuous access.

The digital platform's gamification techniques help improve user engagement through rewards and challenge-based learning inspired by real life.

In addition, the digital platform allows moderators and trainers to monitor groups' progress in real time, providing a clear picture of participation, interactions, and idea development and enabling feedback. Unlike traditional design thinking platforms, eDea redefines the role of the trainer/coordinator as an active promoter and facilitator of innovation.

The eDea digital platform supports the application of design thinking in various fields, such as education, entrepreneurship, engineering, and social sciences. It supports adaptation to different problems, from product development to managing social challenges. Instead of focusing only on education or entrepreneurship, eDea creates a horizontal system of design thinking with cross-sectoral application.

In conclusion, the eDea digital intervention is an important tool that enriches the experience of collaborating in teams to produce innovation with the support of digital

technology, contributing to the interaction and collective introduction of solutions to the challenges of entrepreneurship and social entrepreneurship in the 21st century.

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