# Design thinking, creative thinking, critical thinking,

**art thinking:** applying a Design Led Innovation approach to the advanced textiles sector.





Open educational resource developed by:







## Introduction



The term design has broaden its meaning during the last years. Design can be used to describe a holistic and multi-disciplinary problem-solving approach that takes user needs, desires, and capabilities as its starting point and focus.

This multi-disciplinary approach become fundamental in a sector as that of technical textiles, where the functional aspects are preeminent compared to the aesthetic ones. Textile design is becoming 'smart' with a surge in innovative collaborations.<sup>2</sup>

It leans towards an inherently interdisciplinary methodology, involving two or more fields of study. Collaboration enables development of meaningful relationships, an understanding of each other's language.

Production of technical textiles is a rapidly developing trade in the textile industry, due to availability of the new materials and technologies, for example, high modulus and high tenacity fibres (HMHT), heat-storage and thermo-regulated materials, Phase Change Materials (PCM), Shape Memory Materials (SMM), conductive polymers, micro-capsules and nano-materials.

How Design Thinking Transforms Organisation and Inspire Innovation, Tim Brown – Harper Collins 2009
 Matrixial Narratives of Textile Design, Elaine Igoe – Royal College of Art 2013

# Introduction



Changes being brought to the textile design profession by new smart materials requires that designers think in new ways, embracing these exciting dynamic capabilities, building on the value of collaboration to develop innovative design.<sup>3</sup>

#### Keywords

Design led innovation; Design thinking; Innovation; Critical thinking; Creative thinking; Art thinking; Strategy; Vision; Prototype

## Goals



Design increase quality of goods and services, improve production flexibility and reduce material cost, enhancing the outcomes of numerous innovation activities. Design is an important strategic business resource, helping companies to innovate, differentiate and compete in the global marketplace. It brings a different way of thinking tackling problems to generate novel solutions. The value of design is not just in new products or services, but it go through the entire company's business strategy.

Design Led Innovation further defines the values of design to an organisation. As noted broadly by Verganti (2008) rather than considering design as being solely driven by user needs or technological developments, Design Led Innovation is pushed by a firm's vision about possible new product meanings and languages that could diffuse in society.

Throughout these slides we are going to present a conceptual model and different instruments to explore the worth of adopting a Design Led Innovation approach. This is particularly valuable in the technical textile sector requiring a multidisciplinary perspective, where design has mainly to accomplish with the product functional aspects in different kind of sectors, as for example automotive, construction, wellbeing.

# Learning outcomes

#### Knowledge

- To get knowledge of design led innovation principles;
- To understand the main features of design thinking as a methodology to unlock innovation;
- To understand how creative, critical and art thinking work and their interrelationship with design thinking.

## Skills

- To use design thinking approach to generate innovative solutions;
- To integrate critical and creative thinking in the design thinking approach to foster customer centric solutions;
- To apply different creative thinking techniques;
- To use art thinking approach to generate radical ideas.

#### Competences

- To create a new design / product by applying design led innovation to take weighted decisions and succeed into the market



## **1. Design Led Innovation**

Design driven innovation is a strategy that aims to radically change the emotional and symbolic characteristics of products and services through a deeper understanding of broader changes in society, culture and technology. Design driven innovation is pushed by a firm's vision about possible new product meanings and languages that could diffuse in society.<sup>4</sup> Firms using design driven innovation are competing through products and services that have a radical new meaning: those that convey a completely new reason for customers to buy them.<sup>5</sup>

The design led-innovation framework outlined below, provides a conceptual structure to assist the development of innovation through collaboration across the entire organisation. It integrates the op

external sources.



Figure 1. The Design Led Innovation Framework, Bucolo and Matthews 2011

Desiign, Meaning and Radical Innovation: A Metamodel and a Research Agenda, Roberto Verganti – The Journal of product innovation management 2008
 Mastering Technologies in Design Driven Innovation, dell'Era, Marchesi, Verganti – Research Technology Management 53(2): 12-23



## **1. Design Led Innovation**



#### 1.1 Use design thinking to unlock a company innovation potential

Design can be considered as an innovation catalyst to help firms develop customerinspired innovation to overcome barriers and recognize opportunities within a changing market context. The potential to thinking as a designer, referred to "design thinking" is being recognised as a process to generate new solutions. Design led innovation builds on this theory to internally aligning the solution with the company's strategy, resources and brand.<sup>6</sup> In this perspective design thinking, with his intersections between critical, creative and art thinking, can be seen as an holistic approach contributing to a company design led-innovation.



6. Design and innovation through storytelling, Beckman and Barry – International Journal of innovation Science 2009



Design thinking is a non-linear, iterative process to solve complex problems and to generate innovative solutions,<sup>7</sup> based on a user centred approach with multi-disciplinary teams. Design thinking is a five stage process. These stages are *not* always sequential, and teams often run them in parallel, out of order and repeat them in an iterative way.<sup>8</sup>



7. R. Buchanan, Wicked problems in design thinking, Design Issues, vol. 8, pp. 5-21, 1992.

8. https://www.interaction-design.org

#### 2.1 Process description

Design teams use design thinking to tackle ill-defined/unknown problems because they can reframe these in human-centric ways and focus on what's most important for users. design thinking consists of a flexible sequence of process steps and iteration loops, each including several tools and resulting in different artifacts.

## **Empathise**

## Ideate

Thorough researches gain real insights into users and their needs adopting a user cantered approach. Brainstorm and generate new ides thinking outside the box to create innovative solution to the problem statements.

Personas creation can help to

keep a human cantered vision.

Test the prototype with the end users. The results can be used to redefine the problems and find alternative solutions.

generated ideas.

Test

# Define Nalyse and synthetize observations in core problems.







Figure 2. Three Steps Design Thinking Approach, Tim Browns 2009



#### 2.3 HPI D-School – A Design Thinking process model

There exist different models of the design thinking model. Here we will present the one adopted by HPI School as an example.



Figure 3. Understanding design thinking: A process model based on method engineering: Katja Thoring and Roland M. Muller – International conference of Engineering and product design education, 2011 London



## 2.4 HPI D-School – A Design Thinking process model

Process Step	Goal	How-to	Input	Output
1. Understand	Collect existing	Secondary (desk)	Briefing, media	Collected materials
	information, become	research		printout,
	an expert			documentation
2. Observe	Gather insights	Qualitative Research	Problem definition,	Photographs, videos,
	about user's needs	(interviews,	design challenge,	interview transcripts,
		observation)	questionnaire, the	documents, audio
			subject of the project	recordings, notes
			(specific product or	
			service)	
3.1	Bring every team	Storytelling (verbal	Insights about user's	Written insights and
Storytelling	member on the same	narration/report,	needs (photographs,	sketches on post-it
	level, exchange	concurrent writing	videos, interview	notes
	research results	down by the other	transcripts,	
		team members)	documents, audio	
			recordings, notes,)	
3.2 Clustering	Structure all insights	Grouping of similar	Insights and sketches	Re-arranged
insights		insights, finding	on post-it notes	insights; groups of
		titles for each group		post-it notes
3.3 Synthesis	Condense insights	Clustering, visual	Written insights and	Framework or
	into a visual	alignment of insights	sketches on post-it	persona
	representation, about	in frameworks or as	notes	
	the user's needs,	a user stereotype		
	identifying 'pain			
	points' as room for			
	improvement.			
3.4 Point of	Micro theory about	Searching for	Framework or	Point of View as a
View	user's needs	analogies and	persona	metaphoric user
		metaphors		perspective

Figure 4. The process model based on method engineering: Katja Thoring and Roland M. Muller – 2011 London



## 2.4 HPI D-School – A Design Thinking process model

4.1	Generate	No formal method.	Point of View	Brainstorming
Brainstorming question	brainstorming question that addresses the previously defined problem/user need	everybody suggests a phrased brainstorming question		question, phrased as "How might we"
4.2 Ideation	Generate ideas for possible solutions to the defined problem or needs	Brainstorming, brainwriting, etc.	Brainstorming question, post-it notes	Many ideas written or sketched on post- it notes
4.3 Clustering ideas	Structure all ideas	Grouping of ideas, according to specific criteria (e.g. most useful, most feasible, etc.)	Ideas and sketches on post-it notes	Re-arranged ideas; groups of post-it notes
4.4 Voting	Decide on one idea to develop further	Voting of all team members, stick labels to favorites	All ideas	One idea
5. Prototype	Self-explanatory representation of the concept	Prototyping, modelmaking, role- playing, etc.	Selected idea, tools, materials	Prototype
6. Test	Gather feedback from users and stakeholders about concept and prototype	Show the prototype to potential users and stakeholders; let them work with it, try it out	Prototype, maybe questionnaire	Positive or negative feedback, quotes, documentation of the testing

Figure 4. The process model based on method engineering: Katja Thoring and Roland M. Muller – 2011 London

2.5 The four main models



**Creative Problem Solving** 

It is the most used model. This model involves the understanding of the user's needs assuming a large number of possible solutions to meet them, in order to identify the most effective one.

**Sprit Execution** 

It aims to create a product to be launched on the market, potentially capable of responding to the needs of users, but subject to improvement after analysing the reaction of consumers.

**Creative Confidence** 

It is directly focused on the involvement of people to create and nurture a mentality suitable for facing innovation processes with confidence.

**Innovation of Meaning** 

Companies use this approach to redefine the corporate vision, messages and values related to the products and services they offer.

9. www.zerounoweb.it

# **3. Critical Thinking**



Innovation with design thinking demands critical thinking to understand the assumptions that frame our ideas and shape our design. By blending design thinking with critical thinking we foster innovation that delivers customer-centric solutions.



# **3. Critical Thinking**



Critical Thinking is a part of every stage of the Design Thinking process. Essentially, effective Design Thinking cannot take place in the absence of critical or creative thinking.



Figure 5. Roberts, Addoe-Kyeremeh and Rezoie (2016) The Open University - www.engagevisually.co.uk

Critical thinking requires some form as well as level of creativity. Critical and creative thinking go hand-in-hand and cannot be separated or distinguished using any formal criteria.





11. CriticalandCreativeThinking.com.au

#### 4.1 Visual Creative Thinking techniques

Creative ideas don't just pop in your head. If you need to come up with innovative ideas, you need to set the circumstances for it to occur or give your brain the right material to work with. There exist some techniques that can be used to come up with creative solutions. Considering their interconnections, these techniques are also useful for stimulate critical thinking

#### **AFFINITY diagram**

This technique helps group the data based on themes. This makes it easier to detect patterns and connections among the information gathered.

**Step 1:** Write down the information gathered from the brainstorming session, research, survey etc. on separate cards

**Step 2:** Review the ideas while looking for similarities or whether they are related to each other in some way. Divide in columns the ideas based on the similarities identified

Step 3: Come up with header names for each of the created group

**Figure 6**. https://creately.com/blog/diagrams/creative-thinking-techniques/





#### 4.1 Visual Creative Thinking techniques

#### **SCAMPER technique**

**SCAMPER** stands for seven thinking approaches:

- **Substitute**: test alternatives, es. part of a product, process, service
- **Combine:** test ways to combine part of different product, process, service etc. to create a new solution
- Adapt : apply a solution that worked well to a different problem
- **Modify:** test if changing different aspects of a product, service (i.e. size, shape) it is possible to add more value
- Put to another use: try to change the purpose of a product
- **Eliminate**: eliminate inefficiency
- **Reverse**: try to change the function of a product, service to see things from a different prospective

#### MOOD board

A mood board is a collection of images, fonts, icons, colours etc. that is representative of a particular theme of style. This technique is strictly used for design process.









Figure 8. https://creately.com/blog/diagrams/creative-thinking-techniques/

#### **4.1 Visual Creative Thinking techniques**

#### Six thinking hats

In this method each hat represents a different perspective. It is used during meetings or brainstorming sessions to allow team members to look at different solutions from different perspectives or thinking "White hat – facts and information Red hat – feelings, intuitions, emotions and hunches Black hat – judgment, legality and morality Yellow hat – optimism, benefits Green hat – new ideas, opportunities Blue hat – conclusions, action plans, next steps



Figure 9. https://creately.com/blog/diagrams/creative-thinking-techniques/



## 5. Art Thinking

In *Art Thinking*, we are looking from the point of view of the artist — meaning the person *creating* value and taking risks to put something out into the world,13 as new product/services not replicating the old ones. By placing the consumer at the very heart of the innovation process, Design Thinking can often lead to more incremental, rather than radical ideas.14 The two approaches are highly compatible, but art thinking stakes out more space for the unknown, the untested, and the not yet commercialized.



12. Art Thinking or The Importance of Inventing Point B – Tim Leberecht, 2016 - https://medium.com/

From Design Thinking to Art Thinking with an Open Innovation Perspective, Peter Robins, Journal of open innovation – Technology, Market and Complexity 2018
 Whitaker, A. Art Thinking—How to Carve Out Creative Space in a World of Schedules, Budgets and Bosses, 1st ed.; Harper Collins: New York, NY, USA, 2016.



## 5. Art Thinking

#### 5.1 Process description

Art Thinking is an approach focused on enabling individuals to conceptualize their own vision, deriving its essence from the techniques of visual thinking and prototyping, both of which are core to Design Thinking. There are four key steps to Art Thinking that are part of an iterative process and are repeated.



15. Mind-set and skills to navigate through today's dynamic and uncertain world, Kyoto University of Art and Design, Kunitake Saso 2017



## 5. Art Thinking



#### 5.2 Transfer cognitive strategy of artists in the design processes

Art Thinking is a way of thinking that uncovers opportunities from exploration of other disciplines by having non-artists adopt artists' thinking. It is a process for discovering real issues free from preconceived notions and habits through the issue awareness and future society visions. There are some domain-dominant cognitive strategies of artists that designers can employ to develop creative ideas and innovative solutions, that are used in the previous steps.

#### **Metacognition** Assess successful solutions

against the artist's conception of the problem moving then in the external point of views.

#### **Prolonged research**

Become expert in the domain of interest. This aspect can call for less goaloriented work and provide more room to explore paths that might not lead to fruition.

## Problems creating

Focus on self-generated problems: find the right problem before the right solution. Problem-finding is an ongoing process in art thinking, applied also to the solution developed.

#### **Generators of constraints**

Constantly work on themes or threads of thoughts across multiple projects at once leading to new points of view. Constraints function as a guiding framework (i.e. Budget, project needs and so on)

#### Resource bank

Reflect on the information streaming from internal and external environments: i.e. recording sensory information from a range of sources including personal thoughts, sketches, news, music, film, independent research, and so on.

16. Intersections in Design Thinking and Art Thinking: Towards Interdisciplinary Innovation, Jessica Jacobs – Sciendo, Creativity - Theories, Researche, Application Vol5 Issue 1 2018

## 6. Design requirements for technical textiles

The innovations in textile materials have opened a range of possibilities for the engineers and designers to explore a wide range of technical products, such as in textile composites for aerospace, marine, medical applications, defense, geotextiles, filtration, ballistic-proof etc. Technical textile design innovation not only needs to adapting to new technologies, but also to fulfil market needs, addressing customer needs; performance, quality, ergonomics. form and aesthetics in addition to economic aspects. Meanwhile, the complexity of technical textile design, is the merging of different materials in the same design; fibers, resins, ceramics, metals etc. having different properties and characteristics constituting a design challenge on the way of altering the conventional application of textiles.<sup>17</sup>



Figure 10. Technical textile design spectrum



materials

17. Journal of textile science & engineering – Design and Methodologies for Technical Textiles - Khalifa, J Textile Sci Eng 2013, 3:4



## 6. Design requirements for technical textiles

#### 6.1 Design model

Technical textile design is a structured engineered creative process where one of the major challenges is the compromise of all needs, parameters, and requirements in a design that fulfill the purpose. Therefore establishing a design matrix, addressing all requirements will be fundamental: assigning the design goals, functions and requirements, which then are translated into properties and performance needs, upon which designers begin setting design elements (materials, structures, techniques, production process) passing through a creative process where in many cases it is addressed as tailored design (upon needs for special applications). 17





17. Journal of textile science & engineering – Design and Methodologies for Technical Textiles - Khalifa, J Textile Sci Eng 2013, 3:4

## Conclusions



Designing technical textiles involves a concern with the construction of different materials, and this construction in-turn provides designers with the aesthetic and functional properties to create a new material with unique qualities for areas like interior, automotive, architecture (construction industry), health and wellbeing.

The ability to create a material with inbuilt structural, performative, functional and aesthetic qualities assumes a design collaborative approach.

A designer starts by thinking about the concept and context of the problem first, then by proposing a solution, transforming the initial idea into a final design. We can distinguish two different type of innovations; incremental and radical.

Activities which may relate to incremental change include: product feature change to achieve cost efficiencies; feature additional when a new technology is adopted; and positioning of the product / service through company branding. Within the radical innovation spectrum, a company may adopt a process change, a disruptive technology and it may look to new markets and customers for growth opportunities through new products and services.

## Conclusions



Design Led Innovation is broadly defined as a method which allows a company to consider and evaluate radically new propositions from multiple perspectives, typically spanning user needs, business requirements and technology demands. The final design solution is not presented as an artefact in isolation, but as an integrated product and service concept which anticipates future user needs, builds future proposals and encourages feedback.

In the course of these slides we proposed an approach to Design Led Innovation that combines different type of methodologies, specifically design, critical, creative and art thinking, that can constitute a comprehensive strategy to innovation.



Visit http://destexproject.eu/ to see the rest of the intellectual outputs of the project



#### Disclaimer:

The European Commission support for the production of this report does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

#### Acknowledgement:

DESTEX project (INDUSTRIAL AND CREATIVE DESIGN IN ADVANCED TEXTILE MANUFACTURING; project reference number 2019-1-SE01-KA203-060379) is co-funded by the Erasmus+ programme of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

