



DIGITEX

Textile digitalization based on digital education and innovative e-Tools

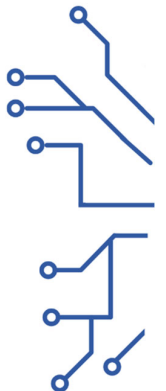


Toolkit for accelerating innovation in
medical, protective, sensorial, and
smart textiles based on creative
methods

Deliverable n. IO 6

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Table of Contents

Table of Contents	3
1 Introduction	4
2 Collaboration tools that are native to Moodle Platform	7
3 Collaboration Tools that can be integrated into the Moodle Platform.....	8
4 Co-design Tools that can be integrated into the Moodle Platform	10
5 Creative tools to foster Design Thinking methodology.....	12
6 Further Reading	14
7 Annexes.....	16
7.1.1 Annex I: English Toolkit	16
7.1.2 Annex II: Romanian Toolkit	16
7.1.3 Anex III: Lithuanian Toolkit.....	16
7.1.4 Annex IV: Italian Toolkit	16
7.1.5 Annex V: Spanish Toolkit.....	16
7.1.6 Annex V: Greek Toolkit.....	16
8 Attributions and copywrite statement.....	17



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1 Introduction

The textile industry is facing a new field of opportunities and challenges with the emergence of novel and technologically advanced yarns and fabrics. From special textiles for medical applications that aid in healing to sensorial textiles that convey information about the surrounding environment, and smart textiles that integrate electronic equipment and actuators, the design of wearables has become a more challenging process, particularly in highly specialized fields, such as personal protective equipment (PPE), medical textiles or even sports gear and automotive textiles. The complexity of materials, technologies, and manufacturing technics, as well as the challenges for end-of-life assessment and the demand for circularity in textiles and wearables production, requires a multidisciplinary approach and a creative mindset. Thus, the textile and wearables industries need to understand the emerging terrain of textile innovation, the growing demand for functional textiles, the impact of sustainability and circularity, and the need for the integration of state-of-the-art technologies. In parallel, they need to adopt creative approaches to design and product development, which require the adaptation of different concepts and methodologies to stimulate new ideas and accelerate the innovation process.

This document aims to present a Toolkit for accelerating innovation in smart textiles by creative, interactive, and collaborative methods which can be incorporated into the DIGITEX LMS platform and provide ground for the training of students and professionals aiming to foster versatile research, development, and innovation to companies in order to strengthen the European position in medical, protective, sensorial and smart textiles.

The term “Creative Methods” refers to different approaches and techniques that may be used to foster and enhance creativity in the process of conceptualizing, empathizing, and eventually designing the production and assessing the life circle of innovative smart textiles and wearables.

Creative methods comprise different tools and practices for stimulating innovative thinking, creativity, and novel solutions. By encouraging individuals and groups to think out of the box, challenge the established norms, and approach smart textiles, wearables, and personal protective equipment design from a new point of view.

The Toolkit has the dual purpose of presenting such creative methods as concepts and pointing out existing online tools that can be used for introducing creative and collaboration methods in a virtual learning environment. Some of the most important methods to be used are listed below:



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- Brainstorming is a method that can generate a large number of ideas in a short time, as participants are encouraged to express their thoughts freely and interact to build a corpus of ideas that is more than just the mere sum of each individual contribution, fostering thus a creative and collaborative environment. It is probably the simplest and more spontaneous methodology that can produce radically novel ideas but has the disadvantage that the discussion may not be well organized, and the different ideas may not converge into one concept. Brainstorming can be the first stage of other creative methods.
- Mind Mapping is a method based on the visual organization of information which can highlight relations and hierarchy between different ideas around one concept. Mind mapping allows participants to generate, evolve, and assort their thoughts and concepts. It is a more structured procedure than brainstorming and be used after filtering and assessing brainstorming results, in order to achieve structuring and organizing the most important concepts.
- Role Play and Scenario Building are techniques in which participants undertake roles under different perspectives or as actors in hypothetical scenarios and situations to generate different and innovative ideas. This is a method that fosters empathy and facilitates designers to think from the perspective of the end users.
- Creative Constraints, Analogous Thinking, and Divergent & Convergent Thinking are some more interesting creative methods. Using Creative Constrains, participants need to generate ideas and concepts with given limits and constraints, which can guide the creative process to more realistic directions and drive them to find creative solutions to bottleneck issues. Analogous Thinking is a method used to generate innovative ideas by drawing parallels and making connections between concepts and areas that do not have apparent correlations. It allows participants to discover underlying common issues and adopt solutions that are innovative for the new field of application. Divergent and Convergent Thinking Divergent thinking is a two stages process that involves encouraging generating diverse ideas and possibilities and then focusing on selecting, refining, and converging the most promising ideas.
- Design Thinking is a multi-stage process based on a human-centered approach that involves empathizing with end-users, defining problem statements, ideating potential solutions, prototyping, and testing. There are several suggested sets of steps in the Design Thinking methodology, one of the most commonly used is the 4D for Design framework or Double Diamond methodology, which comprises 4 stages:

- Discover, which involves empathizing (Problem/Divergent Phase)



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- Define, which involves setting the boundaries (Problem/Convergence Phase)
- Design, which involves ideating solutions (Solution/Divergent Phase)
- Deliver, which involves prototyping and testing (Solution/Convergence Phase)

Design thinking is a methodology that can encompass different other methods and tools in order to achieve a collaborative and innovative synthesis.

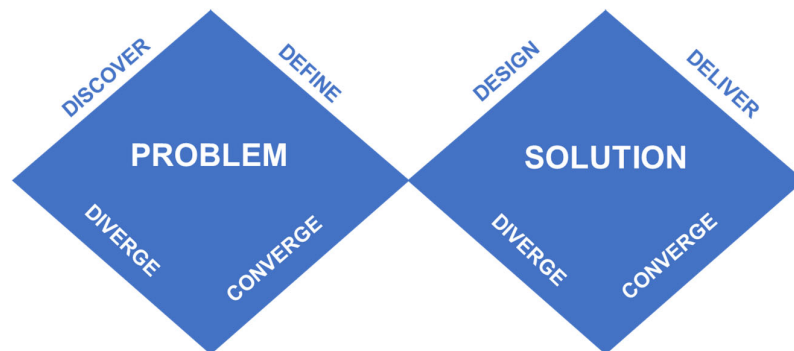


Figure 1. Design Thinking, the 4D framework in Double Diamond schematic presentation.

Thus, Creative Methods in the context of the toolkit represent some methodological approaches and techniques for collaboration that inspire, guide, and facilitate innovative thinking and problem-solving. The toolkit for creative innovation in smart, medical, protective, and sensorial textiles is available to any third party for use and adaptation and aims to be used by any interested organization or group of persons willing to organize courses in creative innovation development for researchers, students, professionals, technicians, and entrepreneurs. On the practical side, the Toolkit will present some of the most important available online tools that may be used in educational or professional contexts in order to foster an entrepreneurial mindset and innovation.



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2 Collaboration tools that are native to Moodle Platform

Moodle LMS Platform offers a multitude of tools and functionalities that can be introduced in any online course and offer different paths for collaboration between the participants. A brief presentation of the most commonly used such tools is given below:

1. **Discussion Forums:** Moodle's built-in discussion forums allow participants to engage in asynchronous discussions, share ideas, and collaborate on various topics. Users can post and reply to messages, facilitating knowledge exchange and collaboration.

<https://www.youtube.com/watch?v=lwfpfHTd0Tc>

2. **Chat and Messaging:** Moodle offers chat and messaging features that allow real-time communication between users. This enables quick and direct collaboration, facilitating immediate feedback, brainstorming, and idea sharing.

<https://www.youtube.com/watch?v=XlaCgIsXJ8s>

https://www.youtube.com/watch?v=t_TlCc5r-So

3. **Wiki:** Moodle's wiki tool enables collaborative content creation. Users can collectively create, edit, and review wiki pages, making it ideal for collaborative research, documentation, and knowledge sharing.

<https://www.youtube.com/watch?v=UXmyzix9osY>

4. **Group Activities:** Moodle's group activities feature enables participants to collaborate in smaller teams within a course. This includes group discussions, assignments, and projects, fostering collaborative learning and innovation.

<https://www.youtube.com/watch?v=3n5VFTggTt4>

5. **Peer Assessment:** Moodle's peer assessment module allows learners to evaluate and provide feedback on each other's work. This feature promotes collaborative learning and provides opportunities for students to share insights and collectively improve their textile innovation projects.

<https://www.youtube.com/watch?v=spPxDMPOjyQ>

6. **Shared Calendars:** Moodle's shared calendar feature allows users to schedule and coordinate events, deadlines, and meetings. This ensures efficient collaboration and time management among project participants.



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<https://docs.moodle.org/402/en/Calendar>

7. **Online Surveys and Feedback:** Moodle provides tools for creating online surveys and collecting feedback from participants. This enables collaborative data collection, analysis, and evaluation.

https://docs.moodle.org/402/en/Feedback_activity

3 Collaboration Tools that can be integrated into the Moodle Platform

Besides the different possibilities for collaboration tools intrinsically offered, Moodle allows integration with various external collaboration tools. By incorporating these tools, users can leverage their advanced features for collaborative brainstorming and management in Project Learning Based assignments. Some of the most useful tools are presented hereby:

1. **Miro:** Miro is a versatile online whiteboard platform that allows users to collaborate, brainstorm, and visualize ideas in real-time. It enables teams to work together, share sketches, create mind maps, and conduct design thinking sessions, making it an excellent tool for co-designing innovative textile solutions.



<https://miro.com/>

2. **Figma:** Figma is a cloud-based design and prototyping tool that facilitates collaborative design work. It enables multiple users to work on a project simultaneously, share design components, and provide feedback in real time. Integrating Figma into Moodle can enable students and professionals to collaboratively design and iterate on concepts and prototypes.



<https://www.figma.com/>



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3. **Trello:** Trello is a popular project management and collaboration tool that uses boards, lists, and cards to organize and prioritize tasks. It can be used to manage textile innovation projects, track progress, assign responsibilities, and facilitate communication among team members.



<https://trello.com>

4. **Slack:** Slack is a communication and collaboration platform that enables real-time messaging, file sharing, and integration with various tools and services. It can be used to create dedicated channels for different innovation projects, facilitating seamless communication and collaboration among team members.



<https://slack.com/>

5. **Google Drive:** Google Drive provides a suite of collaborative tools, including Google Docs, Sheets, and Slides, which allow multiple users to work on documents simultaneously. These tools can be used for collaborative writing, data analysis, and presentation creation in the context of innovation projects.



<https://drive.google.com>

6. **GitHub:** GitHub is a web-based platform that supports version control and collaborative coding. It is particularly useful for projects involving software development or for example the integration of electronic components in textiles. Incorporating GitHub into Moodle can enable students and professionals to collaborate on coding and hardware integration tasks.



<https://github.com/>



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7. **Zoom:** Zoom is a video conferencing tool that allows users to hold virtual meetings, webinars, and workshops. It can be integrated into Moodle to facilitate real-time discussions, presentations, and collaborative sessions.



<https://zoom.us/>

4 Co-design Tools that can be integrated into the Moodle Platform

While many collaboration tools can also be used for the purpose of co-design, like for example Miro and Figma, there are many more online recourses that allow collaborative design for groups of learners or professionals, that can be integrated into Moodle. Here are some suggestions:

1. **InVision:** InVision is a prototyping and design collaboration platform that allows for interactive and collaborative design feedback. Integrating InVision into Moodle enables participants to co-design prototypes, gather feedback, and iterate on design concepts.



<https://www.invisionapp.com/>

2. **Adobe Creative Cloud:** Moodle can integrate with Adobe Creative Cloud suite, including Photoshop, Illustrator, and XD. Users can collaborate on product design projects, share design assets, and collectively work on design iterations within the Moodle environment.



<https://creativecloud.adobe.com/>



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3. **Canva:** Canva is a user-friendly graphic design platform that allows for collaborative design creation. By integrating Canva into Moodle, users can collaboratively design graphics, posters, and visual materials.



<https://www.canva.com/>

4. **Sketchboard:** Sketchboard is an online collaborative whiteboard that facilitates visual collaboration and idea generation. Integrating Sketchboard into Moodle enables participants to co-design concepts, create flowcharts, and visualize design processes.



<https://sketchboard.io/>

5. **Lucidchart:** Lucidchart is a collaborative diagramming tool that supports visual communication and ideation. By integrating Lucidchart into Moodle, users can co-create design diagrams, process flows, and mind maps to facilitate collaborative design thinking.



<https://www.lucidchart.com>

6. **Marvel:** Marvel is a design and prototyping platform that enables collaborative design creation and feedback. Integrating Marvel into Moodle allows users to co-design and prototype interactive experiences, gather feedback, and refine designs.



<https://marvelapp.com/>



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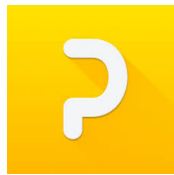
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7. **Sketch:** Sketch is a powerful design tool that supports collaborative design workflows. By integrating Sketch into Moodle, users can for example co-design textile interfaces, create design components, and collaborate on UI/UX design for textile applications.

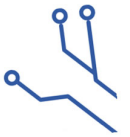


<https://www.sketch.com/>

8. **Prott:** Prott is a collaborative prototyping tool that enables teams to create interactive prototypes and gather feedback. Integrating Prott into Moodle allows participants to co-design and prototype innovative solutions, test user interactions, and refine designs based on collaborative feedback. By incorporating these co-design tools into Moodle, learners, and professionals can engage in collaborative design thinking, iterate on textile concepts, gather feedback, and collectively innovate in the field of textiles within the Moodle learning environment.



<https://prottapp.com/>



5 Creative tools to foster Design Thinking methodology.

Applying the Design Thinking methodology and other creative methods on an online platform becomes more effective when making use of digitalized templates, tools, and techniques that facilitate the different stages and tasks. There is a multitude of online resources that the user may take advantage of. By integrating these creative tools into Moodle, learners, and professionals can actively engage in creative thinking, idea generation, and exploration of innovative possibilities within the textile innovation domain. This encourages a dynamic and stimulating learning environment that fosters creativity and sparks innovation. What follows is a brief presentation of some of the functionalities that can be used in this context:



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1. **Random Word Generators** can be integrated into Moodle to allow participants to generate random words or phrases as creative prompts and stimulate out-of-the-box thinking.
2. **Mind Mapping** tools facilitate visual brainstorming and idea generation. By integrating mind mapping tools into Moodle, participants can collaboratively create and explore connections between concepts.
3. **Empathy Maps** help teams understand and empathize with end-users. By integrating empathy map templates into Moodle, participants can collaboratively gather insights, document user needs, and identify opportunities.
4. **Persona Development** tools facilitate the creation of user profiles and personas. By integrating persona templates into Moodle, participants can collaboratively define and understand the characteristics, preferences, and needs of target users.
5. An **Idea Box** is a virtual space where participants can submit and share their ideas.
6. Integrating **Image Collage** tools into Moodle allows participants to create collages using images related to their subject. These collages serve as visual inspiration and can spark new creative ideas.
7. **Creative Writing Prompts** can be integrated into Moodle to encourage participants to explore innovation through written expression. Prompts can range from describing imaginary applications to storytelling scenarios that inspire innovative ideas.
8. **Artistic Expression Tools:** Tools for digital drawing, painting, or graphic design can be integrated into Moodle to encourage artistic expression. Participants can create digital artwork or sketches to visualize their creative ideas and concepts.
9. Integrating **Virtual Design Exhibition** features into Moodle allows participants to showcase their innovative projects in an immersive and interactive online environment. This fosters creativity, encourages feedback, and inspires further innovative thinking.
10. Moodle can incorporate tools for participants to create and share **Video Presentations**. Video presentations enable learners to express their ideas creatively, engage with multimedia content, and communicate their vision effectively.
11. Moodle can include **Creative Challenges** or design briefs that prompt participants to think innovatively and solve specific design problems. These challenges provide a structured framework for creative thinking and encourage participants to explore unconventional solutions.



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12. Moodle can further integrate **Virtual Collaboration Spaces**, such as virtual reality or augmented reality environments, where participants can engage in immersive and interactive collaboration. These spaces provide a unique and inspiring context for creativity and ideation.
13. **Storyboarding** tools support the creation of visual narratives and scenarios. Integrating storyboard templates into Moodle allows for collaborative storytelling, enabling participants to explore innovative concepts in a narrative format.
14. **Value Proposition Canvas** tools assist in identifying and articulating the value that innovative solutions offer to end-users. By integrating value proposition canvas templates into Moodle, participants can collaboratively define the unique value propositions of their designs.
15. Tools for conducting **Design Critiques** and **Peer Feedback** sessions can also be integrated into the Moodle platform. Participants can engage in structured discussions, provide constructive criticism, and offer suggestions for improvements collaboratively.
16. **Design Sprint** frameworks provide a structured approach to solving complex problems and rapidly prototyping solutions. Moodle can integrate design sprint methodologies and templates, guiding participants through the various stages of a sprint to drive textile innovation.



6 Further Reading

For a better understanding of the utility and importance of using creative methods and tool in educational and professional context, a brief selection of the relevant literature is presented hereby:

A. Design Thinking Methodology

- Bender-Salazar, R. Design thinking as an effective method for problem-setting and needfinding for entrepreneurial teams addressing wicked problems. *J Innov Entrep* **12**, 24 (2023). <https://doi.org/10.1186/s13731-023-00291-2>

Download link: <https://rdcu.be/deBgL>



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- Waidelich, Lukas & Richter, Alexander & Koelmel, Bernhard & Bulander, Rebecca. (2018). Design Thinking Process Model Review. 1-9. <https://doi.org/10.1109/ICE.2018.8436281>

Available through:

https://www.researchgate.net/publication/327065514_Design_Thinking_Process_Model_Review

- Rösch, N., Tiberius, V. and Kraus, S. (2023), "Design thinking for innovation: context factors, process, and outcomes", European Journal of Innovation Management, Vol. 26 No. 7, pp. 160-176. <https://doi.org/10.1108/EJIM-03-2022-0164>

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B. Co-design

- Villatoro, Sofía & Benito, Bárbara. (2021). An Approach to Co-Design and Self-Regulated Learning in Technological Environments. Systematic Review. Journal of New Approaches in Educational Research. <https://doi.org/10.7821/naer.2021.7.646>

Click on DOI to download.

- Dollinger, M., Liu, D., Arthars, N., & Lodge, J. (2019). Working Together in Learning Analytics Towards the Co-Creation of Value. *Journal of Learning Analytics*, 6(2), 10–26. <https://doi.org/10.18608/jla.2019.62.2>

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- Wang, Z., Jiang, T., Huang, J., Tai, Y., and Trapani, P.M. (2022) How might we evaluate co-design? A literature review on existing practices, in Lockton, D., Lenzi, S., Hekkert, P., Oak, A., Sádaba, J., Lloyd, P. (eds.), DRS2022: Bilbao, 25 June - 3 July, Bilbao, Spain. <https://doi.org/10.21606/drs.2022.774>

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- Francés Morcillo, L.; Morer-Camo, P.; Isabel Rodriguez Ferradas, M.; Cazón Martín, A. The Wearable Co-Design Domino: A User-Centered Methodology to Co-Design and Co-Evaluate Wearables. *Sensors* **2020**, 20, 2934. <https://doi.org/10.3390/s20102934>

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- Akhtar, W.H.; Watanabe, C.; Tou, Y.; Neittaanmäki, P. A New Perspective on the Textile and Apparel Industry in the Digital Transformation Era. *Textiles* **2022**, *2*, 633-656. <https://doi.org/10.3390/textiles2040037>

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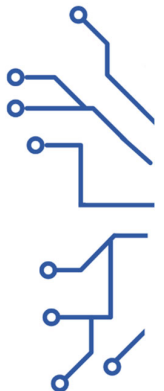
- Zhang G, Shi Y, Gale C. Co-design: a novel approach to create value-added products in the creative fashion industry. *J Textile Eng Fashion Technol.* 2021;7(4):134-141. <https://doi.org/10.15406/jteft.2021.07.00280>

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7 Annexes

- 7.1.1 Annex I: English Toolkit
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